Infection Control for Instruments

by ShelB Rindahl

with Laurel Partin
& Christina Colston

hosted by EASTMAN

Acknowledgements & Disclaimer

Most heartfelt thanks to:

Eastman Music Company, for hosting the introductory video series, for graphic design support, and for housing the literature online, in perpetuity, for free public use. Without Eastman, ICI would not have been as inclusive or as accessible to all those who need it. Key members of Eastman's team were Meagan Dolce, who hosted the webinars and managed the web migration, as well as Chad Archibald, Abigail Brooks, and Beau Foster, who built the online resources and provided graphic design support.

The National Association of Professional Band Instrument Repair Technicians (NAPBIRT), for the platform that first shared ICI, and for their long-time commitment to the professional development of instrument repairers, including the creator of ICI and all of its contributors. Without NAPBIRT, and the strong mentorship of its members, ICI would not have been inspired or developed in this way.

Our test readers, Christina Colston, Meagan Dolce, Jessica Ganska, Kim Jurens, Reese Mandeville, Yvonne Rodriguez, and Steven Thompson, who suffered long hours and many revisions to make sense of our translations.

Our families, friends, and colleagues, who made suggestions for content or organization, and who offered tremendous strength and tireless support along the way.

Disclaimer:

Infection Control for Instruments (ICI) is offered in good faith, but reader and user discretion are advised. The ICI team, our hosts, and our presenters, do not assume liability for decisions or actions of readers and users. ICI is not written or approved by licensed medical practitioners or infection control specialists and is not peer-reviewed.

ICI purposely uses only publicly accessible resources to support shared data, perspectives, and statements, so readers and users can verify information or learn more.

The Answer Guide, with suggested grading and commentary, for the Test Your Knowledge and Apply Your Knowledge sections is restricted to verified repair school instructors to preserve their use of the activity.

AS OF 01.21.21

1

Introduction

This unit should help you get your bearings. It contains our acknowledgements, introduction, abbreviated flyer, ways to access content efficiently, and our call to action.

Every unit in this presentation has a unit title box, like this one, to help you choose which areas matter most to you.

Introducing ICI

Microbes are essential to life on Earth and part of the human experience, but they also cause more human deaths than accidents, diabetes, or cancer [WHO, 2018]. 99% of those infectious germs may be spread by our hands [USChemical, 2016]. ***Infection Control (IC)*** is healthcare's attempt to fight that with hygiene and risk mitigation. Since professional hygiene pairs personal hygiene with occupational safety, gaps in hygiene education risks more than unnecessary suffering from preventable infections. They can leave some workers without the foundation upon which IC stands, as layered strategy.

Infection Control for Instruments (ICI) was created by repairers with unusual cross-training in IC, clinical laboratory science, healthcare management, professional curriculum design, and music education. This unique combination helped translate IC concepts to the work of instrument handlers, to help them manage infectious risks for themselves and their clients with more confidence. Eastman Music Company joined the effort with an introductory series of recorded webinars, graphic design support, and free web hosting in perpetuity.

ICI's Contents are very inclusive. The series begins with overviews of microbes, infectious disease, and immune response. Then, Personal and Instrumental Hygiene (PIH) reviews wellness habits for players. Professional Hygiene adds workplace safety and risk management. IC is introduced, from history to regulatory agencies. Standard and Transmission-Based-Precautions are explained, including the Rational Approach to Disinfection. These concepts are then applied to instrument handling. Relevance of pathogens on instruments is explained through four perspectives, and active responses are discussed according to the gear's the contact type, shared status, and frequency of touch. The prime directive in ICI is made clear. The Table of Relevant Instrumental Pathogens (TRIP) offers a snapshot of germs likely to matter most and how long they might last. Examples of Standards and TBPs in instrument handling show they're already in place.

Commentaries about negligence, reliable resources, and safety manuals support program and business managers who are writing policies. Case stories put the reader at the repair bench to see ICI in action. Brainstormed ideas from allied professionals are offered so no one has to begin the process of thinking through ICI in their roles and workspaces alone. This presentation closes with the answered questions from previous discussions, and an exercise to Test & Apply Your Knowledge. Answer questions, fill in any gaps, and create a sanitary cleaning procedure and instrument care guide. The Answer Guide is restricted to BIR School instructors, but ICI believes readers should be able to grade themselves, based on searched answers and their own confidence. References for both the text and the TRIP are extensive because ICI used only publicly accessible sources, with full links provided to support further study for all.

Everybody is different. ICI supports sanitary experiences for players and safer microbe management for handlers. These are a diverse bunch to gather tools for. Some already know about microbes and hygiene, and already have instrument care guides. Some want to know more, but don't handle instruments for others. Unit title boxes describe each unit so readers can choose which sections matter to them.

ICI isn't really about instruments. It's about wellness advocacy for those who handle instruments and gear, and those who love them. The power of microbial management is literally in their hands, and is not complicated or costly. It's about understanding, not buying.

~ICI is free for everyone and does not sell or promote any products.

Finding ICI Online

Eastman Music Company hosts ICI as a free e-book to support the whole music community. Their amazing graphics team also crafted display-friendly and printable promotional and educational materials.

Visit Eastman Music Company online at www.eastmanmusiccompany.com/infection-control-for-instruments for the latest version and direct all clients and customers there so they can get what they need, while you get back to doing what you do best.

3 Ways to Access This Content

1. Browse it:

Lightly: Read just the table of contents and the unit title boxes to see what sounds interesting. The title page of each unit tells you what is in it and how it flows, so you can choose only the content that matters to you. *We won't be offended if it's not your thing*.

Moderately: Read *also* the glossary and the Case Stories. If nothing here seems new, you've probably already had IC training elsewhere. Test & Apply Your Knowledge, and fill in any gaps.

Heavily: Read *also* the first section of unit. Early units were written as summary overviews, followed by expanded content. The later units, written in series and concept clusters, are really only needed by professionals who deal with them.

2. Find Your Role:

Players, Parents, and Students: Read the first chapter of microbes and the whole unit about hygiene. Make sure you have a care guide for managing *your own* instruments well, since ICI doesn't build each one individually in that way. Test & Apply Your Knowledge, and make your own sanitary cleaning procedure and instrument care guide.

Teachers and Office Workers: Read *also* the unit title boxes, so you know which ones touch your work. Use the content in the hygiene starter guides as fodder for writing your own care guides. We built those for you and for your students. Make sure you understand what ***critical contact type***, ***shared status***, and ***frequency of touch*** really mean. If you are in charge of music programs, read "Resources Matter" and the first chapters of "Thinking Through." If you work in an office, add "Offices and Stores."

Education Administrators: Read *also* the unit about Business and Policy. If you are responsible for making disinfection choices, read that too. In cases of conflict, do as local your leadership instructs. Our way is not the only good way.

Makers and Vendors: Read the first chapter of microbes and the unit about hygiene. Make sure you have care guides for instruments and relevant accessories you make or sell, and that you meet labeling and safety data sheets SDS requirements for chemicals you make or sell.

Repairers and Road-Reps: ICI was first created to support your work, and you'll need most of it. You're the first and nearest resource for client questions. Be ready to answer them.

3. Read it all:

As a project, or a series: The whole thing could be read in one *long* day, or in short sessions for about a week. We were most comfortable with 4 sessions. Charge the gates on the first day, with Microbes and Hygiene. Move through IC and ICI on the second day. Day three covers Disinfection and Business, so it is the heaviest in terminology. Day four is all about application and examples to bring it all together and share real ideas for real people. Finally, Test & Apply Your Knowledge, and build your own cleaning procedure and your own care guide.

As professional training: It is important that repairers and teachers understand the Factors of Risk, Perspectives of Relevance, and C&D Options in Action. It is useful to be able to generate cleaning procedures and care guides, and compassionate to promote better hygiene education for all. It is a *waste* of student training time to memorize germs on chart. ICI encourages closed book *Test (1-60)*, but unlimited time and resource use for the *Application (1-4)* of knowledge.

A Call to Action

Thank you for caring about player wellness. Anyone can make a difference for themselves, and each individual effort also helps others. Here's what ICI asks of you

Adopt the Prime Directive of ICI: ***Keep fomite-mediated germs out of the face or mouth***

Resist the temptation to focus on one fashionable pathogen at a time. Harness the interest in sanitary wellness to make a lasting difference, not just about one germ, now, but about all germs, always.

Print and share the TRIP. It effectively communicates the need for sanitary care in instrument handling (always preserve its citations). ICI content is free for educational and non-compensable use.

Join the conversation about Personal and Instrumental Hygiene. Become part of the effort to make musicians healthier and stronger, with less illness, less tension, and less pain. If you are gifted or trained to write better PIH guides, please help us improve them, and if you've seen really good (and free) care guides, please help promote them.

Normalize the hygiene conversation. Make it easy to talk about basic wellness, especially related to music making. Ask the players and students in your care if they feel confident about Personal and Instrumental Hygiene. If they don't, nothing we do in the shop or classroom will make a lasting difference for them. Teachers and repairers can ask what they do for daily maintenance or review instrument care guides with them. Parents can make sure their players know what to do for their personal hygiene, and that they have care guides for their instruments, and they understand what to do. Any player can be ready for PIH questions, even if it just means knowing where to find answers.

Encourage your maker or vendor to offer care guides for products they make or sell. Reward those that do with your local patronage and your strong promotion.

Keep expectations honest. The goal of effective ICI is a sanitary experience for players and safer interaction for handlers when items are used as intended.

Make and promote sensible decisions about cleaning and disinfection. Know what you're doing, why you're doing it, and how it works. If you're a professional, be able to defend it too.

Use words carefully. The best format for describing unregulated processes used for sanitary services, is [***action***] + [***method***], with ***details*** and ***basis*** on file and on display. *ICI is not a source for basis.* ICI always refers to real IC authorities and agencies, and so must you.

Contact us if a link doesn't work anymore or if you've found updated guidance that supersedes our sources.

Table of Contents

Table of Contents

2

Microbes

Since infection is an invasion of microbes, and that's what we try to manage better with Infection Control, it helps to know what they are, what they do, and how they get around. This unit overviews them, and then lightly discusses each category. There are over 800 references to microbes in ICI.

Intro to Microbes

Microbes are life forms too small to be seen with the naked eye. They're measured in millionths of a millimeter, and over a hundred thousand of them could fit on the end of a single human hair [Piuiu, 2015]. Microbes include bacteria, fungi and algae, protozoa and helminths, and viruses, and they are essential to life on Earth. They break down matter and prepare soil. They make more than half of the oxygen in Earth's atmosphere and most of what fish breathe underwater. Many microbes live within the bodies of other creatures, and can even and help defend them. Some are even used to make medicines [Voss, 2004].

Some microbes can use dormant phases to wait for favorable conditions.Their active state, growing, and multiplying, is called vegetative. When they get too strong, too many, or they cause trouble, we call them germs or pathogens. Their move to new hosts is called *transmission*, and successful establishment is called *infection*. Without transmission, there is no infection or disease, so knowing how they move (and how to block them) gives us the upper hand. This is why germs are often described by their primary transmission routes, but like people, many have

more than one way to get around, and can be described in multiple ways [NIH, 2016].

Blood-borne pathogens are usually transmitted through contact with blood or body fluids, intimate contact, punctures and wounds, or even bites from *vectors* (living organisms) like infected insects and rodents. *Enteric* (intestinal) pathogens are also called fecal-oral germs, because they usually pass through people or animals along the way. Public water sanitation and safe food handling help protect the community from waterborne and foodborne enteric pathogens. *Respiratory* pathogens are usually inhaled with droplets or aerosols. These may be the most common germs spread by hands to the mouth and mucous membranes hands.

Most microbes with known primary routes of transmission can also be delivered to wounds, the mouth, or to mucus membranes on fomites (surfaces that harbor germs) like hands, tools, and instruments [Kraay et. al, 2018]. ***This is why hand hygiene is the best way to prevent the spread of infection*** [CDC, 2016].

Since all people and things are fomites, this is a concern we all share. Relevant Instrumental Pathogens (RIPs) are the local germs most likely to get onto instruments and gear in the course of normal playing, servicing, or handling, and then remain active and infectious on the gear long enough to offer an infectious risk to people. An overview of what kinds of germs may be found on gear, and the risks they bring, is the first step toward sensibly and defensibly managing them.

Before people knew about microbes, they thought sickness was caused by bad luck, bad magic, bad smells, or for no reason at all. They had no idea why grapes became wine, why milk became cheese, or why their wounds got worse [Boundless, 2020]. Now we know that microbes are the cause of all infections and all communicable diseases. Many of them can be managed with good hygiene, so everybody needs to know about germs and how to manage them in their daily lives. Managing microbes on musical instruments or on anything else always begins with being able to manage them for ourselves, our spaces, and our stuff.

Understanding what microbes are and how they move allows us to use strategies to protect others too. Hospitals use a formal approach to manage their germs, called Infection Control. Effective hygiene, whether it's personal, instrumental, professional, or even formal, like IC, always begins with awareness of the microbial world.

Bacteria

Bacteria may be the oldest and longest living organisms on earth [Extreme Science, 2015]. They have only one cell, with no nucleus. All of their inner parts are held together by a cell wall that contains peptidoglycan, a substance that the innate immune systems of all mammals can detect and respond to. Over 30,000 bacteria have been classified so far, and there may be over a billion in the world [Dykhuizen, 2005]. They can be round, long or short, thick or thin, or even curly. Some cluster, while others grow in long chains. Bacteria are classified by their morphology (structure, shape, and arrangement), beginning with whether their cell walls can be stained purple with crystal violet in Gram Stain. This 200-year-old test, named for its inventor, is crucial in bacterial studies [Purcell, 2019]. Gram-positive and Gram-negative bacteria are vulnerable to different things because of major differences in their cell wall thickness and composition [Falk, 2019].

As the first microbes studied, bacteria inspired terminology and methods used in other things. For example, when merchant sailors extended their 30-day harbor wait to 40 days, to prove they didn't carry the plague, they called it a "quarantino." Separation and isolation are still our first line of defense against infection [CDC, 2020], but now we know some germs last longer than others. We still call quarantine, though it isn't always for 40 days anymore [Kramer et al., 2006]. Bacteria reproduce by dividing in half, so one becomes two, 64 becomes 128. E. coli can do that about every 20 seconds, passing 2 million in 7 hours [Microbiology Society, 2019]. Bacteria multiply exponentially until all resources are consumed, and then perish. Doubling time is mathematically predictable, with profound implications for studies about human populations and natural resources.

Bacteria are everywhere, in everything and everyone. In fact, our bodies may contain 10 times as many bacterial cells as human cells [Microbiology Society, 2019]. Most are harmless, and some are even helpful. As part of the human presence, resident flora in our microbiome supports our immunity by competing with others for resources and space. This shuts out transient germs like the microbiomes of others and anything else looking for a way in. Some bacteria even help us digest our food [Shreiner, 2015].

Different hosts or body parts have different normal flora (expected bacteria), and they cause harm when they get too strong or reach vulnerable places. For example, Salmonella is normal in turtles but causes food poisoning in humans [FDA, 2016]. Some bacteria are opportunistic, only able to trouble us when we're weakened, while others are always bad news. For example, the Black Death, one of history's most famous plagues, was spread by Yersinia-infected rats [History.com, 2020]. Botulism is caused by bacteria whose paralytic toxin has even been used as a weapon, but we are more likely to meet its cousin, Tetanus, on contaminated tools or parts. Streptococcus, a common cause of sore throat, can also produce a toxin that damages the heart [CDC, 2020].

Most transient bacteria land on the outer layers of our flesh or supplies, where they can easily be blocked by skin or resident microbes, or be washed away, with soap and clean water before they get to the mouth. On surfaces we touch often, we can also reduce their numbers around us directly, with cleaning and disinfection. Some can resist our efforts by hiding in debris or biofilms, or even make spores to wait out hard times.

We can also combat some kinds of bacteria after they get into the body with antibiotics. Unfortunately, these amazing chemicals were designed to damage or inhibit cells, and they can hurt ours too. They can also decimate our own microbiome, weakening us even more [Modi et al., 2014]. It's better to just keep them out if we can [CDC, 2020].

Fungi and Algae

Fungi are complex, with buds and branches, but lack organelles (little organs) for photosynthesis. Since they don't use light and get nutrients from whatever they grow on, they thrive in dark places. There are around 50,000 types of fungus, including yeasts, molds and mildews, smuts, rusts, and even mushrooms [FDA, 2014]. They can live on land, in water, and in the skin and body cavities of people and animals. Some are beneficial. Molds and mildews can be used to make medicines, dairy products, soy sauce, citric acid, and drink flavorings. We use yeasts to make bread rise. Penicillin, the first antibiotic, was made from mold [PBS, 2013].

Some are even part of our normal microbiome [Purcell, 2019]. They're not always welcome though. Fungi can spoil food and cause infections in soft tissues, especially the lungs. Smuts and rusts usually cause problems for wheat and corn crops [FDA, 2014]. Some kinds of molds can produce harmful toxins, and it's not possible to tell them apart without cultures [OSHA, 2013].

Among millions of classified fungal species, only a few hundred can make people sick. Fungus is usually seen in protected places and their growth on parts or people is opportunistic, taking advantage of a situation [CDC, 2017]. When delivered in high doses or sustained exposures (such as long daily practice sessions) our defenses might not catch them all. Weakened immune systems struggle against them and damaged microbiomes can't compete with them. This is a common cause of yeast infections after antibiotics are taken for bacterial infections. They can also be hard to treat because they're hard to kill and aggressive therapies might harm their hosts too. Some fungi can resist antifungal medications, just like some bacteria can resist antibiotics [CDC, 2020], so it is much better just to keep them out if we can.

Two common and contagious fungal infections, even in healthy people, are Athlete's Foot and Ringworm. Frequently troubling for children and sports, they thrive on dampness, debris, and dust and are easily transmitted on fomites. They can make spores that can wait out hard times, and so treating them can be a real hassle. They can last on surfaces for months, especially in dark or wet areas, like shower and tub floors, and laundry basins. Opportunistic fungal infections can be reduced with hygienic choices like handwashing and keeping the body clean and dry. Using shower shoes in gyms and pool common areas, changing socks daily, as well as cleaning children's shared toys and clothes frequently is important. Washing with soap doesn't kill fungus, but it does help lubricate and wash away dead skin and debris that houses and feeds it. It also helps reduce fungal numbers enough that other germs, like those found in our microbiome, can compete with it [CDC, 2017]. Laundry, especially socks, can grow fungal populations, and shoes worn without socks can hold even more. Since shoes are not washed, and linings aren't changed, fungus can thrive on the dead skin and sweat.

Algae are often presented alongside fungus, but they're not really related. Algae can photosynthesize, so they're almost like plants, but they don't have real roots, leaves, or stems [Vidyasagar, 2016]. What they do have shouldn't be discounted,

as they make half the oxygen in our world. Large algae, like seaweed and kelp, grow underwater forests, while microalgae permeate the lakes and seas. Algae are common to ponds and aquariums, and when nearby human activities offset their nutrient balance, harmful algal blooms pose a health risk for surfers and swimmers [EPA, 2017]. Algae are not limited to wetlands and water. When they grow on tree trunks or wet forest floors, they are sometimes mistaken for fungal molds or mushrooms, or for moss (a plant). Lichens, a partnership between algae and fungus, can also be mistaken for moss or mold.

Fungus and algae often cause problems as cross-contaminants. They can cause problems for hobbyists with wet gear, like scuba divers or musicians, especially when it is stored wet and closed at times. They can also cause illness in pet birds, fish, and reptiles.

Parasites

Parasites are exciting because of their variety of shapes and sizes, and because many of them can move on their own. Microscopic parasites include Protozoa and Helminths. Enteric (intestinal) parasites are found in untreated water, unwashed vegetables, or raw meat and fish, and remain viable on fomites or in soil for months.

Protozoa are single-celled animals. They can store their own nutrients, and some can live on their own as long as they can find food. They're holozoic, meaning they don't absorb and convert nutrients. They eat and digest them [Yaeger, 1996]. Some protozoa use very specific vectors to deliver them. These cause blood infections, like Malaria, that you can't catch from handling instruments. Other protozoa are passed in feces, consumed by other hosts (usually indirectly), and may travel long distances with them. Some, like *Cyclospora* and *Cryptospora*, use cysts (fancy eggs) that are hard to kill and highly infectious, infecting with just one cyst. [Kramer, 2014]. Giardia resists chlorine, causing problems in water treatment facilities [CDC, 2020].

Helminths are worms. They start out tiny, but some get really big. Their eggs are passed to the mouth on dirty hands, or with contaminated food or water. Some can get in through other openings in the body, and a few can crawl right through

our skin. There are over 300 kinds of worms that infect humans, divided into three categories: roundworms, tapeworms, and flukes. Most roundworms and tapeworms live in the intestines, fed and protected by their hosts as they pass eggs in host feces. Flukes also settle into other organs and damage tissues as they eat and grow. Heartworms are roundworms, delivered by mosquitoes. They grow to fatal mass in the hearts of dogs but can't survive long in humans or on instruments.

The most common cause of worm infections in the United States is Enterobius vermicularis, also called pinworms or seat worms. Their eggs can last up to three weeks to be spread on fomites, like the hands and toys of children, or the hands and tools of coworkers. Those battling pinworms are constantly at risk of re-infecting themselves [CDC, 2020].

Ectoparasites like fleas, lice, mosquitos, scabies, and ticks, are actually insects, as are bedbugs and pantry beetles (also known as pad bugs or bow bugs). The microbial influence of these complex organisms is only as eggs or as vectors (living carriers) of other microbes [Anunobi, 2020]. Germs on bugs are still surface germs. Those spread *in* bugs and bug-bites are managed with insect pest controls and the germs die their hosts.

Since parasites aren't all killed by soap, they must be controlled through bioburden reduction to give the body a fighting chance against them. First, water sanitation filters and irradiates drinking water [Scott, 2003]. Then, handwashing with soap and clean water lubes them up and washes them away from us. People who live in regions without public water sanitation are exposed more often, but parasitic infection remains a problem in well-developed communities too [CDC, 2020].

Parasites are among the microbes most resistant to germicidal treatment, so methods are more aggressive. Their disinfectants often take more time and use doses more harmful to humans. Many of those chemicals would be too toxic to drink. For that reason, parasite control inspired many of the early studies about UV as a germicidal treatment. While radiation doesn't kill or stop everything, and has risks of its own, the data from those studies now informs the next steps in research [Scott, 2003].

Viruses

Viruses are the group of organisms with the greatest genetic diversity on Earth. The number of viruses is simply staggering. There are more than 1030 bacteriophages in the world's waters alone, which would stretch out 100 million light years if laid end to end. That makes more viruses than known stars and more biomass in aquatic phages alone than the biomass of all the elephants in the world. Viruses are small, but there is a large range in sizes and structures, such as viroids which have simply one naked viral RNA (vRNA) molecule or Megavirus (yes, that is its real name) with 1,120 protein-coding genes [Racaniello, 2020]. The disease caused, genome type, and structure were historically used to identify and classify viruses. Contemporary virus classification is enhanced with phylogeny, modeling the relatedness of species using their genetic sequences along with other characteristics.

The known virome of Earth outnumbers bacteria by at least 10:1 and is so vast and so diverse that for any one thing we think we know about viruses, there are whole clades (branches or groupings that include a single common ancestor and all of its descendants) that break that rule. Further, top virologists estimate that there are far more than 100 million viruses yet to be identified, so Virology is a burgeoning and exciting field of study [Racaniello, 2004]. There are many characteristic trends within a Genus or Family of viruses which can drive the questions we ask and research. Yet, the immense diversity of the viral world means we need to have well-supported, peer-reviewed, experimental evidence before we can make any claims about any novel virus. We care about viruses because they outnumber cellular life, drive global biogeochemical changes, can be beneficial, and are sources of existing and new viral diseases.

There are things that known viruses have in common. They have either RNA or DNA as their genetic material and are obligate intracellular parasites, which means that they can only be active inside a cell and are dormant otherwise. They infect something living, often producing up to tens of thousands of infectious viral particles (virions) in the course of an infection. They also require the raw materials and machinery of the host cell to replicate. Viruses (nearly) all have structures which can be made up of proteins (capsid), a lipid bilayer membrane, or a combination of these. All living things are infected with viruses giving each species and organism

their own set of viruses. Humans, chile pepper plants, cabbage moth caterpillars, and even bacteria and mitochondria each have their own extensive microvirome. A human has multiple different viruses concurrently in all the tissues throughout their body. Yet only a small handful of the staggering number of viruses are pathogenic to humans. These wondrous varieties share the existence and influence of every organism and viruses dynamically interact with one another and the rest of the microbiome to shape the health and immunity of the host [Cadwell, 2015].

For an infection cycle to occur viruses need a cell which is both susceptible (has a functional receptor for the specific virus) and permissive (has the capacity to replicate the virus). A complete infection cycle might be quite complex. Generally a sufficient number of infectious viral particles need to reach the cell after evading or disrupting system-level host defenses, attach to a cell receptor with preferred binding and initiate successful entry into the cell, utilize host cell raw materials and machinery to release and replicate viral genome and viral proteins, evade or disrupt cell-level host defenses, attain production of new and fully assembled infectious viral particles, successfully exit the cell intact, be transported to exit the host body, transmit to a new host, and cause a new infection. As with so much of the viral universe, infection cycles vary between viruses, sometimes drastically. Each of the details, such as which receptor and assembly mechanisms, depend on the specific virus. Disruption of any of these steps can stop the infection cycle, leaving naked genomic material and compromised or partial viral particles present in the host organism. The presence of viral genome does not always indicate the presence of infectious particles. This means that, for enveloped RNA viruses, viral RNA (vRNA) alone is not infectious virus [Racaniello, 2004]. Viral infections can be stopped before they start if the target receptors are simply not accessible to the infective virion. This can be done by keeping viral particles from reaching the cell surface, which is why physical barriers and behaviors like washing your hands and avoiding touching your face work to break the chain of infection for many viruses.

The ecological success of a virus (the biological win of producing viable progeny that successfully infect new hosts) hinges on a sufficient number of virions finding the right cell receptor for cell entry, fidelity (how few mistakes are made in replication/assembly/release), and how effectively they transmit to and infect the next host. Additional factors like mode of transmission, portal of entry, severity and timing of disease, viral interaction with host defenses (physical and

immunological), incubation period, latency (dormancy inside the host), target cells and tissues, promiscuity (level of success in multiple host species), timing and amount of viral shedding, and stability in the environment outside of host cells all influence viral success. Viruses range wildly in how many viable particles they produce during an infection cycle, ranging from 1 viable in every 35 for Influenza to 1 in 30-1,000 for poliovirus. The viral load needed to initiate an infection and the timing of viral shedding also vary. Incubation periods can vary significantly (1 day for Influenza; 100 days for papilloma; up to 10 years for HIV). Many viral diseases also have inapparent or subclinical infections, where the host shows no outward sign of infection or disease, yet the host can still be shedding large viral loads to the environment. For example, during the Polio epidemic, 95% of those infected were asymptomatic and still spreading the infection [Mehndiratta et al., 2014]. The keystone to most biologically successful viruses is that they are well-adapted to their hosts, replicating enough to spread to new hosts but not causing so much damage that the host stops interacting with others, preventing transmission. All of these aspects contribute to the virulence (ability to cause disease or degree of pathogenicity) and vary broadly between virus types. Focusing on these details helps us understand how to disrupt infections and outbreaks.

Virus-host relationships are symbiotic and can be mutualistic (beneficial to both), commensal (no apparent effect), or antagonistic (harmful to host). Little is known of the benefits of non-pathogenic human-viral infections, but there are many examples of a virus giving a leg-up to the host. For example, there is a parasitoid wasp which can be infected with a Polydnavirus. The infected eggs are injected into a caterpillar as a growth host. Then, the virus from the infected eggs disables specific immune signaling pathways in the caterpillar. The wasp gets prolonged protection of its larval offspring (win), the virus gets to replicate in both hosts (win), and the growth host dies a zombie (not a win). In another example, Sin Nombre Virus infects deer mice as the primary reservoir host. The infected deer mice do not show signs of disease, but other rodent competitors for food and water resources do, so both the virus and the deer mice benefit. There are even plant viruses that make the host plant more drought tolerant. Beneficial symbiosis examples like these are found throughout Earth's microvirome [Roossinck, 2011].

Viral infections can also be antagonistic or pathogenic in the host organism, as was apparent in 2020 as the world negotiated a pandemic of an emerging viral

pathogen. The outbreak that led to the pandemic started as a zoonotic spillover event (an animal host to human outbreak). Virologists and infectious disease specialists agree that this will not be the last outbreak from a viral zoonotic spillover event. SARS-CoV-2, that virus that causes COVID-19 (**Co**rona**vi**rus **D**isease 2019), is a bat Coronavirus that became a human pathogen when it took hold in the human population across the globe. This highly contagious respiratory virus causes disease with severity of symptoms ranging from subclinical (sometimes referred to as asymptomatic) and mild illness to severe and potentially fatal illness, including acute respiratory distress syndrome (ARDS) and significant blood clotting concerns. Even in mild and subclinical cases there is mounting evidence of secondary and chronic problems after recovering from the primary symptoms of the disease. Respiratory viruses, including SARS-CoV-2, may be inhaled with droplets and aerosols or enter through the mucous membranes in the nose, mouth, and tear ducts. We still have much to learn about this viral pathogen, even after a surge of publications. The scientific process takes time because it requires multiple rounds of peer-reviews, collaboration before and after publication, and sufficient evidence to support a hypothesis or model. We do know that SARS-CoV-2 is an enveloped RNA virus with a spike glycoprotein embedded in the lipid membrane, with a handful of other structural and functional proteins which gives us clues on how to deactivate it. At the time of this writing, the pandemic continues to significantly impact public health and continues to evolve. You don't need to become a virologist to follow changes in the CDC/EPA/OSHA guidelines and recommendations, and the CDC has resources dedicated to Coronavirus Disease 2019 which is updated as the situation evolves [CDC, 2020]. The pandemic has shined a light on the potential effects of pathogens, offering a profound opportunity to educate ourselves and our clients and ourselves more safely.

There are other pathogenic viruses that can infect humans and many of them are relevant to musical instrument handlers. Examples include Hepatitis Viruses, Epstein-Barr Virus (EBV), Cytomegalovirus, Influenza A, Influenza B, Herpes Simplex Virus (HSV), Respiratory Syncytial Virus (RSV), Adenov the neurohospitalist viruses, Coronaviruses (MERS, SARS-CoV-1, SARS-CoV-2), HPV, HTLV, Rotavirus, Norovirus, Astrovirus, Varicella-Zoster virus (VZV), Parvovirus B19, Rubella, Measles, Coxsackie A and B, Smallpox, and many more. Some of these viruses can cause viral meningitis including Herpes Viruses (HSV, EBV, VZV), Influenza Viruses, Mumps, Measles, and Non-Polio Enteroviruses like Parvovirus. Reading

this long list of relevant pathogens can make it feel like the sky is falling and that there is no way we can keep a watch for all of them, but these threats do not have to be handled individually. Well-known methods of sanitary hygiene and infection control apply to many of them.

Remember that there is so much variation and diversity in the viral universe that we must be careful not to make presumptions based on generalizations about previously known viruses. Sometimes minimal changes in the viral genome can cause significant changes in infectivity and virulence, while other changes in the genome have no effect. Reliable published studies based on closely related viruses can guide questions and research, but we cannot make claims about the characteristics of a virus until we have evidence to support them. Whether we are focusing on the pathogen of the day or on any of the other known or emerging viruses, awareness gives us knowledge, and knowledge gives us the opportunity to consciously choose how we respond. It is much easier to stop a viral infection before it starts than to treat viral disease. We can do this by avoiding, blocking, or deactivating the viral particles.

The easiest and least inexpensive way to avoid starting a viral infectious cycle is to wait it out. Some viruses will decay naturally in the environment, especially those with RNA genetic material and a lipid envelope. Time periods of stability and viability in the environment vary depending on things like the surface type, environmental factors (temperature, moisture, humidity), and the virus of concern. Some viruses are stable in the environment for less than an hour (Rhinovirus - the Common Cold), while others can be stable for much longer (Parvovirus - stable 6 months on surfaces and up to 1 year in soil).

Another way to stop a virus from causing infection is to keep infectious viral particles from entering a new host organism or host cell. When working with viruses of significant infective concern virologists and clinicians use physical barriers, expensive advanced containment apparati, significant PPE, and even separate isolation facilities for working with viruses - all far beyond the measures that musical instrument handlers require. Physical distancing, proper mask-wearing, and hand hygiene are great examples of ways to inhibit viral particles from reaching new hosts.

We can deactivate viruses by forcing the degradation of the viral proteins, lipid envelope, and/or genetic material with chemicals, harsh environments, or specific temperatures. Lipid envelopes are sensitive to desiccation, degreasing, low-level disinfection, and even washing with soap and clean water, so viruses are often described by whether they have this type of structure. These enveloped viruses often cause serious human infectious diseases, but they also are the easiest viruses to manage on hands and other surfaces before they get into the body. This is important because the diseases caused by pathogenic viruses are usually easier to avoid than they are to treat.

Medical treatment in viral disease usually supports the body with what we know it always needs, like oxygen, fluids, and electrolytes, and what we believe might help it to endure the depletion and damage of battle, like supplements and medications for pain and other symptoms. Some direct antiviral therapies can also help disrupt or slow viral infection cycle processes, like genome replication, giving the body a better opportunity to clear damaged or infected cells. For some viruses, we can even stack the odds in our favor, using vaccination to arm the adaptive immune response against them before we even meet [CPP, 2018].

While it is difficult to treat viral diseases due to the diverse complexity of viral mechanisms, research continues, and it has a far-reaching impact on progress in many arenas of medical science. Early discoveries in virology and communicable diseases laid the foundations of immunology and preventive medicine [Ullman, 2017]. Viruses have also been linked to cancers, including HIV, Human Papilloma Virus (HPV), Epstein Barr Virus (EBV), and Hepatitis C Virus (HCV) [ACS, 2020]. Since viruses and cancers both appear to involve host cells replicating differently, it may be a virologist, searching for ways to reprogram influenced cells, who will one day take the next steps toward curing cancers.

3

Infection, Response, & Prevention

The human body has ways to manage microbes naturally. This unit explains how the body maintains itself, & how the innate and adaptive immune systems respond to irritation and infection.

Then, modern preventive medicine is explained as a holistic effort, where personal wellness and hygiene are as important as medical treatment, and where prevention is better than cure.

Infection and Immune Response

Infection is a successful invasion of pathogens. Microbes are everywhere. In fact, our bodies contain more microbes than human cells. Science is only recently aware of the impact that normal and positive interactions with microbes may have on the human experience. Our microbes are now understood to play a role in our digestion, defense, and perhaps even our genetic identity and predispositions to certain health conditions [Hair & Sharpe, 2014]. When resident microbes get out of hand or transient microbes get in, they cause trouble. We have understood the connection between germs and infection since the 1800's, when Louis Pasteur found they were to blame for his ruined beer. When he proved it, his conclusion changed our understanding of disease forever, *"Life is a germ and a germ is life. Never will the doctrine of spontaneous generation recover from the mortal blow of this simple experiment" [*Dhake, 2017].

Immune response is a combination of natural biochemical responses that don't need to be exercised in order to develop. We perceive the body's defense in two phases or systems we call ***innate*** and ***adaptive***, but they don't take turns. Body

functions are all systems of systems, doing what they do simultaneously. The symptoms of infection or disease, as we describe our experience with them, are the signs of damage done by both the germs themselves and the body's battle with them. As pathogenic populations move and grow, they consume tissue structures and resources. They also produce waste and debris. The body must repair, rebuild, clean up, and filter all that out, using the routine maintenance functions already in place. Normally circulating cells tag and remove tired and damaged cells, including infected cells, and foreign particles. When they don't clear enough (because of an increased burden somewhere), the chemical signs of cell damage reach detectable levels the body responds to. At the same time, other circulating cells detect specific and familiar threats and the body responds to them differently.

The innate system is the body's array of generalized defenses that are *always* working. Barriers and obstacles like skin, saliva, stomach acids, and mucus, constantly block invaders, while the resident microbiome resists transient strangers through competition for resources. Defensive phagocytes (eating-cells) are always on patrol to kill or tag anything that looks foreign, defective, or irritated. Tagged particles or cells are destroyed or dismantled as part of routine maintenance. Accumulations of dead cells, debris, and phagocytes form the material we call pus. The body has ways to collect and remove that too. When the body detects heat, pressure, toxins, or the chemicals signs of damaged, squeezed, or irritated cells, it triggers an inflammatory response. This may raise the local or systemic temperature or change the body pH to make tissue less hospitable, or cause nearby areas to evacuate with coughing, flushing tears, urine, and sweat, or spasmodic vomiting or diarrhea. [Medline Plus Medical Encyclopedia, 2020].

When the body is healthy and strong, it rebuilds and replaces cells and tissues, and filters and eliminates debris and other wastes every day. New skin is constantly in production, pressing out and sloughing off, taking resident microbes and transient germs with it. If resident microbes get out of hand or transient germs overwhelm the body's innate defense, they settle in and multiply. Their populations grow and consume body tissue and resources until they run out of food and die, or until interrupted by the body's second line of defense, the ***adaptive*** immune system, or by medical intervention. The adaptive system only responds to chemical signals and proteins it recognizes. It is also called the acquired system because it learns, and the ability to respond to a recognized threat is called acquired immunity. This

response is powerful and violent, but if the threat is not recognized or learned, the body uses only its innate defenses. The general defense of the innate system is made for maintenance, and resources are limited.

The adaptive system doesn't replace the efforts of the innate system, but joins them [NIAID, 2013]. This happens a lot faster if the threat is recognized, but system is named for its ability to learn new antigens (specific irritating proteins) on or in germs or cells. The adaptive system uses two response pathways, called the ***humoral*** and ***cell-mediated***, and two kinds of lymphocytes, called ***B-cells*** and ***T-cells*** [Khan Academy, 2018 and 2020].

The humoral response uses ***B***-cells (right from the ***b***one marrow) and antibodies (proteins that bind to specific antigens). Naive B-cells circulate with a random surface antibody. When they encounter a perfectly matching antigen, the pairing activates the B-cell to mature and target it. Then they grow very fast and release plasma cells which make even more of that perfectly matched antibody, and memory cells to store the data. A flood of new B-cells and antibodies bind and tag the matching antigens on invaders or infected cells for destruction. The body is constantly producing B-cells and antibodies of known threats and naive B-cells with random receptors, all looking for ruckus. Without B-cells, the body wouldn't learn new threats or know what to kill and remove.

The cell-mediated response uses ***T***-cells (matured in the ***t***hymus). Cytotoxic Killer T-cells directly attack known antigens and infected cells, commanding them to self-destruct, while Helper T-cells call for backup. T-cells know what to attack because of recognized antigens, tags from the B-cells, and chemicals that identify cells as "self' and "non-self" [Khan Academy, 2018 and 2020]. Failure to attack invaders, or an attack on the self is called an altered immune response [Medline Plus, 2020], or auto-immune disorder. If it continues, the outcome can be devastating [Alberts et al., 2009].

Auto-immune disorders may be ***primary***, from genetic deficiencies, or ***secondary***, when they're caused by something else. They can be mild, like seasonal allergies, or severe, like organ rejection or anaphylaxis [Knott, 2015]. Secondary disorders are also called acquired disorders. HIV/AIDS is the Auto-Immune Deficiency Syndrome caused by the Human Immunodeficiency Virus. It binds with T-helper cells and uses them to reproduce, so they never get to call for backup against

the virus or against anything else. Eventually, with no adaptive defenses, the body fails against something the innate system can't fight alone. (HIV can last 7 days on fomites, but it is a blood-borne pathogen. This means it cannot transmit infection *on fomites* unless it meets mucous membranes or broken skin or is placed inside the body by a piercing injury, like a needle. Its example is used here because its name and mechanism illustrate immune response and disorder well.)

B-cells and T-cells drive the adaptive immune response, but they aren't the only cells to display protein antigens on their surfaces. For example, blood types represent the antigens on our red blood cells. Type-A blood cells display A antigens, Type-B have B's, and Type-AB cells display both. Type-O blood is called the "universal donor," because it has no A or B antigens to offend the bodies who need to borrow blood cells. Type-O is given most, and is needed most desperately, but since a blood transfusion is needed every two seconds, in America alone, all donors of all types save lives [SANRC, n.d.].

Just as red cells display their antigens, the B-cells, T-cells, and certain other kinds of tissue cells also display their proteins. Some can also display chemicals of harm and alarm, and the proteins that offend them. Immune response B-cells and T-cells react to those proteins and to special partnered chemicals. That's how they know what does or does not belong in the body. Cells that show what's gotten into them are called Antigen Presenting Cells. APCs are like the neighborhood watch, telling B-cells & T-cells what to look for, so they don't have to find every annoying protein by free circulating circumstance.

APCs are also the key to unlocking and manipulating the adaptive system as part of preventive medicine, when we immunize with vaccines.

The body is constantly renewing its systems, including cells and antibodies. Whether they are always maintained or made on demand, a body's quick recognition and response with them, before the invaders can get out of hand, is called *immunity*. This may be acquired ***naturally*** through fighting real illness, or ***artificially*** from inoculants or vaccines made of weakened, dead, or altered samples. The benefit of B-cell memory and T-cell sensitivity is a much faster response, like printing copies of things you've saved files for already. Less delay means less loss, less collateral damage, and less burden of cleaning up the mess of wars stopped before they started.

Both the battle and the recovery process are supported by wellness habits that provide tools and strength to overcome challenges, and sanitary hygiene habits that reduce the strength and number of battles we have to fight at once. Compromised systems are disadvantaged when recovering from other illnesses and injuries. Mental and physical stress can also weaken body systems and slow recovery, especially when chronic [APA, 2006]. Slow recovery leaves the body weakened longer, even as new threats are encountered in ongoing daily life.

Full recovery means not only clearing invaders, but also rebuilding lost tissues and immune readiness, and a damaged microbiome, especially when antibiotic are used. Immune response to infection is a war, fought by the body, for the right to keep it and use it for the self. It is a violent process. The more cells are infected, the more are destroyed. Resources are not limitless, so we can't fight too many battles at once, and we can't fight a sustained one for too long. When health is weakened or immune response is altered, compromised, or already depleted, these defenses are diminished and the body is more vulnerable to attacks it would otherwise have managed well [Khan Academy, 2018].

Even when everything works, the body doesn't always win, and some germs never leave. They may join the biome, battling for their own place and use of our resources. They may use up too much of us and kill us, or we may seem to recover and then suffer reinfection or resurgence. Some infections clear or become unnoticeable. Others cause chronic flare-ups. Collateral damage from immune defense, removing debris, sustaining functions, and moving fluids and supplies through inflamed and congested systems can leave lasting complications like nerve damage and organ failure. Infectious disease is easier to avoid than overcome, so we try to reduce exposures through hygiene and infection control, and to stack the odds in our favor with vaccines.

Vaccines are an injection of a specific irritant that teaches the body to respond to a specific protein antigen on a particular pathogen. Most are made by growing the real thing and then modifying or killing it so it cannot cause real infections anymore. Unlike bacteria, which can be cultured (isolated, developed, and maintained in purity) on whatever they'll eat, viruses are only ever active inside host cells. This is why virus cultures are so often grown in eggs or egg-substitutes and why many vaccines can't be given to people who are allergic to eggs. Vaccines are only the latest attempt to immunize (make hosts immune, without suffering the

infectious disease). Like viruses, they take advantage of a system already in place in the body.

Inoculation (or variolation), scratching people with infectious material, may have been used as early as 200 BCE in China and India, but it's hard to be sure of the details that long ago. Many historians credit the achievements that came after viruses were discovered, beginning with Edward Jenner. He inoculated people with cowpox in 1796. Humans can't catch cowpox, but the immune system thinks it looks so much like smallpox, that those who were inoculated with cowpox resisted smallpox and lived.

Since then, larger and more precise batches of immunity stimulating proteins have almost eradicated Smallpox and Polio. Advancements in how vaccines are made and preserved, as well as better injection technology, have greatly reduced suffering and death of countless children and adults from Diphtheria, Influenza, Measles, Mumps, Rubella, Rabies, Tetanus, Whooping Cough, and more [CPP, 2018].

Modern Preventative Medicine

Modern preventive medicine broadly includes healthy habits of nutrition, fitness, mental health and spiritual enrichment, wellness checkups, public water sanitation, hygiene, and immunization. These strategies all work together to defend the body from multiple threats to wellness at the same time. From a holistic perspective, missing out on any of them can leave unnecessary gaps in our defensive array. Improved diligence in one area can affect another, such as nutrition influencing fitness and mental health. Focusing on disease transmission, hygiene and Infection Control can reduce problems with more than one pathogen at a time. For example, when measures like hand hygiene and physical distancing were used to combat COVID-19, Strep and Flu infections appeared to go down too, because they're passed around in the same ways.

Modern vaccines can target many strains of a virus at once, and every season, they are customized to prepare us for the latest threats. Predictions are complex, so some people still get sick. Vaccines don't contain infectious agents, but since they

teach the body about an antigen, there is a response to it. This may be mistaken for actual illness. If an infection has already started when a person is vaccinated, the vaccine may be blamed for that too. Vaccines don't cause infections, but they contain protein antigens, and people can react badly to them. Some people are wary of vaccine manufacturing processes or preservatives, so the CDC provides information about vaccine contents.

Vaccines work by stimulating the body's natural responses. When the Body's Antigen Presenting Cells (APCs) show the vaccine's antigen protein to the B-cells and T-cells, the body adapts to make cells and antibodies for it. The body still triggers the collateral inflammation and flushing or other body defenses, but they're discontinued almost immediately because the dose is so tiny, and it doesn't replicate, so there's no further irritation to flush out. The body does not know the attack is only a simulation or why it was such an easy win.

The information is still stored, as if the body had won a battle with it, and the body would be quick to respond if the real thing showed up, so it either wouldn't take hold or wouldn't last as long against us. Some stored antibodies are constantly made. B-cells always circulate with them, and plasma cells constantly produce them, and we can even measure them in blood tests. This is what is meant by blood antibody "titers." Not all antibodies are made constantly. Some are stored and recalled as needed. Some are not stored very well, or the strains just evolve so fast we don't recognize them anymore. Then we don't raise the same kind of quick and powerful response to them. The Flu is a good example of this, which is why we need a new vaccine every season to protect us, as best as we can guess, from the most likely new mutations we'll see.

Pathogens with many strains don't have to take turns presenting them each season, so it's possible to catch the Flu twice in the same season, with different strains. Unrelated germs also don't take turns invading people, so it's possible for a person to catch Chicken Pox, Measles, Flu, and Strep all on the same day. With modern hygiene and vaccination programs, extreme examples like this would be rare indeed.

Nonetheless, concurrent infection does exist and since infection weakens us, "when it rains, it pours." Cancer patients aren't the only people who can be weakened in immune response. Young children, the elderly, and people who have to

take suppression medicines for organ transplants are at risk. Everybody who has recently battled other infections, disorders, exhaustion, illness, stress, or anything else that weakens the body as a system, is vulnerable. Even healthy people can have a microbial bad day, and catching or avoiding one germ one day doesn't safeguard anybody from that and other threats the next day, or forever.

This is why education about germs, hygiene, infection control, and preventive medicine is so important. Ignorance about hygiene leaves people vulnerable to unnecessary suffering.

4

Hygiene

Infection Control is a professional hygiene tool, and all hygiene begins with the care of each person, as a person.

This unit presents hygiene as wellness practices everyone needs and deserves to know about. Personal and Instrumental Hygiene are focused for players, while Professional Hygiene takes all that to work. Starter Guides are offered for all three.

Hygiene is referenced over 300 times in ICI.

Intro to Hygiene & PIH

Hygiene is a group of habits that keep bodies, items, or systems healthy, safe, or sanitary. People have not always known how pivotal cleanliness is to wellness, and so the word is also used to describe habits of clean living, nutrition, sleep, fitness, and for broad social wellness and safety ideas like industrial and cultural hygiene. In every context, hygiene is about people, and studies show a “continued, measurable, positive effect” on infections [Aiello & Larson, 2002].

The most frequent context is cleanliness of our bodies and hands. ***Hand hygiene is the single most effective personal tool against microbial infection.*** Clean hands entering a space like a classroom, store, or gym, reduce incoming microbial litter. Clean hands on the way out leave it all behind. The combined effort by everyone, everywhere, results in fewer burdens for all. When direct cleaning and disinfection are needed, they are easier to accomplish with confidence.

By keeping resident microbiomes managed and transient germs from taking hold, those who practice and promote good hygiene can influence the health of

everyone they touch. A review of what hygiene is and how it applies to our bodies, accessories, spaces, as well as to our interactions with instruments, fills in details for some and makes conversations about Personal and Instrumental Hygiene (PIH) more accessible to others. When that carries over into professional settings, it lays the foundation Infection Control relies on in layering precautions.

Traditions in holistic and lifestyle wellness go back as far as 3000 BC, and focus on disease prevention, attributed to Hippocrates, appeared around 500 BC. The first writings to connect health, nutrition, and fitness appeared in the 1600's, but according to The History of Wellness [GWI, 2010] the real wellness movement in America didn't gain momentum until after 1970. Research for preventive care has been slow because priority and funding follow existing concerns and marketable remedies. Only in recent years has wellness become a commodity in itself, and many levels of supportive care for mind, body, and spirit are still viewed as luxury or pseudoscience. Some health plans sometimes still only cover wellness care for small children. For adolescents and adults, hygiene may only be discussed when problems arise, even though we know hygienic wellness, including good sanitary care, nutrition and healthy activity, can prevent many problems before they start. Preventive Medicine, with concern for whole health promotion, is now recognized as an actual medical specialty [ASCPM, 2019].

When people do talk about hygiene, it's often because poor hygiene has caused health problems, social difficulties, or impaired job opportunities. For example, an online search for it yields 6 Ways to (Tactfully) Bring Up Personal Hygiene [Patterson, 2015]. Positive conversations about prevention are uncommon, and guidance about hygienic practices for everybody can be hard to find. Education about The Importance of Hygiene [Ames, 2020], which considers the care of the body and routines to manage it, still allude to teaching plans for children. Public service literature about hygiene often only addresses care for children, surgical patients or elders.

Some guides also support those teaching in rural or underserved communities. For example, the Australian Government's Department of Health published a personal hygiene education manual to help health workers educate Aboriginal and Torres Strait Islander communities [DOH, 2010]. Disadvantage impairs health opportunity and deprives people of basic human rights, and direct outreach like this is certainly needed to remedy that [WHO, 2017]. Unfortunately, when materials like

these aren't also seen everywhere for everyone else too, it implies that hygiene education is something only needed for certain people. With this as the pervasive social perception, no one wants to bring it up, for fear they might insult someone. What's worse, those who need help may be too afraid to ask questions because they might be seen as dirty, uninformed, or unacceptable people, rather than as people who haven't yet heard the news. Ignorance about hygiene leaves people vulnerable to unnecessary suffering.

In the age of technology, information is more accessible and affordable, and sensitive topics are becoming more approachable than ever. There may be existential argument about what everyone deserves, or if anyone deserves anything [Kashtan, 2013], but one popular view is that people have the right to know what they need to know in order to help themselves. They have the right to try. If that is true, advocacy for sanitary wellness education is part of the fight for basic human rights. For some, this means bringing it to under-served communities. For others, it also means working within their own circles to ensure the next generation doesn't have to wait for sickness, crisis, or social embarrassment to hear about hygiene and health. If hygiene education is available in simple language and is always offered in encouraging and positive ways, these conversations should get easier, and help should get easier to find.

Personal Hygiene (PH) refers to the care of the person's self, spaces, and stuff. It begins with the care of their own body, clothing, and the more immediate possessions they carry, like keys, bags, and instruments. Next, concern expands to include their rooms, homes, and cars, and all the items they own or interact with, i.e. dishes and furniture. Everything they touch or that touches them, and everything within their reach is under the influence of their PH. The whole collection of their presence and influence, microbes and all, moves together through their world experience. ***Hand Hygiene is the one personal habit that makes the biggest difference in the fight against microbial infection*** [CDC, 2016]. Hands should be washed or sanitized frequently, especially after using the restroom or interacting with others, and before preparing food, eating, drinking, or touching the face or mouth. This is the very best way to keep germs out of the body. It's also the best way to keep them out of spaces and situations. Placement matters for stations and supplies too. People are more likely to perform hand hygiene when they don't have to leave a room or travel too far out of their way. Stations near doors and bins are used

most, and they reduce germs coming in, protecting people and gear inside, and reduce germs going out too.

Personal wellness endeavors can be described in terms of hygiene too, like sleep hygiene [NSF, 2019] or clutter-free housekeeping [Picard & Garrity, 2020]. Many self-help resources already address spaces and endeavors, so the gap often lies at the basic foundation, individual sanitary care of the body. Since personal hygiene is then applied in all endeavors and spaces, a lacking PH education could be a critical failure. If so, free access to basic body-care guidance for everybody would grant equal access to optimal outcomes of consistent informed sanitary care.

While generic wellness guidance remains difficult to find, the recommendations for popular medical problems can be a great resource. For example, foot care tips that help prevent and manage problems with MRSA, fungal infections, or diabetes, can also support people whose sports and hobbies involve marching and running. Basic care that keeps people clean and healthy with special needs often applies to everybody else too. However, it is also possible to do too much of a good thing, and aggressive care for special situations can be more than wasteful. Over-scrubbing or harsh chemicals may damage skin. Aggressive scrubbing and splashing can also aerosolize microbes and spread them around onto other things [Larsen, 1999]. This is an excellent example of why real understanding is better than to-do lists, so people can protect and care for their bodies with habits that evolve as needed in new places and changing times.

All PH needs to be in place before it can be applied to other concerns, because all areas of hygiene begin with the care of the person, and when focusing on their spaces and their stuff, that person still wields the biggest influence. The combined PH of people everywhere affects the environment and experience they share. PH is presumed when adding focus on endeavors like Instrumental Hygiene or adding layers of Occupational Safety in Professional Hygiene. Formal strategies, like Infection Control, rely heavily on PH, and especially Hand Hygiene (HH) as a Standard and Universal Precaution. *Without a strong foundation in Personal Hygiene, trying to add Infection Control Precautions is like spreading frosting onto a cake-less plate.*

Instrumental Hygiene (IH) addresses the cleanliness of gear and all the personal and professional habits that help players interact with their instruments in healthy ways. IH applies to player and then to ensemble, in the same way that PH applied

to professional hygiene. That starts with ***Hand hygiene (HH) the best way to keep germs out of the body***. Hands should be washed or sanitized frequently, especially after using the restroom or interacting with others, and before preparing food, eating, drinking, touching the face and mouth, and ***before and after handling instruments and accessories.*** In groups, that means before setup or strike, to minimize burden on gear, and after rehearsals, to leave what's there behind. Musical instruments are often the dearest possessions of players, embraced for hours a day, perhaps for life. Most have bodies and some have names, but IH really isn't about the instruments themselves. It's about protecting those who interact with them.

At home and at school, IH includes cleaning mouthpieces, swabbing bores, venting cases, wiping strings, and all the things players do to keep their instruments clean and working well. It also includes habits to keep them safe, like storing them in cases properly, without loose items banging into them or sheet-music crushing them. It also means *not* leaving them on chairs to be sat upon. IH includes the safe and sanitary habits of players with their own gear, and the health safety of those helping others. This means players need to know how to take care of their own instrument and accessories, and how to stay safe and healthy while helping others.

Instrumental Hygiene, as a holistic perspective, also includes any instrumental comfort and posture concerns. Sometimes the gear, the setup, or how we interact with it all, introduces friction or poor economies of motion that can affect performance or progress. It can also cause tension, pain, and repetitive stress injuries. For heavy instruments or those that cause one to sit in awkward or uncomfortable positions, players need to know if there are available ergonomic comfort accessories. For example, shoulder rests for upper strings, longer pins for basses and cellos, support stands for large brass, thumb cushions and adaptors for clarinets, palm risers for saxophones, and hand guards for trumpets, can make the difference between practicing and performing with or without pain. Not every problem can be blamed on the gear and setup. Every player is different, and so are their body-to-instrument interactions, so players need wise and watchful teachers and mentors to help them avoid pitfalls.

Personal and Instrumental Hygiene (PIH) is the combination of all PH and IH concerns. It includes all habits of wellness for the player, healthy interactions of that player with their instrument, and the routine care of their instrument for best

function. Some ignore it for fear of awkward conversations, overestimated cost, underestimated need, and the assumption (or hope) others will address it. Parents may assume teachers will go over everything related to class gear, while teachers expect parents to figure out the needs for their children in all their endeavors. Repairers and vendors may defer to each other for care guides or for cleaning and maintenance instructions to avoid liabilities. In the end, some players don't get the help they need until after they suffer preventable harm. Instrument handlers have a gatekeeping opportunity to assist the players in their care even if this means referring them to reliable literature. Since playing involves body contact with instruments, PIH education literature or access to resource links, offered with all sales, services, and first lessons, would protect and empower the real makers of music and our highest instrumental priority, the players.

One solution would be a paired presentation of guides to personal wellness*, like ICI's PIH Starter Guides,* promoting hygiene practices consistent with recommendations from IC agencies, paired with the *instrument specific care guides* written by makers of instrumental products. With both accessible, putting them into the hands of musicians would be simple. When instrument care guides are not available, mentors may need to help players build them for themselves, with alternative recommended literature or discussion in lessons.

Materials from makers and vendors are sorely needed. No one knows their product components, surfaces, vulnerabilities, or needs better than they do. The very best individual instrument care guides would come from makers and then be shared by vendors and service providers who know the needs of their individual clients and their gear. Makers and vendors only need to address the hygienic concerns of the products they actually make or sell, and fully printed guides are not needed if their promotion or labeling refers to available resources. The goal is to ensure their players have access to what they need, not that there's a book in every case. A company webpage with brief notes about group of products that can simply be washed or wiped with a suggested common product would address many at once.

Availability of product support, in repair parts and in clear instructions for use and care, is also a quality measure for modern consumers. Service professionals always check first for manufacturer specifications, and then must find comparable resources, or reengineer parts and solutions when those don't exist. This can be

laborious, and labor is costly, so professionals and consumers seek and recommend products with support. Makers and vendors who understand that offer resources for all of the instruments and accessories they are most proud of.

These describe how the items should be cleaned and how often, and they may recommend products for use in those steps. This way, players know what to do every day they play, or every month, week, or when something is sticky. Although there is an expected variance in how long things will last between people, an estimate of how often a service visit may be needed would really help players to plan for routine service, adjustment, cleaning, and replacement of consumables. For example, "your violin bow's hair might need to be replaced after 800 hours of play, 6 months for professionals, or a year or two for students." If scheduled service isn't common, then they need to know what problems to watch out for instead. It would also help to know if gear is meant to be disposable. For example, some swabs or cloths can be washed frequently, while others are meant to be replaced. Likewise, some entry level violin bows are not meant to be re-haired, and some are meant to participate in school exchange programs. Knowing that kelps them choose the right product, keep it well, and save for upgrade.

Guides should also note any special consideration for long term storage, such as whether a brass instrument should be stored with oiled or dry slides. Guidance about recommended humidity or temperature would also be helpful, if instruments should make use of hygrometers, thermometers, and hydration or desiccant systems. This may be an area with some variables, because instruments are sold and used in many regions, but there's no reason for a player to go home with a new instrument unaware of some little things they could do to make a lasting difference. Their improved maintenance would prolong product life and improve ratings too.

Creating PIH Guides is a daunting task, but the best way to reduce individual suffering and embarrassing correction is to offer preventive guidance for everybody. The need for PIH to reach differing age or ability groups, or to speak to different instrument families, is probably why so few excellent guides exist. Finding a balance might mean linking resources for general student wellness, and then presenting the highlights that speak to students and players in each program. In the past, this has been seen as a pep talk on the first day of band camp or student health links on school web pages. Ideally, PH should overview hygiene from top to toes, and

the IH sections should body parts that interact most with the instruments or that the program has seen problems with before, like blisters on marching feet, or mold in gear carrying cases.

In support of those building better PIH education, ICI offers Starter Guides for PH and IH, and for PIH-Pro (for PIH at *work*). Copying and adaptation are encouraged, and ICI invites sourced recommendations for updates to make them better. Paired with excellent care guides *per instrument*, these should help empower players for better PIH.

Starter Guide for PIH (Personal)

Personal Hygiene (PH) is the collection of habits that manage the sanitary care of a person's self, space, and stuff. That includes body and skin care, oral and dental care, and grooming of nails and hair. It includes washing clothes, cleaning accessories and personal spaces, and food and water supplies. PH (good or bad) influences all other endeavors. The goal is to care for the body and keep its microbiome from getting out of hand or transient germs from taking over. That always begins with ***Hand Hygiene (HH), the best way to fight infection*** [CDC 2016]. Hands should be cleaned or sanitized often, especially after using the restroom or interacting with others, and before preparing food, eating, drinking, or touching the face or mouth. HH when entering spaces also reduces personal litter wherever we go, and HH when exiting leaves germs behind. That's true for our activities too. ***Players should also perform hand hygiene before and after handling instruments.*** The body is the full physical presence of the human organism, and hygiene helps preserve and protect our fleshly in all we do.

The body is protected by its largest organ, the skin. It is essential to keep it clean and dry, intact, and supple, because it shields what's inside from what's outside. It helps regulate our temperature and gathers information about things we touch or that touch us. The skin is constantly changing and renewing itself, bringing new cells to the surface almost every day, and replacing itself every other week [Larson, 1999]. The outer layers contain the oldest cells and lots of transient bacteria and debris. This needs to be washed away with soap and clean water even when it

doesn't look dirty. Dirt, debris and oils, and germs are often layered, and soap works molecule by molecule, so we have to use enough to get the job done, give it time to work, and wash more than once if needed. That's true about cleaning all sorts of things too.

Skin areas with more body hair can shield extra layers of skin, oil, and germs, so they might need more attention. Some body washes or body bars contain more oils than soap, while others with harsh chemicals may strip, dry, or even burn skin. Since some kinds of skin are more sensitive than others, many face and body washes are specially made to cause less irritation. It is important to follow the directions on product labels, especially about contact time. Most people would say they know that soaps need 20-30 seconds to neutralize and lift away germs, but this doesn't always translate to diligent contact times at the kitchen or bathrooms sink. In that case, the likelihood that the body is getting that contact time with soap everywhere in the shower is pretty slim. It's even possible that some of the benefit of luxury products is the contact time that their extra fuss encourages, rather than the actual contents of their fancy containers.

Fabric can harbor a lot of debris, including soil and microbial bioburden, and it doesn't always wash away. Clothing can trap dead skin and germs against the body, especially where it is layered or where skin folds, like underarms, toes, and groin. Clean clothes are needed every day, especially in layered areas. Those who don't wear socks can't change them, so their toes sit in un-washable shoes, full of growing germs, dead skin, and debris. Efforts in energy and water conservation have reduced wash temperatures, and colored wash loads often avoid germicidal detergents to preserve their bold designs. As a result, more socks and underpants are left with bioburdens than in the past, supporting relapses in those recovering. When those germs spread to other body parts or other people on fabrics washed with them, one person's foot fungus or jock itch can become a whole family's problem [Ritchie, 2015]. Fabrics we think are clean may also retain and spread fecal bacteria to the rest of the wash, including dishtowels [Borreli, 2013]. Many opportunistic germs die off in the open, from desiccation and harsh environments, but in dark or wet places, adding more with every wearing, some eventually reach infectious payloads. Dark, wet, and undisturbed machines house growth in the same way. Thought must be given to sanitary laundry methods, pretreatment as needed, and even to the wash basins used.

Bedding also gathers body soil, as the average person spends 49-63 hours week in their sheets [NSF, 2019]. Sheets, pillowcases and blankets in direct body contact with sleepers should be washed weekly, and the other non-decorative layers should be washed at least monthly. Outer accessories, like coats, hats, shoes, or backpacks are cleaned less often than the shirts and pants that go right into the laundry. That may not be a concern for the parts that don't interact closely with the body, but these and other personal items like jewelry and keys are carried so closely and constantly and their sanitary cleanliness should really be addressed as part of personal care. Phones, checked 47 times a day, may be 10 times dirtier than toilet seats [Abrams, 2017]. Since phones also touch the face, they really should be sanitized regularly.

Dirty fingernails also add extra germs to foods and toys and can cause infections while scratching itches. Many string players need short left-hand fingernails, and classical guitarists shape their right fingernails for picking. Grooming for appearance and playing function is up to players and teachers. For hygiene, nails must be cleaned often, especially before preparing food, eating, or touching the face. According to the CDC, handwashing is one of the best ways to stop the spread of germs and disease, and diligent hand hygiene can literally save lives [CDC 2020].

The feet and toes are the furthest from our heads and may be the furthest from our minds. *"The average person will walk the equivalent of twice around the world in a lifetime,"* according to HappyFeet.com [Labarge, 2016], so we should take care of them. Shorter toenails fit better in shoes and are easier to clean but cutting them too short or round may cause painful ingrown toenails. Toenails should be trimmed straight across and their sharp edges filed away. It is also essential to wash and scrub the feet and toes every day, and to keep them clean and dry. Wear socks so they can be changed every day, or twice on long sweaty days. Rotate which shoes are worn daily to let them dry well [IPFH, 2016]. Foot care is crucial in activities that add friction or abuse. Feet are dark and sweaty in shoes for hours and walking on them builds strong calluses. These provide natural armor while walking and marching, but they also offer extra layers and crevices for germs to hide in, waiting for a chance to break inside [MacMillan, 2018].

Oral health is important too. The voice is the oldest human wind instrument, and a healthy mouth and airway is essential to truly excellent singing and speaking. The American Dental Association recommends brushing and flossing twice per

day [ADA, 2020]. Good technique mechanically removes food and bacteria. Toothpaste and mouthwash chemically disrupt germs, but their instructions must be followed carefully, as they need time to work. It is also important to visit the dentist at least annually. Professional cleaning removes biofilms, like plaque, that shelter bacteria while it eats your enamel. Dentists can also detect many problems even before the average person notices them, and some germs may even lead to heart trouble [Salinas, 2019]. Great Woodwind and Brass-wind players count on a reliable embouchure, and this can be weakened by tooth and gum disease, or infections, or sores on the lips and tongue. Loss of teeth can affect the range of expression too, if "lipping" support is lost. Of course, it's hard to deny the confidence supported by a broad and healthy smile on stage.

In addition to cleanliness, the body needs fuel for strong and resilient tissue, and high performance and higher thinking. On top of shorting the body of what it needs, unhealthy choices may additives, overages, and toxins that disrupt body processes over time. The CDC promotes healthy nutrition [CDC 2018], but the USDA offers best guidance about building your best plate [2018]. Most people don't need a special diet unless their doctor recommends one, but balanced nutrition should maintain bodyweight and supply proportionate macronutrients (fats, proteins, and sugars), and micronutrients (vitamins and minerals) [NAIMS, 2017]. The US Geological Survey says our bodies are 60% water. We may need over 2 liters of water every day to keep it functioning well (some of that comes from food) [USGC, 2019]. Dehydration can cause real and lasting health problems, so it is wise to make an active effort to dink enough water.

Resistance challenge helps prevent muscle atrophy and bone loss, while exercise that makes us breathe faster and harder also strengthens the heart muscle. That's why they call it cardio. At least 60 minutes per day of a variety of activities, like walking, jogging, biking, lifting weights, playing sports, and dancing are all good ways to build and preserve the body and its abilities. To help prevent muscle injuries, warm up before using great efforts or complex motions, to loosen and prepare muscle tissue for challenges, and cool down and stretch after working hard, to loosen the muscles that have tightened. Wear the recommended protective gear for your sport, like pads or helmets. Start slowly after periods of inactivity, and pay attention to fatigue, tension, and pain. Don't try to push through severe discomfort unless you know your body well or have a trainer to help you know when to stop

and rest, or when to see a doctor. Use careful form, especially when lifting or bending, to protect your back [NIAMS, 2017].

Everybody has different needs, hopes, and struggles, but there are some concerns we all share. The President's Council on Sports, Fitness & Nutrition offers guidance about healthy habits in some of those areas, and how to take small steps to improve them [PCSFN, 2019]. For example, physical challenge builds and maintains the body's strength, flexibility, speed, and endurance. Lack of it not only neglects muscle, it also permits unused tissues, including muscle, to be dismantled and used for other things. Healthy activity signals both the preservation and the strengthening of existing muscle tissue, and it also improves circulation through the demand to feed it. It also promotes restorative sleep, through the exercise-sleep connection [NSF, 2020].

Before it is artistic, music making is both intellectual and athletic. The body's basic needs must be met for a musician to devote their full attention to any academic progress, athletic refinement, or technical performance. Poor nutrition, dehydration, physical weakness, or lack of sleep can all impair strength and focus, higher thinking, and virtuosic delivery, as can infection, illness, or even minor skin irritations. Good self-care empowers players to prepare and present their very best. Like germs, hygienic efforts can be infectious, and awareness can be contagious. PH influence on the move reduces both personal risk and biological footprint. Since everything touched leaves a mark, for better or worse, anyone can change the world, but hygiene always begins with the care of a person, as a person.

PH also applies to personal items like phones or instruments, and to spaces like practice rooms and restrooms, and to everything we encounter in endeavors, like music performance or work. Environmental surfaces that are rarely touched are cleaned, vacuumed, or polished, just to keep debris off and look nice. Things that are touched more often are cleaned with soaps to make them sanitary, especially when touched by multiple people. When items touch the airway, face, or mouth, like phones or instruments, they need to be sanitized or disinfected, especially if others used them. Environmental surfaces generally don't touch the mouth or airway, but may still store lots and grow germs and pass them around. This is why wet surfaces like bathtubs and sinks should be cleaned and disinfected with products that are labelled to kill tough germs like fungus and bacterial spores. More intimate clothing, like underpants and socks, and foodservice fabrics, like

dishtowels, need similar consideration and perhaps more regular replacement.

Since ICI supports healthy interactions with instruments, Starter Guides are offered for Instrumental Hygiene (IH) and for PIH at work in instrument handling jobs (PIH-Pro). These don't cover the routine maintenance of each specific instrument, so players still need care guides for each instrument they play. The best care guides come from makers, because they know their products best. When care guides are not easily available, teachers, repairers, and mentors, can help players build their own. Some schools and shops have already seen the need and built supportive literature. When we don't know where to begin or when to quit, questions are always a great place to start looking for answers. ICI's IH Starter Guide has a list of questions to help players ensure they've got it covered. It's like a scavenger hunt, where everybody wins.

Starter Guide for PIH (**Instrumental**)

Instrumental Hygiene (IH) describes healthy interaction with musical gear. Sanitary hygiene and wellness can be applied to almost anything, but they translate best to bodies and their close accessories. Musical instruments are among the dearest possessions of players, embraced for hours a day, often for life. Most instruments have bodies and some even have names, but IH isn't really about the instruments. It's about their players, and all the handlers who help them. PH applies to a person's self, spaces, and stuff (and endeavors). Instruments are an example of stuff, used in varied spaces, in endeavors that extend and express the self.

PIH always starts with hand hygiene, because it's the ***very best way to keep germs out of the body*** [CDC, 2016]. Hands should be cleaned or sanitized often, especially after using the restroom or interacting with others, and before preparing food, eating, drinking, or touching the face or mouth. Players should also perform hand hygiene before and after handling instruments, and mouthed parts should be cleaned every day they are used. However yucky the mouth and teeth would get if they were not cleaned every day, that's yucky mouthpieces and reeds might get too. People, hands, and close accessories, are top transmitters of germs. PIH always begins with care of each person, as a human. Then, instrument and body

contact can be reviewed from top to bottom for sources of infection, injury, or irritation. Early attention to friction hotspots, ergonomic discomfort, tension, and economies of motion may help prevent wounds or repetitive stress injuries. Health and comfort also improve confidence and reduce performance anxiety. Sharp edges or pressure points, especially on heavy instruments, can cause wounds or blisters, so those areas should be attended. String instruments that rub the neck may cause irritation, especially if the skin is dirty or if the player scratches with dirty fingernails. The face and neck should be gently cleaned and may need to be protected with a soft cloth while playing.

Fine instrument surfaces must often be handled carefully to avoid upsetting fine adjustments or damaging delicate surfaces, and to reduce the touchpoints that can't be cleaned or polished. Many instruments need professional cleaning, lubrication, and adjustment at least annually. Most instruments have certain ways that are best and safest or hold them while assembling, playing, disassembling, and even while resting. Touch-pieces like buttons, keys, pegs, fretboards, and fingerboards are often designed to withstand handling, sweat, and oils, and this often makes them more tolerant of cleaning too. Chinrests and fingerboards should be kept free of buildup of dead skin, oil, or make-up.

Wind players should avoid sweets or sodas and should brush and floss their teeth shortly before playing, because residues in their condensate can cause sticky pads and sluggish pistons or slides. It may also promote microbial growth by offering more germs per session and feeding them. Wind instruments, especially the ***mouthed parts, should never be used by others without disinfecting them first, and reeds should never be shared*** at all. Metal instruments with valves often need to be bathed and lubricated, so it's important to get good advice about what to use and how to do that. Wood bore instruments with keys should be swabbed and gently wiped after use, and it's important to use swabs that won't get stuck and can be pulled back out easily. These also need to be dried well, so the instrument and case doesn't get musty and moldy inside.

Some woodwind instruments also use accessories that help vent their keys while drying. Case handles, pencils, ligatures, or other accessories can be cleaned or sanitized, but good HH is the best way to keep their germs out of the mouth. Neck straps, swabs, and case cloths should be cleaned or replaced regularly. Ensemble players should help clean the surfaces they use, stack or rack chairs and stands,

and clean up their own litter, including condensates. Some products that are great for cleaning hands or household items are actually harmful to instruments. Hand sanitizer is very convenient, but many chemicals and sprays should be kept far away from gear.

Instrument makers should provide care guides about the maintenance and cleaning that players should do, and videos and books may also support each instrument family. When the instruments don't come with care guides, vendors, repairers, and teachers may recommend resource literature or videos that talk about what players need to know. Some repair schools and some universities with music programs have also prepared basic guides and videos. If the instructions are confusing or if players and parents don't know what to use or how to use it, it's best to find good help right away. Ignoring problems often makes them worse, and can hold back a player's progress unnecessarily. The old saying, *"we don't know what we don't know,"* really speaks to player preparedness with instrumental hygiene. How do players know they are taking their best care of their instruments and getting the most out of them? Players can create their own best care guides by finding the answers to all these questions about instrument care.

Storage & Rest: How should I pack for storage and transport it safely, with nothing loose? How should I hold it, assemble and disassemble it safely? How do I hold it at rest while I stand or sit with it, so it isn't damaged? What temperature and humidity is best for my instrument? How do I influence the temperature and humidity for my instrument?

Supplies: What kinds of supplies does it need (like oils, tarnish paper, or swabs)? How should I use those supplies, and is there anything I should avoid?

Playing & Function: How does my instrument work to make and move its sounds? What can make my instrument easier or harder to play? Where will it get "sticky" first and how should I "un-sticky" it? Do I need any comfort or ergonomic accessories? Where do players of my instrument have to watch out for playing tension?

Home Maintenance: Where does my instrument get dirty first? Where does my instrument have germs I should manage? How do I manage my instrument's germs? How do I clean it? How often? What should I use?

Professional Service: What are some common mechanical failures for my kind of

instrument? Do I know my instrument is in its very best tip-top shape right now? Where do I get help with things I can't do for my instrument? How often does my instrument need to be serviced professionally? How do I know when to get help?

Financial Matters: How much money should I save for routine service or maintenance? How long is my instrument supposed to last? Does my instrument need insurance?

IH in ensembles is about PIH when playing together with others, just as professional hygiene is about PH when working together with others. In fact, social courtesies and help with environmental cleaning in ensembles are described in professional terms. Ensemble PIH begins with HH when entering to reduce the burden on fomites inside, and when leaving to protect the self. Social courtesy includes helpfulness with set up and strike, being on time, prepared, quiet, attentive, and respectful of the learning and personal space of others. Environmental cleaning means leaving spaces better than they found them. This includes managing debris, including condensates, and straightening or racking chairs and stands. Participants may even help sanitize or disinfect the frequently touched fomites used in their art. Ensemble means working together. It also means considering many things or many people as one. Great ensemble players know it has to begin before the first notes are ever played, and it lasts long after the last notes are heard.

Starter Guide for **Pro**-PIH (**Professional**)

Professional Hygiene informally describes PH for self, spaces, and stuff, *at work*, so it adds environmental cleaning, social courtesy, and occupational safety for each job. PH applies to everything we touch, so ***hand hygiene is the best way to keep germs out*** at work too [CDC 2016]. Hands should be cleaned or sanitized often, especially after using the restroom or interacting with others, and before eating, drinking, or touching the face or mouth. Professionals ***should also perform hand hygiene before and after handling instruments***. Nothing should touch the face or mouth unless it has just been cleaned and sanitized or disinfected (as appropriate). HH on the way in reduces burden in the space, and on the way out leaves work germs behind.

PIH-Pro is a workplace expression of PIH, so workers in instrument handling jobs need to start with excellent PH, and excellent general IH. Then, as professionals, they need to be familiar with the care guides of each instrument they handle or service. A worker whose job is to clean trumpets all day should know the typical concerns of trumpets. When asked to also clean and pack clarinets, that worker should then review the care guides for clarinets too. Band directors should review the care guides for the instruments they teach, to avoid accidental mishandling, and to know how to pack them or budget for their service. A binder with an inventory list and a set of care guides makes make it easy to answer questions or give copies to players. For example, when a horn player is confused about where the oils go, and the band teacher plays viola, the care guide will have the answers needed.

Social courtesy involves respecting the space, privacy, and property of others, praising in public, correcting in private, and avoiding gossip or bullying. Careless words in the heat of the moment can create lasting damage to the group dynamic, and lead to job loss if social distraction makes it hard to work together. Strong scents or spices and loud or offensive noises should be avoided. Every social group decides what is acceptable, but everybody deserves to feel safe and welcome at work. When each person tries to promote the best environment of work of others, there is no room for difficulty. Environmental cleaning includes personal areas and shared spaces, like walkways and staff lounges. It is the responsibility of every person in a workspace. Even if there is a janitorial service engaged, the PH of each person influences how clean the front desk phone or the lounge refrigerator is. Any item or area that is not formally assigned to one person at a time is the responsibility of every person who uses it at any time.

Some aspects of occupational safety are universal, like fire and storm response and security of the premises and property. Other safety areas vary according to each setting and the kinds of work done. The exposure hazards of employees drive the details for areas like machine safety and electrical and chemical safety. Infectious disease is an occupational hazard if there is potential for significant exposure to the blood and body fluids of others. Those who work in health care, childcare or caregiving situations, laboratories, law enforcement are examples, and some crowd control or education workers also receive training about significant exposures. The common theme for those not directly handling biohazards is direct contact with people.

Employees who touch mostly things instead of people have less *direct contact,* so they have less risks of catching communicable diseases from their work. They may still see things that have blood or saliva on them, but without live interaction with moving people, low-risk employees have more control over how they touch those items. They can clean and disinfect most frequently touched environmental surfaces and wash their hands before touching the face or mouth. Good Professional Hygiene, built on good PH, may be all they need. Those who work more *directly* with higher risks of accidental or frequent exposure to the germs of others are more often trained in Infection Control (IC), or with materials referencing it. For example, food handlers have a version that includes HH and safer food preparation and storage to protect their consumers. Childcare workers use guides about common childhood illnesses so they know how long a sick child should stay home and how to clean after exposure to avoid passing it to other children (TDSHS, 2013). These guides often refer to Infection Control Standard Precautions directly..

Accidental employee exposures to germs at work are similar to other accidental exposures at work. Catching a cold is usually a risk of interacting with others, not really caused by the work itself, unless the work involves constantly interacting with people or their contaminated property. Accidental client or customer exposure is usually only an issue when service contacts the face and mouth. Germs shared in other services are expected to be managed by PH alone. Client PH reduces the germs coming in, employee PH keeps them from spreading, and then client PH leaves shop germs at the shop. Work that touches more clients and their frequently handled items brings more exposure to their germs. Formal safety protocols about them are usually only required if there are risks of significant exposures to body fluids. Instrument handling does involve a lot of interaction with people and their things, but skin and condensate (even when wet) are not significant *contact* threats. As long as they don't reach the mouths and faces of others, *touching* them shouldn't make anyone sick. HH keeps them out.

An effective delivery of infectious germs to an appropriate portal of entry (like the mouth), is called a significant exposure. These are managed like other accidental exposures, with safety measures (like hand hygiene) to control or reduce them. All accidents follow chains of events that led to them. Finding and eliminating unsafe actions (like mouthing contaminated items) breaks those chains to prevent the harm from happening again. All chains have a beginning and an end, though

people often see only their end. Direct influence is hard to prevent except by barrier and avoidance, but indirect contact involves longer chains with more steps and more ways to break them. Germs have direct and indirect routes too.

D*irect* transmission requires people to touch each other or share respiratory droplets or aerosols. Controls that reduce respiratory droplet and aerosol transmission include air filtration and air flow, and face-to-face measures like physical distancing, and use of masks or other coverings for bodies or for tool or instrument openings. Guidance about precautions like those comes from governing agencies, with help from the CDC, OSHA, EPA, and FDA, and it usually evolves with situations. ***I****ndirect* routes are those that have vectors or fomites in their chains of infection. Fomite-mediated-transmission is indirect, but it not airborne, so it offers the most opportunities and easiest ways to block them. That's why personal hygiene works, why the guidance is so stable, and why the things people are advised to do at home look the same as entry level professional procedures.

When work processes liberate surface germs and make them airborne, like sprayers or powered cleaning brushes, respiratory protection against dust and chemicals blocks germs too. There are fewer *leftovers* to liberate from reservoir items than are continuously generated and super-emitted by live singers or players, but this doesn't make cleaning aerosols safe to breathe.

As in any area, professionals are required to know more and to do more. They also have access to more of the process steps than end-users. They use more precise language, and their safety measures are discussed in terms of application rather than who they protect. CDC's guide to Operational Considerations describes layers of personal, administrative, and engineering controls that reduce exposure risks. This samples the Hierarchy of Occupational Safety Controls, from the National Institute of Occupational Safety and Health (NIOSH), improving workplace "protection through design." These sites update guidance during incidents and outbreaks too.

There are many ways to work with music and musicians, and all require us to bring our best PH with us, keep areas clean, and use products and methods as directed. Whatever safety programs are advised there should be followed and reviewed annually.

5

Infection Control

Infection Control is a germ safety platform developed by hospitals. This unit explores its history and relevance to industry. Then, precautions are expressed as universal or specific blockers of transmission, comparable to other strategic safety measures.

Regulatory agencies and authority are explained, and IC is presented as mitigation, not elimination of germs. Disinfection is one of the precautions that IC considers Standard and Universal.

IC History and Relevance

Infection Control (IC) is a professional platform to prevent or reduce the spread of microbial disease. Infection is a microbial invasion. Control is the attempt to manage or contain it. In the 1800's, medical students in Vienna worked on cadavers in the morning and maternity patients in the afternoon. Adding handwashing between them reduced the deaths of those new mothers from 18.8% to 1.2%. Still, it wasn't until HIV/AIDS emerged, almost 200 years later, that Universal Precautions was adopted, so safety practices would be used all the time, instead of just when something look dirty. It seems obvious to us now that handwashing stops the spread of disease, but it wasn't always so, even in health care [US Chemical, 2016].

It's taking even longer to pass it on. Not everyone believes IC matters to them. Studies show even folks who know they should wash their hands don't always do it. Signs are now posted in restrooms to remind employees to wash hands before returning to work. When COVID-19 emerged, hand-sanitizers appeared more frequently at the fronts of grocery stores. Public awareness has reached an

all-time high, and now everyone has heard of germs, hygiene, and IC. People want to know how to protect themselves and others sensibly and consistently.

Sharing things means sharing the germs on them, unless we purposely avoid, kill, or block them from reaching us. Professionals face new and higher expectations from people who want sales, services, and experiences without unnecessary risks. Safety for employees also matters, and the IC platform pairs the science of germs with existing professional hygiene and safety concepts like the hierarchy of controls [CDC, 2015]. Personal, administrative, and engineering controls layer precautions against direct and indirect exposures to hazards, and they are defined by how they're used, as seen in CDC's guide to Operational Considerations.

Since variety in sales and service industries is immense, the literature does not speak to every problem or every type of business. However, instrument handling shares many of the concerns that drove the early developments of others. Hospital guidelines were created to keep employees, patients, and visitors from infecting others who share the same services, spaces, and tools. Later, foodservice, child-care, and school guides addressed things that might go in the mouth or that children might play with.

All of these in some way speak to playing and handling instruments and gear. In industries where IC is well established, surfaces are made to be easy-to-clean and are designed to withstand the germicidal agents and methods they typically use to clean them [FDA, 2017]. That's not a luxury instruments often share. Whenever the recommended processes might harm the gear more than help the player, it is important to remember that where there is a range of purposes, there is also a range of options that serve them. Where there are multiple parts, surfaces, and situations, there are different ways to deal with them. There are ways to know what is needed, when, and why, in controlling infectious risks on surfaces.

This is especially important in setting safe protocols for reprocessing and turnover. Reprocessing prepares durable things for *reuse*, like repacking a lunchbox, rinsing a mug, or wiping a bench. Turnover is the whole set of *combined reprocessing steps* to reset a kit, system, room, or space *for a new user*. For example, restaurants reset tables, wash dishes, and wrap cutlery. Servicing gear for the same player is obviously simpler than the turnover of items or spaces for new players, just as (we hope and expect) it's different for staying or new hotel guests. Knowing how far

to go and why is the key to layering IC strategies well and wisely, and to avoiding wasted time, effort and expense.

IC was developed to protect people from harm in sustainable ways. It was never meant to add significant burden or frivolous expense for those it served. All those who choose to apply IC strategies, hoping to share its impact, should also adopt its goals and prudence.

IC Precautions and Transmission Routes

Precautions are safety practices for individuals or systems, built in response to risk of harm. IC **P**recautions (IC-**P**s) are designed to prevent or reduce the spread of infectious germs, and they are applied in two phases. ***S***tandard ***P***recautions are the baseline practices that make equipment or spaces sanitary, or safe for their intended use. They are ***U***niversal, considering everything contaminated and everyone worth protecting, since we can never tell what germs are where. **S**tandard **U**niversal **P**recautions (SUPs) lay a foundation of sanitary safety so we don't have to plan around every germ, everywhere, all the time. When unique situations add extra germ risks our IC-SUPs don't manage, we add strategic sanitary safety measures called Transmission-Based Precautions *(TBPs)* to block them. All IC-Ps do work to block transmission, but TBPs target the known routes of known germs specifically and purposely [CDC, 2016].

Standard Universal Precautions (SUPs) began as responses to injuries or accidents of patients or employees. When they made an obvious and lasting difference, they became the norm. Standard Precautions defined in IC include hand hygiene, use of personal protective equipment, respiratory hygiene, sharps safety, safe injections, sterile processing, and cleaning and disinfecting environmental surfaces [CDC, 2016]. All but two (shots and sterilization) apply to instrument handling. Hospital IC secures one space or protects one patient at a time, so our precautions might look different with people and gear always on the move.

Hand Hygiene (HH) includes handwashing with soap and water or use of hand sanitizer. Standard use of personal protective equipment (PPE) refers to the things workers *always wear* to protect themselves and others, like gloves and lab coats in

a laboratory. Respiratory hygiene includes cough etiquette, and use of masks and filters on people, things, or air handlers when recommended to protect others. Sharps safety is the safe handling and disposal of items with potential to wound others, especially if they are contaminated blood or fluids, like glass bottles, needles, or scalpels. SP cleaning and disinfection refers to the recommended levels of disinfection for different types of tools or surfaces, based on their body contact type. SPs do not require every facility to use the same products or perform the same procedures. They require consideration of products and procedures that touch these categories, to make safer practices more consistent. Consistent safety protects employees and patients (or clients and players) through protocol, rather than individual guesswork or varied opinions about due diligence.

Transmission-Based Precautions (TBPs) are extra measures taken when the SPs aren't enough. Formally defined IC-TBPs for hospitals tell them when to restrict visitors, wear more PPE, or clean and disinfect differently [CDC, 2016]. Like other safety measures, IC precautions include source controls to prevent or contain risks at a point of origin, PPE to shield recipients, and interventions to block the route (breaking the chain) between the two. TBPs are only effective when germs and routes are known.

Transmission Routes most relevant to musicians are ***contact*** (touching hands and other fomites) and ***respiratory*** (breathing droplets or aerosols). There are defined IC-TBPs that address each of these [CDC, 2019]. Some are simple, based on PH, while others are more complex. While TBPs are not universal, they should still be consistent and reasonable. TBPs outside of health care may be less formal, but they should always be route blockers. They look like conditional standards (if *this* happens, we will do *that*).

Contact transmission (aka Fomite-Mediated Transmission) requires touch. Since people and things are fomites, musical gear *handling* offers a contact risk. This is the easiest kind of transmission to block. We can avoid that contact through isolation (quarantine), reduce it to sanitary levels (hygiene and cleaning), block the movement of germs to us (PPE and Barriers), or kill them before we touch the source or it touches us (disinfection).

Respiratory transmission involves inhalation of droplets or aerosols, generated and released while breathing. Deep production, vibration, and forced breathing,

such as speaking, singing, and trilling, may generate more (and finer) particles. Instruments that share the same source and physics can offer similar action and particles. Although sound itself is a transmitted signal, and not a moving mass, the particles generated while creating sounds do move and mix with the air they are in. Coughing, sneezing, and yelling also propel the air they are in, making it travels farther and faster. It then moves and mixes with the air there too.

All air moves unless it is controlled or in vacuum. That's a really good thing because if it didn't, we would all suffocate. The CDC pairs existing data about the generation and behavior of aerosols [Baron, n.d.] with respiratory droplet and aerosol studies, pathogen persistence, and regional case reporting, to make community recommendations for precautions like physical distancing and face masks. These, along with air handling, air exchange, air treatment, filtering, and fogging are all examples of *respiratory TBPs.*

Basic safety control strategies against many kinds of exposures involve the use of time, distance, and shielding. As a safety platform, IC uses them too. Known respiratory routes can be blocked at the source, by containing the droplets and aerosols of people breathing out, or at the end, with recipient PPE. Since indirect transmission is also possible, there are middle steps that can be blocked too. Respiratory TBPs include quarantine and limited contact (concentration and duration), spacing and staging (distance), barriers and filtration (shielding), and germicidal treatment. Droplets are much larger than aerosols, so they are much easier to contain or avoid.

TBPs with barriers or filters can confuse those who don't understand routes or targeting strategies. For example, simple cotton masks offer significant containment of large droplets cast out into the world when worn as source controls. Meanwhile, recipient PPE masks to protect end-users from payloads of fine particles in high risk engagements must filter more and finer particles for longer periods of time. If conversation about safety controls like masks is too vague, people may hear *"masks* don't work," rather than "*these* masks don't work *for that.*"

Another area of confusion is the evolving nature of infectious disease, especially emerging communicable disease. Respiratory risks and recommendations for chemicals and machinery remain fairly constant over time. Working with a lathe always requires safety glasses, and working with dust always requires a respirator.

Infectious risks in the community don't stay put like that. They also don't just arrive and leave. They surge and fade, and move through the population. IC agencies monitor them and balance risks of exposure against societal burdens to make recommendations for the people.

As risks move and change in different regions, so does the advice for the people in those regions. In serious threats, they recommend the individuals totally isolate themselves (with no further exposure, there would be is no further infection, and no disease). If a disease cannot be contained, they will try to slow it down or spread its numbers over time. This protects the medical infrastructure from immediate and overwhelming surge. It also buys time to prepare isolation and treatment facilities and strengthen supply chains. When the results of efforts like those can't be seen, they may be perceived as wasted. It is very hard to prove something might have happened that didn't, or to prove *why* it didn't to those who never believed it might.

The evolving nature of respiratory risk, as a thing we cannot see, makes it nearly impossible for SUPs outside of our controlled spaces to eliminate the need for TBPs. Masks, air filters and air handling are proven to make a difference, but each emergence of a novel respiratory risk still requires guidance from IC agencies about the best TBPs for each stage of the crisis. We can also expect it evolve differently in each region over time, from conservation to protection to isolation, and back again, perhaps repeatedly.

IC Agencies and Authorities

IC strategies didn't come from a single agency with clear instructions. They grew in hospital programs trying to improve outcomes for real patients, and in committees to compare notes and set new standards. The things they tried had to comply with existing laws, even before inspecting or accrediting agencies evolved to track them. According to the American Hospitals Association (AHA), hospitals must satisfy requirements of over 629 federal agency departments, in addition to state and local agency mandates [2018].

Instrument handlers do not need to meet the requirements of hospitals. Like the early IC pioneers, we just want to take steps to keep clients safer. As we do so, we need to be mindful that the things we say and do are not violating any regulations that relate to the steps we take. Since there isn't just one IC agency for everything, when we adopt a principle or practice, we need to know who oversees it and what they say about it.

In the U.S., the Center for Disease Control and Prevention (CDC) is a cluster of agencies focused on the study and control of health problems [2016]. They educate the public and make recommendations about disease prevention for both individuals and organizations. The Environmental Protection Agency (EPA) focuses on the protection of human health, especially regarding the environment and our use of it [2020]. They are best known for efforts against pollution, but it's not all they do. The Food and Drug Administration (FDA) regulates all foods except meat, poultry, and eggs, and anything used for foods or food animals. FDA also regulates medical drugs and devices, and anything used to make them, so they also oversee all sanitizers, antiseptics, and antimicrobials for use on food and drug preparation surfaces and on people [2014]. The CDC, EPA, and FDA are part of the Department of Health and Human Services (HHS), responsible for the health of all Americans. They are the best sources of IC guidelines because of their *mandatory* and *leadership* roles in IC and public food and drug safety.

The Department of Agriculture (USDA) regulates meat, poultry, and eggs, and all related products and processes. The Occupational Safety and Health Administration (OSHA), focuses on work hazards, and that includes biohazard exposures [2020]. USDA and OSHA are under the executive branch of the US government, focused on safety as an aspect of national security. These have *mandatory* roles in IC only when a concern touches their primary focus.

When missions overlap, agencies with *leadership* roles issue informed decisions and instructions, and one assumes *mandatory* role with absolute authority. All others assume support roles, using their resources to uphold those in mandatory or leadership roles [ASPA, HHS, 2015]. This system should offer a single voice in governance but sometimes the agencies disagree about who or what to protect first. Together, they manage areas of safety and IC with strict and specific regulations, and with guidelines that leave room for interpretation.

It isn't necessary to add more agencies every time another safety concern is realized. Adding more voices would probably only make things more complicated anyway. Instead, all US industries use existing guidelines, and track changes across multiple agencies. This can get so complex that businesses under regulatory authority often hire third parties to help them.

Efforts to use standards for better patient outcomes were seen as early as 1917. With over 1,000 surveyors and 22,000 participating facilities, The Joint Commission is the largest and oldest standards-setting and accrediting body for healthcare, and their goal is zero-harm [2020]. Medical science attempts to improve and prolong human life, so there will always be room for growth. Practices that fall short of modern standards are seen as harmful, because the medical mantra, "first, do no harm," is interpreted as, "when suffering exists, let it at least not be because of us." When people in unregulated industries embrace IC tools, it's usually because they feel the same way.

IC as Risk Mitigation

Mitigation is an attempt to lessen the severity of something undesired, often when it can't be eliminated. IC is a risk mitigation strategy, combining hygiene with occupational safety. The goal is to achieve a sanitary state through sensible, defensible means. ICI supports sanitary experiences for players and safer interactions for handlers. Guidance has been developed for areas like food services, hospitals, schools and daycares. Internet access brought simplified versions to help the public with individual homes and offices, but other industries were slow to add IC tools, until the emergence of COVID-19 added momentum to many businesses. While it is good to address current risks well, effective IC manages not only one germ risk, but many.

In most situations, people have a duty to mitigate harm they may cause others, or damage caused by things they have control over. For example, a school suffered loss from water damage during a plumbing upgrade, and their insurance claim for ruined gear was denied. They had been warned about the work ahead of time and didn't move the equipment. Water leaked, and they didn't check into it for a

while, so even things that could have been dried off were beyond repair. Ignoring it, perhaps hoping for total replacement, made it worse. Failure to mitigate the damage disqualified their claim.

Mitigation is a broad word and it can be applied very loosely. For example, eating fewer cookies mitigates weight gain. Seat belts have saved over 300,000 lives [Greenbauer, 2018]. Of course, loss mitigation seems a poor way to describe that kind of an impact. ***Hand hygiene is the greatest mitigation tool of infectious diseases***. Millions of children still die each year of preventable diseases around the world, and the mitigating power of soap, is literally in our hands to change that [McAnulty, 2015].

To avoid confusion, mitigation methods with names should use them. "Mitigating germ transmission on soiled hands," should just be called hand hygiene. Mitigation, mediation, reduction, and treatment, all describe efforts to make a difference. While they don't make quantifiable promises, they still imply action, so claims are vulnerable to legal challenge, especially if fees are attached to them. When we disinfect mouthpieces, clean chinrests, swab bores, wipe touch-pieces, and offer barriers and hand hygiene, our goal is a sanitary experience for players and safer interaction for handlers, when items are used as intended.

The best format for describing unregulated processes used as risk mitigation sanitary care services, is [***action***] + [***method***], with ***details*** and ***basis*** on file and on display. (ICI is not a source for this basis. ICI always refers to real IC authorities and agencies, and so must you).

To be both sensible and defensible, IC precautions, as measures to protect clients and customers, players, and workers, must be traceable to the recommendations of IC agencies. Mitigation products, sales, and services, must be transparent in cost and purpose and free from predatory or fear-based marketing. They must avoid claiming the actions of legally defined words. Obviously, they must not risk harm to people or property, even by offering assurances that create false confidence. Since ICI adopts health science precepts, anyone joining in should embrace the mantra, "first, do no harm." This means respecting life safety and personal privacy, and avoiding actions that are likely to make matters worse [Spacey, 2016].

Safety measures cannot guarantee safety. Seat belts don't save everyone who gets in an auto accident, safety glasses will not stop all powerful projectiles, and machines and tools can hurt us even when we are being careful with them. Face masks do reduce the spread of germs on breath, so less people get sick, but all masks do not protect all wearers from all exposures. Partial quarantines reduce viable loads of germs handled by employees, and that is mitigation, but this can't be used to clear used instruments for new players. We can tell our players what we are doing to help make them safer, but we cannot promise to "make them safe."

6

IC for Instruments

As hygiene practices may be applied to any endeavor, so can IC strategies. This unit applies both to instrument handling. The first section explains responses to microbe awareness, and tools used even without formal IC.

The second section dives deeper into ICI, presenting the 3 Factors of Risk, 4 Perspectives of Relevance for Instrumental Pathogens, and the Prime Directive in ICI. Finally, real life examples of safety precautions are discussed.

Responses to Microbe Awareness

What we do about germs and infectious risk (whether we use formal IC or not) may be described as passive, active, or even aggressive. These words describe the purposeful effort safety measures require, not our attitudes or the absence or presence of a reasonable process. Ignorance, whether unaware of germs or unwilling to deal with them, is no response at all. The two passive responses are ***incidental quarantine*** (storage) and ***dismissal,*** and they require only intelligent awareness. Active responses include all measures to prevent or reduce transmission, such as: ***hygiene and HH***, ***intentional quarantine***, ***IC-Ps (including cleaning, disinfection, and PPE)***, ***education,*** and ***advocacy***. Mitigation is one of the recognized strategies of risk management, so every genuine effort counts [Study.com, 2019]. Professional Hygiene methods without IC still use these responses, but they approach them differently; probably with less detail.

Quarantine (QT) is a timed of separation to reduce or eliminate contact with specific germs. It can be incidental (storage) or intentional. QT was the first response to diseases and remains a first line of defense today. Waiting is cheap and easy, but

some germs can last a long time. People are hosts, and they continue to shield and multiply germs until after they've totally recovered. QT for people begins after asymptomatic people are exposed to a relevant pathogen, and it ends on time if they don't develop an infection. If they do succumb, their QT begins after they recover. If their germs are a type that do not or might not clear, QT is not an effective way to reduce exposure to them. This concept applies to fomite QT use (and times) too.

Dry fomites that don't *host* (house, feed, and shield) germs can begin QT times right away, like recovered exposures, including coincidental storage time. Wet items or thick areas of bioburden contain cellular debris, mimicking infected hosts, so they cannot start a QT clock. Even when dry, some germs last longer than others, and some use capsules, spores, or dormant states to wait out hard times. QT can only clear germs blocked for longer than they can last without hosts. *There is no universal quarantine time to render all germs non-viable without any other active intervention, even on less hospitable or germicidal surfaces*.

Viability is the ability of an organism to live and reproduce. This idea includes both persistence on surfaces and resistance to abuse, like exposure to harmful agents, hostile environments, or extreme temperature or humidity. The pathogenic population does not all perish together at the end of their quarantine times. They don't know what time it is. Their numbers decay over time depending on their species and their situation. Extensive research about each kind of microbe is used to estimate the reduction in their numbers (and therefore risk levels) after they dry completely, and then after a number of hours, days, weeks, months, etc. Since germs require infectious doses to be successful, these reductions matter in risk management. In theory, there is a range where germs are still there but can't kill us, can't hurt us as much, or can't infect us at all anymore [Stephens et al., 2019].

During outbreaks, IC specialists use this data to recommend full quarantines and to estimate partial decays of germs for their risk tiers [DHS, 2020]. They may advise 24-hour shops close overnight or add extra cleaning, or suggest hospitals wait 24 hours to clean vacated rooms. These risk tiers should only be used by IC specialists to make recommendations for others, but knowing germs decay over time gives individuals more control over the risk levels they enter themselves. For example, workers may add different types of PPE at QT-3D, QT-7D, or QT-DATE, or even refuse non-emergency contact with items for QT-24H. When COVID-19

emerged, many repair shops enforced QT-4D or QT-7D, depending on which studies they read about it. PIH, especially HH keeps germs out of the face and mouth, but QT keeps them off the bench entirely. Without protocols and guidance, "all or nothing" decisions can look like the only options. Whether using full or partial QT tools, date labeling for all play or disinfection is key.

Studies are also performed on various surface materials like cloth, copper, paper, silver, and steel, to inform development of better materials that can withstand necessary cleaning and disinfection methods or might even harbor fewer germs on their own. This causes confusion when people misinterpret less hospitable surfaces as having active or immediate germicidal activity, exposing them to great harm through false assurance or misplaced confidence. Certain metals and new infused products have antimicrobial properties that slow growth and reduce loads, but not as fast as active methods. Soap still costs less, works faster, and kills more stuff.

Dismissal is the *informed decision* not to take action against irrelevant microbes, based on which matter when, to whom, and why. Germs cleared by QT or reduced by other means are not threatening. Items in long term dry storage have different, and less, germs of relevance than those in active use. Germs are also less threatening when already part of a microbiome, which is why people are comfortable with their own gear and germs, and why players can manage the basic sanitary cleaning for most of their gear at home. Some microbes belong where they are. We expect books, floors, furniture, and tools to be dirty, so we dismiss the germs on them. It's not that we don't care, but we know HH has those covered without the cost, risk, and work of direct treatment. We also dismiss germs when a quick fix can be managed safely with Pro-PIH. When germs cannot be dismissed and quarantine is ineffective for them or inconvenient for us, they must be managed with a little effort. In other words, *active* responses are needed for actionable germs that matter to us. ICI calls them Relevant Instrumental Pathogens (RIPs).

Active responses include all actual efforts to prevent or reduce significant exposures. In review, after hygiene advocacy and education, ICI presented PIH, especially HH as central to defense, and PPE as both source and recipient control. ICPs were introduced as SPs and TBPs, with SPs as SUPs that include appropriate use of cleaning and disinfection (C&D) and PPE. Our options include defensive strategies of time, distance, and shielding, and offensive assaults, like sanitary cleaning and direct disinfection. As options progress from active to aggressive, the

cost, effort, risk of damage, and exposure to harmful processes increase. Since aggression is the purposeful harm of life, even gentle disinfection is an aggression against microbes. Disinfection treats germs as pests and chemicals as pesticides, so we always try to use the least aggressive process that satisfies the level of sanitary care needed for each item or situation. This requires an understanding of all available options and a logical path to decision. IC uses the Rational Approach to Disinfection to determine how far to go.

When a desired response cannot be satisfied because items can't or shouldn't be treated directly, focus shifts to player protection, through PIH and PPE. ***Hand hygiene is the best way to keep contact germs out***, but handling something what we can't clean or disinfect adds extra risk. To balance that, we may add more QT, clean what we can to reduce the overall burden of touch, and add barriers between people and germs for a period of after-service time (i.e. 2-3 months). ***E***xtra steps or diligence can be added to any measures, as in E-PIH-HH after service, but that doesn't mean we shouldn't use sanitary hygiene all the time. This is like being extra careful in extreme road conditions or construction zones, though we always try to drive safely.

Another example of this idea is professional dental cleanings. They're extra thorough but don't eliminate brushing and flossing at home. Daily hygiene is critical to oral health, but doesn't negate the need to visit the dentist and remove harmful plaques. Both are important and neither replaces the other. Likewise, professional instrumental service, repair, and sanitary cleaning do matter, but so does diligent care at home. This is why PIH education is so essential. People who cannot perform their own hygiene, especially HH, must be more actively protected (as children from dangers they cannot manage for themselves). This limits their options, raises their costs, and delays their access to gear after service (for QT to avoid liability). Sadly, even if every item is cleaned at the shop, it doesn't reduce their ongoing exposures when they leave.

IC for Instruments and Handlers (ICI)

Applying IC to instruments and handlers acknowledges them as fomites with germs, and blocks their germs from people, through PIH and IC precautions. We don't have to kill all our germs, and we couldn't if we tried. We are also not limited to just one response, like universal disinfection (put the flame-thrower down). We have an array of sensible and defensible ways to keep germs out of the face and mouth. These range from hygiene to quarantine, to barriers, and then finally to cleaning and disinfection of environmental surfaces, instruments, and other gear and accessories. We call this approach Infection Control for Instruments (ICI).

With facts about microbes, immune function, hygiene, safety control, and IC mitigation, handlers can apply sensible and defensible solutions in ways that go further and last longer than a single procedure or to-do list ever could. This can be used to help individual clients and service individual instruments, as well as to evaluate processes and programs. Roles and spaces can be reviewed for new standards from perspectives that move from self to surroundings, or from top to bottom, or from wide to narrow, or the reverse of any of these. A new platform or kill-procedure for every new germ or situation isn't needed.

Since risk management directly affects professional liabilities, all choices must be sensible and defensible. Sensible choices satisfy reason, while defensible choices are easy to justify against legal scrutiny [Dictionary.com, 2020]. They meet goals effectively, satisfy promised sales or services, and respect feasibility and return on investment for clients and shops. They honor safety of staff and players, vulnerabilities of instruments, and all applicable laws. Sensible and defensible service does more than avoid lawsuits. It improves outcomes.

When we translate IC-Ps to our work, we restructure them, *setting our own Standards.* IC-SUPs that translate to jobs with instrument handling are ***H***and ***H***ygiene (HH), use of PPE and barriers, respiratory hygiene, and surface cleaning and disinfection. Surface cleaning and disinfection, applies to our environments and workspaces as systems, as well as all individual fomites in them, including instruments we handle, play, and service. An example of a Standard Universal Precautions (SUP) in instrument handling would be, *"always disinfect mouthpieces before play-testing or returning to clients,"* and *"always HH before setting up ensemble spaces."*

As ***P***ersonal ***H***ygiene (PH) includes all of a person's self, space, and stuff, ***Pro***fessional ***H***ygiene (Pro-PH) includes that self, space, and stuff *at work*. It also adds shared environmental cleaning, social courtesy, and occupational safety. At many jobs, Pro-PH is enough for sanitary interaction between people. Their social customs define what is *acceptable* for *them* in their spaces, and problems only arise when their norms conflict. Their Standards include custodial plans, lending practices, personal boundaries, restrictions to eating areas, safety protocols for their specific job risks, and the typical steps needed for client or customer care. For example, auto-repair shops have Standards restricting customers from machine areas, and they use liners to protect the driver's seat from soil. Techs there have strong feelings about tool sharing, shop organization, and lunch labeling, and their chemical hygiene plan is highly detailed.

Once defined, *Standards* should be *Universal*. That doesn't mean there is only one kind of procedure available or that all surfaces get the same treatment. It means shop safety protocols should be followed by everyone. If a certain cleaner requires gloves, everybody uses gloves with it (not just *some people*, and not just *when they feel icky*). When Standards aren't enough, we add ***E***xtra steps. Welders add helmets with special eye protection and thick gloves for their hands and arms. Repairers use chemical gloves with dangerous cleaners. This ***E***-PPE protects people from risk by blocking its route of injury. When someone has been sick and we want to contain it, we isolate them and step up cleaning and disinfection in their areas. These extras are examples of source controls, targeting the risk right there instead of shielding the recipients.

Quarantine (QT) is the timed duration of isolation that eliminates our exposure to a known pathogen. Sanitary hygiene includes Personal Hygiene (PH), Instrumental Hygiene (IH), and Professional Hygiene. Therefore, professional instrument handlers use Pro-PIH. Personal protective equipment (PPE) and Barriers include anything placed between the infectious source and the recipient (anywhere between any steps). Any IC-Ps can be enhanced with Extra diligence, layers, or steps and any might be seen in any of the shop Standards, IC-SPs, or IC-TBPs, depending on how often they are used or why.

The IC-Ps (SPs and TBPs) in instrument handling may not look exactly like those in healthcare or food service, but they're still easy to spot. They use words like "*always* and *never,*" or *"if, when,* and *then.*" Like driving slowly through construction

areas, or using windshield wipers when it rains, extras enhance safety efforts and reduce risk, but can't replace basic diligence or eliminate the need for a plan. The value of written plans is that people can be on the same page (if there is no page, nobody can get on it). Then, they don't have to work out what to do from scratch every time.

Since planning and setup are the most laborious and least paying phases of any project, lack of a plan eats away at efficiency and the bottom line. It also leaves too much open to diverse opinions or artistic interpretations on the fly. For any risk, the most effective safety measures are those used consistently. That doesn't mean shops and programs that don't use IC words are without any Pro-PIH. They just have different ways of describing it, and deciding what to clean, when, or how. Words don't mean anything until people feel there is something important to discuss and give it a name.

When safety steps are missed, odds of harm increase, but even careful workers still have accidents. This is true in IC as well. Hands of caregivers are still the number one source of hospital acquired infections, even though they're trying to prevent it. Hands, clothes, and tools can hold a lot of germs in deep layers, nooks, and crannies. We're constantly multiplying them and picking up more so it's hard to always reduce them enough to prevent shedding them around. If that's true for hospitals, it makes sense that germs slip through the cracks in homes and workplaces when we get busy.

It is very important to remember the bigger picture when considering how IC fits in with everyday people in everyday environments. We're not trying to be as good as hospitals are at managing germs. We're not performing surgery, though sometimes repairing might feel like it, and music mentors aren't *that* kind of clinicians. We're just using some of their tools to improve our hygienic outlook. Applying what we can, where we can, our precautions reduce the number and strength of pathogens on gear. When we share this understanding with others, our influence is multiplied exponentially.

We're not trying to sterilize music-making. We're trying to reduce infectious burdens of instrument handling to a level that most of our immune systems should be able to manage. That's basic sanitary care, and it is not an unreasonable or unreachable goal, as long as we understand ***risk*** and ***relevance***. We're trying to

support sanitary experiences for players and safer interactions for handlers. When setting Standards and TBPs (defining IC safety measures or updating our cleaning and disinfection procedures at work because of germs), we have to narrow the focus to what matters when, based on the ***risks*** and ***relevance*** of microbes.

There are three factors that determine pathogenic risks of microbes on musical gear. They are ***contact type, frequency of touch,*** and ***shared status.*** Together, they influence the four perspectives of relevance in instrument handling, ***personal hygiene, instrumental hygiene, contagion,*** and ***occupational safety***. Risk and relevance drive all of our active response choices. They explain why we care about what germs are where, and which kinds of germs matter more when, or to whom. This is how we know what to do, how far to go, and when to quit.

The 3 Factors of Risk

There are three factors that determine pathogenic risk in instrument handling. They are ***contact type, frequency of touch,*** and ***shared status.*** These express why we care about germs.

Contact type describes an item's expected body interaction. Some only meet intact skin, mostly limited to the hands, some meet the face or body, and some directly access the mouth and airway. This distinction affects the player's route and risk, and therefore our type of active responses required. This term may be confused with known exposure (described as having been *in contact* with sick people). While a known exposure informs QT times, using Standard Precautions *Universally* already manages known and unknown germs together.

Frequency of touch describes how much or how many people touch an item or area. All spaces have frequent fomites where the most germs, and the most diverse and recent germs, are likely to be. Keeping them from the face and mouth is easy as cleaning or disinfecting those frequent fomites and the hands that touch them. The CDC advises we pay attention to items and areas (or parts) touched most frequently.

On cases, that means handles, latches, and tabs on cubbies. On benches or desks, that's the place-mat-zone, and on music stands, that's tops, sides, and ledges. On doors, that's knobs and push-bars, and in offices, it's light switches, phones, and keyboards. In bathrooms, it's the sink and toilet handles, and the buttons on dryers. On instruments, it's touch-pieces where players' hands and faces go. Some things really aren't touched frequently, or they don't go in the mouth, like buffers, erasers, table legs, or wheels. They are usually only cleaned as needed for function and dirty might be their normal state (like rocks). Other things are touched by so many people and are so soiled everybody washes their hands after touching them (like toilets).

Shared status describes whether an item is moving to a new user. ***Unshared*** items will be handled or played next by the same player, offering no new communicable diseases, so only sanitary risk is relevant. ***Shared*** status offers germs to a new host next, risking their exposure to communicable disease too. Many environmental surfaces and some individual fomites exist in a constant shared state, always used by multiple people. Examples are floors, school desks, music stands, and pianos. When limited to hand contact, their germs are managed with hand hygiene. Shared items offer contagion to every user, in addition to sanitary risks they face alone.

Shared status is the "stranger-danger" that repulses us from the slobbery drool of others. Our stuff is swimming in microbiome that only bothers us when it gets out of hand or gets in the wrong places. PIH and sanitary cleaning control resident microbes and transient germs very well for unshared items, but close and frequent contact builds unwelcome or harmful payloads. When not limited to the hands, they're risky, and when they contact the airway, face, or mouth, they're unacceptable.

Shared status is why we clean gear between players and Enhance PIH when instruments can't be cleaned to our satisfaction. Items should never transfer to new users without appropriate turnover. This practice, called a ***wet-share*** (even when dry), introduces opportunity for contagion. This doesn't mean every item needs aggressive disinfection. It means every item going to a new user should be considered for contact type and frequency of touch to determine the best precautions for safe turnover.

When instruments only need a quick fix or minor adjustment, IC still matters. For handlers, *everything* is *shared*. Then, whatever steps were needed *before* service to protect handlers, also applies *after* service, to protect players from what handlers

leave behind. For example, a repairer sanitizes touch-pieces and mouthpiece, and uses Pro-PIH-HH to repair and playtest a clarinet. After service, they repeat the same SUPs to protect the client, and suggest the client use E-PIH-HH for 2-3 months after service (based on patterns seen on the TRIP)

The 4 Perspectives of Relevance

There are four perspectives of pathogen relevance in ICI, which drive our active response choices. Each adds a layer of concern. They are ***personal hygiene (PH), instrumental hygiene (IH), contagion,*** and ***occupational safety***. These express **which germs** matter **to whom** and **when.** Driven by compassionate care of people, each perspective adds layers of concern.

First, we care about *Sanitary PH*, for germs everyone faces on foods or fomites around them. Germs implicated in basic sanitary failure, like *E. coli, Norovirus*, and *Shigella*, cause hundreds of thousands of cases of intestinal distress every year. These and other transient germs are easily managed through PH, especially diligent HH, after using the restroom or interacting with others, and before eating, drinking, or touching the mouth or face. HH should also be performed before and after handling instruments.

Second, we care about *Sanitary IH*, for accumulation of a player's resident microbiome on instruments and gear, and the gathering of all the transient germs they've picked up along their musical journeys. Fed by bio-debris, condensates, and the materials they grow on and in, these germs may grow strong enough to create health problems for the player or loss of function for the instrument. Examples are *Staph.* and *Strep., which* cause skin and respiratory infections, and molds or mildews which can cause chronic lung infections and wreck bores and cases.

Opportunistic germs hiding deep in instrument bores, tubing, and crevices, can grow and multiply until strong enough to offer payload levels. They make things sticky, gooey, and smelly. They affect lubricants, pads, and glues, and shorten the life of parts, reeds, and case materials. Thick sludge, crust, or biofilm houses even more kinds of germs, making them an even bigger threat. These are the germs we target with mechanical and sanitary cleaning to remove debris and any

opportunistic payloads. This is also where we counsel PIH to support the health of the mouth and skin, HH to put fewer germs on the gear in the first place.

Third, we care about *Contagion*, threatening new players and handlers of used gear. This is where the host of possibilities exists in the biomes and communicable diseases of others. This is where choices are made about how far to go in cleaning and disinfection, and where extra measures are added when desired responses cannot be satisfied. In service, rental, and re-sale, it influences turnover practices, and in client care, it informs counsel for E-PIH-HH after service or handling. This is also where players ask about germs they want to avoid catching or giving to others, and where clients are advised to observe E-PIH-HH after service.

Fourth, we care about *Occupational Safety* for handlers, whose work brings them in contact with gear and its microbial baggage. Here, professionals must add the risks in their facilities or functions. For example, Tetanus threatens unvaccinated workers who get hurt, and Listeria thrives in stagnant plumbing of closed buildings. Shared spaces and tools also add burden and risk, so Pro-PIH-HH meets shop safety and social customs in the workplace.

Knowing what kinds of germs might be there in the first place and how long they remain a threat is essential. The ability to share this information with others is incredibly valuable. However, it is neither convenient nor necessary to become a microbiologist and master all germs everywhere. A basic understanding of microbes and hygiene enough for most players, and sanitary cleaning and PPE supports most private instruments. For repair, rental, and re-sale, reprocessing and turnover are built to prevent contagion, and professionals pair Pro-PIH with OSHA guides to work safely.

The Table of Relevant Instrumental Pathogens (TRIP) is a snapshot of 75 RIPs most likely to get on instruments, accessories, or tools, and their viable persistence. This tool effectively demonstrates relevance of instrumental pathogens and PIH education and advocacy, and supports decisions about QT prior to service or re-issue, or about after-service E-PIH-HH.

The Prime Directive in ICI

The Prime Directive in ICI is to keep fomite-mediated germs out of the face or mouth. This is the best way to support sanitary experiences for players and safer interactions for handlers.

All people must *keep that rule for themselves* wherever possible, and should try to *reduce the burden of others* wherever possible. The primary means to accomplish this is hand hygiene before and after contact with people, places and things. The secondary means is sanitary cleaning, sanitizing or disinfecting items directly. Hygiene education is vital to success, because it is impossible to safeguard everyone from everything.

Professionals must take sensible and defensible steps to *make it easier* for those they serve to keep that rule. This includes performing hand hygiene diligently, offering hygiene education, reducing germs on surfaces to the sanitary levels for their intended uses, and providing barriers and hand hygiene supplies as appropriate. This also includes advising E-PIH-HH for a period of time after service as needed.

Caregivers, *responsible for the safety and wellbeing of others,* must take sensible and defensible steps to *keep that rule for them*. For *parents*, *teachers*, and *care providers*, this can be exhausting until their charges can manage sanitary hygiene for themselves. Caregivers of children and those with special needs often require additional staff to help them because their charges *cannot* manage sanitary hygiene for themselves.

Real Standards and Precautions

Real life is easier to live out than to describe in writings. Safety practices and policies in spaces or situations all mean to protect our players and ourselves. Germs, words, and safety gear don't read books or follow rules. Arguing about which precaution category a gray-area rule belongs in is like arguing whether "Pink," is truly a red color or one with its own family.

Standards are expectations in safety practice, quality, or measurements. Rules that help preserve quality are Standards. All safety measures are precautions, and for germs, they're IC-Ps. When they're rules, they're IC-SPs, and when they use the words "*always*" or *"never,"* they're IC-SUPs. For example, a requirement that all first-time workers or visitors complete an hour of safety training is a safety standard. Requiring them all to perform hand hygiene on their way in is an IC-SP. Total forbiddance of wet-shares should be IC-SUP, so that issuing used instruments to new players always follows consideration and application of appropriate turnover and client counsel for E-PIH-HH.

Cleaning every bench after servicing, and disinfecting every mouthpiece before play are IC-SPs. Recurring and defined janitorial care in schools and cleaning schedules posted in gas stations and restaurant are Standard Practices for sanitary cleaning. If all students in an ensemble must wash hands before a lesson, remove their own garbage, including any bio-debris and condensates, and then spray and rack their own stands and chairs, they are being held to a certain Standard, guided by PIH and IC-SPs. Some Repair shops may choose Standard ***Q***uarantine ***T***imes of 12 hours (QT-12), or 24 hours (QT-24), or QT-4D, QT-7D, or longer, etc. prior to full disassembly of wind instruments. Others may waive QTs before services, relying instead on Pro-PIH to keep work germs out of their faces and mouths. They'll swab and wipe parts and benches, disinfect mouthpieces, and counsel clients to use E-PIH-HH after service.

Some safety standards are already true Industry Standards, seen from shop to shop, like safety glasses in chemical rooms and ear protection in loud tooling rooms. Those already regulated by OSHA are a good example, but it doesn't always take a regulation for people to see that something needs to be done. When the most obvious Standards and the most sensible language are adopted by enough shops to become industry standards, professionals have a better expectation of basic safety in at work. They also have more solid footing for decisions in cleaning and disinfection when everybody is using similar processes, and they don't have to fully explain them in every conversation. Players also have a better array of options and expectations for service. At some point, SPs are so obvious that options are nearly intuitive. That isn't true yet, so we still need to be able to explain our choices and actions, and translate what Standards and TBPs do in our real-world instrument handling environments.

TBPs are extra measures when Standards just don't cut it. All safety areas have E-measures like thicker gloves, different shields, or steps that block a safety risk. In IC, they always block an infectious transmission, along a known route. Interventions that don't are frivolous, and only added at a client's informed request. *Contact* TBPs include gloves and other barriers, limited access to spaces or fomites, and staging of clean or unclean areas. *Respiratory* TBPs are adding or upgrading masks, spacing and filters, crowd control, limited capacity or duration in spaces, and air handling. Whether it's a single instrumental situation, or a community response, TBPs fluctuate in real time.

Some TBPs are defined by shops, with words like, *"if this happens, then we will do that."* Sometimes the shop permits workers choose when and where to add more measures to their Pro-PIH, like providing gloves for optional routine contact. ***Gloves can never replace HH anyway.*** Gloves only reduce what HH washes away. They spread germs everywhere that dirty hands would too. Their only effective use relevant to PIH is to reduce a contact load for the handler.

Setting or updating standards and precautions requires thinking through various roles or spaces with available options in mind. It doesn't mean reinventing all processes and procedures. It means calling things what they really are, ad seeing what's covered, so what remains to be done might be revealed. Once defined, Standards, SPs, SUPs, and TBPs should be upheld. They need to be recorded so folks know what to do where. Any optional and temporary actions noticed by the staff should also be tracked, because that's how all standards came to be.

People use precautions all the time, even if they don't realize it. Whenever a family member gets sick, the family learns what to do keep the rest of the household from catching it. Precautions are seen in non-microbial threats too, like umbrellas used for rain and not sun. Put simply, the volume knobs on specific safety concerns can be turned up when needed and down when not needed any more.

Some TBPs are meant to protect a certain vulnerable person from normal things, rather than protect average people from especially harmful things. A person whose immune system has been weakened by surgery or chemotherapy might wear more barriers to keep contact with transient microbes to a minimum. One might choose fragrance free laundry soap for infant bedding and clothing to avoid contact irritations with the baby's skin. They might not let anybody kiss the baby

while too young to make antibodies, so the baby to grow a healthy familial biome, unimpaired by antibiotics.

What we do, when made aware of Infectious risk, or which active responses we'll use, depends on who we are and what we do. Players might take time to make sure they know how to take care of themselves and their instruments and then get back to their practice and performance.

Repairers might make a list of all the instruments they work on or the processes they do, and then check each one off with ICI in mind. Teachers might think through their spaces and the types of classes or lessons they are involved in. ICI content might change how they perceive the flow and the instructions from districts, or how they'll answer questions of students and parents, or what new supplies they'd like to have.

Shopkeepers and office workers might look around their spaces for areas to improve sanitary baselines. Are there lesson and practice rooms that should be cleaned daily and at intervals? Are there products we should have available for users? Are there schedules and signs we can hang up to help people feel safer about our hygienic spaces?

Owners, managers, and supervisors might be thinking about how to harness this information efficiently, get the tools up and running, and get back to what they were doing before all this interrupted them. Band, orchestra, and other program directors might be wondering how this can be layered into their inventory planning, or how to begin an inventory planning project if it didn't exist before.

ICI has prepared two support sections for those thinking about these things. Thinking Through offers brainstormed ideas from allied professionals per role or workspace. It also expresses a couple different ways to process those thoughts and perspectives. The Business of ICI is a collection of concerns for those who are writing policy.

Those building or updating procedures for cleaning and disinfection of instruments and parts should hold fast to PIH and PPE concepts explored to this point. Of all IC-Precautions, cleaning and disinfection are the last and most aggressive options precautions on the list. Of all active responses, direct cleaning and disinfection offer

the most cost, effort, time, and risk to surfaces and to those performing procedures. When germs on environmental surfaces offer no significant threat and can be kept out of the face and mouth with hand hygiene, there is no need for that extra cost, effort, time, or risk. This is why we don't disinfect our rocks and mailboxes.

7

Cleaning and Disinfection

Cleaning and disinfection may be the first things that come to mind when considering microbe management, but they are the last on the list of IC Standard and Universal Precautions, and the last active response explored in ICI.

This unit clarifies the terminology used in cleaning and disinfection and presents the Rational Approach to Disinfection. Finally, the methods of cleaning and disinfection are explained.

C&D Terminology

Terminology in cleaning and disinfection (C&D) is confusing, mostly because of careless marketing and popular slang. C&D are ***actions*** achieved by various ***methods***. For confident choices, we need to know what we're doing and why, and be able to explain it to others. The goal of IC is to prevent or reduce the spread of infection to people. In instrument handling, the goal is always to keep germs on surfaces out of the mouths and faces of players and handlers.

In the context of IC, harmful germs are called *pathogens*. How they move from one host to another is their *route of transmission*, and how they get inside is their *mode of infection*. How well they spread is called *infectiousness*, and how long they remain viable on surfaces is their *persistence*, often used for quarantine times. *Cleaning* is the removal of debris. *Sanitation* is the public water treatment to reduce enteric germs to safe levels. *Sanitary* means "safe for intended use" according to a standard, while *unsanitary* means unsafely soiled (washing dishes and laundry makes them sanitary). Sanitary cleaning means washing with soap to make items safe for intended use. *Sanitary treatment* is a germicidal process that reduces germs

to safe levels but doesn't remove debris. *Hygiene* is a group of habits that keep bodies and items sanitary

Sanitizing, like sanitation, reduces microbial loads to "safe-use levels" with products proven safer for humans. Some industries have mixed ideas about this, but the FDA regulates all sanitizers for hands or food or drug preparation surfaces, as well as antiseptics, antibacterial or antimicrobial soaps, and anything else claiming medicinal or therapeutic use. Most sanitizers and antiseptics are *antibacterial,* not antimicrobial. They target bacteria, not molds or viruses. Hand sanitizers must be safe on skin and kill 99.9% of vegetative bacteria in a timed test, and food contact sanitizers are even stricter at 99.999% [FDA, 2014]. The EPA still regulates and registers all commercial sanitizers, but FDA regulates *their use* and their effective action. Most sanitizers in IC must be recommended by CDC, registered by EPA, and approved by FDA for use.

Disinfection removes or destroys pathogenic life on surfaces or in contact with surfaces, so most methods weren't designed for safe use on flesh. The CDC's Guide to Disinfection and Sterilization defines many ways to kill microbes, including heat, chemicals, radiation, and fumigation. They're all sorted into three levels that correspond with Spaulding's Rational Approach to Disinfection. The highest level is sterilization, which destroys all life (harmful or not) including viruses and spores. Critical for surgery, sterile processing services require maintained certification of all methods and users. Musical instruments only need moderate or low levels, if any. Many environmental surfaces or tools are rarely disinfected, if ever.

Disinfectants are pesticides that treat germs as pests. Regulated by the EPA, they specify what they kill and instructions for use, including contact time. Different products and methods are effective on different types of germs, so disinfection may targets specific germs, germ types, or defined levels of action in categories. Products and methods all have strengths, weaknesses, and hazards, and those targeting fungus or spores require specific labels. When germs are too new to be on labels yet, the EPA hosts an Emerging Pathogens List (EPL) of products and active ingredients proven effective. They have searchable tools for pathogens and products, so users can be confident in their products and methods. It is not lawful to use pesticides *off-label* (not as directed in application or dilution), to claim or imply disinfection levels not justified by approved methods, or to misuse the defined action terms (i.e. sanitize, disinfect, and sterilize).

Professionals, or anyone advising others, need to understand that many (if not most) germicidal products, services, and methods are *regulated* [Alston & Bird, 2020], and how those regulations work [NPIC, 2010]. Serving or advising others assumes certain responsibilities for their harm, even when not part of paid services. Unregulated processes used in sanitary service are best described as ***[action]*** + ***[method]***, with ***details*** and ***basis*** on file and on display.

In Terms of Hand Hygiene

Hand hygiene helps keeps surface germs out of the face and mouth. *"Hand hygiene"* refers to all sanitary methods for hands. Since *sanitary* means *safe for intended use*, chosen ***methods*** must effectively reduce relevant germs to a level safe for use in each situation. "Achieve" and "reduce" are ***action*** verbs, and the reduction achieved by a C&D method is described as ***action***. Actions of C&D are *cleaning, sanitary cleaning, sanitizing, disinfecting,* and *sterilizing.* They all have defined methods with strengths, weaknesses, functions, and purposes. Hand hygiene is familiar to most instrument handlers, and offers helpful examples of C&D terms in action.

A person who is painting a fence over the weekend may occasionally hose off the hands to keep paint from spreading to unintended places. A rag and hand cleaner helps rub here or there to keep the hands from getting slippery, sticky, or crunchy. Washing with a hose, rag, and cleaner is *cleaning* for functional or mechanical purposes. It's not enough for food, surgery, or touching the face or mouth, but it's sanitary for painting a fence, cleaning the garage, and giving the dog a belly rub. At lunch, those hard-working hands are washed with soap and rinsed with clean water. This *sanitary cleaning* makes hands safe to touch others, go shopping, or eat lunch.

In professional foodservice, this is not enough. When our weekend warrior goes back to work at a pizza restaurant, they'll use additional measures to protect diners. Making foods for strangers exposes them to germs of contagious disease, food prep and storage, and sanitary failures. Foodservice workers wear gloves as barriers to protect consumers. Out for delivery, our pizza pro has no access

to soap and water, so the hands are rubbed with a hand sanitizer until dry. This is *sanitizing*, using a product labeled safe for use on hands or on food or drug preparation surfaces (as appropriate), and proven to reduce vegetative bacteria and some types of viruses, to levels the FDA calls safe. *Sanitizing* doesn't kill everything, and rubbing it on doesn't remove anything at all. Handwashing is best when soap and water are available. Since soap doesn't kill everything either, professionals in service fields often perform both *sanitary cleaning* and *sanitizing* of the hands. Handwashing with *sanitizer* doesn't work because water dilutes *sanitizer*, for a weird wash without soap. *Cleaning* and *sanitizing* hands takes two steps.

The surgical scrub is an example of professional hand hygiene for a specific purpose. It layers sanitary cleaning with soap, sanitizing, and scrubbing with antiseptics to kill and remove as much as they can without damaging their skin. Medical procedures are named by [purpose] + [treatment]. Function and purpose may change, but action does not, so non-medical C&D is described by highest action, as in [***action***] + [***method***], with ***details*** and ***basis*** on file and display. We'd call this a [sanitizing] + [scrub], with "***ABC Stuff for 3 minutes,***" and we'd retain the ***SDS, instructions and who said to use it.*** It's *not disinfecting,* because pesticides are not to be used on living tissue, and it's *not sterilizing*, because that destroys all life, including the cells of hands. Since the surgical scrub is a professional tool, using enhanced hand hygiene, it's an E-Pro-HH.

C&D ***actions*** make items sanitary, or *safe for intended use,* and ***methods*** have limitations. Sterile gloves protect surgical patients from what *sanitary cleaning* and *sanitizing* the hands cannot. When instruments and gear cannot tolerate the preferred C&D methods to make them sanitary for playing and handling, we use other active response options too. QT, PIH, PPE, and HH protect players and handlers from what our available options cannot do. Just as hands may be treated, using different *methods* of appropriate *action*, to meet sanitary levels needed (to make hands safe for each situational use), other fomites can be managed with action methods to achieve sanitary levels too. Surgery requires sterility, but other interactions don't need to be sterile. Knowing where and when C&D action is needed or how far to go is as important as what the terms mean. Required sanitary levels for hands, surfaces, and even surgical tools, is defined by how critical their interaction with the body will be, in the Rational Approach to Disinfection.

The Rational Approach to Disinfection

The Rational Approach to Disinfection **(RAD)** was developed over 30 years ago, by Surgeon E. Spaulding. It was adapted from the microbial disinfectant hierarchy [Rutala, 2015], with three levels of disinfection for tools or parts, according to critical contact type [Rutala et al., 2008]. Surgical tool sterility is ***Critical (Cr)***, requiring the very highest level of disinfection. Parts that access the airway, mouth, or mucous membranes are considered ***Semi-Critical (SCr)*** and need moderate level disinfection. Items meeting only intact skin are ***Non-Critical (NCr)*** and need only low-level disinfection, if any. The CDC later added a fourth level for ***Environmental (Env)*** surfaces and tools with even less contact [2008]. The RAD is very widely accepted and correlates with CDC's disinfection methods and EPA's graded disinfectant activity [WHO, 2004]. Products for general use (by the public) achieve low to moderate levels of disinfection. The EPA limits stronger "Restricted Use Pesticides" to certified professionals for safety [2019].

When we disinfect mouthpieces, clean chinrests, swab bores, wipe touch-pieces, and use barriers and HH, our goal is a sanitary experience for players and safer interaction for handlers, when items are used as intended. **Most instrument-handling fomites are** Env, like furniture, tools, cases, accessories, drumsticks, pianos, and the hands of others. With no access to the airway, mouth, or mucous membranes, instrument parts that touch intact skin of the face or neck, like chinrests, are NCr. After functional cleaning and sanitary care, most of the focus of NCr's is on PIH. ***Diligent hand hygiene, before and after handling, keeps contact germs out of the face and mouth.*** Comfort cloths, liners, or gloves, and tracked QT are options when parts can't be treated to satisfaction. Extra care is needed for broken skin, and gear should always be free of sharp edges. Touch-pieces and parts handled most carry the most bioburden and should be cleaned and disinfected when it is safe to do so. The greater risks if NCr is in shared status.

Wind instruments access the airway, mouth and airway, and are always SCr. When they are disassembled, mouthpieces and related accessories remain SCr, but other parts are NCr, or even Env, because they're not meant for the mouth. ***Bore contents should never be aspirated***. The risk of deeply placing harmful content far outweighs the benefits of reed-clearing, and oral vacuum is not a valid leak test,

since play with positive pressure. Condensates do leave more significant biological loads in bores and openings than non-winds, but as NCr fomites, ***washing hands and mouthed parts keeps their germs out of the face or mouth.*** Reeds should never be shared, and mouthed parts and storage accessories for mouthed parts (like reed cases and water-cups) should be disinfected or sanitized between players.

Handling and contact risks increase with mouthing or splattering, and decrease with PPE, distancing, and good PIH-HH. All interactions between people and things are only as safe as their weakest links. Clean straws do not clean dirty water, and wiped stands will not clean unwashed hands. Teachers helping students, and repairers helping players, with gear should be diligent about performing and demonstrating ***HH as the best way to keep germs out of the face and mouth.*** Supplies to clean and sanitize hands and SCr parts should always be accessible without having to leave the room, so dirty hands or dropped mouthpieces never go into the mouth for lack of them. All players should be taught to manage their own litter, including condensates, to support true ensemble, which exists beyond the first and last notes played.

Teachers who touch students and gear should perform HH to protect students and themselves. Repairers should clean benches and hands before and after servicing gear. This offers a clean slate, reducing microbial exchange for clients and accumulation for themselves. Some use QT before servicing and wipes to reduce loads on touch-pieces, but Pro-PIH-HH remains their primary defense against germs to their own face or mouth, and E-PIH-HH education helps to protect players after service or handling by strangers.

Methods of C&D

Methods of cleaning and disinfection (C&D) are a hot topic in instrumental service. Cleaning simply means removing debris. There is nothing wrong with a good cleaning or polishing as needed. Soaps, detergents, or other chemicals, aided with the scrubbing of rags, brushes, or ultrasonic waves, can remove oil, skin, sludge, and bioburden. Mechanical cleaning supports instrument function so parts move

easier and last longer. Clean instruments also look, feel, and sound better. Sanitary cleaning (with soap) also chemically damages many common germs. Washing with soap and clean water is a common home-maintenance process for Brass-winds (and their players). Other kinds of detergents and chemical cleaners remove debris, but cannot claim the sanitary care of soap. They have an effect but with different use and contact times. They also can't claim to sanitize or disinfect without specific labeling. Antibacterial and antiseptic soaps enhance handwashing, like surgical scrubs do, but are still sanitary cleaning. For things that don't go in the mouth or to others, this may be enough. PIH, the immune system, ***hand hygiene, and avoiding the face and mouth, keeps germs out.*** For more, we get aggressive.

Microbes can be killed with heat, chemicals, radiation, irradiation, fumigation, ozone, and steam. The CDC's guide explains how these work, what disinfection levels they achieve, and where they are often utilized. EPA and OSHA also have regulations and guidance because of the hazards of using and working with them. The methods of disinfection in most contemporary music repair shops involve heat or wet chemical contact, but emerging tech may include UV radiation and cold hypochlorous fogging. Since many instruments can't take the heat needed to cook germs, and radiation and fogging are still emerging technologies, many shops use EPA-registered pesticides for germs, called disinfectants, for low to moderate level disinfection of vegetative microbes. These are graded differently than hand and surface sanitizers, which usually target bacteria only. Sanitizers are registered by EPA, but must also be approved by the FDA for use on humans or on food and drug preparing surfaces. Disinfectants must declare what they kill and how long it takes. They need specific labeling for fungus, parasites, or spores. Sterile processing services require methods review and continuous user training.

Kill levels are defined for disinfection methods and terminology must claims about germicidal targets, kill levels achieved, wet contact times, health benefits, and uses for food and drugs. Directions for each claimed method must be carefully followed, especially about dilutions, contact time, exchange (freshness), and disposal. Claims about evolving technology must be carefully worded. Some skin-safe sanitizers are also low-level disinfectants. One popular example is alcohol-based hand sanitizers (ABHS). They are recommended by CDC, approved by FDA, and commercially registered by EPA. Some people choose antiseptics for sanitary care. Their *off-label* use as sanitizers or disinfectant cannot be justified professionally.

Unregulated processes used for sanitary service are best described as [***action***] + [***method***], with ***details*** and ***basis*** on file and on display. Sanitary cleaning or treatment is usually only sufficient for environmental surfaces (Env) and tools not meant for the face or mouth.

The CDC's wet chemical disinfectant guide discusses alcohols, chlorine and its compounds, hydrogen peroxide, iodophors, ortho-phthalaldehydes (OPAs), quaternary ammonium compounds (QUATs), and more. All are regulated by the EPA as pesticides. Each has its strengths, weaknesses, and hazards to people, parts, or the environment.

All workplaces must maintain safety data sheets (SDS) for chemicals they use, store, or sell, including cleaners and disinfectants [OSHA, 2012]. Employees should review them at least annually, to maintain proficient use, respond quickly in an accidental exposure, and to ensure company protocol still matches SDS and labeling. Employers must meet safety requirements for facility of use, such as extinguisher type and eyewash provision. This includes DIY and refills.

8

C&D for Instruments

Just as hygiene and IC were ICI first introduced and then applied to instruments, this unit follows C&D (and sanitizing), and applies them to instrument handling.

It contains the first ICI commentary to appear in support of repairers working out the best services and methods for their players. Discussion is specific to service options and to concerns of instrument families. Consideration is given to the true meanings of contact and contact time, and to justification of methods used.

C&D for Instruments and Parts

Instrumental cleaning, sanitizing, or disinfecting needs are determined by RIPs, based on contact type, frequency of touch, shared status, and critical contact type. At home, most parts are managed with PIH and sanitary cleaning, unless there's reason to do more. Basic steps for cleaning and maintaining gear at home should be guided by maker instructions, and resource references should be included with sales and rentals. Care guides from makers or supportive literature tell wind players how to wash, sanitize, or disinfect their mouthpieces and how to keep their horns clean and dry. They tell string players to gently wipe instruments after every use with a soft cloth. Players need to know what to do at home and when to get help for more.

When chemicals (like disinfectants) are used, players need to know which need to be rinsed away. Most mouthed parts can be removed for appropriate cleaning and disinfection. Many touch points are also resilient to cleaning, but not all. Some surfaces are too delicate to be wet washed or disinfected. Some can only be cleaned rarely and professionally. These rely on PIH-HH of players to reduce

the accumulation of germs, oils, and debris on instruments in the first place, and also to keep what is on them from reaching the face or mouth. Parts made to be mouthed and cleaned have more options, but don't eliminate the need for PIH-HH.

Sanitary cleaning demands clean water. Fouled water or systems breed and spread germs. Soap destroys some germs chemically, while mechanical agitation, brushing, or scrubbing lifts away others. Degreasers, corrosives, or acids must be neutralized or followed with a soap wash and rinse. This is chem-cleaning, deep cleaning. Some shops use ultrasonic cleaners to break down debris. They may also boost it with detergents that make fewer bubbles and leave fewer residues. Cleaners and detergents are not soaps. Sanitary cleaning adds a wash & rinse with soap or sanitary cleanser after deep clean or UC to kill some germs and rinse others down the drain. Sanitizing reduces vegetative bacteria to levels similar to low level disinfection at similar cost. Sanitizers are often an *antibacterial alternative* to disinfectants when other contagions are not relevant, chosen by unshared users to avoid pesticides.

There is a wide array of options for cleaning and disinfection or sanitization, based on who is served, what they need addressed, and what the vulnerabilities of instrument or part are. Disinfection and sanitization are presumed performed on complete parts or defined areas, so it's important to specify what is treated how. Spot-treatment, whether by sanitary cleaning, sanitizing, or disinfecting, for quick repairs or safer playtesting or client courtesy, is often un-billable to clients, because it is not a completed action on a whole part or area.

Unfortunate slang refers to all germicidal options as "disinfection," like calling all carbonated drinks "soda." False assurance puts players at risk and in sales and services, even when innocent; this may be a form of negligence [Schmitz, 2020]. Using one option to describe all is confusing. It's best to refer to the category as "*germicidal"* services, treatments, or care, and call specific options by name. For wet-contact disinfection, it is best also to specify the process or chemical and duration on selection menus or invoice.

Cleaning and disinfection serve the needs of people, not their germs or fomites, and methods are not always chosen for maximum kill. Like other services, options lie along spectrums of Good/Cheap/Fast and the 4D Picture of Done. For instrumental services, those four dimensions are hygiene, function, comfort, and

appearance. PIH at home, as well as professional repair and restoration, adjustment, mechanical cleaning, sanitary cleaning and disinfection all serve these dimensions in various ways.

According to the CDC, germicidal treatment always goes *after* cleaning and *before* final rinsing to remove residues. Even those using heat or UV must still remove debris as needed, and polishing the bright-work is obviously the last step in making things clean and shiny.

CDC's Guide to Disinfection and Sterilization [2008] supports consistent and cost effective protocols in hospitals, where everybody needs processes to work the same way every time. It takes into consideration that all of their surfaces and tools were designed with existing cleaning products and methods mind. (They call these surfaces easy-to-clean). As alcohols strip varnish and turn adhesive labels into goop, alternative chemicals and concentrations, or unexpected processes can strip, etch, melt, harden, or weaken them microscopically. Over generations of use, later workers never know the surfaces are compromised. Their processes don't work with the same contact time, or at all. Pairing recommended methods with approved surfaces protects their patients from damaged and contaminated surfaces and tools.

The CDC knows other industries are using the content now, and they explain other Miscellaneous Inactivating Agents, just a click or two into the main guide. Repairers have shown interest in ***other germicides***, ***metals as microbicides***, ***UV radiation***, and ***Pasteurization***. Unfortunately, less market (than hospital chemicals) means less development and availability of ready methods or literature about their function, action, and applicable uses.

Among the ***other germicidal*** chemicals, familiar examples are chlorhexidines, glycols, mercurials, and peroxides. To use these as wet-germicidals, professionals must find and make reliably sourced formulas and concentrations, find or create SDS and labeling, and store and dispose correctly. They'd be used like available products (swabbing, dipping, soaking, spraying) for the right contact time (in some cases, that's 20 hours). This service would be "germicidal treatment with XXXXX chemical." Since minutes are money, most repairers just buy a product they know already works and then get back at it, unless the tried and true is unsafe for items.

Metals like copper, iron, silver, and steel are used in many viability studies, and have been added to disinfectants. Emerging technology includes alternative coatings and infused alloys, but none are meant for items with extended or oral contact. While their environmental baseline may improve outlook in situations where hand hygiene is not available, none of them can compete with active methods. Even plain soap is faster, cheaper, and kills more stuff.

UV radiation cleans air and water in ***closed systems*** and empty treatment or production rooms. Consumer safe products will be welcome for turnover of parts that cannot bear wet-treatment, so long as their effective action is proven and the human hazard is managed well.

Pasteurization boils germs. After 30 minutes at 70C/158F, milk or water is safe to drink, and respiratory equipment is ready for re-use. This process was common before disinfectants were developed. (When sick, our fever of 38.9C/102F interferes with bacterial reproduction.)

Dry heat is baking. It is less effective than wet heat, especially without a fan. In 2020, dry heat became popular for treating reusable masks, reaching 170C/340F for 60 minutes. The FDA recommends meats reach (internal temperature) 71C/160F to be safe to eat [2017]. Some shops already exceed that to seat pads and set epoxy in the 82C/180F to 93C/200F range for 15 minutes. Duration heat users must find and justify the settings for heat and contact time that work for the shop's equipment and processes, and are safe for gear (tolerances vary). Contact time begins *after* the whole item reaches temperature.

The good news is what went in the oven before is fair game now. The bad news is heat melts glue, plastic, and shellac, dries wood and textiles, and moves pads. Baking is not an intake protocol or standard practice because it affects protein and fiber at a molecular level, risks damage and alters adjustment. However, knowing germicidal temperatures have already been exceeded while doing something else does waive the need for active and direct disinfection of that part, in that moment. (It wouldn't apply to other parts or offer protection over time.)

Baking is not a listed and recommended method of disinfection. Until recommendations use stronger language about heat for low level microbicidal reduction, it's not a billable service. It's best described as a germicidal treatment, i.e., "sanitary heating, at XXC/XXF for XX minutes."

The Best Services, Actions, & Order

The best services we can offer anyone are PIH education and informed choice.

Cleaning & Disinfection (C&D) Options in Action:

Cleaning: debris removal for functional or mechanical purposes

Deep Cleaning: cleaning that uses an advanced or aggressive method (such as Texas Flush), where difficult residue is problematic, for functional or mechanical purposes.

Chemical Cleaning (Chem-Clean): cleaning that uses chemicals to dissolve persistent debris or mineral aggregates for functional or mechanical purposes

Ultrasonic Cleaning (UC): removes debris, including bio-debris, with subsonic waves to disrupt persistent aggregates, for functional or mechanical purposes

Sanitary Cleaning: removes debris, including bio-debris with SOAP, or with a labeled antiseptic or sanitary cleanser, to chemically disrupt some germs and mechanically remove others. When used as directed, sanitary cleaning makes surfaces safe for their intended use (*not for face or mouth items for new users).*

Sanitary Treatment: reduces vegetative pathogens on items to safer levels for intended use without cleaning them, using a justified but unregulated process. This can also broadly describe unbillable courtesies and spot-treatments of touch-pieces incidental to repair. When specified, these are best described as [action] + [method], with details and basis on file (*not for face or mouth items for new users).*

Disinfecting: destroys vegetative pathogens on nonliving surfaces, by name or by level. *This is the most common germicidal service, especially for mouthed parts or before new users.*

Sanitizing: reduces *bacteria* to sanitary levels when other germs are not relevant, making touch-pieces safer for handling and unshared mouthed parts safer for mouthing by the same user. (Some sanitizers are also labeled effective against

lipid enveloped viruses).

Sterilizing: totally eliminates all life, including spores, this service is not possible on flesh and unlikely on instruments, due to requirements for safe and effective method claims.

Freshening or Polishing: (unstandardized) improves odors with enzymatic or scented chemicals, or appearance with surface treatments. Some destroy germs, but *none are considered sanitary or germicidal care* because intended use and levels are different.

Order of Operations **(examples of germicidal methods following cleaning):**

Sanitary Clean*:* Soap Wash & Rinse (Bubble Bath, & Scrubbing Flush, Clean Water Rinse)

Sanitized COA*:* Disassembled Clean & Sanitize all, Disinfect MP, Bright-work Buff

Sanitary Quick Fix: HH, Disinfect MP (& bore?), sanitize touch-pieces. Repair & play-test. When finished, repeat the same sanitary care before returning to client. **Avoid touching face and consider barriers. Counsel client PIH-HH aftercare for 2-3 months, as per shop.*

Chem-Clean & Sanitary*:* Prep, CC & Rinse, Soap Wash & Rinse, Disinfect MP.

UC Deep & Disinfect*:* Prep, UC & Rinse, Disinfect & Rinse, Disinfect MP

Contact-time and Reach

Contact time, especially Wet-contact time, is the duration of exposure or direct contact a ***method*** requires to reach the ***action*** it claims [Lowe et al., 2018], as in liquid chemical disinfection. Other examples are baking, UV exposure, paint-stripping, rust-removal, and electroplating. Wet-contact inspires fearful images of delicate instruments floating in buckets of suds. Since many instrumental surfaces cannot bear such treatment, some wonder what to do or whether anything can be done. Dunking is not the only way to manage germs. To explore other possibilities,

we turn to the bathing of a person.

If the bubble bath calls for 30 minutes of luxury, submerging the whole self would mean drowning. Instead, they rest part of themselves underwater, and use wet cloth on the face. They may use different products for feet, face, and hair. Some choose the shower, and after ensuring lather stays put for 30 seconds (soap's contact time), they rinse it away, avoiding their eyes. They can repeat that procedure when extra oily or dirty, or use less soap as desired. The point is that options exist for personal preferences.

Instrument bodies have options too. Partial submersion, alternative delivery, and light or repeated application help meet the needs of vulnerable parts. Fortunately, the parts most *critically contacted* and *most frequently touched* are often the parts most resilient to treatment. Mouthpieces and touch-pieces are designed to resist moisture. It should be safe to submerge plastic or metal mouthpieces in gentle soaps, cleaners, or disinfectants. It should also be safe to swab, spray, or wipe buttons and pegs, key-work, fingerboards, fretboards, case handles, chairs, stands, and metronomes, with appropriate products until their directed contact times are met.

Brass-wind instrument parts are usually meant to be washed and most surfaces will tolerate popular disinfection or sanitizing products. Quats should always be rinsed because they may react with alloys, and degreasing disinfectants should be cleared to prevent lubricant interference. Care should be used near cork, felt, rubber, or string, and body-blowing (directly mouthed valve checking at the heart or lead pipe) should be avoided.

Woodwind bores that are swabbed after playing to *remove* moisture can also be swabbed to *introduce* disinfectants. To minimize excess moisture to delicate pad seats, the barrels should be oriented with pads-up, and swabs should be wrung out first to reduce slop. If this does not remain moist for the full duration of seconds to minutes, the swab may be moistened again and reinserted until the time is completed. Pad seats on the back can be protected with cling film and clamped shut, or even removed. Pads on the back are often the most replaced anyway, due to condensate flow and drying patterns. Key-work areas are often wiped after playing or servicing, as are the large touchable areas of many wind instruments. When frequently touched areas are allowed to remain wet, or are re-wetted as needed,

for the duration required for *low-level disinfection,* microbial burden is reduced to safe levels *to touch*. Multiple cloths or swabs may be required for cleaning, germicidal treatment, rinsing, etc.

String instruments are often too delicate for wet-contact disinfection. Guitars and fine varnished violins can only rarely and carefully be treated on their touch points. No cleaners or solvents are allowed on their other areas, and they're usually serviced only by professionals. Players are taught to keep them safe and dry. Instruments like these rely heavily on players and handlers to use diligent PIH, especially HH, before and after playing and handling them. Student rental instruments are sometimes made with more resilient surface finishes that can withstand the cleaners and polishes recommended by their makers. When instruments have large areas that cannot be treated, touch-pieces can often still be addressed, and quarantine time (QT) is used between users who cannot perform PIH-HH. Emerging technology may soon support more options for closed system dry germicidal treatment with UV between rentals.

Contact type is about body interaction, and contact time is about exposure. The CDC says to focus on cleaning and disinfecting the *most frequently touched fomites* for Env's, because contact type, frequency, and shared status determine which parts matter when, or to whom. Wind instruments have SCr parts, and *mouthed* parts *must* be disinfected, especially before new players. Like other instrument families, they also have NCr parts *touched often,* which *might* need to be cleaned and disinfected. Lastly, they have NCr and Env parts *rarely touched*, and rarely cleaned or disinfected, if ever. Non-wind instruments have fewer materials that can stand wet-contact, but with no SCr parts, their microbial burden can be managed with PIH-HH.

Parts out of reach are also parts less likely to be touched. Unreachable dents are a well-developed concept for brass-winds. Nobody is dismayed when decisions must be made about wise and prudent dent-work, especially to avoid disassembly. The same prudence applies to cleaning and disinfection service. Some instruments have areas off limits to wet-contact or *out of reach* without major disassembly. These are often best supported with hygiene education.

It is inappropriate to call an instrument with untouchable zones (pads, delicate woods) "*disinfected,"* unless it was truly stripped down, because untreated areas

cannot claim the actions or status of neighboring parts. Instead, declare what was done where, as many other repair services do. When a key is repaired, a string replaced, or two pads or corks are replaced, we would not say we replaced strings, pads, and corks, because we know it would imply more than we did. It's okay to have some parts cleaned, some sanitized, some disinfected, and some vacuumed, freshened, or polished. Service applied where and how the player wants or needs it is not a contradiction of care. For example, a player may get their mouthpiece, ligature, and case handle disinfected and the key-work and bore lightly sanitized. The case interior may be vacuumed and freshened, the overall key-work function slightly adjusted and oiled, and one tenon re-corked. Most of the invoice is service-billed, if the shop bills cork and pads as parts. *"Mouthpiece disinfected; touch-pieces & bore sanitized,"* allows the player use E-PIH-HH wisely.

Service and sanity are the goal at the end of the day. C&D serves people, not their programs, their germs or their instrument types. Most often, sanitary experiences for players and safer interactions for handlers should be achieved with as few added steps, fees or extra process risks to the gear as possible. Choices look different when just load-reducing for a quick fix because Pro-PIH protects the worker from putting germs into the face or mouth. The touch-pieces could be sanitized, and the bore treated with disinfectant on a long and fluffy wand swab. While that's in there, the case and handle can be treated, and the mouthpiece disinfected. Repeat all of that to return gear to players. Then reset and disinfect the bench on the clock.

There is a difference between what is done for disassembled or assembled gear, wood or metal gear, shared or unshared gear, mouthed or un-mouthed gear, and frequently touched or rarely and barely touched fomites. The precautions to keep bench techs safer touching items for ten minutes are less than those needed for players to embrace them for months. It has been said that real music exists between notes. Real choices for effective C&D service exist between these kinds of details. What often derails handlers is looking for one answer to all situations, instead of intelligently processing needs of each instrument or player before them, and writing it all down. After a few similar processes, such protocol nearly writes itself.

While fomites and germs matter, infection is a people problem. In instrument handling, contact risk is in what we touch, but the greater reservoir and source of

germs is generated and emitted by people playing, not by the things they play. In other words, a sick player super-emits much more on a clean horn than a healthy handler can liberate from a dirty one. Areas with live playing and playtesting, and repair related generation, have droplets and aerosols landing on more surfaces, as if they were universally touched. This is why ***HH is the best way to keep germs out of the face and mouth***, and why so many are looking into germicidal air exchange.

Justifying Actions and Methods

Sensible, defensible cleaning and disinfection methods must be effective against target RIPs and safe for players, handlers, and instrumental surfaces. They must also be considerate of client cost and shop feasibility. Disinfection should not be offered to clear specific germs that have likely perished in dry storage. This doesn't mean clients can't buy higher levels of service than needed. The "picture of done" is painted by the client, and upgrades are subjective. Even superfluous service is ethical, so long as it's an informed choice, and not a predatory practice.

Professional sanitary cleaning and disinfecting methods are most easily justified by CDC's recommendations [CDC, 2020] or by EPA's Registered Disinfectants. EPA's searchable lists of agents effective against specific germs are especially helpful during outbreaks and known infections. Sanitizers, antiseptics, etc. must meet guidelines of the FDA as a class of drugs [FDA, 2019]. When they are not directly recommended by one of these agencies, most germicidal treatments should be described by their ***action*** and ***method***, as in "sanitary heating," and "germicidal UV exposure." The ***details*** (brand, how hot, how wet, how long) and ***basis*** (who says it works) should be on file, and displayed when appropriate. Spot-cleaning, spot-treatment, and tools to reduce bio-burden are often used to support internal shop safety precautions. They may also be used for client courtesy, but are not billable as sanitizing or disinfecting services because those actions are regulated. OSHA also speaks to workplace safety and all products used to support it, including pathogenic exposure [OSHA, 2020].

For all methods, directions of SDS, label, or agency must be followed. For example, alcohol-based hand sanitizers cannot be kept in large volume or open containers

due to fire and inhalation hazard, and evaporation, so buckets cannot be kept in band rooms. Alcohols may harm plastic, rubber, wood, and finished surfaces. QUATS may react with raw brass. Chlorines and peroxides may bleach fabric or risk health with prolonged or repetitive exposure [BNYU, 2015]. Acidic, alkaline, or corrosive chemicals are harmful to people and to instrument parts, and must be handled with care. Most chemicals really should be rinsed away, especially from parts that go into the mouth. When the intended use (as directed) is incidental or occasional, frequent use increases doses to levels beyond the evaluated exposure of those claims.

UV-C and other forms of radiation may cause harm to vision and flesh, and may discolor or damage surfaces. Radiation only reaches surfaces in direct line of sight (where the light lands) and may need to be very close to work, because air is a medium too. There are multiple ways to generate and deliver radiation or ionizing radiation, with differing contact times and hazard shielding required. Radiation doesn't always kill everything, and radiation that causes harm to one organism may also harm others [Kim, 2018, NAFA, 2017, & Tseng et al., 2007]. That doesn't mean it offers no hope for use. UV is already proving success in closed system air handling. However, markets often flood with early efforts, look-alikes, and gimmicks. Emerging technology may be expensive, hard to defend, and low in return on investment (ROI). If waiting for certain germs to die cuts risks, steps, and costs, people deserve to know that. At the same time, service providers use many safety measures at work which do not concern clients unless they make claims, risk damage, or increase service fees. Sanitary treatment is fair game too.

Many degreasers have germicidal action. Some can serve double duty as low level disinfectants. Another familiar repair process with germicidal action is heat. Temperatures over 71C/160F are harmful to most pathogens, except spore formers. Ovens and torches work, but there are risks. Heat releases glues and pads, melts plastics, like resonators, and may dry or crack wood bodies. Dry heat is not practical as routine intake protocol or re-processing, but incidental use (in other procedures) may still reach germicidal levels. This may eliminate the need for other active responses, like direct disinfection, on that part at that time.

9

The Business End

This section is dedicated to those choosing methods and products, or writing policy and protocol. It speaks first to customer care, client service, and forward thinking, then negligence, neglect, and loss of plausible deniability.

Reliable resources are encouraged, and IC is presented as a chapter of the safety manual. A side-note discusses DIY's & Faves, and letting go of the quest for the magic pill.

Business and Policy

Shop owners and managers handle all the building operations and schedule all the personnel and oversee all workload, supplies and inventory. Then they add client services and billing. They write new policies in trying times, and clean up messes they didn't make, and problems or delays they didn't cause. They answer uninformed inquiries and panicked questions with common sense and uncommon grace. Their plate is full before the first sale is ever made, yet they're already thinking about sustaining and growing into the future.

ICI brings a new perspective to some old housekeeping to-do lists, with new questions, new decisions, and new supplies to order. Some new policies or procedures write themselves if choices and updates are recorded throughout the day. New ideas and shared problems do get people thinking and talking, so participation and awareness multiply themselves. Employees should be encouraged to track and report changes they notice in their daily processes and needs.

Professional legalities demand reliable resources, so it is important to track which agencies regulate what requirements in the business and on the shop floor. To

avoid backlogs or missed updates, set a schedule for review at intervals. Awareness of agencies that regulate our biggest clients can also help us make and market products and services for them. This includes federal, state, and local agencies for industries and services, school or business administration standards, and franchise rules. Scheduled reviews of things that drive policy can help the shop move with the times. Mobile benches and pop-up displays have many of the same problems as brick and mortar spaces, and a few bonus complications from moving them from place to place. It is important to define a working zone and manage it just as well and safely as if it were a permanent location, with a written plan.

The IC chapter of the safety manual will be a hefty one, with all adopted standards, and the training employees will receive to help them comply. It should explain spacing, staging, and signage the shop is using so there is just one place to review that annually. Any IC labeling, guidance for PPE, quarantine times that the shop adopts as universal, and tiered practices should be written down too. Restrictions to different areas where PPE are required, where food or client access is restricted, or where clean spaces are off limits to bench-soiled staff should be clearly marked. Station limitations should be specified too, such as computers, benches, or phones that are dedicated to only one user. The schedule for custodial housekeeping should be defined for all areas. When policy statements develop into procedures of their own, a summary should still be kept in the main safety manual, and it should refer to the expanded locations.

Mandatory updates need a common posting space and a way to make sure everyone gets messages. If there is no email update system, posts should include a message block that workers mark when seen. A statement may be needed that addresses safer hygiene practices, and what the shop is doing. Conversation and action plans should be inclusive.

Everyone deserves to know how to reduce their personal risks, as well as to be engaged in the group efforts. Workers should have related duties based on skill set, not based on their size, shape, or mobility restrictions. Inclusivity and access take more than placing tools within reach and setting up some occupational task independence. It's important to consider best placement of hygiene and safety items, so employees in wheelchairs don't have to reach through fire or goop to get them. Truly thoughtful inclusivity can be graded by whether those with challenges feel welcome. Ask if they've been directly asked recently if they have what

they need to work safely and comfortably, and if they'd like to participate in quality improvement or other group efforts. When workers with special needs are the only ones not professionally and socially encouraged, engaged, inspired, and involved, accidental discrimination hurts too.

Customer Care and Client Service

Customer care includes transparent ICI steps like posted sanitary cleaning schedules and client education (in conversation and with printable literature). Extra cleaning bottles or wipes for lesson and practice rooms, hand hygiene and mouthpiece cleaning stations, and barriers for playtesting make clients feel cleaner and safer in the shop too. Businesses always have limitations to scope of services, and sometimes need to document warnings about services that may risk damage or residue. For example, ultrasonic cleaning may reveal aging or plating issues, remove lacquer, or release weak braces. Because of IC risks, buyers deserve to know when gear has been used and whether it has been disinfected. This helps them to enhance their diligence in PIH through the expected persistence of RIPs. Hand-outs or embedded notes in emails or invoices can direct players to where they can learn how to manage their own IC risks through PIH. This will also strengthen client confidence in shops that address ICI.

ICI-related services are marketable with care. Cleaning and disinfection are value-added services, but over-service in response to fear (even accidental) is professional negligence. It is very important to avoid predatory practices like inflated advertising or the use of snake oils (unproven or indefensible methods), especially during pandemics. In addition to keeping the shop legal and upright, it will build client understanding and trust in service values. Wise counsel that considers client investment and clear and transparent invoicing can go a long way. Rush service offers with surcharges should always include an option to avoid them. Written estimates with pre-approved call thresholds, help clients feel confident about finances. It is also important they really know what they're paying for. For example, cleaning is good, but it is unethical to perform functional or sanitary cleaning and call it "*special virus cleaning*," or to allow clients to believe they need more escalated services than they do. For example, mechanics shouldn't try to

sell new tires to naive customers with every oil change. When people hear about predatory moves like that, dirty profit dries up faster than a hand sanitizer.

Client services consider the spectrum of choice in terms of Good-Fast-Cheap, and the Picture of Done. Tiers of available C&D services should be defined as clearly as every other kind of sale or service, and that includes billing details. Sensible, defensible C&D services are billable in parts (consumables) and labor (average tech time). When recovering cleanup and prep between clients and repair instruments, fair labor time should count the bench reset, rather than the bench preset, to avoid accidentally charging for shop cleaning. Fair parts and labor builds that use existing shop billing structures avoid predatory practice claims. While service rates may also be established per instrument type, service, or turnover set, collaborative billing discussions should be very mindful of antitrust laws.

Forward thinking means engaging risk reduction early, and proudly promoting safety measures and client-care products and services. Market research for new tools or technology, cleaning methods, and emerging diseases is important, but enthusiasm for process improvement should be paired with healthy skepticism. Not every new gadget or idea will justify investment, and those that do take time to prove effective and reach affordable application. In 2020, schools and businesses closed to slow the spread of a new virus, and reopening guidelines changed the face of client interactions forever. Not every first reaction was positive and not every early response to risk was effective. Many businesses struggled to interpret guidance that applied to them. Knowing ahead which agencies to follow, and when to buy what, would have supported their wiser purchases, saving them time and money. Some, when presented with a solution that cost less than $10 or ten minutes, spent hundreds of dollars and weeks of research, trying to find cheaper or more clever ways to mitigate risk. In terms of return on investment, that's a hard loss.

Negligence and Neglect

Negligence and neglect are often used to describe mistakes or lack of care, especially for the most vulnerable among us, like patients, children, and the elderly. These words don't really mean "not helping" or "not helping enough," and they

don't have to mean intentional disrespect or dereliction. They describe a failure to meet a reasonable standard or expectation. We don't need to break a promise or breach a contract to be found at fault. Whether it is from a lacking response, missed steps, or acting beyond appropriate training or credentials, the failure is in knowing and meeting reasonable expectations. So long as all decisions are clearly sensible and defensible, any accidents that happen won't be caused by negligence or neglect. The opposite of neglect is care that exceeds expectations.

Examples of negligence are a teacher losing instruments because they don't track them, a parent drilling a clarinet for a stuck swab, or a repairer gouging an instrument with loose bench tools. Claims for financial restitution must prove four elements of tort law. These are duty, breach of duty, harm, and fault. Negligence, even unintentional, causes damage that could reasonably have been avoided. "I didn't know stealing cars was illegal," is an absurd claim, and "I didn't know I could twist the trumpet," admits an unqualified repair attempt (failure to stop). Professionals, by definition, are marketed as qualified to serve or to advise. Clients have a right to the risk level they've been sold. Unqualified service, fraud, or guesswork raises that risk level behind their backs. Plausible deniability does not offer faultless protection for those who are presented as knowledgeable or professional.

When instrument makers, vendors, and repairers were flooded with questions about how to manage SARS-CoV-2, their position as industry authorities most people expected to know (what to do with instruments) was clearly demonstrated. When all reopening businesses implemented safer practices, it showed clear duty to care, even before legal requirements emerged. Since all the information needed to make sensible and defensible choices is freely available, failure to try constitutes a breach of that duty. It is up to each industry, shop, or heart of service to avoid the final two elements of negligence, which are preventable harm or damage, and causal connection (fault) through failure.

Plausible deniability about this was destroyed when schools and businesses were locked down for months and media coverage was rich with this conversation. "*I didn't know that instruments had germs that matter to players or that I needed to worry about them,"* just won't work anymore. Shops that seize the moment to learn and adapt now can share the community learning curve. Failure to face the issues and respond to them might leave the shop in the dark ages, eventually bringing harm to clients. Even without any lawsuits, the stigma of a "dirty shop" could damage a

reputation and client base, just like it does to restaurants with food poisoning or foul bathrooms, and to food companies with a sanitary recall on record.

Sensible and defensible choices, by definition, already meet or exceed expectations, lifting businesses above accusation and into the realm of proud and excellent client care. All of the efforts that businesses make to support public safety and serve the needs of their clients should be proudly promoted and easily explained. This is what builds the relationships of trust that bring clients back for more and makes them send friends and family in too. No matter how great a deal was for a sale or a repair, what people remember most about any sale or service is how it made them feel to go there, be there, and get that done. Simple and effective policy and signage, compassionate availability of hygiene literature, free access to hygiene supplies and barriers while in the shop, and consistent communication and training of staff, will present a solid face forward. The “4-D picture of done” (hygiene, function, comfort, and appearance) is painted by clients. If the opposite of neglect is care that meets or exceeds expectations, let’s do.

Reliable Resources

Before people knew about germs, they thought sickness came from bad smells magical curses, or the punishment of fates and deities. People responded with spells, dances, and fabled remedies. Some led to medicines we trust today, but others, like bloodletting, were worse than what they treated. When people are really sick or when they’re worried about precious loved ones, their desperation to “just do something” can make them vulnerable to bad advice or scams, even when they know better.

It's even worse when the threat is in an area of life or science they can’t see or don’t fully understand. Social media content, presented as factual news, can be added by anyone, anytime, about anything or anyone, and none of it has to be proven true first. Vague stories, chain-posted clickbait, or untraceable tips should be viewed with healthy skepticism for both source and content. Misinformation isn’t a new threat, but its sources have multiplied over time, and good intentions don't always shield us from it. The advice we take, especially if we use it for others,

must come from trusted sources.

For reliable information about Infection Control (IC), we start with agencies that regulate and educate, and then add primary and peer-reviewed literature from experts in the field. In the US, the CDC focuses on disease prevention, IC education, sanitation, and hygiene. The EPA regulates pesticides, including disinfectants. The FDA also regulates sanitizers, as well as antiseptics and antibacterial soaps used on hands, bodies, or on surfaces used for food or drug preparation. OSHA provides guidance for workplace safety hazards, like chemical use.

Primary sources are directly quoted webpages, books, and articles. These are only as strong as the credentials of their authors or the validity of their cited studies. Peer review is a strict formal process of expert evaluation prior to publishing, often with many revisions needed to eliminate things like fuzzy phrasing and anecdotal or faulty logic. Textbooks and articles from news, magazines, and trade publications offer a great launch pad, but are most credible with strong citations. Literature from vendors may help too, but content truly meant to educate doesn't advertise except to thank sponsors. Field experts often share information that is considered basic to their fields without citations, but they should reference sampled works and they generally offer resources to support specific claims or promote further studies.

Vertical help (from those truly more advanced) is more reliable than the lateral support of well-meaning peers. Students whispering amongst themselves, instead of asking their teacher for help, might only add to class confusion. Likewise, guides written "by teachers for teachers" about topics that are outside of their training might include tips that service professionals in those fields would never support. DIY chemical recipes may not specify starting and final dilutions, stock stability and storage needs, usage limitations, or even safety hazards. Since IC affects the health and safety of others, all IC advice needs to be ultimately traceable to IC agencies or to the signed instructions of IC doctors or IC nurses, who know the situation and how to respond to it.

When Earnest Hemingway was asked what one thing anybody needed to be a great writer, he advised the use of a *"built-in, shock-proof, crap detector"* [Aranha, 2019]. His words have since inspired a variety of popular acronyms for teaching due diligence. Whichever version you agree with, references and resources used

to make sensible and defensible decisions should always pass the CRAAP test. To be sure you've got details you can count on for yourself and for others, check all your decision-making facts and where they came from, for ***C***urrency, ***R***elevance, ***A***uthority, ***A***ccuracy, and ***P***urpose.

The Safety Manual

The Shop Safety Manual is nothing new, though some programs have written more down than others. ICI is a new chapter in that book for many. Of course, a safety plan doesn't guarantee that nobody will get hurt or sick, but it does reduce risks and demonstrate due diligence that meets or exceeds reasonable expectations. Safety plans should be easy to follow, and create a safe space, even for visitors. Written systems are more effective at protecting people than verbal rules or presumptions. "Everyone who attends our training first takes this tour and reads a flyer," holds up a lot better than "people ought to know better." If the opposite of neglect is to take proper care, the way to oppose it is to exceed expectations in protecting people. The style of the manual is unimportant. What matters most is content and location.

Every great workplace safety manual covers fire and storm response, machine and chemical handling, and other common hazards. Mobile workspaces, vehicles, and pop-ups use smaller versions on the move. Schools also have them, even if copies aren't kept in every room. IC is just another chapter in the book. It won't go as far for repair shops and instrumental programs as it does in healthcare or foodservice settings, but peeking into their procedures can help jumpstart the process. Those new to writing procedures might try the subtractive approach, copying a well written chapter from a health safety plan, like the Bloodborne Pathogen Policy for Snohomish Washington [2007], replacing things that don't apply with things that do, and re-designing or re-styling it as desired. Be careful to only sample things from public use documents and that use standardized (non-proprietary) formats.

The IC chapter should explain germs and infection, and what the shop is doing to reduce them for workers, participants, and guests. The shop's cleaning plan might list only frequent fomites and key areas, or name a cleaning service. Shop staging

should be defined for clean areas where food is permitted and dirty areas that use PPE. Staff training should be noted, including how often they should review it. Guest area access restriction, signage, and education should be noted too. Displayed literature or posted cleaning routines for practice rooms and restrooms, and lists of all the extras that make clients feel safer, like hand hygiene and mouthpiece cleaning stations should be there, including temporary or interim measures and when they end. One area of recent relevance is droplet and aerosol generation in aggressive or powered cleaning processes. Chemical SDS and dust protection were already recognized in occupational safety, but in 2020, shop employees became concerned also with airborne germs. Sinks, mechanized brushes and buffers, etc. should be reviewed for upgraded safety needs.

Protocols for workflow and gear handling, including cleaning and disinfection, are driven by IC risk responses. Every detail doesn't need to be spelled out, but it should be clear which practices are standard, and there should be some difference in how instrument parts or other fomites are handled, based on their shared status or critical body contact type. If these can't be easily explained, they can't be easily marketed, performed, or billed. Since professional decisions must be sensible and defensible, the shop's responses to any reasonable risks, including germ handling, should be articulated in the safety manual.

Nobody is an expert at everything, and writing procedures may be intimidating, even for seasoned masters, but repairers are people who figure things out and make them play. Business managers and administrators are project managing champs. Shop leads know how process work. Musicians are always finding creative forms of expression, and teachers know how to break things down, reinterpret and repackage them until understood. Instrument handlers are much better prepared to address these tasks than they know, and the great works we have now were written by regular people who did what they knew and wrote it down.

DIY Remedies & Faves

DIY Remedies and favorite products present a problem for those adopting compliant C&D, especially those wanting a single product for everything. To sensibly and

defensibly recommend, sell, or claim use of a sanitizer or disinfectant, it must be label compliant or perfectly match a product that is, and professionals have to prove their claims on demand. The source of the chemical's name and claim is always the SDS, and the EPA regulates all pesticide use (including disinfectants) in the US.

This doesn't mean there are no effective holistic recipes or privately made stock solutions. It means that those who make or use them for others are responsible to label them for how they work. That includes the strengths and formulas, storage, disposal, effective stability, health or safety concerns, risks of damage, and what they must be kept away from. The two primary concerns with DIY's are they don't come with all of that information, and untrained preparation or handling may be unsafe or ineffective.

For example, some recipes found online suggest mixing bleach, peroxide, or vinegar with water, but they don't account for availability of those in multiple strengths. They also don't account for quality or hardness of water, which greatly impacts effective strength and stability. This leaves room for wide variance in final dilution. Unfortunately, the differences between their minimum effective concentrations and their maximum strength for safety are not wide enough to guess. The required wet contact time and exposure risks are different at each concentration, so all formulas and instructions for use must be specific and be traceable to the recommendations of IC agencies or signed prescriptions of IC specialists. When used, sold, or recommended for others, they also need to be label compliant and supported by a directly comparable SDS. This is why some people buy labeled containers of sanitizing or disinfecting products, even when they're easy to make, and they refill them with exactly matching formulas (as in alcohol-based hand sanitizers). That's permitted if perfectly matched and handled well.

Product labeling and method justification really matter when claiming to sanitizing or disinfecting action. This is especially true when using products on flesh, on food preparing or mouthed parts, or when claiming (or implying) to address specific germs or levels. Very specific labeling and validated methods are also required to claim to address resilient germ types like fungus, spores, and mycobacteria, and claimed services must follow the product or method instructions exactly. This doesn't mean all other cleaning methods or products are useless. It means that we need to know what we are doing, and when and why, and we need to be able to

defend product and methods choices and service claims on demand for defined actions.

In early 2020, great focus turned to the novel agent that causes the respiratory virus we call COVID-19. The CDC already had a website dedicated to IC education, including disinfection, and the EPA published a list of products and chemicals proven effective against SARS-CoV-2. Professionals who claimed to sanitize or disinfect needed products that were supported by CDC's methods or by that list when addressing that virus, but could still use other products when that wasn't relevant. Many professionals searched their existing cleaners for labeling that supported disinfection claims, hoping to save time. Some cleaners can serve double duty when debris is minimal, but cleaning and disinfection are different functions. Some great cleaners are just great cleaners. Disinfection is a value-added service, and the CDC recommends disinfection (any level) should follow cleaning anyway.

It really isn't necessary to force all processes into one bottle. Nobody tries to clean their whole house with one squirt bottle, or even wash our bodies, hair, and teeth with just one kind of soap. We wouldn't try to fix all instruments with only one tool, or teach all classes with only one book. Efficiency is great, but extreme searches for one-step magical methods in C&D have led to unfortunate and unhelpful recommendations. For example, a recommendation was seen on social media, to save time and steps by washing hands with alcohol based hand sanitizer. This is a perfect example of unfounded advice for off-label use, exposing others to harm. The water would dilute the alcohol, and without soap, the hands would be left with a strange-smelling rinse and little or no action at all.

Some cleaners, polishes or fresheners don't disinfect. That's okay. Plenty of musical moments and smelly situations just call for cleaning, polishing, or freshening. This is why we have so many tools, methods, and reagents to choose from. Different needs call for different means, so our favorite agents are still appropriate for their intended uses. Only when claiming to sanitize or disinfect do we need to justify those claims. When addressing SARS-CoV-2, or any other specific pathogen, we need products and methods to be listed for it. We can use what we like for ourselves, but any actions and recommendations used for anyone else (professional or not) need to be so far above accusation that they'll never require defending.

If you think your preferred product should be effective, but it doesn't meet labeling

needs, consider reaching out to the makers. They'll either defend it with a statement you can stand on, or advise you not to claim the product for that action or purpose. Be sure to promote those makers and vendors who take the time to make sure their products justify their place on your shelf. To encourage a maker to get their labeling and SDS sorted out for professional use or sales in your industry, this sample letter format may help you get that going.

Sample Letter to Product Supplier:

[INSERT BUSINESS BLOCK OF THEIR INFO] [DATE]

Dear awesome makers of [INSERT PRODUCT]

Many music supply vendors who participated in infection control training are now asking if [INSERT PRODUCT] is acceptable for use as a sanitizer or disinfectant, and how to justify that claim professionally so we can keep using it, promoting it, and selling it.

To demonstrate use of your product is sensible and defensible, it needs to be labeled as effective against the pathogens of concern, or clearly labeled with an active ingredient which exactly matches others listed by the CDC, EPA, or FDA *(OR the agencies of your own nation, if you're not in the US)*.

Without that, one last option is a statement from the maker saying it is effective and the compliant labeling is in the works. We couldn't find any such statement for your product, and we really want to remedy this. Can you offer any support in this regard so we can all continue to promote use of your [INSERT PRODUCT]? We really dig your product.

Thank you for your attention to this matter,

[*sign it, even in email*]
[INSERT SIGNATURE BLOCK
WITH YOUR CONTACT INFO]

10

Thinking Through ICI

This is a collection of brainstormed ideas from allied professionals, thinking through ICI. It's not a to-do list. It's a digital hug from friends, so no one has to start their journey toward new or updated standards and precautions alone.

The ideas and comments are sorted, as best we could, into the spaces and situations of Classes & Ensembles, Shops, Stores, & Offices, Repair Shops, and Pop-Ups & Petting Zoos.

Getting Started

Getting started in the process is probably the hardest part of anything, even a review. As you look into risk mitigation, begin with state and local guidelines and then add your own comforts to that, rather than invent your own solutions and try to make required actions fit around them. The CDCs Operational Considerations guide explains how layers of controls work together to protect people. You'll recognize concepts from ICI among them. All of the major health and safety agencies have IC advising pages that support a broad variety of workspaces. While it won't make everything magically easy to find the first time, every time, knowing how all of these things work, or why agencies would suggest certain steps, makes their implementation more confident and effective. It also helps to preserve your most costly and limited commodity; your own time, spent thinking, planning, and working.

Guidance about safer direct interpersonal interaction (face to face) must come from local leadership, because they evolve. ICI addresses only indirect transmission, using PIH education to manage the germs on instruments as fomites. We must all monitor evolving recommendation about air handling and air exchange, and other respiratory precautions.

Setting or updating IC Standards begins with a review of basic housekeeping. Then, when there is concern about a specific pathogen, the existing methods, products, and precautions, are reviewed for effectiveness against it. When they aren't enough, more are added to reassert sanitary hygiene in the space. Whether precautions are temporary or permanent, the real cost of upgrades need to be recaptured in program tuition, in service parts and labor, or in bundled services. Since every shop, job, and program is different, each must set their own Standards. While these helpful suggestions come from role-based perspectives, ideas don't have boundaries. These thoughts are only meant to assist instrument handlers to review their own Standards with ICI in mind.

If working through the shared areas or items and frequently touched fomites in spaces and programs seems overwhelming at first, there are two approaches that may help. The first is to begin with your own seat and evaluate everything from the central perspective outward. From your desk or bench, list all the surfaces that are constantly touched or contaminated by you or by others. Trace your nearest tools, keyboard, phone cradle, and everything between you and your door, or between your desk and piano, or whatever your common paths are. Repeat that process from the perspectives of all other common users or visitors. The second approach is to work through processes from start to finish, considering different jobs or service scenarios. Including the perspectives and input of others makes this process better for shared spaces.

Once a program has been updated to satisfaction, all new threats, out-of-usual events, special situations, abnormal crowd sized, and still need review to ensure they're covered by your standard precautions. Do defend the status of the program or space as up-to-date any new products or methods need to be added to procedure and safety manuals too, and the SDS should be updated. A good rule in adopting new or emerging technology is to spend as much time researching its safety needs as its cost, methods, and action.

How fomites are handled and how accessible they are drives what is needed. A doorknob in a private office might need wiped less often than in a shared bathroom. Many items don't need to be cleaned from top to bottom. Pianos are touched most at the front interface, while music stands are touched most on the ledges and the upper parts of the pole. Chairs are touched most at the top or arm rails. At the class board, primary touchpoints are markers and erasers. The most frequently touched

parts on shared items might need to be wiped between users. The workload of cleaning can also be reduced by restricting access to certain users.

Music touches everyone in some way, and the need to help reduce the spread of infectious disease matters to everyone. Some might not realize that ICI can help singers too. Voice was the first wind instrument and it still speaks. Any tool for a task is an instrument, and all surfaces are fomites. In this way, we are all instrumentalists, and we can all be instrumental in improving the health and wellness of others. When vocalists get sick, they cannot set their instruments down. Vocal performers must not be neglected when it comes to providing sanitary spaces to practice and the hygiene education to maintain their sanitary safety wherever they go.

Whatever your function is, wherever you work, consider your own time and effort to be the most expensive part of any endeavor, right from the start, and defend them fiercely. Create empowering shared solutions rather than a personal pile of to-do lists. Even if all organizations hired specialists to manage safety, they couldn't clean everything, educate everyone, and wash everybody's hands. Educating and empowering others helps them long after the last notes play.

To begin, work through the space, considering basic hygiene and housekeeping, as you know them. Then expand that through the shop, class, or program. Most of the urgent things will also have obvious answers. Do only what you know, and keep track of concerns and questions, because even a list of questions can show you the next steps. Don't be discouraged by the things that take time. When many situations are layered, their solutions fall into place as their key details are worked out.

Cleaning schedules are often managed by schools, but classroom accessories may be left to instructors. If so, school districts may still require cleaning products to be approved for use on campus. Products for cleaning shop benches are often chosen for degreasing ability. Bath and kitchen cleaners and glass cleaners still work for their normal uses and disinfection of key touchpoints is still expected. ICI doesn't replace basic housekeeping. It calls for a thoughtful review. Since hygiene isn't a new idea, existing plans might already be enough. Decide what spaces are shared with others or are safe personal zones, and then get the plans for shared spaces written down. With a plan, daily startup and shutdown and all common processes go more quickly. They're also easier to pass on to others. Even tiny coffee shops have opening and closing lists, so it's not too hard to set up. Focus on

the things that are touched most often, or by many people, and consider whether their bioburdens can be safely reduced.

Ensembles and other group activities require the help of all participants. Custodians can't clean every surface or perform basic hygiene for every guest, and neither can teachers or directors. All players who are able should help clean or disinfect the touch points on items they use and remove their own litter, including their condensates. They should also help setup and strike unless those services are otherwise arranged. When players are too young, otherwise or unable to manage their own hygienic needs, additional support is needed from parents or hired staff. Cleaning plans for the space, and any expectations of student players, should always be explained in the class syllabus, and in communications with parents when players are minors. Since instruments spend more time at home than in class, education that supports PIH at home has even more impact than cleanings during ensemble times.

It can be a daunting task to think through everything that might be improved. Germs are everywhere all the time, and nobody could or should try to eliminate them all. This is why ICI focuses on what is sensible and defensible, and cannot write a policy manual to fit every shop, class, and office. Everybody has to work through their own situations and solutions, and it is best to share the burden of review, planning, and everyday work, with all participants there.

To support that effort, brainstormed ideas were gathered from allied professionals and online searches, and the fruit of that is offered here. We hope it will encourage and inspire those thinking their way through ICI in classes and ensembles, stores and offices, repair shops, and pop-ups and petting zoos.

Classes & Ensembles

If you're reading this page, you're probably a teacher. Thank you! We see you, and we know you're busy. These are not to-do-lists. They're hugs and high-fives with ink. Working through workspace changes is overwhelming on top of the details, decor, lesson plans, and everything else that happens before the bell rings. Breathe, take good notes and lots of breaks, and when discouraged, remember why you do what

you do. Beyond that, two concepts may help you defend hope in your continued influence. First, it is easier to bear tight restrictions that loosen over time than the pressure of ever-increasing controls, so start strong. Second, limited expression is worse than physical restraint could ever be. As artists and teachers, watch for the ways to let voices speak.

Start with what you need to feel safe in your own space. Take the time to wipe your desk or podium. If you don't want to share, it really is okay to keep your own bottle of sanitizer. Be clear about your boundaries and "your zone." Mark the safe spot for others to stand when they visit. People feel more welcome when they know you prepared a place for them and you really want them there in it.

Follow guidance from local and district instructions first, so you don't have to squeeze them in between your own ideas later. ICI only supports fomite management. Guidance about respiratory precautions and supplies, face to face requirements like occupancy, capacity, and limited contact duration, as well as interactive spacing or student placement, from IC agencies and district management, will all evolve over time. Schedule reviews for that stuff, so each update doesn't feel like an unexpected shift. Figure out how you'll track supplies that move and measures that might be temporary.

When tempted by DIY solutions, make sure they truly save time and money. Some creative solutions will cost an hour of research and $6 in supplies, to "save" $3 in sanitizer. Be certain they'll be approved for use in your spaces. All workplace products require compliant labeling and SDS, and your school may limit your options or require you to get them approved by management.

Believe in your players and empower them for self-sufficiency. Give duties to section leaders or row captains, so they learn how to manage team needs. Teach them to handle their own trash, including condensates, and make hygiene a normal thing that students see their teacher participate in. Just as there is a roped rosin block and a lost music shelf, plan for access to extra disinfectant wipes or a quick mouthpiece cleaning. Make HH on the way into ensemble areas a standard practice, even before setup, to reduce the burden on fomites in the space, and again on the way out, to leave musical microbes behind.

When you have different needs per class type, or teach outside, plastic closing totes help you change modes or spaces quickly. The touch pieces of your cart or

dolly needs to be easy to wipe down, and it may help to mount something for quick access to the hand sanitizer, disinfectant bottle, wipes or towels, and trash bag. The less you have to hold or carry in the hands, the better, as teachers have always got their hands full.

When widely spaced, students should usually retain their gear close to them, but at times, the guidance is to minimize clutter nearby. To manage the clutter around seats, you may need students to uncase at a wall. Space is a commodity in those situations, and you may need to assign space per section or allot time for pack-in and pack-out. If timing between classes is tight, and your class groups alternate walls or paths, check for district updates on school flows first, and if none is provided, then check CDC's guidance for managing that kind of traffic flow in businesses (and schools), like air exchange time at intervals. That's the source that should inform districts and local boards anyway, and you may be able to get your findings to the right people to get those updates adopted.

If instruments or supplies are ever shared, adult students and parents of minor students must understand and consent to that. People deserve to have a say in the risks they or their children take, and to know how to use PIH and E-PIH to reduce them. Further, there are some instruments and parts that are never safe to share without cleaning because they contact the mouth, face, or other sensitive skin. There are also mouthed parts that cannot be cleaned, and should never be shared, like reeds.

Some programs have ignored the infectious risks of sharing musical instruments or uniforms for so long that communities and participants came to accept the practice as normal. Some have justified the practice because they guessed that the cost of providing clean and safe supplies for every participant would be too high. At the same time, since they could not see germs or know for certain that student players might get sick from them, it became easy to hope that it would never happen.

In economically disadvantaged areas, program administrators may even have convinced themselves that music students and parents would choose opportunity with exposure over avoidance for expense, even if they were educated about germs and hygiene risks. Instead, the public outcry about students returning to school while the 2020 pandemic case numbers were still high in the US showed

that a significant number of parents would reject exposure risks when made aware of them. The position that "anything is better than nothing," just to permit musical participation is not valid, and perhaps never was. Parents and teachers alike are showing preference for the position, "better safe than sorry," even at the expense of opportunity.

All unsafe wet-shares must be eliminated. This term describes the use of the same instruments by more than one player without sanitary cleaning between them. In some cases, instruments were used in back-to-back classes, still dripping with the condensates of previous players. Though the term graphically expresses what is wrong with that practice, germs and their infectious risks persist even if dirty instruments are allowed to dry off between uses or between players.

Drying germs doesn't kill them all. Some remain infectious a very long time on surfaces. Depending on the body contact type, playing soiled instruments after others is like eating from other people's dishes without washing them first, or wearing other people's dirty clothes without laundering them first. Unsanitary literally means unsafe for use in the way it is being used.

The actual cost to provide clean and safe gear for all participants may be less than program administrators would guess, especially when parents or community volunteers can assist with sanitary care costs. In addition to avoiding the health risks, providing an unshared instrument or equipment for the school season also allows that student to practice with it outside of class. During the 2020 pandemic shutdown, parents and teachers throughout the community became aware of the importance of infectious risks.

The conversation about restarting the economy, social engagement, and education participation was passionate and polarized. Even during a period of financial struggle, that kind of interest and awareness should be captured. The movement to strengthen safe participation is in the spotlight, and the best time to promote awareness and secure support is during the time when everybody else is acutely aware of that need too. Fortifying responses are in their most expected and supported positions while everyone looks for a new normal, and the assessment of program supply and demand, and plans for the future should not be delayed. First, inventory and label all of the instruments in your program, and assess their playing readiness (both in function and sanitary care). Create an inventory record,

and make room for notes for condition and when it was last played, cleaned, or assessed. Always dating the stored instruments will support confident quarantine times or readiness projections. This is a valuable tool in maintaining inventory readiness, knowing what is ready at all times, and planning ahead for needs.

Compare what you have with your wish list and real usage, and track your actual use over at least three years. Some items on your wish list are rarely used. Some are used frequently, but only come up short once in a while. If those infrequent instruments or occasional shortfalls can be locally rented, then make those the lowest priority in building up the program's instrument census. This is where strong partnerships with local providers are critical.

Direct the strength of purchasing strategy to those instruments that are always needed, because those are the only purchases that will reduce rental costs enough to justify themselves over time, especially when the cost of maintenance and storage are included in rental arrangements. Don't waste money repairing or storing items your program doesn't use or has avoided using in the past. For example, if you have a horn that is always ignored because rentals are always better, find out how to send it to surplus and get something the program will use. Resist the temptation to force absent instruments to meet the needs of enrollment. In other words, don't put two students in one desk or on one horn. In the same way that space, desks and chairs, and students per teacher have a capping influence over how many students may participate, embrace the truth that instrument availability is finite. When there are not enough instruments, get more. When that is not possible, do not add students. It sounds overly simple, but the compassionate desire to do more with less makes more sense when stretching meals for mouths than when stretching one clarinet to three players.

Determine which needs are immediate. Create a plan over time to purchase instruments to meet census plan, to repair a percentage of each musical family of gear annually, to send out seasonal cleaning between sessions, and to purchase supplies for what cleaning and care will be done in-house. Know how to clean everything, so you know where best to spend the money. You'll also know what things can most easily be done by parents and volunteers, preserving resources to send other work to professionals.

Most importantly, do not allow your cost-saving strategy to be built on the amount of time, expense, and physical effort you as an individual are willing to sacrifice.

While giving is kind and loving, there is a limit to what each person can do. There are other places to spend the budget of what and who you are. Moreover, ***a program that cannot stand without you will not last long after you.*** Building and empowering the real program is as important as building and empowering young people, and for all the same reasons. Building a thing or finishing a creative work means making it stand alone, and possibly growing others who can sustain it.

Vendors often have published estimates for instrument lifespans, and those should be used for budget projections. When an instrument outlives its projection, that funding is simply used for alternate repairs or supplies instead. It is essential to create all proposals and requests based on the true cost of programs, rather than based on what you imagine you might be able to save and scrimp on. This will mean a phased program plan, so your program is stronger and more ready each year. Get it all written down so you can really know what you're looking at.

Plan ahead and write down notes about what to ask repairers or vendors. It is easier for them to address your program questions when you know what to ask, and when they're already assisting you with a purchase or paid service. Ask about when your instruments must rotate for deeper cleaning or how long they might last before the next repair is needed.

Sustainable programs have recurring and justifiable budgets, and requests are more easily approved when they are consistent and make sense, and when they only peak with actual participation increases. Squeezing by and waiting for some catastrophic failure to beg for bailouts, using only desperation to justify requests is not a sustainable strategy. Even when administrations cannot fulfill requested support and fundraising is needed, promotion and donor engagement are easier when real plans with realistic numbers can be shared.

Donors are also much more motivated to give when they truly believe their contribution can make a lasting difference. Any perception of waste or futility will snap their hypothetical wallets shut like clams. Of course, all of this was true about gear management and funding efforts before Infection Control came into focus.

Now that there is more concern about germs in the band room, there are some things that need to become part of instrumental awareness. Take the time to teach all players about personal and instrumental hygiene. In this digital age, much of

this can be sent by video and the content reused with little extra work. Local shops, repairers or vendors may teach class presentations for a fee or may have lists of resources prepared for you. Presentations from other schools or popular makers may also be helpful, and sometimes other teachers or private students have created good demonstrations.

Keep a list of what sources and content you do or do not recommend, so you'll know your students get the advice you'd want them to have. Anybody can make a video, but your students and players need quality information to ensure their best success. Since it is not well covered, explain the ideas of staging and micro-staging to students and players. Just as their toothbrushes have ends that shouldn't be touched with dirty hands, help them understand that mouthpieces or reeds have mouthed parts that need to be kept clean.

To save time explaining hygiene to players and parents, collect your list of recommended videos and guides, and use links to healthy resources in your greeting emails or syllabus. If you can't find something you'd stand behind, write your own. It will probably take less time to write it than to find one that you agree with, that meets the age and ability groups in your own ensembles and that doesn't contain advice you don't want followed with your kind or brand of gear. Put HH stations where they are easy to use and along the flow path. Adding more hand hygiene manages germs better than taking away touchable décor, because there is always another surface behind it or nearby to be touched too.

Think about risk and relevance. These concepts don't just persuade us to care about hygiene. They as tell us when we're finished. They remind us not to panic about every fomite everywhere, because ***hand hygiene is the best way to keep germs out of the face and mouth***. Teach students about PIH, and sing the song of hand hygiene and clean mouthpieces.

Think ahead about what might need to be written to pitch funding for updates, or to change the seating in the ensemble, or how best to communicate updates and new requirements to players and parents. Keep a binder of resources, ideas, and decisions so you don't have to rework all of the things you've already been through. Share what you can with others and work with local shops to determine your best service and scheduling options.

Knowledge really is power. Time spent getting things sorted out will take less than half of the time spent worrying about it and far less than trying to work around strange problems that didn't need to be there.

Shops, Stores, & Offices

So many businesses have already started implementing protocols that their clever innovations and silly flops are everywhere in town. While ICI offers ideas for everyone, CDC, OSHA, Small Business Association (SBA), and even the Department of Homeland Security (DHS), already have really strong guides for cleaning office spaces and equipment, and for managing face to face workflow too. Be sure to visit them.

Whether the shop is a music store, shipping office, or big warehouse doesn't matter. Folks in offices have concerns about IC too. When working with musicians and their gear, admins will also need to be able to offer courteous and knowledgeable support to the people and programs they care about. Clients reach out to those who sold them their music-related things or hosted their events. Many offices are already set up to control some traffic flow and restrict access, but boundaries may be improved with visual indicators. A wide path of space on a desk helps to define your side.

A side table, with hand sanitizer, notepad, and a mug holder welcomes guests to their side of the space, and away from yours. A solid plastic square or boosted side box can offer cleaner parking for briefcases too. Create your own daily tour-de-wipe of all the things you touch constantly, like your mouse and keyboard, phone and cradle, light switch, and the touchpoints on doors and windows. This should also include the most touched areas on the chairs and desk ledges. If you have frequent visitors and they play with a row of fidget toys on your desk, clean those daily too.

If your perch includes a shared station, it may be wise to repeat that tour at certain times throughout the day. In stores, you'll want to include the entry doors and handrails, payment kiosks, and other obvious touchpoints. Commercial locations often have shared restrooms or lesson rooms that need to be cleaned and disinfected daily (or more), with schedules posted to show what is done when. The shop should keep an extra cleaning bottle for those who want to clean the sink

faucet or the lesson room chair, and nobody should ever be made to feel uncomfortable for asking to borrow it.

Use cleanable surfaces in lesson and play-testing areas and laminate signage in areas that need cleaned often, like notes on counters. Plastic-covers, vinyl, packing tape, or other materials offer inexpensive and durable wiping surfaces. Depending on local face to face guidelines, benches that face each other, registers, or check-in windows may need clear barriers between them. Pass-through payment spaces should not be in line with faces. Hand hygiene is more likely to be performed when it isn't necessary to leave the room. HH Stations should be accessible, but might need to be secured.

Vendors should expect increased sales of cleaning, sanitizing, disinfecting, and germicidal support products. It is essential that terminology be clear, honest, and backed by labeling, SDS copies, or reference links. Players may choose products that make sense for personal use at home, but professionals must be able to defend every product and every claim. It is also better to offer support over sales when appropriate.

Empowering others with what they need to know to do their best work will also let you get back to yours. Shops should be proactive about charges that speak to ICI or lockdown fairness. Disallowed returns or charges for restock reprocessing should be disclosed prior to sales. Many states require refunds for wasted library, gym, or rental fees during regional shutdowns. Outreach for outstanding gear or invoices should show reason and care while making things right and sorting things out. This will strengthen and reaffirm your position as a knowledgeable resource, aware of the unique challenges your clients, players, and teachers face. Become vital, or even pivotal, to their solutions.

Repair Shops

ICI was born in service to repairers, so the whole presentation speaks to them in some way. How it shakes out at the bench and around the shop, or how you'll advise clients moving forward, really depends on the shop. The first step is to get a binder and track questions you have and choices you make, so you don't have to

re-do your work. Your minutes are your money, so don't let one-man to-do lists be a solution to anything unless you work alone. Update safety measures for clients and staff and communicate with them in their differing types of needs, perspectives, and vernacular. Use very clear language and labeling. Proudly promote the steps your shop is taking. Be able to explain why you do what you do, so you market yourself as a knowledgeable service provider.

Use defined staging to put distance between dirty check-ins and what is clean and ready. Shipping areas, with boxes and labels, should be clean zones so no weird fussery is needed while picking and packing. Consider a consult or check-in table, with just a few tools, a cleaning bottle, and an evaluation or invoicing pad or an easy-to-clean device. Consider which procedures might liberate aerosols (like powered cleaning).

Avoid soiled parts or tools in clean offices or lunch areas. People need to know which areas are safer for eating or using the phone, and they need to be able to trust their own personal spaces or tools to remain in the sanitary risk-tiers they left them in. If bench techs are set less than 6 feet (2 meters) apart or facing each other, add clear barriers to help separate them and block the most direct movement of their largest respiratory droplets. If keeping sanitizers in toolboxes for hands and mouthpieces, beware of fire or other hazards. People are less likely to clean hands when they have to leave the room to do it, so make hand hygiene easy everywhere.

Wear an apron or change clothes to leave the work yuck behind, and keep enough extras to wash or rotate them. Divide the shop into 5 areas and the bench into 5 sections, to clean one easily each day. Disinfect mouthpieces before and after playtesting. The first is for you, while the second is for others. Clean and reset your bench after every instrument on the clock, so Pro-PIH is sustainable. Limit reset charges to 5 minutes or less, and be mindful of any processes that serve the shop rather than clients. Treat disinfection of gear as a value-added service, performed and billed fairly for parts and labor, like any other service.

Around the shop, find the most frequently touched things and make them part of the tour-de-wipe at scheduled intervals. Clean hands frequently and between people or instruments. Use gloves as desired, especially when skin is broken, but never consider them a substitute for hand hygiene. Sanitize your mobile phone and keep it in a baggie, or leave it outside of your unsanitary workspace. If you keep

drinks at the bench, use straws or shielded tops with clean zones for sipping. This is a form of micro-staging, like keeping the tip of a toothbrush or reed untouched.

When cases are clean or outfits are ready to ship, there's no need to fully bag them unless there are dust, pest, or other storage issues. Full bags may even add humidity problems, so don't add them if infection control was your only reason to do so. Cling straps around one end can mark cases closed for less, with plenty of room for labeling without residues.

Use defined and consistent indicator system to help avoid reopening work and causing rework. Germs or no germs, your minutes are your money to spend or to save. Whatever you decide about microbe management, be sure you can make perfect sense of it yourself and easily defend it to others. Then just write it all down. Date all instruments and gear, and clearly note what the date represents, i.e. when it was played, serviced, disinfected, etc., or when it should be released from or QT. Keep a key that interprets your indicator system on file and on display.

Pop-ups and Petting Zoos

Pop-up displays, booths, and benches are mini-shops on the move. If there are tools, chemicals, or flames around, there should be a safety manual. This should include how to get help if there is an accident or injury, and a back-up plan strike and secure the property. Someone on site and someone off site should know you're there. The written plan can be a reusable folder with the cover page and on-call person updated as needed. While the physical area a pop-up is smaller, people and germs still pass through. Hand hygiene should be available, and signs should be laminated or easy to clean. Totes should be cleaned quarantined between events.

Petting zoos and playtesting parties, like any other group activities, always take extra care and planning. This should include cleaning and disinfection as appropriate for all spaces and frequently touched fomites, especially hands and instruments. When a booth runs out of clean instruments, they run out of instruments. This may mean less participants, or more cleaning supplies and helpers, but the need for sanitary safety cannot be overlooked. When existing practices do not fit the need, they must evolve. Evaluate the event's real purpose to ensure the real goals are met

and costs are covered fairly. Some events are meant to set up assigned rentals, while others are for student enrichment and fun. Recruitment and rental setup parties are sometimes offered by shops, with time and effort sacrificed as an investment. It's important to remember that shop cost, even when absorbed, is still costly.

While most students want to touch and see things up close, every player doesn't need to touch and mouth every kind of instrument. Class videos or assemblies with sections and selected student demonstrators can reduce the burden for shops supporting large school rental assignments. Schools that require large numbers of assignment instruments may need to buy or rent try-out kits. Businesses may sponsor assignment try-outs for rental recruitment or petting-zoos for educational enrichment that supports music in the community. These are costly and should not become presumed or expected obligations. Most instrumental services, enrichment entertainment, and learning activities requested by the school should be fee based. Real and honest conversation about this sensitive issue is needed to keep such events meaningful and sustainable in the future.

All participants should wash hands before and after group events and sanitize hands after handling instruments. They already do that for snack-time and potty-time, so it isn't out of the ordinary to them. Make hand hygiene, mouthpiece washing, and instrument assembly and case-packing part of the fun. Carefully consider what toys or activities are appropriate for different age or ability groups. Some participants don't understand germs, or they may need extra help keeping clean. Rather than reduce their spectrum of opportunities, try to find ways to bring the activities within safer reach if possible, and have extra staff to support better interaction. Don't try to pack in activities to fill every single moment or assign duties to every single helper. Reserve wiggle room for real people to have real fun with real help.

Some may wonder why washing hands, keeping things out of the mouth, or supervising children at play would be new conversation to anybody, but the reality is these ideas haven't always applied to handling instruments. Those whose experience in healthcare, childcare, or food-prep, gave them a head-start in IC, should use it to help others improve programs and normalize the PIH conversation. Blame and shame helps no one, and those with experience have the means make a real and lasting difference.

11

Case Stories

This is a collection of modified stories that demonstrate ICI in action. These adventures put you at the repair bench, helping a few memorable clients.

Aside from showing how it works, these stories make it clear that ICI isn't about infection, control, or instruments. It's about helping people to help themselves.

Intro to Case Stories

Case studies are true stories that support in-depth understanding in real-life contexts. They're often used document patient illnesses or injuries, or to demonstrate responses to medical treatments or trials (with privacy protected details omitted).

In law, health science, and business teachings, accuracy is often preserved to support legal claims, scientific studies, and medical care protocols. That's not always so, as sometimes, they're used to illustrate realistic theoretical examples too.

ICI's case stories are fictional adaptations of real events, to help demonstrate IC ideas in a storied form. Many of the concepts discussed in ICI are intellectual and theoretical, so it may help to see a few examples of real-world scenarios. ICI's case stories are all inspired by real situations, but their names, instruments, and details have been scrambled to serve our purpose and to protect their privacy. They're also merged from multiple situations and presented as first-person adventures that put the reader into the story, as an instrument repairer in a music shop.

Sentimental readers may be encouraged to know these happy endings really did happen, and will happen again and again.

Learning about ICI has been compared to learning about music theory. It takes some effort to get through the first bit of literature, but understanding how things work can really help people to know what is really going on in the music they make. That knowledge is what helps them share it with others, and even write their own. It can be difficult to explain its value to those who might feel overwhelmed about the details, and there will always be some who simply refuse to take it on. Those who do invest the time and effort soon find that even a little knowledge and understanding opens doors and brings more opportunities within reach. With theory, the processes of learning and playing music becomes easier, and this allows more room for real creativity and personal performance to shine through.

As in music theory, the most basic introductory concepts in ICI can be shared easily. Unlike theory, it doesn't take multiple semesters and a lifetime of diligence to thoughtfully apply infection control. Though entire medical professions have been dedicated to improving the wellness of human populations, most of us don't need to go that far to make a difference.

Infectious disease is a problem that all people share and that no single hero can eliminate. The greatest impact is made when every person understands and embraces their own small part to play in managing bioburdens. Every effort to help control the spread of infectious disease makes a difference in the lives around us, and then in the lives they touch too. When we use what we know to support musicians, their instruments, their programs, and their spaces, we are making even more music possible.

The time and effort needed for the everyday person to be well informed about ICI is much less tasking than music. There are no keys, modes, styles, or complicated histories we need to memorize or practice. If it were described in terms of a musical composition, the whole piece was meant to be read in a day or so, and then played with confidence right away.

Panic at the District (SARS-CoV-2)

Mr. Maxfair is a school district administrator. Among other duties, he oversees details for some of the public-school music programs, including his niece's marching band. Some of his school admins and teachers are returning to work and nobody knows what needs to be done about disinfecting all the stored instruments. It has never been such a big deal before, and he is certain they can't sustain sending in every single thing every single semester. He wants to get some straight answers about clearing gear for use again, and especially about COVID-19 (SARS-CoV-2). He says the booster clubs are already raising money, but it doesn't look good, and he wonders how this program can survive in the new normal. His question is half defeated complaint and half desperate plea*, "What are we all supposed to do now?"*

Even though ICI speaks to managing germs in spaces and on music-related things, the real purpose is to help people make music. Whether selling or servicing instruments, teaching others to play and perform, or managing programs for competitions and community arts, all efforts of all instrument handlers still serve people and their music. Most are musicians themselves! Instruments don't get sick, so Infection Control for Instruments is really about people. ***Mr. Maxfair's fear of the unknown is top priority.*** Then we can talk about the gear.

He needs to hear that the local shop that serves his students is competent to address these issues and answer his questions. You tell him you recently took the time to get up to snuff about Infection Control for Instruments, and free resources are available to help him make smart choices, not only about SARS-CoV-2, but about germs and hygiene in general. Guidance will come from his state and facilities about the school setup and safer-spacing, and it applies to the arts in the same ways as other school and business spaces.

He can rest assured that germs and infection control aren't new and information about is free for all. All musical instruments and accessories are fomites, so their risks are addressed through sanitary hygiene. Hand hygiene keeps germs on non-mouthed parts from getting to the mouth, and any part that goes to a face or mouth needs to be clean and disinfected first.

Then you speak directly to the viable persistence of SARS-CoV-2, and tell him that

all of his gear that was in long term dry storage is already cleared from that, but that other germs that can make players sick still exist as they always did, and that calls for sanitary care between players. Clean and maintained instruments also play better and last longer. He needs to work out a plan for revolving and incidental services that makes good sense for scheduling and budgeting, and review it regularly. It is also likely that this year, the sudden end of programs and storage without maintenance may lead to extra repair problems and related expenses in the fall.

You tell him the shop's services are sensible, defensible, and sustainable. You tell him where he can educate himself and his staff about ICI, and reassure him they can learn it in as little as a day or two.

Then you make an appointment to review his inventory so you can bid for his updated plan for scheduled service and sanitary care. For now, you offer new reeds, a labeled mouthpiece sanitizer, and a cute hand sanitizer with your shop's logo on it.

Marvin's Flooded Bari Sax (Mold)

Marvin's basement flooded last summer, and his saxophone was down there. He had too much to deal with to address it until now. He wants a re-pad and he read on the internet that mold can be persistent, so he wants disinfection. *"I don't want to mess around here!"*

Some shops only pull out old pads and poke in new pads when a client asks for a re-pad, just like changing out the tires on a car. Since you know everyone and every shop has a different "picture of done" and that expectations matter, you make sure your language is very clear. You offer him a cleaning and mechanical overhaul with no surface refinishing. You'll remove and clean all the mechanical parts and fully replace all of the soft or consumable parts, like pads, corks, and felts, and you offer him disinfection for mold as a value-added service.

You ensure your disinfectant says it addresses molds, and you feel it shouldn't hurt the instrument's surfaces. You advise him that there are some chemicals that can help treat fabrics, but his case is really bad and the wood is buckled. You can't treat it because you can't get your chemicals all the way in and then all the way out.

It's not really worth repairing either. You really recommend he get a new case. To be honest, he's been wishing for something lighter for years, but there's this old decorative medallion his Pops glued on the accessory bin. That's probably been the real hold up about upgrading the case. You look more closely, and see the thing is just epoxied on. A hot knife lifts it right out, and you hand it over. He comments on how small it is now. That's strange, because it looks so heavy in his hands.

You offer him some price point options for a new case, and since you can't treat inside his metronome and music book is soggy toast, you also offer replacements for those too. You tell him about the free phone Apps for the metronome, in case he needs to cut corners. The reeds are toast, but your shop has options. Your "Reeds Parade" sampler pack offers an assortment of popular favorites with less financial burden than whole boxes. You also show him a decent ligature because you saw him picking at his old one and giving it the "stank eye."

Marvin feels confident that he got good advice and had some real choices, and he can't wait to make some noise again. He tells his pals he feels the clouds parting a little. He's kind of excited about the Reeds Parade, and naturally, they want to know where to go to get that!

When he comes back, he asks you to re-mount that medallion. "Sure, man. Pops-Medallion mounts are always complementary." It looks pretty sweet, and while he waits a few more minutes for the glue to set really well, he wanders around to find a few more goodies he didn't know he needed.

Mrs. Frenchie's Mono-tizer (Mono)

Your local high school band director calls and asks what to do with a French Horn after a player in the wind ensemble had Mono. The horn was restrung recently, and it still plays great, but Mrs. Frenchie is very conscientious. *"Can the instrument give Lucas Mono again after he gets well? Can it give his Mono to me if I help clean it? What about next term? We already had it fixed up and we don't want to waste money, but what should we do?"*

You look up Mono in the Table of Relevant Instrumental Pathogens (TRIP), and you tell her that it's a virus and yes, everything he slobbers on is just as contagious as he is. Fortunately, it doesn't last very long outside the body, so the horn will clear up very soon after he does. Meanwhile, just touching it won't give the Mono to anybody else as long as they use good hand hygiene after handling it and keep it out of their mouth. That's good advice for touching and handling all instruments anyway.

You remind Mrs. Frenchie that nobody should ever share dirty mouthpieces, and that hand hygiene and personal and instrumental hygiene is essential to the health and wellness of all players. That's always true, but especially when there's a slobbery virus on the loose in the band room. Lucas and his family should follow their doctor's advice about staying home, and about caring for him and handling all of his other things safely.

As for the question about other players using the band room, the table says the pathogens that cause Mono are viable for several hours. You advise her that if the horn and all the class supplies are totally dry, the Mono would be cleared overnight.

It's still important to consider what should be done for sanitary cleaning between visitors and players, for the same reasons that we wash dishes and cutlery between dinner guests. It isn't always necessary to aggressively disinfect every inch of the classroom or every part of every instrument. If this is the first time she has ever really thought about germs in the band room, she may need to review the cleaning plan. She may also like to add a disinfectant spray or wipes to her band room, as well as hand hygiene and mouthpiece washing stations.

It's almost the end of the school year, and the horn just had service and cleaning. If Lucas will keep using it, the horn only needs its usual sanitary cleaning, with real soap and water. Obviously, the horn needs to be cleaned again before it goes to a new player, and the mouthpiece should be disinfected or sanitized with a labeled or approved product and then rinsed well. Your shop does that too, if she's interested.

Mrs. Frenchie is relieved that no immediate action is needed, but even more impressed with your informed counsel. She can't stop thinking about all those "dirty

dishes" in the band room and she is already making a list of which instruments she wants to bring back first for sanitary cleanings. She also told her community band friends about the shop that knows how to keep it clean and keep it real, and she displays your shop's business cards on her super cute new mouthpiece and hand hygiene bar.

Mom & Mikey (Hepatitis and Herpes)

Sally has chronic hepatitis and herpes labialis (cold sores). Her doctor told her not to share drinks or dishes with others. She wants to give her old college trumpet to Mikey for use in his school band. She asks you to disinfect the trumpet for hepatitis and herpes, so she can give it to him safely*, "and what can we do about this funky old case?"*

You look up hepatitis and herpes on the TRIP and tell her it's cleared for Toot-Toot-Take-off just a few months after she stops playing it. She's right that she shouldn't share instruments with Mikey, because cleaning the instrument once doesn't make it contamination proof. If she has been playing it, it's not safe to give him.

You tell them about PIH, especially hand hygiene and about parts that go to the mouth. Any other advice about preventing transmission, beyond the scope of instrument handling, should come from doctors, not repairers. You know that, and you avoid discussing vaccines or other treatments. If she asks about any disinfection methods for anything beyond the trumpet and accessories you refer her to CDC's website.

She says she play-tested the horn this morning and it needs a little work, and she can't wait months to give it to him. His band class starts in a week. You offer her a COA (clean, oil, and adjust), and offer her disinfection with a product labeled to kill hepatitis and herpes.

She doesn't have to replace the old case. She could line it with a barrier fabric for a couple of months, or use an old shop loaner case. She could even rent a whole trumpet outfit for him while you prepare her old kit, with a discount for renting while servicing.

Of course, you also show her a sweet new case for Mikey that is much lighter and has cool cubbies for his accessories. You point out that the case is what he'll carry everywhere and what all his mates will see, so it would really make the whole outfit feel more like his very own. It's ready to pack and it's also on sale. After a bit of thinking, she goes for it.

When she brings him to pick it all up, he can't believe how nice everything looks now, and he picks out a blue tuner. You notice, and you swap out his complimentary cloth, so he gets a blue one. He smiles, tracing your shop's logo in the corner with his finger.

You charge her fairly, respect her privacy (medical conditions are always very sensitive information), and you're done. Your options gave a second-hand horn new life, Mikey is super stoked about his trumpet, and Sally will tell all the other moms in the bleachers that your *shop really gave a toot.*

You disinfect your bench and clean your hands after servicing the instrument, just like you always do, and you don't put dirty hands, tools, or parts in your face or mouth. You know these universal precautions help keep you safe, but since you work hard and your hands are always cut and torn, *you feel more comfortable* wearing gloves while working on this one until it's been disinfected, and *that's okay.*

Since you do know two pathogens need to be addressed, you check your chosen disinfectant's label for them and honor the wet-contact duration time for *their* levels.

Work is easier and more fun when you've got a little peace of mind.

Orchest-rama (E-PIH-HH)

Your shop has a strings department, and the luthiers are high strung about the big sale next week. The discounts for good grades Solo and Ensemble Stars are going to be stackable. The sales team is expecting playtesting in the shop, and they aren't sure about what to do with the safe-distance things, or with possibly back-to-back players.

Your shop has to honor the same safe-distancing guidelines that affect all shops, businesses, and schools, even during really cool sales. You may have to stagger the sale crowd, host play-testing appointments in alternating lesson rooms, and post sign-up list, duration and air exchange times. If the community requirement calls for masks, players should keep them on in those spaces, because doffing them extends the time needed between occupants.

Staff will need to track who has which instruments in what trial in rooms if they'll be out of sight. Staff will also need to clean the rooms between users and the cleaning plan needs to be posted. Barrier cloths should be offered at no charge (here's a great place to give away cloths with shop logo). Extra disinfection of requested room surfaces should be free. Hand hygiene should be required of all visitors entering and leaving playtesting areas, even if they won't play. This reduces the whole transient bioburden in the space.

Everyone should be reminded about keeping parts and hands away from the face and mouth. How the instruments are wiped between players should be prominently posted, and HH stations should be accessible to anyone to clean their hands again.

Since the surfaces of wooden instruments are so delicate and their finishes are sensitive to alcohol and other cleaners, add hand-drying towels and trash bin to the HH station, and position it a safe distance from the instruments and accessories.

For instruments sold, the cases, accessories, and resilient touch-points should be cleaned for point of sale. Educate all of the buyers, players, or parents about personal and instrumental hygiene, and about E-PIH-HH. A pre-printed flyer or invoice message about this can save a lot of time. A message on the web page or by email might save a few trees too.

Always the optimist, you suggest they pre-print vouchers to honor the discount for appointments within 14 days. These should be offered to guests who were locked out by limited room availability. You ensure there are plenty of shop monogrammed comfort cloths, because Client Cares are great marketing tools.

All of your visitors are impressed by the care your shop took to make sure they went home with cool new instruments and tons of hope, rather than heaps of germs.

They actually hadn't thought about germs very much because their instruments aren't wind instruments and aerosol seemed like all anybody was talking about.

"I guess germs matter to everybody, & I'm glad someone is paying attention."

Killing the Buzz (SARS-CoV-2)

Rene plays classical guitar. His ensemble is the pride of your hometown and was out on tour when COVID-19 emerged. Their whole lineup was cancelled, and the band came back home. Everybody was careful about safety, but one of the band-mates got sick. When he woke to a high fever and he couldn't smell his morning coffee, his heart sank. He called his mates right away and everybody got tested. Only two tested positive, and Rene was one of them. Thankfully, both have mild symptoms.

Everybody in the band self-quarantined right away. The *local* health advisory recommends that those exposed to confirmed cases should self-quarantine for two weeks if they had no symptoms and no positive tests. Those with positive tests were given instructions for how to recover at home and what to watch out for to get more help. They were also advised to remain in quarantine until recovered and feverless, and for at least one week after new negative tests come back (guidelines in their region)

It has been almost two weeks and Rene just got his first negative test. He started his 7-day countdown to freedom, but the clinic recommended he repeat his test in a few days. As long as both are negative, he'll be out and about. His buddy is still sick in bed, but seems to be improving. The one silver lining in this whole dark cloud has been the free time alone. Rene cleaned his garage, updated his music files, and spent some real serious quality time with that guitar.

Along the way, he noticed a few things didn't feel quite right and can't remember when he had it serviced last. There's a buzz in there somewhere and it looks like the fingerboard needs some serious cleaning. Since he can't gig right now, he figures this might be the perfect time to bring it in. He calls your shop, *"I'm just recovering from COVID-19 and I need my guitar serviced. Should I do anything about*

the virus too?"

Your staff already understands ICI and uses SUPs: They treat all instruments as potentially infectious, and they wash their hands, disinfect surfaces, and avoid touching their faces and mouths at work. They know that these are what keep them safe and healthy, not only from this virus now, but from other germs all the time too. They also understand the value of quarantine, and they advise Rene that if his community health advisory says he should keep his germs to himself for another week after recovery and negative testing, then the *same goes for his guitar too*. After that, it's back to business as usual, and with all the usual safety precautions in place.

Since the CDC says SARS-CoV-2 doesn't last longer than that on surfaces, there's nothing extra that needs done to clear the virus, and your shop doesn't charge people for doing nothing.

You wish him the best in his recovery and look forward to seeing him and his guitar in a week or so.

12

Resources

This is where you'll find the Glossary, all of ICI's Questions Answered and tools to Test & Apply Your Knowledge. You'll also find the Table of Relevant Instrumental Pathogens (TRIP), and the references used for both the TRIP and the text of ICI.

They are separated to support further study and printing requirements (the TRIP must always preserve its citations).

All cited references include links to public access information.

Glossary of Terms

TERMS	MEANINGS, IN THE CONTEXT OF ICI
Active	*engaged, working, or using energy*
Aerosol	*particles suspended in air*
Aggressive	*confrontational, offensive, acting with intent to harm*
Air handling	*managed movement of air, including air cleaning or air exchange*
Antibody	*protein that binds to antigen or specified irritant*
Antigen	*irritating substance*
Bacteriophage	*type of virus that infect bacteria*
Barrier	*a boundary, container, or shield*
Biofilm	*film, slime, sludge, or crust of microbes attached to each other or to a surface, often protective and difficult to remove, AKA plaque*
Burden	*a carried weight or cumbersome load*
Capsid	*the protein shell around a viral genome*

TERMS	MEANINGS, IN THE CONTEXT OF ICI
Chem-Clean	*enhanced cleaning process that uses non-detergent chemicals, often powerful and hazardous*
Clade	*branch (or grouping) that includes a single common ancestor and all of its descendants*
Clean	*to remove debris*
Client	*purchaser of services, rather than products (potential relationship)*
Contact	*exposure or interaction with potential for influence or change*
Control	*contain, direct, manage*
Critical contact (Cr)	*items that may contact internal body tissues*
Cultured	*isolated, developed, and maintained in purity*
Customer	*purchaser of products, rather than services (potential relationship)*
Defense	*protection, resisting attack or risk of attack*
Defensible	*justifiable by obvious reasoning, cited reference, or legal precedent*
Desiccation	*drying out*
Disease	*a health problem caused by infection or body failure, rather than by injury, defect, or disorder*
Disinfect	*bring purposeful harm to specific pathogenic microbes, as pests, using defined, or regulated process*
Dismissal	*the informed decision not to take action against irrelevant microbes*
Dormant	*temporarily inactive*
Drop-sinking	*wetting dust particles (when heavy, they fall faster from air)*
Droplet	*wet particles*
Education	*systematic instruction, or the content of that training*
Enhanced (E-)	*extra steps or extra diligence in an area of safety or hygiene*
Envelope	*a surrounding packet or membrane*
Environmental contact (Env)	*a surface expected to contact only intact skin, and mostly limited to extremities; includes tools*
Epidemiology	*the study and control of health problems in populations*
Exchange	*giving something and receiving something in return; trading germs*
Feasible	*reasonably possible, attainable, sustainable*

TERMS	MEANINGS, IN THE CONTEXT OF ICI
Fidelity	*graded precision in replication (how few errors are made)*
Fogging	*dispersing liquids into air, misting, or fumigating*
Fomite	*any surface that may harbor infectious microbes, including people*
Fomite Mediated Transmission	*transfer of infectious organisms on items that can harbor them, catching germs from touching contaminated things*
Frequent fomite	*an item or an area that is touched often or by multiple people*
Fumigation	*fogging with chemicals, usually as a pesticide*
Genome	*the genetic instructions of a life form, cell, or virus*
Germ	*slang for microbes, especially harmful pathogens*
Germicidal	*any substance or process that kills some germs (non-specific)*
Hand Hygiene (HH)	*making hands safe for intended use, with soap or approved sanitizer*
Handler	*person or system that makes, manages, touches, or uses something*
Harbor	*to hold, store, carry, or protect*
Humoral	*relating to body fluids and antibodies*
Hygiene	*habits or systems of health and wellness, cleanliness, and safety*
Immunize	*pre-arm the body to recognize a protein antigen*
Industry	*domain of business or type of work*
Infection	*successful invasion by microbes, implies reproduction of replication*
Infectious	*able to invade, and reproduce or replicate*
Inflammation	*immune triggered biological defensive response to infection or injury*
Innate	*pre-existing, naturally occurring, or possessed at birth or creation*
Instrument	*a tool or implement of specific purpose*
Interaction	*reciprocal influence; how people or things together*
Irrelevant	*having no value or concern, posing no threat, requiring no action*
Labeling	*intentional marking of identity, possession, sorting, priority, contents, in-date, or out-date*
Liability	*legal or financial responsibility for harm or damage caused by professional or personal action or inaction*
Literature	*existing writings, accepted body of knowledge*

TERMS	MEANINGS, IN THE CONTEXT OF ICI
Manage	*to plan, organize, maintain, or control people, processes, programs*
Marketable	*sellable, legally and sustainably profitable (products, services, content)*
Mediate	*to intervene, assist, negotiate, or transport*
Microbes	*living beings too small to be seen without magnification*
Microbiome	*the combined populations of all microbes that share a creature or system's life experience*
Mitigate	*to make smaller, or to lessen impact or damage*
Morphology	*identifying or descriptive structure, shape, or arrangements*
Negligence	*performance of unqualified function, or failure to meet reasonable expectation or standard*
Non-Critical contact (NCr)	*of little significance; in IC, refers to items that contact intact skin only, but is not limited to extremities*
Normal Flora	*normal, harmless bacteria, expected to be in that host body part*
Offense	*any act of insult, harm, attack, or injury (with or without intent)*
Opportunistic	*taking advantage*
Parasite	*organism that uses the resources of another to live, grow, or reproduce*
Passive	*without any need for added effort or energy*
Pasteurize	*particular process of heat or radiation that reduces germs in food and dairy products*
Pathogen	*germs, harmful microbes that cause infection and disease*
Payload	*significant delivery, valuable cargo, effective dose, infectious exposure*
Persistence	*continued tenacity, longevity of life*
Personal & Instrumental Hygiene (PIH)	*the combined and holistic approach to health and wellness of a person and their body interaction with musical gear*
Phylogeny	*method used to model relatedness of species, based on genetic sequences along with other characteristics.*
Picture of Done	*the image of outcome expectation or completion quality, in 4D: hygiene, function, comfort, and appearance*
Plaque	*solid state biofilm*
Practice	*a quality driven habit or proceduret*

TERMS	MEANINGS, IN THE CONTEXT OF ICI
Precaution	*measure to avoid, reduce, or respond to an unsafe or unpleasant thing*
Predatory	*behaviors and attitudes that target victims*
Professional	*service that is paid, affects property or safety of others, or is expected to meet industry standard; or a provider of same*
Promiscuity	*level of success of a virus in multiple host species*
Protocol	*standardized process or plan of action*
Quarantine	*duration of isolation to avoid contact with infectious pathogens, based on expected viable persistence*
Rational	*sensible, reasonable, based on a logical or systemic process*
Relevant	*related to a topic, important in context*
Repair	*fix, make right, make whole, or make work*
Reprocessing	*re-preparing reusable items for reuse, even by the same person*
Resident	*organism that lives or belongs in a place, system, host, or body part*
Resistance	*objection, survival despite abuse*
Respirator	*Passive device that protects breather from contaminants (no pump)*
Respiratory	*related to the body system of breathing and exchanging air*
Response	*action in that opposes, answers, or follows*
Risk	*threat or likelihood of harm, damage, or loss*
Route	*pathway or portal, steps along a journey, chain of events*
Sanitary	*clean enough for safe use, often based on a hygienic standard*
Sanitation	*water treatment for sanitary public use, especially drinking water*
Sanitize	*broad spectrum (non-specific) reduction of living microbes to a designated degree (usually logarithmic)*
Semi-Critical contact (SCr)	*of moderate importance; in IC, refers to items that access the airway, mouth, or mucous membranes*
Sensible	*reasonable to common sense, easily explainable to others*
Shared	*used or handled by another person or by more than one person (i.e. friends, loaners, trials, rentals, re-sales)*
Snake oil	*unproven cure, undocumented remedy, or a scam sale or service*

TERMS	MEANINGS, IN THE CONTEXT OF ICI
Standard	*basic, expected level, controlled number or measure, or an established practice*
Sterilize	*make barren or void of life, including spores and mycobacteria, often with certification required*
Susceptible	*vulnerable, has a weakness*
Touch-piece	*an area of an instrument or item where player hands are expected to be placed while playing and handling*
Transient	*passing, traveling, temporary*
Transmission	*exchange, transfer, spread, successful delivery*
Turnover	*all the steps that prepare durable items or systems for a new user*
Ultrasonic Cleaning (UC)	*using very low frequency sound waves, in water, to loosen debris*
Unfounded	*without proof or justification that can be defended logically or legally*
Universal	*applies to everyone, everything, everywhere, every time, all the time. In IC Standards, using precautions even if things don't "seem yucky"*
Unshared	*used and handled by only one person, not moving to a new player*
Unsupported	*statement without scientific basis or professional recommendation, or products without parts or service*
Validation	*verification of accuracy or of process methods, usually by a recognized authority*
Vector	*live carrier or deliverer of microbes*
Ventilator	*active air exchanger, (with air pump) with or without filtering*
Viability	*ability to succeed or thrive, ability to infect, or ability to resist treatment or withstand abuse*
Virion	*complete viral particle (usually implies functional and infectious particle)*
Virulence	*ability to cause disease, degree of pathogenicity*
Wet-share	*Unsafe transfer of gear between player without turnover (even if dry)*

ICI's Questions Answered

How long are the quarantine periods for instrument families?

Quarantines are not based on instrument families. They are based on the viabilities of each relevant pathogen. Since SARS-CoV-2 is an emerging pathogen, the data on its viable persistence is still evolving. At the time of this writing, the CDC still said it might be viable on surfaces for "hours to days." Quarantine is a passive response. Those who don't want to wait have to use active responses instead.

What about my shop? Can I fix things faster than the 7-day quarantine? What about play conditions and quick fixes?

ICI does not recommend a specific quarantine time per shop or per function. Each shop and each person must choose the contact risk levels they will enter when handling gear, and then must take steps to protect and empower players who handle gear after them. Presuming this virus decays over time, quarantine before servicing would offer lower estimated contact risks for handlers, so shops might delay service handling for hours or days to reduce or eliminate their contact risk. While it is sensible, we are not IC specialists and have no authority to advise emerging protocols ahead of the CDC. For now, the only defensible professional statements we can offer clients who ask is that when we last looked, the CDC said that SARS-CoV-2 can remain viable for "hours to days" on a variety of surfaces. There are other germs on gear, and many take longer to die. Thankfully, quarantine isn't the only way to keep them out of the face and mouth. Quarantine is a passive response. Those who don't want to wait have to use active responses instead.

Where did the "4 days" and "7 days" for quarantines come from?

An early article in the New England Journal of Medicine shared a viability study that detected SARS-CoV-2 for up to 3 days, but the Lancet later shared a study that reached 7 days. Folks who read the first study rounded up to 4 days, for passive quarantine, which was in keeping with the CDC's "hours to days" advisory. When the second study came out, folks extended their range. Some say those traditional controlled studies exaggerate persistence by using concentrated samples and protecting them too much, since "worst case" numbers aren't as true to life. In any

case, there still isn't enough data for the experts at the CDC to confidently update their “hours to days” advisory to anything more specific. Quarantine is a passive response. Those who don’t want to wait have to use active responses instead.

If there are areas on a horn that are still wet after sitting for a few days, is the virus still alive? Does the instrument have to be bone dry for 2-3 days for the virus to be gone?”

The studies on viable persistence are done on clean and dry surfaces. Germs last longer in biofilms and wet environments, so quarantines begin when the gear is dry. Quarantine is a passive response. Those who don’t want to wait have to use active responses instead.

How do we address equipment and accessories?

All people and things are fomites. They all have areas of greater and lesser touch-points, and easier and harder parts and places to clean. Consider contact type, share status, and surface vulnerabilities. Some shops put the small accessories into labeled baggies (cleaned or not) to reduce parts loss or tech contact. Baggies can be dated and labeled with whether contents are cleaned or just contained. Environmental surfaces are managed with sanitary cleaning and hand hygiene.

Should we quarantine instruments separate from cases and vent the cases?

Instruments should only leave the safety of their cases for playing, or for servicing the case or the instrument. Venting decisions are important in many “cases” *(get it?)* but not for this.

What about cases?

All people and things are fomites. Some are more frequently touched, or have more frequently touched parts (like case handles and latches). Consider the contact type, shared status, and surface vulnerabilities. For cases, review the hardware, leathers, furs and fabrics and make sensible and defensible choices about them. Not everything needs quarantine, cleaning, or disinfection, but items that are should be labeled for convenience. Environmental surfaces are managed with sanitary cleaning and hand hygiene.

Does ultrasonic clean and disinfect?

UC is a very effective cleaner (debris remover), especially in nooks and crannies, but does not disinfect, and never claimed to do so.

Is there infectious risk in my UC now?

Your UC is just as nasty as it always was (like old shared bathwater for hundreds of people). Respond to that in a way that preserves your equipment and protects your staff from harm. Use PPE and diligent hand hygiene, and don't allow guests or food in the cleaning room. Pay attention to how frequently the water, additives, and filters are exchanged. Don't skimp there because aging mixtures lose effectiveness and can grow and spread more germs. Reuse inevitably leads to offset dilutions and spent molecular capacity. Do it right and recapture the cost in your billing. UC may offer respiratory dispersal and contact risks of the germs in the bath.

What kind/type of disinfectant can be added to an ultrasonic cleaner?

Disinfectants are EPA controlled pesticides. You must follow their instructions exactly (which means not in the UC). Those instructions include concentration and contact time. Filling your UC with them would be wasting an awful lot of reagent. The order of operations is: Clean, Prep & UC, Soapy Wash & Rinse, Disinfect, Soapy Wash & Rinse.

My favorite UC Booster doesn't say SOAP. What should I use instead?

Most folks choose detergents as their favorite boosters for the UC instead of soaps, on purpose. By design, detergent cleaners leave less residues, and they avoid the mountainous bubbles that real soap is known for. In essence, the thing that makes detergents ideal for use in the UC is also what makes them not SOAP. UC is an excellent functional cleaner, but not a sanitary cleaner.

What about Sani-Mist, isopropyl alcohol, distillery alcohol, etc.?

CDC says alcohol at 60-70% is effective against SARS-CoV-2. Branded products only offer convenient solutions when their labels are compliant, if their product is EPA registered to be effective against what you want to kill, or their active ingredient

exactly matches one that is. Many of chemicals in sanitizers should be rinsed, because the rinse-less dose was meant for incidental use, not frequent mouthing.

Does temperature have any effect? Will a higher temp kill a virus?

Heat is one of the oldest tricks in the antimicrobial book! That's why we cook our food and pasteurize our milk. Many germs (of all sorts) die at hotter temps than we want our gear to get, which is why most people only heat them for repair service purposes. There are temperatures that make items safe to eat (or play.)

How do you "aggressively" treat a flute or clarinet for the virus before repairs begin without causing damage?

"Disinfection" purposefully destroys germs, and "Aggressive" means purposely harming life, even tiny life. Even if you disinfect them gently on a silken pillow, while singing sweet lullabies to them, your action is aggressive against microbes.

It is not necessary or possible to render every instrument germ-free before touching or repairing it. Understanding infectious transmission will help you choose the safety precautions that will keep the germs on your fomites out of your face and mouth. Environmental surfaces are managed with sanitary cleaning and hand hygiene.

Would you be able to speak to UV/Laser Light and new technology?

Germicidal radiation is not entirely new, and some large-scale commercial solutions have proven effective. New options for consumer use look hopeful, but UV-C also comes with limitations and hazards to humans and some surface finishes. Another emerging technology is hypochlorous fogging. This has great promise because it works quickly and appears harmless to humans (so far).

New gadgets suffer developmental growing pains and novel models are often the most costly. Some will not improve shop output or safety. It's also important to take IC claims very seriously, as missteps in health safety carry more serious consequences than the disappointment of unimpressive tools. Shops and makers are already researching and developing impressive solutions that may help those suffering chronic instrument related illnesses. Be careful not to rely on vendor input alone for new tech, and to avoid claims that are not supported by the CDC or

governing agencies. Everything old was once new, and we should keep an open and hopeful mind, but professional recommendations must always be sensible and defensible.

How can I know if my cleaner is fine?

"Fine," is not a specific enough word to describe what we do or where we stop. Cleaners are debris removers. Soaps, detergents, and other cleaners and degreasers all help remove debris. If you're asking if your cleaner is soap because you've heard soap is a lipid virus busting sanitary cleaner, trust its label. If you wash with soap and clean water, you can claim to perform sanitary cleaning. If you are asking if your cleaner also disinfects, trust its label, SDS, or EPA's registration for what it claims to kill. Disinfectants are pesticides (germs are pests), so only when you follow instructions for what they're registered to kill, can you claim to kill it. Since SARS-CoV-2 is emerging, EPA's N-List can help you check for products proven effective. Don't be discouraged if your cleaner is just a cleaner. CDC and EPA recommend that disinfection always follow debris removal anyway. They expect it to take two steps unless there isn't much to clean first. Sometimes we need to clean, sometimes we need to disinfect, and sometimes we need to do both.

We can't wash string instruments, what can we do?

String instruments don't need to go into the mouth, to they are considered Non-Critical (NCr) fomites, needing low level disinfection, if any. Most of the surfaces that are meant to be handled often can be cleaned according to the instructions of their makers. When an instrument has delicate surfaces that cannot be treated in the way that you would prefer, you can break a different link in the chain of infection, with quarantine, education, barriers, and Personal and Instrumental Hygiene to keep those germs out of the face and mouth.

Environmental (Env) surfaces and Non-Critical (NCr) surfaces can be managed with sanitary cleaning and hand hygiene. Faces can be protected with barriers.

Are flutes semi-critical or not? What did you mean in that video?

ALL wind instruments are Semi-Critical (SCr) contact items because they access the mouth and airway. When taken apart, the parts that touch the face or mouth are still SCr items. The further from the mouth each part is, the less risk it carries,

but wind instruments will always harbor more bioburden, because of condensates, than other kinds of instruments. Handlers and players use distancing and micro-staging to reduce movement of those bioburdens toward the face.

Since risk is never eliminated, Personal and Instrumental Hygiene, especially hand hygiene, always applies to all parts of all types of instruments. This means always washing hands before and after handling gear, and avoid touching the face or mouth with unwashed hands. It also means good habits like never using soiled mouthpieces, never aspirating condensates and never sharing reeds or other untreatable mouthed parts.

You have an exercise to write a cleaning procedure, but you didn't share any. Why?

ICI was written to fill in gaps in hygiene and infection control, which handlers may not see in their professional journeys. Each must then pair this with the details of their own experience and literature. Cleaning for function and maintenance, and sanitary cleaning, are not new to instrument handling. You really don't need us to reinvent cleaning for each germ on every fomite you play or work with. If you do, then we will have failed in what we set out to do here. ICI is frosting for your cake.

Are viruses actively contagious on brass and silver instruments and their cases? If so, how long will they remain contagious? Does anyone actually know?

Yes, germs are active and contagious on metals. They don't magically sterilize themselves. We do know some are less hospitable than others and are worth a closer look (every little bit helps). Silver has some antimicrobial action with wet contact, and copper can slow food spoilage (but not stop it). Copper doorknobs and handrails may reduce hand to hand transmission where it is hard to disinfect often. So far, studies have shown less germ numbers on those surfaces over time, but they didn't decrease the number of infections there (there were still enough germs to make people sick). Surfaces used most in clinical or food prep and those with historical germicidal promise are always included in viability studies to see how much or how fast they can help us.

Meanwhile, flutes aren't all silver, and if we're going to soak them wet enough to help, we might as well wash them. Brass horns aren't all copper either. They're

alloys of varying copper content, covered in lacquer or plating, and they have other materials here and there. One good look will prove they're not germ-proof and they still need to be cleaned. These metals may be helpful, but they are not magically miraculous, and the metal parts of instruments are usually the easiest parts to clean anyway.

Is brass poisoning from raw brass like mouthpieces a real thing?

Yes, bare metal offers potential metal toxicity. This usually concerns damaged or aging mouthpieces, but recent conversation has also moved to making them with more antimicrobial metals. There has not been enough research to justify investment, since washing mouthed parts is so easy, affordable, and effective, and metals may be toxic.

Further, the rate and capacity of metals to denature or neutralize germs cannot be guaranteed to a point that would eliminate the need to still wash those parts. (Historically, copper pots slowed contents from decaying. They did not prevent them).

Can a virus be spread in the air playing an instrument?

It is believed so. Musical sound is a vibration, amplified and transmitted as a message. Wind instruments use human breath to instigate that, just like speaking and singing, and these all produce aerosols. The idea of “super-emitting,” is a concern for everyone who longs to be together again, as respiratory droplets and aerosols appear to offer the primary transmission route of this and other respiratory viruses. This is a strong focus of significant ongoing studies, not only for music, but for all F2F activities. We can only follow the evolving recommendations from CDC and governing agencies.

What about special needs classes and petting zoos?

Group activities with youngsters always take extra care and planning, especially if anything goes in the mouth. Those who aren’t able to understand hygiene or infection control for themselves rely on their teachers and caregivers to do it for them. That’s not new for those helpers at all.

What do you recommend to band directors who might be exposed to liquid from

water-keys on a student trumpet, and may need to help another after another right after it?

Whether you use the restroom, wipe up a puddle, help a student blow his nose, or wiggle his trumpet mouthpiece loose, your next step is hand hygiene. No matter how many times you've already done it, every time is the right time. Make sure the kids see how to do it and that you do it every time for every touch, not because Johnny is "dirty." As soon as they're old enough, teach players to manage *their own condensates*.

Does soldering on an instrument that has COVID-19 on it expose me so I have to wear N-95 masks?

We didn't find any studies that specifically addressed whether soldering fumes carried more or less disease particles. We can say that soldering brings its own safety risks (fire, burn, eye, respiratory). Once you've got all that settled, work is work, germs are germs, and precautions are precautions. If you don't want to service items with germs on them, clean or treat them before servicing. Wash your hands with soap and clean water, especially before eating, and keep all parts or tools out of your mouth and face. Molten solder is too hot to support germ life.

Don't people usually clean their school instruments every year? This should not be new to anyone!

We wish that were so. There are two common reasons problems aren't solved or steps aren't taken. Either folks don't know about the problem or the missing step, or they believe solving it is hopeless or the steps are out of reach. ICI targets the first possibility through free education. Since germs are invisible, infection control isn't intuitive. It has to be taught. The second possibility is harder for any one person or program to remedy. We offer encouragement that knowledge is power, and hygiene is more affordable than most people think, but this doesn't reduce the burden of programs already struggling to maintain the gear they have. The need for advocacy for music programs is not new. We must encourage everyone who loves music and people to get involved. Bring whatever skills or knowledge you may have to the table, until every soul who hungers for music is well fed.

Can you give another example of the surfaces and responses in the moment?

Absolutely! Consider the mobile phone shop. All the phones in their wrapped cases, and the shelves they're on, are all *Env*, and rarely or never cleaned. When the associate spills coffee, it is *cleaned* off the packages. Owned phones *touch faces* but are *not shared*. They are *sanitary cleaned* to reduce and remove skin, oil, and germs. In the shop, touched and *faced by others*, they need to be *sanitized or disinfected* too. When people let small children play with phones, they become SCr, because toys g*o to mouths*. Children can't manage their own HH, so adults *must sanitize* their world.

Who should I talk to… to review if my plan is sensible and defensible?

In any field, sensible and defensible choices and plans justify themselves by acting in a way that is above reproach. If you feel uncertain about something you're doing, dig in and get to the bottom of it, strengthening your position until no doubt remains. *ICI empowers instrument handlers to do that for themselves.*

Test Your Knowledge

True/False Statements

1. T / F The virus that causes COVID-19 is the only pathogen of relevance nowadays, so we can all stop washing our hands and things once it's under control.
2. T / F It is much easier to manage germs before they get into the body.
3. T / F Only sick or weak people need to worry about germs.
4. T / F Mouthpieces dissolve in soapy water and should never be cleaned.
5. T / F Only wind players need to worry about germs reaching their faces.
6. T / F Gloves don't eliminate the need for hand hygiene.
7. T / F Dismissal is the informed decision not to take action against irrelevant microbes; doing less when less is needed.
8. T / F Copper is so germicidal, anything made with it is always instantly sterile.
9. T / F DIY sanitizers need safety labels even if they're donated.
10. T / F Pop-ups and mobile displays do not need safety plans or chemical labels.
11. T / F Sterilization of living tissue is impossible because it kills all life, including spores.
12. T / F Disinfection of living tissue is not recommended, because methods and products of disinfection are not proven safe for use on flesh.
13. T / F Some parasites are not killed by soap or alcohol, so we rely on the mechanical action of washing and rinsing hands before eating to help us combat them.
14. T / F Surfaces on people, pets, foods, instruments, and bugs are all fomites.
15. T / F When there is an outbreak of a new infectious virus in humans, we can assume that it will have the same characteristics, like virulence and disease symptoms, as similar viruses in that virus family.
16. T / F Aggressive scrubbing and splashing can aerosolize microbes and spread them around onto things nearby.

Fill in the Blank

17. _____ _____ is the best way to keep surface germs out of the face and mouth.
18. Surfaces that are capable of harboring or delivering germs are called _____.
19. _____ is a duration of separation to avoid or reduce infectious contact.
20. Successful invasion and reproduction of germs is called _____.
21. Ignorance about _____ leaves people vulnerable to unnecessary suffering, which might be prevented with simple sanitary habits.
22. _____ _____ refers to workplace sanitary habits, social courtesy, and safety.
23. PIH is the abbreviation for a holistic approach to _____ and _____ hygiene.
24. Personal hygiene refers to the wellness habits and sanitary care of a person's self, spaces, and _____.
25. _____ is the attempt to lessen the severity of anything undesired.
26. Preparing a durable item for reuse is called _____.
27. Preparing used items, spaces, or systems for a new user is called _____.
28. Two transmission routes most relevant to music making are _____ and _____.
29. Standard Precautions are also called _____ because sanitary safety matters all the time, not just when people or things "look dirty."
30. IC measures that strategically block the primary routes of known pathogens are called _____-_____ Precautions.
31. The prime directive in ICI is to keep fomite mediated germs out of the face and _____.
32. All people must keep the prime directive for themselves and try to reduce the _____ for others, wherever possible.
33. Professionals must take sensible and _____ steps to make it easier for those they serve, to keep the prime directive for themselves.
34. The reason we must clean and sanitize (or disinfect) so many surfaces for children is because they cannot yet manage their own _____ _____.

35. Teachers are caregivers when they are _____ for the sanitary safety of others.

36. _____ is the ability of an organism to infect and reproduce. This includes both persistence on surfaces over time, and resistance to abuse, like exposure to harm.

37. The three primary resources for IC guidance are the CDC, the _____ and the FDA, because they have mandatory and leadership roles in that area of governance.

38. Passive responses to microbe awareness include incidental quarantine and dismissal. What is a simpler word for incidental quarantine? _____

39. ICI suggests defining unregulated germicidal treatment as: [action] + [method], with details and basis on file and on display. Product name and contact time are examples of _____

40. The 3 Factors of Risk that influence our perspectives and our need for action are contact type, frequency of touch, and shared status. Which risk factor describes how critical an item's access is to the body? _____ _____

41. Which describes the "stranger-danger" in used items for new users? _____ _____

42. There are four perspectives of relevance of instrumental pathogens in ICI. They are sanitary PH, sanitary IH, Contagion, and Occupational _____ for handlers.

43. Long ago, laundry was boiled to kill germs. Nowadays, heating liquids, like water or milk, to make them safe, is called _____.

44. Using disinfecting or sanitizing products in ways not directed is called off-_____ use.

45. The "4D Picture of Done" is painted by clients and players. The four dimensions are _____ , function, comfort, and appearance.

46. Infection Control is a chapter in which company or shop policy manual? _____

47. Earnest Hemingway advised the use of a "built-in, shock-proof, _____ -detector."

48. It's not necessary to clean and disinfect in only one step or use one product or tool for every service. The CDC recommends disinfection always follow _____ anyway.

49. A program that cannot run without you will not _____ long after

you.

50. Is disinfection the first or last Infection Control Precaution? _____

51. Using C&D action terminology to describe HH methods, handwashing with soap and water is _____ _____ , while rubbing the hands with 70% alcohol is sanitizing.

52. A _____ guide has helpful information about sanitary use of an instrument

53. Tommy has Strep. Pneumoniae in his throat. His mom wants to make his mouthpiece sanitary when he feels well enough to practice. On the TRIP, what kind of germ is Strep. Pneumoniae? _____

54. How long can Strep. Pneumoniae last on Tommy's Tuba? _____

55. The CDC website says Strep. Pneumoniae is killed with Sanitary Cleaning with soap and water. What other two C&D ACTIONs can Tommy's mom use to make his mouthpiece safe to play on, besides waiting for all the old germs to die? _____ or _____

56. After he plays his tuba, especially after he has been sick, Tommy should always clean his _____ and his _____.

57. Semi-Critical contact (SCr) items are those with access to the _____ , _____ and mucous membranes.

58. _____ _____ is the duration of exposure a disinfection method requires to achieve the action it claims.

59. A _____-_____ is the unsafe practice of passing used instruments to new users without appropriate turnover.

60. Many students were sick last week with the Flu. Today is Friday. According to the TRIP, will the bandroom and dry gear stored there be clear of Flu germs by Monday for Band? _____

Apply Your Knowledge

Essay Questions

1. Write the aftercare advice that you might expect to receive after your primary instrument has been serviced or handled by others. Does your answer differ from advice you have received in the past? If so, how?

_____
_____
_____
_____
_____
_____

2. What would be needed to sensibly issue your used instrument to a new user if it were rented or sold by a music shop, or used by a school? Defend your answer.

_____
_____
_____
_____
_____
_____

Real World Application

3. Using the form provided, write your own best step-by-step procedure for sanitary cleaning your primary instrument ***at home.*** Use the terminology of cleaning and disinfection wherever possible. Defend your choices and justify your methods. Are there also some professional services needed? If so, when?

4. Using the form provided, create your own best instrument care guide for your primary instrument, or one specified by your instructor. Use the questions about instrument care, from the Instrument Hygiene (IH) chapter, to guide you and any available resources to help you. Credit anything you copy and cite NON-ICI sources for advice about germicidal actions.

My Sanitary Cleaning Procedure

Owner/Player's Name _____ **Instrument:** _____

Brand: _____ **Model:** _____ **Serial:** _____

Supplies Needed _____

_____

_____

_____

_____

_____

_____

Sanitary Cleaning Process for the Accessories _____

_____

_____

_____

_____

_____

_____

Sanitary Cleaning Process for the Instrument _____

_____

_____

_____

_____

_____

_____

_____

Reassembly Lubrication or Preparation (if any) _____

_____

_____

_____

_____

_____

My Instrument Care Guide

Owner/Player's Name _____ **Instrument:** _____

Brand: _____ **Model:** _____ **Serial:** _____

Storage & Rest _____

_____

_____

_____

_____

Supplies _____

_____

_____

_____

_____

Playing & Function _____

_____

_____

_____

Home Maintenance _____

_____

_____

_____

Professional Service _____

_____

_____

_____

Financial Matters _____

_____

_____

_____

Table of Relevant Instrumental Pathogens

Relevant Instrumental Pathogens (RIPs) are germs likely to get on instruments, gear, and repair tools, and persist long enough to infect others. Similar germs concern workers in healthcare, childcare, foodservice, or education, because these places all serve people, and people move germs. Knowing which germs matter, and how long they last, supports decisions about sanitary cleaning and disinfection, as well as counsel about Personal and Instrumental Hygiene (PIH) and hand hygiene (HH), especially after service and handling by others.

For professionals, an overview of RIPs and their expected viable persistence also supports a sensible and defensible approach to sanitary care, including appropriate cleaning and disinfection. After quarantine, un-dismissed RIPs require active responses based on their contact type, frequency, and shared status. Active response options include sanitary cleaning, disinfection, E-PIH-HH, and PPE of players and handlers, and combinations of these. Sanitary cleaning includes all home or professional cleanings with soap or labeled sanitary products. It is only sufficient for unshared parts or for parts that touch only intact skin (NCr or Env). Parts that touch more than hands (NCr) should be disinfected or sanitized when safe to do so. Parts with access to airway, mouth or mucous membranes (SCr) require disinfection between users.

Methods of disinfection are defined by CDC's guide, while chemical disinfectants are registered by the EPA. When gear is not resilient to treatment, un-dismissed RIPs guide the selection of quarantine or other transmission-based precautions (TBPs). These are recipient focused and include E-PIH and PPE barriers through viable persistence of RIPs. E-PIH-HH is common after service or handling by others.

The Table of Relevant Instrumental Pathogens (TRIP) offers a snapshot of 75 RIPs that effectively illustrate the importance of PIH and sanitary cleaning. Bacteria are marked as Gram-positive (Gp) or Gram-negative (Gn), courtesy of Cellinlife [2012]. Lipid enveloped (Le) viruses are indicated [Navaratnarajah et al., 2008], as are Spore (Sp) formers [Hartmann, 2020]. Persistence is adapted from the listed references to support dismissal through quarantine of dry gear that is free from obvious biofilm, bioburden, or thick debris. Quarantine cannot dismiss RIPs that are fed by their substrates (bodies, parts, or cases), or that can be independent or

dormant. The most likely disinfectant category is offered, courtesy of Hartmann's Bode Science Center, but every user is responsible to follow the directions of their products for each use.

TRIP data is adapted and presented in good faith. It does not supersede guidance of any governing bodies or IC agencies. Medical advice should come from licensed practitioners, not repairers or other handlers. The TRIP is meant to help clean instruments and accessories wisely, not to treat sick or infected people. It represents only a sampling of RIPs, with preference to those common to the United States. Details about new germs and their viable persistence, and new technology for dealing with them, are always evolving. Every player or professional handler is responsible to verify information for themselves and make their own most sensible decisions about when to use suggested passive quarantines, active response precautions, or both.

ICI supports sanitary experiences for players and safer interactions for handlers. The TRIP is a powerful tool for PH and PIH education advocacy. It helps answer questions about options for specific germs on instruments and guides protocol choices for reprocessing and turnover. It also shows why we might recommend clients use E-PIH-HH for 2-3 months after service or handling by others, especially when C&D cannot be achieved, to keep contagions on instruments out of the face and mouth. Most importantly, the TRIP presents sanitary hygiene as a concern for many germs all the time, not just when a noteworthy pathogen makes headlines.

The TRIP is designed to print with standard settings. Permission to print and share is granted for educational and non-compensable use, *if referenced sources are always preserved.*

Relevant Instrumental Pathogen (RIP)	Microbe Type [Hartmann, 2020]	Viable Persistence Range (rounded up)	Source of Viable Persistence Range	Germicidal, [Hartmann, 2020]
Acinetobacter spp.	Gn Bacteria	2 weeks	Kramer et al., 2006	Bactericidal
vActinomyces spp.	Gp Bacteria	7 weeks	Gadjacz, 2020	Bactericidal
Adenovirus	Virus	3 months	Kramer et al., 2006	Virucidal
Aspergillus spp.	Fungus (Sp)	> Years (spores)	CDC, 2020	Sporicidal
Astrovirus	Virus	3 months	Kramer et al., 2006	Virucidal
Bacillus spp.	Gp Bacteria (Sp)	> Years (spores)	Hartmann, 2020	Sporicidal
Blastocystis spp.	Protozoa	Unknown (cysts)	CDC, 2020	Parasiticidal
Blastomyces spp.	Fungus (Sp)	> Years (spores)	MSDSonline, 1999	Sporicidal
Bordetella pertussis	Gn Bacteria	5 days	Kramer et al., 2006	Bactericidal
Brucella spp.	Gn Bacteria	24 hours	Corbel, 2006	Bactericidal
Burkholderia spp.	Gn Bacteria	7 days	Sham et al., 2007	Bactericidal
Campylobacter jejuni	Gn Bacteria	6 days, (thrives wet)	Kramer et al., 2006	Bactericidal
Candida spp. (yeast)	Fungus	4 months	Kramer et al., 2006	Fungicidal
Chlamydia spp.	Gn Bacteria	15 days	Kramer et al., 2006	Bactericidal
Clostridium difficile (C.DIFF)	Gp Bacteria (Sp)	5 months (spores)	Kramer et al., 2006	Sporicidal
Coronavirus-02 (SARS-CoV)	Le Virus	9 days	Kramer et al., 2006	Virucidal
Coronavirus-19 (SARS-CoV2)	Le Virus	Hours to Days	CDC, 2020	Virucidal
Coxsackie Virus	Virus	2 weeks	Kramer et al., 2006	Virucidal
Cryptosporidium spp.	Parasite	2 hours	Kramer et al., 2006	Parasiticidal
Cytomegalovirus	Le Virus	8 hours	Kramer et al., 2006	Virucidal
Dientamoeba spp.	Parasite	> Unknown (cysts)	Stark et al., 2016	Parasiticidal
Echovirus	Virus	7 days	Kramer et al., 2006	Virucidal
Enterobius vermicularis	Parasite	3 weeks	CDC, 2013	Parasiticidal
Enterococcus spp. (incl. VRE)	Gp Bacteria	Years	Kramer & Assadian, 2014	Bactericidal
Epstein-Barr Virus (incl. HSV4)	Le Virus	< 1 hour	CDC, 2018	Virucidal
Escherichia coli	Gn Bacteria	16 months	Kramer et al., 2006	Bactericidal
Giardia lamblia	Parasite	Months (eggs)	CDC, 2015	Parasiticide
Haemophilus influenzae	Gn Bacteria	2 weeks	Kramer et al., 2006	Bactericidal
Helicobacter pylori	Gn Bacteria	2 hours (thrives wet)	Kramer et al., 2006	Bactericidal
Hepatitis A Virus	Virus	2 months	Kramer et al., 2006	Virucidal
Hepatitis B Virus	Virus	1 week	Kramer et al., 2006	Virucidal
Hepatitis C Virus	Virus	6 weeks	Painstil et al., 2014	Virucidal
Herpes Simplex Virus (1&2)	Le Virus	2 months	Kramer et al., 2006	Virucidal
Histoplasma spp.	Fungus	> Independent	CDC, 2018	Sporicidal
Human Enterovirus 71	Virus	3 days	Cox et al., 2017	Virucidal
Human Immunodeficiency Virus	Le Virus	7 Days	Kramer et al., 2006	Virucidal
Influenza (incl. FLU A, B, H1N1)	Le Virus	2 days	Kramer et al., 2006	Virucidal
Klebsiella spp.	Gn Bacteria	> Independent	Kramer et al., 2006	Bactericidal

Relevant Instrumental Pathogen (RIP)	Microbe Type [Hartmann, 2020]	Viable Persistence Range (rounded up)	Source of Viable Persistence Range	Germicidal, [Hartmann, 2020]
Legionella spp.	Gn Bacteria	< 1 hour	OSHA, 2018	Bactericidal
Micrococcus / Paracoccus spp.	Gp Bacteria	> Years	MSDSonline, 2010	Bactericidal
Microsporum / Trichosporum spp.	Fungus	> Independent	CDC, 2019	Sporicidal
Molluscipox Virus	Le Virus	Unknown	CDC, 2015	Virucidal
Moraxella spp.	Gn Bacteria	27 days	MSDSonline, 2010	Bactericidal
Mumps virus	Le Virus	< 1 hour	CDC, 2019	Virucidal
Mycobacterium bovis	Bacteria	> 2 months	Kramer et al., 2006	Bactericidal
Mycobacterium tuberculosis	Bacteria	4 months	Kramer et al., 2006	Bactericidal
Mycoplasma spp.	Bacteria	< 1 hour	MSDSonline, 2010	Bactericidal
Neisseria spp. (incl. gonorrhoeae)	Gn Bacteria	3 days	Kramer et al., 2006	Bactericidal
Norovirus	Virus	> Weeks	CDC, 2015	Virucidal
Papillomavirus	Virus	> 7 days	Kramer et al., 2006	Virucidal
Papovavirus	Virus	8 days	Kramer et al., 2006	Virucidal
Parainfluenza spp.	Le Virus	10 hours	Brady & Evans, 1990	Virucidal
Parvovirus	Virus	> 1 year	Kramer et al., 2006	Virucidal
Poliovirus type 1	Virus	8 days	Kramer et al., 2006	Virucidal
Poliovirus type 2	Virus	2 months	Kramer et al., 2006	Virucidal
Proteus vulgaris	Gn Bacteria	2 days	Kramer et al., 2006	Bactericidal
Pseudomonas aeruginosa	Gn Bacteria	> 16 months	Kramer & Assadian, 2014	Bactericidal
Respiratory Syncytial Virus (RSV)	Le Virus	6 hours	Kramer et al., 2006	Virucidal
Rhinovirus (common cold)	Virus	7 days	Kramer et al., 2006	Virucidal
Rotavirus	Le Virus	2 months	Kramer et al., 2006	Virucidal
Rubella	Le Virus	<1 day	MSDSonline, 2010	Virucidal
Salmonella spp. (food poisoning)	Gn Bacteria	1 day (years biofilm)	Kramer et al., 2006	Bactericidal
*Salmonella typhi, & typherium	Gn Bacteria	4 weeks, > 4 Years	Kramer et al., 2006	Bactericidal
Serratia marcescens	Gn Bacteria	5 weeks	Kramer et al., 2006	Bactericidal
Shigella spp.	Gn Bacteria	5 months	Kramer et al., 2006	Bactericidal
Staphylococcus aureus	Gp Bacteria	7 months	Kramer et al., 2006	Bactericidal
Streptococcus pneumoniae	Gp Bacteria	3 weeks	Kramer et al., 2006	Bactericidal
Streptococcus pyogenes	Gp Bacteria	> 6 months	Kramer et al., 2006	Bactericidal
Tinea spp.	Fungus (Sp)	Years (spores)	CDC, 2018	Sporicidal
Torulopsis spp.	Fungus	5 months	Kramer et al., 2006	Fungicidal
Toxoplasma spp.	Parasite	Years (cysts)	Mirza et al., 2018	Parasiticidal

TRIP Referenced Sources

All cited links were accessed September 2020, (See also text-cited sources)

Brady, M. T., Evans, J., & Cuartas, J. (1990). Survival and disinfection of parainfluenza viruses on environmental surfaces. *American Journal of Infection Control*, 18(1), 18–23. DOI: 10.1016/0196-6553(90)90206-8. https://pubmed.ncbi.nlm.nih.gov/2156469/

CDC, US. (2020, April 20). Aspergillosis. https://www.cdc.gov/fungal/diseases/aspergillosis/index.html

CDC, US. (2020, May 24). Blastocystis infection. https://www.cdc.gov/parasites/blastocystis/index.html

CDC, US. (2020, June 16). Coronavirus Disease 2019 (COVID-19). https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/how-covid-spreads.html

CDC, US. (2013, January 10). Enterobiasis, Pinworm infection. https://www.cdc.gov/parasites/pinworm/index.html

CDC, US. (2018, May 8). Epstein Barr Virus and Infectious Mononucleosis. https://www.cdc.gov/epstein-barr/index.html

CDC, US. (2015, July 22). Giardia. https://www.cdc.gov/parasites/giardia/index.html

CDC, US. (2013, August 13). Histoplasmosis. https://www.cdc.gov/fungal/diseases/histoplasmosis/index.html

CDC, US. (2019, May 29). Microsporidiosis. https://www.cdc.gov/dpdx/microsporidiosis/index.html

CDC, US. (2015, May 11). Molluscum-contagiosum. https://www.cdc.gov/poxvirus/molluscum-contagiosum/index.html

CDC, US. (2019, March 08). Mumps.https://www.cdc.gov/mumps/index.html

CDC, US. (2015, January). Norovirus: Key facts. https://www.cdc.gov/norovirus/downloads/keyfacts.pdf

CDC, US. (2018, August 06). Tinea, Ringworm. https://www.cdc.gov/fungal/diseases/ringworm/index.html

Corbel, M. (2006). Brucellosis in humans and animals. Food and Agriculture Organization of the United Nations, and World Organisation for Animal Health. WHO Press. https://www.who.int/csr/resources/publications/Brucellosis.pdf?ua=1

Cox, J. A., Hiscox, J. A., Solomon, T., Ooi, M. H., & Ng, L. (2017). Immunopathogenesis and virus-host interactions of Enterovirus 71 in patients with hand, foot and mouth disease. *Frontiers in Microbiology, 8, 2249*. DOI: 10.3389/fmicb.2017.02249. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5713468/

Environmental Protection Agency (EPA), US. (2018, October 17). Bed bugs: Get them out and keep them out. https://www.epa.gov/bedbugs

Gajdács, M., & Urbán, E. (2020). The pathogenic role of Actinomyces spp. and related organisms in genitourinary infections. *Antibiotics, 9(8), 524. MDPI AG.* https://doi.org/10.3390/antibiotics9080524

Gelderblom, H. (1996). Structure and classification of viruses. In: Baron S., eds. NIH.Gov; University of Texas Medical Branch at Galveston. From*: Medical Microbiology. 4th edition, 2014.* https://www.ncbi.nlm.nih.gov/books/NBK8174/

Hartmann, P. (2020) Relevant pathogens from A-Z. *Bode Science Center.* https://www.bode-science-center.com/center/relevant-pathogens-from-a-z.html

Kramer, A. & Assadian, O. (2014). Survival of microorganisms on inanimate surfaces. In: *Borkow G. (ed). Use of biocidal surfaces for reduction of healthcare acquired infections. Springer, Cham.* https://doi.org/10.1007/978-3-319-08057-4_2

Kramer, A., Schwebke, I. & Kampf, G. (2006, August 16). How long do nosocomial pathogens persist on inanimate surfaces? A systematic review. *BMC Infectious Diseases 6, 130.* https://doi.org/10.1186/1471-2334-6-130

Mirza Alizadeh, A., Jazaeri, S., Shemshadi, B., Hashempour-Baltork, F., Sarlak, Z., Pilevar, Z., & Hosseini, H. (2018). A review on inactivation methods of Toxoplasma gondii in foods. *Pathogens and global health, 112(6)*. https://doi.org/10.1080/20477724.2018.1514137

MSDSonline (1999, November). Blastomyces. *MSDSonline: Free safety data sheet index.*https://www.msdsonline.com/resources/sds-resources/free-safety-data-sheet-index/blastomyces-dermatitidis/

MSDSonline (2010, November). Micrococcus. *MSDSonline: Free safety data sheet index.*https://www.msdsonline.com/resources/sds-resources/free-safety-data-sheet-index/micrococcus-spp/

MSDSonline (2010, August). Moraxella. *MSDSonline: Free safety data sheet index.*https://www.msdsonline.com/resources/sds-resources/free-safety-data-sheet-index/micrococcus-spp/

MSDSonline (2010, September). Mycoplasma spp., including M. Pneumoniae. *MSDSonline: Free safety data sheet index.* https://www.msdsonline.com/resources/sds-resources/free-safety-data-sheet-index/mycoplasma-spp/

MSDSonline (2010, September). Rubella. *MSDSonline: Free safety data sheet index.*https://www.msdsonline.com/resources/sds-resources/free-safety-data-sheet-index/rubella-virus/

Navaratnarajah, C., Warrier, R., & Kuhn, R. (2008). Assembly of viruses: Enveloped particles. *Encyclopedia of Virology, 193–200.* Elsevier. https://doi.org/10.1016/B978-012374410-4.00667-1

Occupational Safety and Health Administration (OSHA), US. (2018). Legionellosis: Legionnaires' Disease and Pontiac Fever.https://www.osha.gov/SLTC/legionnairesdisease/index.html

Paintsil, E., Binka, M., Patel,A., Lindenbach, B., & Heimer, R. (2014). Hepatitis C virus maintains infectivity for weeks after drying on inanimate surfaces at room temperature: Implications for risks of transmission, The Journal of Infectious Diseases, Volume 209, Issue 8. DOI: 10.1093/infdis/jit648. https://academic.oup.com/jid/article/209/8/1205/830800

Shams, A., Rose, L., Hodges, L., & Arduino, M. (2007). Survival of Burkholderia pseudomallei on environmental surfaces. *Applied and Environmental Microbiology. 73. 8001-4.* DOI: 10.1128/AEM.00936-07. https://www.researchgate.net/publication/ 5895154_Survival_of_Burkholderia_pseudomallei_on_Environmental_Surfaces

Stark, D., Barratt, J., Chan, D., & Ellis, J. (2016). Dientamoeba fragilis, the neglected trichomonad of the human bowel. *Clinical Microbiology Reviews. 29(3), 553–580.* DOI: 10.1128/CMR.00076-15. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4861990/

ICI Referenced Sources

All cited links were accessed September 2020, (See also TRIP-cited sources)

Abrams, A. (2017, August 23). Your cell phone is 10 times dirtier than a toilet seat. Here's what to do about it. Time; Health, https://time.com/4908654/cell-phone-bacteria/

Aiello, A., & Larson, E. (2002). What is the evidence for a causal link between hygiene and infections? *The Lancet. Infectious diseases, 2(2), 103–110.* https://doi.org/10.1016/s1473-3099(02)00184-6

Alberts, B., Johnson, A., Lewis, J., Raff, M., Roberts, K., & Walter, P. (2009). The Adaptive Immune System. Nih.Gov; Garland Science. https://www.ncbi.nlm.nih.gov/books/NBK21070/

Alston & Bird. (2020). Who regulates what in cleaning chemicals? Cleaning up after COVID-19: What you need to know before you manufacture, import, or sell sterilizers, sanitizers, purifiers, and disinfectants. *Attorney Advertising.* https://www.jdsupra.com/legalnews/cleaning-up-after-covid-19-what-you-56881/

American College of Preventive medicine (APCM). (2019). Our mission & history. *Www.Acpm.Org*. , https://www.acpm.org/about-acpm/mission-history/

American Dental Association. (2020). Brushing your teeth. *Mouthhealthy: Life Stages.* https://www.mouthhealthy.org

American Hospitals Association (AHA). (2018). Federal Agencies with Regulatory or Oversight Authority Impacting Hospitals. https://www.aha.org/system/files/2018-01/info-regulatory-burden-federal-agencies.pdf

American Psychological Association. (2006, February 23). Stress weakens the immune system. *Friends, relaxation strengthen health*. https://www.apa.org/research/action/immune

American National Red Cross (ANRC). (n.d.). Facts about blood and blood types. *Redcrossblood.Org*. https://www.redcrossblood.org/donate-blood/blood-types.html#:~:text=Blood%20types%20are%20determined%20by,blood%20typing%20and%20cross%2Dmatching.

Ames, H. (2020, May 20). Personal hygiene: Benefits, types, and routine. *Medicalnewstoday.com.* https://www.medicalnewstoday.com/articles/personal-hygiene#children

Anunobi, V. (2020, August 11). What are ectoparasites? *Healthtian*. https://healthtian.com/ectoparasites/

Aranha, R. (2019, July 03). Helping students become 21st-century "crap detectors." In: *Touro College Learning & Teaching Exchange.* https://learningandteachingexchange.wordpress.com/ 2019/07/03/ helping-students-become-21st-century-crap-detectors/

Assistant Secretary for Public Affairs (ASPA), US. (2015, October 27). HHS Agencies & Offices. *HHS.Gov*. https://www.hhs.gov/about/agencies/hhs-agencies-and-offices/index.html

Australian Government Department of Health (DOH) Commonwealth of Australia (2010) Personal Hygiene. *Environmental health practitioner manual: a resource manual for environmental health practitioners working with Aboriginal and Torres Strait Islander communities, chapter 7.* https://www1.health.gov.au/internet/publications/publishing.nsf/Content/ohp-Enhealth-manual-atsi-cnt-l~ohp-enhealth-manual-atsi-cnt-l-ch3~ohp-enhealth-manual-atsi-cnt-l-ch3.7

Baron, P. (n.d.). Generation and Behavior of Airborne Particles. [Presentation] *Division of Applied Technology, for National Institute for Occupational Safety and Health and Centers for Disease Control and Prevention.* https://www.cdc.gov/niosh/topics/aerosols/pdfs/Aerosol_101.pdf

Block, M., & Rowan, B. (2020). Hypochlorous acid: A review. *Journal of Oral and Maxillofacial Surgery. joms.2020.06.029* https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7315945/

Borreli, L. (2013, August 22). Laundry bacteria could be in your "clean" clothes. *Medical Daily.* https://www.medicaldaily.com/laundry-bacteria-could-be-your-clean-clothes-ways-reduce-germ-growth-your-wash-253557

Boundless (2020, September 06). History of microbiology: Hooke, VanLeeuwenhoek, and Cohn. General Microbiology at Boundless, 2018, June 20, Biology LibreTexts. https://bio.libretexts.org/Bookshelves/Microbiology/Book%3A_Microbiology_(Boundless)/1%3A_Introduction_to_Microbiology/1.1%3A_Introduction_to_Microbiology/1.1B%3A_History_of_Microbiology_-_Hooke%2C_van_

Leeuwenhoek%2C_and_Cohn
Bureau of Communicable Diseases and Emergency response. (2014, May). Childhood Communicable Diseases. *Wisconsin Department of Health Services*. https://www.dhs.wisconsin.gov/disease/childhood-communicable-diseases.htm
Cabot, G., & Baes, F. (2011). Ultraviolet Radiation #9450. *Ask the Experts, Health Physics Society. 2016.* https://hps.org/publicinformation/ate/q9450.html
Cadwell K. (2015). The virome in host health and disease. Cell.com. Immunity, 42(5), 805–813. https://doi.org/10.1016/j.immuni.2015.05.003
Centers for Disease Control and Prevention (CDC), US. (2012, May 08). Introduction to applied epidemiology and biostatistics DSEPD, *Principles of Epidemiology in Public Health Practice, Third Edition*. CDC, US. https://www.cdc.gov/csels/dsepd/ss1978/lesson1/section1.html
CDC, US. (2020, March 13). About antibiotic resistance. https://www.cdc.gov/drugresistance/about.html
CDC, US. (2018, April 30). About nutrition: Why It matters. https://www.cdc.gov/nutrition/about-nutrition/why-it-matters.html
CDC, US. (2020, April 01). Cleaning and disinfection for community facilities. https://www.cdc.gov/coronavirus/2019-ncov/community/organizations/cleaning-disinfection.html
CDC, US. (2016, April 12). Environments pesticide fumigants. *National Environmental Public Health Tracking: Pesticide Exposures. Ephtracking.Cdc.Gov.* https://ephtracking.cdc.gov/showpesticideFumigants.action
CDC, US. (2017, January 25). Fungal diseases. https://www.cdc.gov/fungal/infections/index.html
CDC, US. (2008). Guideline for Disinfection and Sterilization in Healthcare Facilities (2008). https://www.cdc.gov/infectioncontrol/guidelines/disinfection/index.html
CDC, US. (2015, January 13). Hierarchy of Controls, (2019). *National Institute for Occupational Safety and Health (NIOSH) Online.* https://www.cdc.gov/niosh/topics/hierarchy/default.html
CDC, US. (2020, July 20). History of quarantine. https://www.cdc.gov/quarantine/historyquarantine.html
CDC, US. (2016, July 26). Hygiene. https://www.cdc.gov/healthywater/hygiene/body/index.html
CDC, US. (2016, January 26). Infection control basics. https://www.cdc.gov/infectioncontrol/basics/standard-precautions.html
CDC, US. (2019, May 29). Legionella Growth and Spread. https://www.cdc.gov/legionella/wmp/overview/growth-and-spread.html
CDC, US. (2020). Novel Coronavirus 2019. https://www.cdc.gov/coronavirus/2019-ncov/index.html
CDC, US. (2018, April 13). Nutrition: Why it matters. https://www.cdc.gov/nutrition/about-nutrition/why-it-matters.html
CDC, US. (2020, Aug. 25). Operational considerations for schools. https://www.cdc.gov/coronavirus/2019-ncov/global-covid-19/schools.html
CDC, US. (2020, July 20). Parasites. https://www.cdc.gov/parasites/index.html
CDC, US. (2016, June 17). Teacher's roadmap: What is epidemiology? *CDC Museum*. https://www.cdc.gov/careerpaths/k12teacherroadmap/epidemiology.html
CDC, US. (2019, February 28). Tetanus. https://www.cdc.gov/tetanus/about/causes-transmission.html
CDC, UC. (2019, January 07). Transmission-based precautions.
https://www.cdc.gov/infectioncontrol/basics/transmission-based-precautions.html
CDC, US. (2019, August 05). What's in vaccines. With *National Center for Immunization and Respiratory Diseases.* https://www.cdc.gov/vaccines/vac-gen/additives.htm
CDC, US. (2016, August 20). Workplace Health. https://www.cdc.gov/workplacehealthpromotion/health-strategies/flu-pneumonia/interventions/environmental-support.html
College of Physicians of Philadelphia (CPP). (2018, January 10). The history of vaccines: Viruses and evolution. History of Vaccines. https://www.historyofvaccines.org/content/articles/different-types-vaccines
Dhake, K. (2017). A brief summary of Louis Pasteur's germ theory of disease. *BiologyWise; Buzz Ie.* https://biologywise.com/louis-pasteurs-germ-theory-of-disease
Department of Agriculture (USDA), US. (2019). Choose my plate. https://www.choosemyplate.gov/
Department of Health Services (DHS), Wisconsin. (2017, May 31). Childhood Diseases in Wisconsin. DHS Wisconsin resource of childhood diseases
Department of Homeland Security (DHS), US. (2020, May 11). Estimated surface decay of SARS-CoV-2.

https://www.dhs.gov/science-and-technology/sars-calculator#
Dictionary.com. (2020). Definition of defensible. *Dictionary.Com*. https://www.dictionary.com/browse/defensible?s=t
Dictionary.com. (2020). Definition of sensible. *Dictionary.Com.* https://www.dictionary.com/browse/sensible
Dykhuizen D. (2005). Species numbers in bacteria. *Proceedings.* In: *California Academy of Sciences, 56(6 Suppl 1), 62–71*. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3160642/
Encyclopaedia-Britannica, Eds. (2020, May 08). Negligence: Definition, examples, & facts. https://www.britannica.com/topic/negligence
Encyclopaedia-Britannica, Eds. (2017, July 14). Virion: Viral structure. *Encyclopædia Britannica.* https://www.britannica.com/science/virion
Environmental Protection Agency, US. (2019, March 16). Food Irradiation. *EPA, US OAR*. https://www.epa.gov/radtown/food-irradiation
EPA, US. (2019, August 20). Does ultraviolet (UV) radiation UV lamps kill mold? https://www.epa.gov/indoor-air-quality-iaq/does-ultraviolet-uv-radiation-uv-lamps-kill-mold-0
EPA, US. (2020, July 20). Pesticide Registration: Selected EPA-registered disinfectants. https://www.epa.gov/pesticide-registration/selected-epa-registered-disinfectants
EPA, US. (2019, April). Pesticides. OCSPP, OPP. https://www.epa.gov/pesticides
EPA, US. (2013, March 12). The effects: dead zones and harmful algal blooms. https://www.epa.gov/nutrientpollution/effects-dead-zones-and-harmful-algal-blooms#:~:text=Elevated%20nutrient%20levels%20and%20algal
EPA, US. (2019, October). Pesticide worker safety: Restricted use Products (RUP) Report. https://www.epa.gov/pesticide-worker-safety/restricted-use-products-rup-report
Extreme-Science. (n.d.). Oldest living organism. *Extremescience.* http://www.extremescience.com/oldest-living-thing.htm
Falk, N. A. (2019). Surfactants as antimicrobials: A brief overview of microbial interfacial chemistry and surfactant antimicrobial activity. *Journal of Surfactants and Detergents.* https://aocs.onlinelibrary.wiley.com/doi/full/10.1002/jsde.12293
Food and Drug Administration (FDA), US. (2019). Drug safety and availability. https://www.fda.gov/drugs/information-drug-class/qa-consumers-hand-sanitizers-and-covid-19
FDA, US. (2017) US Public Health Service (PHS): US. Food and Drug Code, 2017. https://www.fda.gov/media/110822/download
FDA, US. (2016, May 18). Pet turtles: cute but commonly contaminated with Salmonella. https://www.fda.gov/consumers/consumer-updates/pet-turtles-cute-commonly-contaminated-salmonella
FDA, US. (2020, February 27). Potential risks associated with the use of ozone and ultraviolet light products for cleaning CPAP machines and accessories https://www.fda.gov/medical-devices/safety-communications/potential-risks-associated-use-ozone-and-ultraviolet-uv-light-products-cleaning-cpap-machines-and
FDA, US. (2017, November 30). Safe food handling. Center for Food Safety and Applied Nutrition, U.S. Food and Drug Administration. https://www.fda.gov/food/buy-store-serve-safe-food/safe-food-handling
FDA, US, with National Science Teachers Association (NSTA). (2014). Science and our food supply: Food safety A to Z reference guide. https://www.fda.gov/media/90663/download
Gelderblom, H. (1996). Structure and classification of viruses. In: Baron S., eds. NIH.Gov; University of Texas Medical Branch at Galveston. From*: Medical Microbiology. 4th edition, 2014.* https://www.ncbi.nlm.nih.gov/books/NBK8174/
Geological Survey (USGS), US. (2019). The water in you: water and the human body. https://www.usgs.gov/special-topic/water-science-school/science/water-you-water-and-human-body?qt-science_center_objects=0#qt-science_center_objects
Global Wellness Institute. (2010). The history of wellness. *Globalwellnessinstitute.Org.* https://globalwellnessinstitute.org/industry-research/history-of-wellness/
Greenbauer, L. (2018, March 5). Seatbelts save lives. For: Department of Transportation (DOT), US, National Highway Traffic Safety Administration (NHTSA), US. https://www.nhtsa.gov/seat-belts/seat-belts-save-lives

Griffis, S. (2020, June 05). Finding and evaluating information. The basics, general resources, peer review and primary literature, an introduction: Is it primary? How do I know? *Mildred F. Sawyer Library, Boston Suffolk University.* https://suffolk.libguides.com/c.php?g=654047&p=4589820

Hair, M. & Sharpe, J. (2014, January). Fast facts about the human microbiome. *The Center for Ecogenetics and Environmental Health, University of Washington, 1/2014. NIEHS Grant #P30ES007033.* https://depts.washington.edu/ceeh/downloads/FF_Microbiome.pdf

Haque, M., Sartelli, M., McKimm, J., & Abu Bakar, M. (2018). Health care-associated infections - an overview. Infection and drug resistance, 11, 2321–2333. https://doi.org/10.2147/IDR.S177247 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6245375/

History.com, Ed. (2020). Black Death. *History.com, Original: Sep 17, 2010.* https://www.history.com/topics/middle-ages/black-death

HIV.Gov. (2020, June 05). What Are HIV and AIDS? (Orig. 2018, February 21). https://www.hiv.gov/hiv-basics/overview/about-hiv-and-aids/what-are-hiv-and-aids

Informed Health. (2019, Aug 29) What are microbes? *Cologne, Germany: Institute for Quality and Efficiency in Health Care (IQWiG); 2010, Oct. 6.* https://www.ncbi.nlm.nih.gov/books/NBK279387/

Institute for Preventive Foot Health (IPFH). (2016, March 31). How to practice good foot hygiene. In Thompson, C. & Throneburg J., Eds. *Ipfh.Org. Scientific Advisory Board.* , https://www.ipfh.org/foot-care-essentials/how-to-practice-good-foot-hygiene

Joint Commission (2020). Facts about The Joint Commission. (2020). Jointcommission.Org. https://www.jointcommission.org/about-us/facts-about-the-joint-commission/

Kashtan, M. (2015, May). Does anyone deserve anything? *Psychology Today.* https://www.psychologytoday.com/us/blog/acquired-spontaneity/201305/does-anyone-deserve-anything

Khan Academy. (2018). The Immune System Review. *Khan Academy*. https://www.khanacademy.org/science/high-school-biology/hs-human-body-systems/hs-the-immune-system/a/hs-the-immune-system-review

Khan Academy. (2020.). Adaptive immunity: Immune response. *Khanacademy.org.* https://www.khanacademy.org/science/in-in-class-12-biology-india/xc09ed98f7a9e671b:in-in-human-health-and-disease/xc09ed98f7a9e671b:in-in-types-of-immunity-and-the-immune-system/a/adaptive-immunity

Kim, D., & Kang, D. (2018). UVC LED irradiation effectively inactivates aerosolized viruses, bacteria, and fungi in a chamber-type air disinfection system. *Applied and Environmental Microbiology, 84(17)*. https://aem.asm.org/content/84/17/e00944-18

Knott, L. (2015, October 23). Immunodeficiency: Primary and secondary, From: P*aediatrics, Professional Articles, In: Patient Platform Limited.* 10004395, 934 (v30), LS19 6BA. Cox, J. (Eds).https://patient.info/doctor/immunodeficiency-primary-and-secondary

Kraay, A., Hayashi, M, Hernandez-Ceron, N. *et al.* (2018). Fomite-mediated transmission as a sufficient pathway: A comparative analysis across three viral pathogens. *BMC Infect Dis 18, 540 (2018).* https://doi.org/10.1186/s12879-018-3425-x

Kramer, A. & Assadian, O. (2014). Survival of microorganisms on inanimate surfaces. *In: Borkow G. (ed). Use of biocidal surfaces for reduction of healthcare acquired infections. Springer, Cham.* https://doi.org/10.1007/978-3-319-08057-4_2

Kramer, A., Schwebke, I. & Kampf, G. (2006, Aug 16). How long do nosocomial pathogens persist on inanimate surfaces? A systematic review. *BMC Infect Dis 6, 130*. https://doi.org/10.1186/1471-2334-6-130

Labarge, M. (2016). 10 Tips for maintaining healthy feet. *Happy Feet Plus.* https://www.happyfeet.com/blog/maintain-healthy-feet/

Laboratory-Info, Eds. (2020). Gram staining: principle, procedure, interpretation and animation in bacteriology, *Laboratory Info, Microbiology.* https://laboratoryinfo.com/gram-staining-principle-procedure-interpretation-and-animation/

Larson, E. (1999, November 01). Skin hygiene and infection prevention: More of the same or different approaches? *Clinical Infectious Diseases, 29(5), 1287–1294.* https://doi.org/10.1086/313468

Lichtman, A. (n.d.). How the body reacts to viruses. *HMX | Harvard Medical School*. https://onlinelearning.hms.harvard.edu/hmx/immunity/

Lowe, R, Strazdas, L., Quon, J., & Srikanth, L. (2018, February 16). The importance of contact time and visible wetness to ensure effective disinfection. *Beckers Hospital Review.* https://www.

beckershospitalreview.com/quality/the-importance-of-contact-time-and-visible-wetness-to-ensure-effective-disinfection.html
Lytle, C., & Sagripanti, J. (2005). Predicted inactivation of viruses of relevance to biodefense by solar radiation. *Journal of virology, 79(22), 14244–14252.* https://doi.org/10.1128/JVI.79.22.14244-14252.2005
MacMillan, A. (2018, September 04). A 4-year-old developed sepsis after shopping for shoes without socks. Here's what doctors think. https://www.health.com/condition/skin-conditions/dangers-shoes-without-socks-podiatrist
Markel, H. (2013, September 27). The real story behind penicillin. PBS NewsHour. https://www.pbs.org/newshour/health/the-real-story-behind-the-worlds-first-antibiotic
McAnulty, A. (2015, September 02). How soap can save lives. *Global Citizen.* https://www.globalcitizen.org/en/content/how-soap-can-save-lives/
McDaniel, R. (2010, June 10). Case studies. *Vanderbilt University*. https://cft.vanderbilt.edu/guides-sub-pages/case-studies/
MedicalNewsToday. (2020, May 20). Personal hygiene: Benefits, types, and routine. *Medicalnewstoday.* https://www.medicalnewstoday.com/articles/personal-hygiene#children
MedlinePlus Medical Encyclopedia. (2020, August 25). Immune response. MedlinePlus. A.D.A.M. Medical Encyclopedia. Johns Creek (GA): Ebix, Inc., A.D.A.M.; c1997-2020. https://medlineplus.gov/ency/article/000821.htm#:~:text=The%20inflammatory%20response%20%28inflammation%29%20occurs%20when%20tissues%20are
Mehndiratta, M., Mehndiratta, P., Pande, R. (2014, October 04). Poliomyelitis: Historical facts, epidemiology, and current challenges in eradication. The Neurohospitalist, 4(4), 223–229. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4212416/
Microbiology Society. (2019). About microbiology: bacteria. *Microbiologyonline.* https://microbiologyonline.org/index.php/about-microbiology/introducing-microbes/bacteria
Modi, S., Collins, J., & Relman, D. (2014, October 1). Antibiotics and the gut microbiota*. Journal of Clinical Investigation 2014;124(10):4212–4218.* https://www.jci.org/articles/view/72333
Møller, J., Hyldgaard, C., Kronborg-White, S., Rasmussen, F., & Bendstrup, E. (2017). Hypersensitivity pneumonitis among wind musicians: an overlooked disease? *European Clinical Respiratory Journal, 4(1), 1351268.* https://doi.org/10.1080/20018525.2017.1351268
National Institute of Allergy and Infectious Disease (NIAID), US. (2013, December 30). Overview of the immune system. https://www.niaid.nih.gov/research/immune-system-overview
NIAMS. (2017, March 9). Healthy muscles matter. National Institute of Arthritis and Musculoskeletal and Skin Diseases (NIAMS). https://www.niams.nih.gov/health-topics/kids/healthy-muscles
National Institutes of Health (NIH), US. COVID-19 Treatment Guidelines Panel. (2019). Antiviral therapy: Coronavirus Disease 2019 (COVID-19): COVID-19 treatment guidelines. https://www.covid19treatmentguidelines.nih.gov/antiviral-therapy/
NIH, US. (2016, September 21). What are microbes? https://www.ncbi.nlm.nih.gov/books/NBK279387/
National Pesticide Information Center (NPIC), US. (2010). Antimicrobials Fact Sheet. *Orst.Edu.* http://npic.orst.edu/factsheets/antimicrobials.html
NPIC, US. (2020, March 31). Antimicrobials for pathogens. http://npic.orst.edu/ingred/ptype/amicrob/pathogens.html#covid
National Sleep Foundation (NSF). (2019). How sleep adds muscle. *Health Forward Media Partnership, Sleep.org.* https://www.sleep.org/how-sleep-adds-muscle/
Occupational Safety and Health Administration (OSHA), US. (2012, February). Hazard communication standard: Safety data sheets (SDS). *OSHA Brief, US DOL.* https://www.osha.gov/Publications/OSHA3514.html
OSHA, US, (2020). Safety and health topics: Learning to recognize hazards https://www.osha.gov/SLTC/covid-19/hazardrecognition.html
OSHA, US. (2013, Nov 08). A brief guide to mold in the workplace. *Safety and Health Information Bulletins.* https://www.osha.gov/dts/shib/shib101003.html
Patterson, K. (2015, October 12). 6 Ways to (tactfully) bring up personal hygiene issues. *Psychology Today.* https://www.psychologytoday.com/us/blog/crucial-conversations/201510/6-ways-tactfully-bring-personal-hygiene-issues

Picard, C., Am, & Garrity, a. (2020, March 19). 50 of the best cleaning tips to make your house look brand-new. Good Housekeeping. https://www.goodhousekeeping.com/home/cleaning/g2550/best-cleaning-tips/

Puiu, T. (2015, March 04). The smallest lifeform imaged:150,000 cells could fit onto the tip of a human hair. Biology News, ZME Science. https://www.zmescience.com/science/biology/smallest-bacteria-ever-found0-0432423/

President's Council on Sports, Fitness & Nutrition (PCSFN), US. (2019, July 19). Fitness: Be active. *HHS. gov. 1-26-17.* https://www.hhs.gov/fitness/be-active/index.html

Purcell, A. (2019). Bacteria. *Basicbiology.net. From: Basic Biology, Inspired by Life.* https://basicbiology.net/micro/microorganisms/bacteria

Racaniello, V. (2020). Principles of Virology. ASM Press, Colombia University Lecture. https://virology2020.s3.amazonaws.com/004_4310_20.pdf

Racaniello, V. (2017, February). Viral RNA is not infectious virus! https://www.virology.ws/2017/02/17/viral-rna-is-not-infectious-virus/

Racaniello, V. (2004). Virology 101 https://www.virology.ws/virology-101/

Ramel, G. (2019). Bacteria: Shapes & sizes of these unseen miracles of life. *Earthlife.net.* https://www.earthlife.net/prokaryotes/technology.html

Ritchie, D. (2015, October 15). Do socks harbor fungal pathogens? *Podiatry Today.* https://www.podiatrytoday.com/blogged/do-socks-harbor-fungal-pathogens#:~:text=%20Do%20Socks%20Harbor%20Fungal%20Pathogens%3F%20%201

Roossinck, M. (2011). The good viruses: Viral mutualistic symbioses. Nature Reviews Microbiology, 9(2), 99–108. https://doi.org/10.1038/nrmicro2491

Rutala, W., Weber, D., and the Healthcare Infection Control Practices Advisory Committee (HICPAC). (2019, May). *Guideline for Disinfection and Sterilization in Healthcare [PDF]*. 2008. https://www.cdc.gov/infectioncontrol/pdf/guidelines/disinfection-guidelines

Rutala, W. (2015, October.). Overview of current disinfection hierarchy models. https://www.epa.gov/sites/production/files/2015-10/documents/rutala_overview_of_current_disinfection_hierarchy_models_final.pdf

Salinas, T. (2019, January 25). Your teeth and your heart: What's the connection? *Mayo Clinic FAQ*. https://www.mayoclinic.org/healthy-lifestyle/adult-health/expert-answers/heart-disease-prevention/faq-20057986

Schmitz, A. (2012). Legal aspects of marketing and sales. *Saylor Academy*. https://saylordotorg.github.io/text_legal-aspects-of-marketing-and-sales/s13-02-misrepresentation.html

Shreiner, A., Kao, J., & Young, V. (2015). The gut microbiome in health and in disease. *Current opinion in gastroenterology, 31(1), 69–75.* https://doi.org/10.1097/MOG.0000000000000139

Spacey, J. (2016, January 15). What is Do No Harm? *Simplicable.* https://simplicable.com/new/do-no-harm

Stephens, B., Azimi, P., Thoemmes, M. S., Heidarinejad, M., Allen, J. G., & Gilbert, J. A. (2019). Microbial exchange via fomites and implications for human health. *Current Pollution Reports, 5(4), 198–213.* https://link.springer.com/article/10.1007/s40726-019-00123-6

Stott, R., (2003) Handbook of water and wastewater microbiology. *ScienceDirect Topics: Parasite - an overview. (2012).* https://www.sciencedirect.com/topics/earth-and-planetary-sciences/parasite

Study.com. (2019). Risk response planning: Strategies & tools. https://study.com/academy/lesson/risk-response-planning-strategies-tools.html

Texas Department of State Health Services. (2013, March). Communicable disease chart and notes for schools and child-care centers. https://www.dshs.texas.gov/immunize/docs/6-30.doc

Tseng CC, Li CS. (2007). Inactivation of viruses on surfaces by ultraviolet germicidal irradiation. *J of Occ Env Hyg. 2007;4(6):400-405.* https://pubmed.ncbi.nlm.nih.gov/17474029/

Ullman, A. (2017, July 14). Vaccine development. In: *Encyclopædia Britannica.* https://www.britannica.com/biography/Louis-Pasteur/Vaccine-development

USChemical, Eds. (2016). The science of handwashing. http://www.uschemical.com/wp-content/uploads/2016/04/L000253_SCIENCE_OF_HANDWASHING.pdf

Vidyasagar, A. (2016, June 04). What are algae? *Live Science.* https://www.livescience.com/54979-what-are-algae.html

Voss, S. (2004). Microbes of Many Talents. *National Museum of Natural History: Smithsonian*

Environmental Research Center. https://forces.si.edu/soils/02_04_04.html
Yaeger, R. (1996). Protozoa: structure, classification, growth, and development. *Medical Microbiology. 4th edition*. https://www.ncbi.nlm.nih.gov/books/NBK8325/
Washington State Department of Labor and Industries. (2007, January). Employee Bloodborne Pathogen Exposure Control Plan (ECP). https://www.everettcc.edu/files/students/ early-learning-center/ bloodborne-pathogen-policy.pdf
World Health Organization (WHO). (2009, July). Guidelines on hand hygiene in health care: a summary. *Patient Safety: A World Alliance for Safer Healthcare*. WHO/IER/PSP/2009.07. https://apps.who.int/iris/bitstream/handle/10665/70126/WHO_IER_PSP_2009.07_eng.pdf;jsessionid=3FF746B26E4B62A1F70687BCF4E6F359?sequence=1
WHO. (2017, December 19). Human rights and health. https://www.who.int/news-room/fact-sheets/detail/human-rights-and-health#:~:text=The%20right%20to%20health%20is%20one%20of%20a
WHO. (2004). Laboratory Biosafety Manual 3rd edition. https://www.who.int/csr/resources/publications/biosafety/en/Biosafety7.pdf
WHO. (2018, May 24). The top 10 causes of death. Who.Int; World Health Organization: WHO. https://www.who.int/news-room/fact-sheets/detail/the-top-10-causes-of-death
Wolf, A. & Underhill, D. (2018). Peptidoglycan recognition by the innate immune system. Nature reviews. Immunology, 18(4), 243–254. https://pubmed.ncbi.nlm.nih.gov/29292393/

13

The ICI Team

These are the people who put ICI together. We hope you found it both helpful and hopeful.

Now, go wash your hands. Hand hygiene is the very best way to keep the germs on surfaces out of your face and mouth.

ShelB Rindahl, *Author, Creator of ICI*

ShelB served as a Clinical Laboratory Scientist (MT, ASCP) in clinics and trauma level hospitals for over 25 years, and also holds a Bachelor of Science in Healthcare Management, from SIU, Carbondale. She was a Hospital Corpsman in the US Navy, where she received commendation for leadership in education and training, and was honored as Junior Sailor of the Year at Naval Medical Clinic, Annapolis. She attended Badger State Repair School and studied String Instrument Repair through the National Association of Band Instrument Repair Technicians (NAPBIRT). She attended bow rehair and repair training at Learning Trade Secrets, with Mohr & Mohr. She is the Curator of Instruments at UW-Parkside, where she studies music (violin) and has been accepted to the MBA program. Her small business offers private bow rehair and repair, and she accepts referrals and seasonal overflow of band and orchestral instrument repairs from local shops. ShelB believes all things and all people are connected and that all of our efforts do make a difference, even when we can't see it right away. She endeavors to make hers a good one.

In ICI, ShelB was the instigator and the writer. The strong community response to the emerging respiratory virus, COVID-19, brought the idea of germs on instruments into the light. Teachers, directors, parents, professional repairers, and music store owners shared concern about what they might do, but most of them had no infection control experience or training to support the conversation. ShelB started posting an informal daily training mini-series about germs, infectious risks, and personal and professional hygiene on the social media page of the National Association of Professional Band Instrument Repair Technicians (NAPBIRT). The goal was to empower others to use sensible and defensible decisions in support of sanitary hygiene, in under 5 minutes a day, for less than 40 days..

The 40-days rule came from the historical quarantine length, and her best guess at how long a shutdown, might be. It was also an inside joke with friends that even God didn't rain on people longer than 40 of anything, so the training should take less than that. After a real interest was made clear, ShelB re-wrote everything to be more inclusive and traceable, with live-linked resources. When repair schools expressed interest in ICI as training material, she added the Test Your Knowledge and Apply Your Knowledge sections to support academic use. With help from Christina and Laurel, she made them welcoming for players, teachers, and others to use as tools for personal study. ShelB wrote all ICI sections except Laurel's improved introduction to Viruses, and the Test and Apply Your Knowledge Answer Guide. (She admits this is all her fault, but asks readers not to throw anything, at least until they've washed their hands). ShelB also presented in the webinars that introduced the series.

Laurel Partin, *Contributing Editor, Co-author and Video Presenter of the Introduction to Viruses*

Laurel is a member of NAPBIRT, with a certificate in Band Instrument Repair Technology from Renton Technical College (RTC). She has been a clinician for NAPBIRT at international, national, and regional events. She has also been a guest clinician at RTC, Western Iowa Technical School, and at the Yamaha Shokunin training. Laurel is the shop manager for a high production shop and a repairer of professional-grade woodwinds at Tim's Music in Sacramento, CA. Laurel is also

a science educator and curriculum innovator. She designed multiple courses accredited by the University of California system as lab science credits and has taught science since 1995 in universities, colleges, and top independent schools. Prior to teaching, Laurel was a viral biochemist and electron microscopist, earning her MS in Chemistry and Biochemistry. Her thesis was based on her research on Sin Nombre Virus (a new world Hantavirus) after its outbreak in the Four Corners region in the Southwest US. She developed the assay for Nucleocapsid (N) protein RNA binding activity and showed the tetramerization of expressed N proteins via electron microscopy. Laurel plays saxophone, flute, clarinet, vox, and french horn in both professional and community groups. A lifelong musician and learner, she is currently studying bassoon. This project is an expression of her deep care for technicians, shop owners, clients, and musicians.

In ICI, Laurel was the early organizer and the educator. She has long desired more field-driven opportunities to influence sanitary practices for players and handlers. She saw the early ICI posts and jumped right in. Her interaction synergized the response on social media. Activity in the comments increased and caught the attention of Eastman Music Company. When they proposed the webinar series to introduce the ICI project, Laurel persuaded ShelB that it could, and should, be presented, even though the final product was incomplete. Laurel also helped repackage the early modules so the webinars would contain what people needed most to be empowered to find the reliable information they needed to move forward on their own.

Laurel was the primary organizer in the first half of the content build. The original series of posts on social media were abbreviated and modular. Laurel's experience in curriculum design were vital in presenting complex and interwoven ideas in more connected series. She also helped streamline the answer guide for instrument repair school instructors. Laurel is ICI's ranking biochemist, with extensive experience working directly in the field virology. Naturally, she prepared and presented the introduction to viruses for the webinar, and she expanded the content to calm the nerves of those worried about the climate of alarm at the time. She also re-wrote the chapter on viruses, bringing its quality and approachability to a new level. Laurel's signature on the ICI project was her tremendous passion for encouragement. She was adamant that ICI should offer more answers than fear-factors, and more hope than work.

Christina Colston, *Proofer, Designer of PDF Version*

Christina is an instrument repair technician, teacher, and flutist, with a Bachelor of Arts degree in Music Education from Southwestern Oklahoma State University. She also has six certifications from the Colorado Institute of Musical Instrument Technologies (CIOMIT), in brass and woodwind repair. She is a newer member of NAPBIRT. Christina is a certified installer and service provider for Straubinger Flute pads. She has studied under respected repair technicians, Weldon Collier, Daniel Parker, and others. She has focused on woodwind repairs since 2011 at multiple locations. She served as the head woodwind tech at Midwest Music, and as the general manager and head woodwind tech at CIOMIT. Since 2018, she has been the owner and operator of The Tuneful Tech, in Oklahoma City, OK, where she provides repair services and education to the musicians in OKC and the surrounding areas. She works on all levels of woodwinds, from beginner to professional.

Christina is a helper and teacher at heart. She found ICI while looking for direction in writing her own policy guidelines. She said, "*It was ShelB's commitment to teaching about IC without writing individual policies that caught my attention.*" Christina joined the ICI project with the hope of encouraging and empowering others to pursue self-governed IC standards, rather than relying only on the opinions, policies, or to-do-lists of others, and to do so with confidence in sensible and defensible methods.

In ICI, Christina was the proofer and the finisher. She reached out to the group just as the webinars went live. She said she wasn't sure how she could help, but wanted to be part of it. As our primary proofreader, she read the whole series, in various forms, more than anyone else. She was a savage editor and champion of consistency. She was the champion of late-night pep talks, the mover of margins, and the defender against annoying distractions in the writings. For example, she forced rewrites to remove over 400 unnecessary instances of "*that*," and "*so that*."

Christina was the primary organizer during the second half of the project. She helped clarify all of the headings, and structured the table of contents for better reader navigation, and figured out where figures and resources might go. She styled all figures, tables, and forms, and helped fit the content in intuitive visual spacing. When Christina designed the visual style for the benchtop PDF version,

her creative process adjusted and solidified the linear format, allowing Eastman's graphics team to begin their work of making ICI available to the public online. It also made it possible to share the preview with NAPBIRT members, granting them months of early access to pre-released content and the opportunity to comment or request additional content.

Her training as an educator supported the design of the Test Your Knowledge and Apply Your Knowledge sections. Most notably, she created the forms in such a way that readers can use them to write their own best Sanitary Cleaning Procedure and their own best Instrument Care Guide. In this way, what first inspired her to join the effort, empowering the individual, became her final gift in the product design.