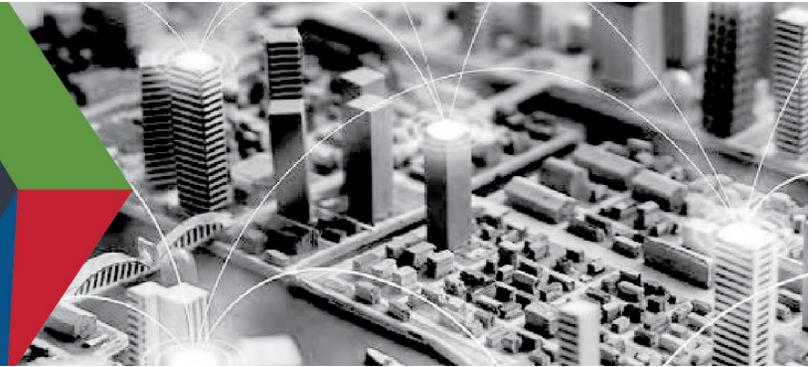




DEFEND TODAY, SECURE TOMORROW



DISINFECTANT PRODUCT ALTERNATIVES

This fact sheet provides information that disinfectant users can review and reference to compare types of disinfectants and make informed decisions about potential disinfectant alternatives.

Quaternary ammonium (quats)-based disinfectant products are predominant within industrial, commercial, and consumer products used for disinfection. However, under COVID-19, demand for disinfectants has increased, but the raw material needed to produce some quats – ethylbenzyl chloride or EBC – is only manufactured outside the US, and the present manufacturing capacity is at its maximum, thus, quats are in short supply. As a mitigation to quats supply concerns, alternatives may be found for those applications that can make use of substitutes for EBC-based quats products.

BASIC CONSIDERATIONS

When choosing a disinfectant consider the following:

- The microorganisms present
- The item to be disinfected or surface(s)
- Corrosivity or hazards associated with the chemicals in the disinfectant
- Ease of use

BASIC DEFINITIONS AND SPECIFICATIONS



- To disinfect means to destroy or irreversibly inactivate specified infectious fungi and bacteria, but not necessarily the spores, on hard surfaces.
- To sanitize means to reduce microorganisms of public health importance to levels considered safe, based on established parameters, without adversely affecting either the quality of the product or its safety.
- While disinfection measures may be employed in food processing and preparation, it is much more common to utilize sanitization methods to reduce microbial presence.
- Sanitary practices in food manufacturing facilities target the elimination of pathogens and reduction of contaminating microbiota that gain access to the processing environment, often from the raw material and food ingredients, but also from workers, drains, and ventilation ducts.
- The efficacy of a chemical used for sanitizing or disinfection rests upon its ability to reduce the contamination level. The sanitization standard for contamination reduction of food contact surfaces is generally accepted as 99.999% (a 5-log reduction) achieved in 30 seconds.

WARNING

**UNDILUTED DISINFECTANTS
MUST NOT GO DOWN THE DRAIN**

**THEY ARE HARMFUL TO THE ENVIRONMENT
AND CORROSIVE ON PIPES**

BACKGROUND



Many industries have moved to the use of quaternary ammonium (quats) compound-based disinfectant products because of the advantages they present.

- They are potent disinfectant chemicals commonly found in disinfectant wipes, sprays, and other household cleaners that are designed to kill germs. Quats are often what allow a product to claim to be antibacterial, as they are certified by the EPA as pesticides.
- Quaternary ammonium salts are used as disinfectants, surfactants, fabric softeners, and as antistatic agents (e.g. in shampoos). In liquid fabric softeners, the chloride salts are often used. In dryer anti-cling strips, the sulfate salts are often used. Quats can be found in shampoos, toilet cleaners, hand soap, shaving cream, baby wipes, body wash, sunscreens, moisturizers, disinfectant sprays, liquid fabric softeners, anti-cling dryer sheets, disinfectants, and spermicidal jellies.
- Unlike bleach, they do not damage clothing and carpets. They are also non-corrosive to metal pipes and other surfaces, another advantage over bleach.
- They are considered low-level disinfectants, as defined by the US Centers for Disease Control and Prevention. They are effective against most vegetable bacteria and enveloped viruses, and some fungi. The conditions necessary to attain disinfection with quats depend on concentration and contact time.

The table below provides some alternatives disinfectant products for consideration by users that can make changes to their disinfectant standard operating procedures.

TABLE OF DISINFECTANT ALTERNATIVES (INCLUDES QUATS FOR COMPARISON)

PRODUCT	RECOMMENDED USE	HOW IT WORKS	ADVANTAGES	DISADVANTAGES	COMMENTS AND HAZARDS
 70% Isopropyl Alcohol Solution	<ul style="list-style-type: none"> ▪ Cleaning some instruments ▪ Cleaning skin 	<ul style="list-style-type: none"> ▪ Changes protein structure of microorganism ▪ Presence of water assists with killing action 	<ul style="list-style-type: none"> ▪ Fairly inexpensive 	<ul style="list-style-type: none"> ▪ 50% Solution not very effective -Not active when organic matter present ▪ Not active against certain types of viruses ▪ Evaporates quickly ▪ Contact time not sufficient for killing ▪ Aqueous alcohol solutions are not appropriate for surface decontamination because of the evaporative nature of the solution; a contact time of ten minutes or more is necessary and not achievable using a 70% (v/v) aqueous solution of ethanol. 	<ul style="list-style-type: none"> ▪ Flammable ▪ Eye Irritant ▪ Toxic

PRODUCT	RECOMMENDED USE	HOW IT WORKS	ADVANTAGES	DISADVANTAGES	COMMENTS AND HAZARDS
 <p>Hydrogen Peroxide (3%)</p>	<ul style="list-style-type: none"> ▪ Human hygiene ▪ Cleaning skin ▪ Mouthwash 	<ul style="list-style-type: none"> ▪ Peroxides are oxidizing agents, which means they work by pulling electrons from other molecules in the cells. 	<ul style="list-style-type: none"> ▪ Fairly inexpensive ▪ Safe for the environment ▪ Active against a wide range of microorganisms, including bacteria, yeasts, fungi, viruses, and spores 	<ul style="list-style-type: none"> ▪ It can be unstable. ▪ If it comes into contact with other molecules like organics and soil that haven't been cleaned before the disinfectant was sprayed, then effectiveness will degrade. 	<ul style="list-style-type: none"> ▪ Processes that include thorough cleaning before the disinfectant application will need to be a high priority when using hydrogen peroxide disinfectants.
 <p>Chlorine Compounds</p>	<ul style="list-style-type: none"> ▪ Spills of human body fluids ▪ Bactericidal – Good ▪ Fungicidal – Good ▪ Sporicidal – Good at >1000ppm Sodium Hypochlorite 	<ul style="list-style-type: none"> ▪ Free available chlorine combines with contents within microorganism reaction byproducts cause its death ▪ Need 500 to 5000 ppm ▪ Produce chemical combination with cell substances ▪ Depends upon release of hypochlorous acid ▪ Recommended contact time: 10 minutes ▪ Recommended Working Dilution: 500 ppm (1:10 dilution of household bleach, 5% hypochlorite ion) 	<ul style="list-style-type: none"> ▪ Kills hardy viruses (e.g. hepatitis) ▪ Kills a wide range of organisms ▪ Inexpensive ▪ Penetrates well ▪ Relatively quick microbial kill ▪ May be used on food prep surfaces 	<ul style="list-style-type: none"> ▪ Corrodes metals such as stainless aluminum ▪ Organics may reduce activity ▪ Increase in alkalinity decreases bactericidal property ▪ Unpleasant taste and odor ▪ Tuberculocidal with extended contact time 	<ul style="list-style-type: none"> ▪ Follow spill procedure and dilution instruction ▪ Make fresh solutions before use ▪ Eye skin and respiratory irritant ▪ Corrosive ▪ Toxic
 <p>Glutaraldehyde</p>	<ul style="list-style-type: none"> ▪ Bactericidal – Good ▪ Fungicidal – Good ▪ Tuberculocidal – Excellent ▪ Virucidal – Good ▪ Sporicidal – Good 	<ul style="list-style-type: none"> ▪ Coagulates cellular proteins 	<ul style="list-style-type: none"> ▪ Non-staining relatively noncorrosive ▪ Useable as a sterilant on plastics, rubber, lenses, stainless steel and other items that can't be autoclaved 	<ul style="list-style-type: none"> ▪ Not stable in solution ▪ Has to be in alkaline solution ▪ Inactivated by organic material 	<ul style="list-style-type: none"> ▪ Eye, skin, and respiratory irritant ▪ Sensitizer ▪ Toxic

PRODUCT	RECOMMENDED USE	HOW IT WORKS	ADVANTAGES	DISADVANTAGES	COMMENTS AND HAZARDS
 <p>Iodophors (Iodine with carrier)</p>	<ul style="list-style-type: none"> ▪ Disinfecting some semi critical medical equipment ▪ Bactericidal – Very Good ▪ Fungicidal – Excellent ▪ Virucidal – Excellent 	<ul style="list-style-type: none"> ▪ Free iodine enters microorganism and binds with cellular components ▪ Carrier helps penetrate soil/fat ▪ Need 30 to 50 ppm ▪ Probably by disorder of protein synthesis due to hindrance and/or blocking of hydrogen bonding 	<ul style="list-style-type: none"> ▪ Kills broad range of organisms ▪ Highly reactive ▪ Low tissue toxicity ▪ Kills immediately rather than by prolonged period of stasis ▪ Not affected by hard water ▪ May be used on food prep surfaces 	<ul style="list-style-type: none"> ▪ May stain plastics or corrode metal ▪ May stain skin/laundry ▪ Stains most materials ▪ Odor ▪ Some organic and inorganic substances neutralize effect ▪ Tuberculocidal with extended contact time ▪ Sporocidal, some 	<ul style="list-style-type: none"> ▪ Dilution critical ▪ Follow directions! ▪ Use only EPA registered hard surface iodophor disinfectants ▪ Don't confuse skin antiseptic iodophors for disinfectants ▪ Skin and eye irritant ▪ Corrosive ▪ Toxic
 <p>Phenolic Compounds</p>	<ul style="list-style-type: none"> ▪ Bactericidal – Excellent ▪ Fungicidal – Excellent ▪ Tuberculodial – Excellent ▪ Virucidal – Excellent 	<ul style="list-style-type: none"> ▪ Gross protoplasmic poison ▪ Disrupts cell walls ▪ Precipitates cell proteins ▪ Low concentrations inactivate essential enzyme systems 	<ul style="list-style-type: none"> ▪ Nonspecific concerning bactericidal and fungicidal action ▪ When boiling water would cause rusting the presence of phenolic substances produces an anti-rusting effect 	<ul style="list-style-type: none"> ▪ Unpleasant odor ▪ Some areas have disposal restrictions ▪ Effectiveness reduced by alkaline pH, natural soap or organic material ▪ Sporocidal, no 	<ul style="list-style-type: none"> ▪ Skin and eye irritant ▪ Sensitizer ▪ Corrosive ▪ Toxic
 <p>Quaternary Ammonium Compounds (QUATS)</p>	<ul style="list-style-type: none"> ▪ Ordinary housekeeping (e.g. floors, furniture, walls) ▪ Bactericidal – Excellent ▪ Fungicidal - Good ▪ Virucidal – Good (not as effective as phenols) 	<ul style="list-style-type: none"> ▪ Affects proteins and cell membrane of microorganism ▪ Releases nitrogen and phosphorous from cells 	<ul style="list-style-type: none"> ▪ Contains a detergent to help loosen soil ▪ Rapid action ▪ Colorless, odorless ▪ Non-toxic, less corrosive ▪ Highly stable ▪ May be used on food prep surfaces 	<ul style="list-style-type: none"> ▪ Does not eliminate spores, TB bacteria, some viruses ▪ Effectiveness influenced by hard water ▪ Layer of soap interferes with action 	<ul style="list-style-type: none"> ▪ Select from EPA list of hospital disinfectants ▪ Skin and eye irritant

DECISION OUTCOMES

Any disinfecting solution you choose to bring into your infection prevention program will be an important aspect of a much larger strategy that must include planning, training, and fully understanding the processes needed to allow that disinfectant to prevent the spread of infection. Your strategy might also need to account for high-density workspace, current trends in virus or bacteria outbreaks (e.g., pandemic). For more information, please see joint guidance from the Center for Disease Control (CDC) and the Environmental Protection Agency (EPA) regarding frequency of disinfection, worker distancing protocols, availability to clean areas and work surfaces during work and non-work hours, and other social and environmental concerns.

Always follow the directions for use on the packaging of the disinfectant you chose to utilize.

REFERENCES AND OTHER INFORMATION

<https://ehs.stanford.edu/reference/comparing-different-disinfectants>

<https://www.cmmonline.com/articles/disinfectant-pros-and-cons-hydrogen-peroxide-vs-quats>

<https://www.ursourceinc.com/faq/bleachquat.html>

<https://www.cleanlink.com/hs/article/Alternatives-To-Disinfecting-With-Quats--23440>

Bucket Fact Sheet:

<http://dph.nv.gov/uploadedFiles/dph.nv.gov/content/Reg/Regulatory/Docs/SanitizerBucketSetUp.pdf>

Sanitize Safely and Effectively: Bleach and Alternatives in Child Care Programs:

https://cchp.ucsf.edu/sites/g/files/tkssra181/f/SanitizeSafely_En0909.pdf

Bleach Incompatibility Chart (to prevent accidental mixing)

- <https://www.chlorineinstitute.org/stewardship/sodium-hypochlorite/>

The American Cleaning Institute:

- COVID-Specific: <https://www.cleaninginstitute.org/coronavirus-cleaning-information>
- Surface Cleaning more generally: <https://www.cleaninginstitute.org/cleaning-tips/clean-surfaces>

Here are links to finding safer institutional cleaning products:

U.S. EPA Safer Choice: <https://www.epa.gov/saferchoice/products>

U.S. EPA List of Disinfectants for use against COVID-19: <https://www.epa.gov/pesticide-registration/list-n-disinfectants-use-against-sars-cov-2-covid-19>

U.S. EPA and CDC Reopening Guidance for Cleaning and Disinfecting Public Spaces, Workplaces, Businesses, Schools, and Homes: <https://www.cdc.gov/coronavirus/2019-ncov/community/reopen-guidance.html>

City of San Francisco Approved: <https://www.sfapproved.org/cleaners> and <https://www.sfapproved.org/disinfectants>

SF Environment: Safer Products and Practices for Disinfecting Surfaces:

<https://sfenvironment.org/download/safer-products-and-practices-for-disinfecting-surfaces>