Impacts of Chemical Substitution on Employee Health and Organization

The Issue: The Devil You Know or the Devil You Don't Know

For the past 40 years, glutaraldehyde has been the chemical of choice for high-level disinfection. It is very effective, easy to use, and does not damage equipment. The problem, however, is that glutaraldehyde can negatively impact the health of workers who come into contact with it. Healthcare workers who use glutaraldehyde can experience a number of health problems, including dermatitis, skin irritation, respiratory symptoms, and even occupational asthma.

What are High-level Disinfectants?

Health Canada defines these as, **"**disinfectants that kill all microbial pathogens, except large numbers of bacterial spores."

High-level disinfectants destroy vegetative bacteria, mycobacteria, viruses, and fungi. High-level disinfection is the maximum level of disinfection possible next to sterilization. They are used to clean multi-use medical instruments that cannot be sterilized because they are not stable to heat.

Until recently, there was no viable alternative to glutaraldehyde. Since 1999, two new alternatives have become available that are advertised as safer substitutes for glutaraldehyde. One of these alternatives is a solution of 0.55% ortho-phthalaldehyde (OPA), which is manufactured by Advanced Sterilization Products (a division of Johnson & Johnson Medical) and sold under the name Cidex OPA (R). The other product is a mixture of 7.35% hydrogen peroxide and 0.23% peracetic acid, available in a product called Compliance TM, manufactured by Metrex. Unfortunately, there is little evidence to support (or deny) claims that these products are safer than glutaraldehyde.

The table below outlines the common side-effects of glutaraldehyde and its alternatives.

Glutaraldehyde	OPA	Peracetic Acid	Hydrogen Peroxide
skin & eye irritation	skin & eye irritation/corrosive	skin & eye irritation/corrosive	skin & eye irritation
allergic contact dermatitis	possible allergic contact dermatitis (raw material can cause allergic reactions)	respiratory irritation	mild respiratory irritation
respiratory irritation	respiratory irritation		
respiratory sensitization / occupational asthma	possible respiratory sensitization / occupational asthma (never been studied, but several cases of asthma associated with OPA have been reported in US)		

Dealing with Uncertainty
When faced with a choice between several chemical disinfectants, all of which may be harmful to the health of employees, a decision can be extremely difficult. When the health hazards are largely unknown, the decision is even more difficult. This is the current situation with high-level disinfectants. The choice has only been between glutaraldehyde—a chemical known to have very serious heath effects—and two other products that may be safer or may be even more dangerous. As the health hazards of OPA and peracetic acid/hydrogen peroxide become better understood, this decision may become easier. It is likely, however, that other new disinfectants and chemical products will be introduced, and these may also come with unknown hazards. A way to make better decisions in the face of uncertainty will be essential to protecting employee health in the future.

Why was there a Study?
This study, funded by the Community Alliance for Health Research (CAHR) and conducted by researchers at the University of British Columbia (UBC), was initiated because healthcare workers were unsure which products would best protect their health.

The objectives of the study were:

- Predict the relative health effects of currently available chemicals used for high-level disinfection: glutaraldehyde, OPA, peracetic acid, and hydrogen peroxide.
- Examine how high-level disinfectants are used in BC hospitals and how decisions are made related to these products.
- Develop recommendations for minimizing employee health risks associated with the use of high-level disinfectants.

This study was also intended to provide information to develop an in-depth study into exposures and health effects associated with the use of glutaraldehyde alternatives.

What are the Recommendations?
Based on the information that is available, it appears that OPA may have similar hazards as glutaraldehyde. However, the OPA product currently available (Cidex OPAÂ®) is more dilute than glutaraldehyde and it seems to be less likely to vapourize. This may offer some protection by lowering exposure levels. However, contact through the skin or during spills could lead to high exposure levels that might cause very serious health problems, possibly even asthma. Fortunately, OPA has a strong staining effect on the skin, which may encourage people to take extra care when using this chemical.

Peracetic acid and hydrogen peroxide, which are used together in a single product, could seriously irritate the skin and damage the eyes upon contact. It can also irritate the respiratory system. Fortunately, there is no evidence to suggest that it might cause allergic reactions or asthma. For this reason, we suggest that peracetic acid/hydrogen peroxide solutions might be the safest choice.

It is important to remember that all of these chemicals can be quite dangerous and must be treated with the utmost care. OPA is probably a sensitizer and should be treated as one until more is known. Peracetic acid and hydrogen peroxide may be the safest choice right now, but they are certainly not harmless. No matter what high-level disinfectant you choose, you should

use it in areas with local exhaust ventilation and you should wear protective clothing, such as impermeable gloves that cover the forearm and protective gowns to prevent dermal exposure.

It is important to remember other considerations when choosing high-level disinfectants. This study only looked at one issue: employee health with a specific focus on skin and respiratory symptoms. Other potential health issues have not yet been considered. There are also many other important factors, not least of which is the ability to prevent spread of infection between patients by effectively disinfecting instruments. Other considerations that are less serious but are nonetheless important in the healthcare industry include cost, ease of use, and the effect of the chemical on the equipment to be cleaned.

What's next?

Researchers at the University of British Columbia are considering an epidemiological study to look at the effect of glutaraldehyde alternatives on employee health. Researchers hope to hold discussion groups with healthcare workers involved in high-level disinfection to uncover some of the important issues and their concerns. They plan to develop a method to measure exposure to some of the new chemicals and subsequently use it to find out if people could be exposed and, if so, to measure actual exposure levels for people using these products. Researchers also plan to measure symptoms and other health effects (such as lung function) among people who use alternative high-level disinfectants.

Guidelines: What can I Do?

Here are some suggestions to take away as much of the guesswork as possible, and hopefully help you to make easier, better decisions about chemical choice.

Work together

Coordinate activities between hospitals, particularly if you are a smaller centre. Designate a person or small group who will be responsible for gathering as much information as possible and distributing it to the group. Try to involve people with specific occupational health training in your group.

Educate

Once you decide who is responsible for making decisions in your hospital or health region, make sure the entire group is educated about the issues and risks associated with high-level disinfectants (or whatever type of chemical you are working with). Everyone involved in the decision process should be knowledgeable about potential health hazards, other considerations such as efficacy, and how to deal with the inevitable 'unknowns'.

Go straight to the source

Dealing with manufacturers may be easier if you work in groups at the regional or provincial level. Ask manufacturers of new products to provide scientific evidence to support their health claims. Ask them to provide a method for measuring exposure to their product and to estimate what exposures might be during normal use of the product. You could even ask them to suggest safe exposure limits if the WCB hasnâ€™t set any. Requests such as these could be conditions for purchase of a new product.

Go elsewhere
Check to see if a 'new' chemical has been used in other industries or for other purposes. Perhaps it has been used in other countries for some time. If a chemical that is new to you has been used elsewhere, there may be health information available from these sources..

Talk to people
Use contacts through occupational health professional societies to link with people who may have already done the research you are looking for. There are a number of good occupational health discussion groups on the Web. Two of these include Duke University's Occupational and Environmental Medicine group (Occ-Env-Med-L - http://occ-env-med.mc.duke.edu/oem/occ-env-.htm) and the American Industrial Hygiene Association's Global Occupational Hygiene Group (globalocchyg-list - http://groups.yahoo.com/group/globalocchyg-list).

Protect yourself
Personal protective equipment such as impermeable gloves and gowns can help prevent skin contact with potentially allergy-causing chemicals. Respirators or masks can minimize or prevent breathing in chemicals that might cause or worsen respiratory conditions.

Protect your environment
Make sure that areas in which chemicals are being used are well ventilated. Place hoods or ventilation ducts as close to the source of the chemical as possible. Keep products covered and sealed as much as possible, and try to use automated washers instead of soaker boats for high-level disinfection.

Use the Precautionary Principle
When health hazards are uncertain, assume the worst. Treat unknown chemicals as if they were very hazardous until you have evidence to show they are not. For example, there are strict ventilation requirements in place for glutaraldehyde use in BC; you may wish to use these guidelines for alternative products as well until you know them to be overcautious.

Useful Links
UBC School of Occupational and Environmental Hygiene
http://www.soeh.ubc.ca

WorkSafeBC
http://www.worksafebc.com

Health Canada
http://www.hc-sc.gc.ca

Therapeutic Products Directorate (Health Canada agency that regulates high-level disinfectants)
http://www.hc-sc.gc.ca/hpfb-dgpsa/tpd-dpt

US Food and Drug Administration (FDA)
http://www.fda.gov

Center for Devices and Radiological Health (FDA agency that regulates high-level disinfectants)
http://www.fda.gov/cdrh/rad-health.html

PubMed (US National Library of Medicine database for medical literature -- free!)
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi

Occ-Env-Med-L Internet Mail List (discussion forum for occupational and environmental medicine)
http://occ-env-med.mc.duke.edu/oem/occ-env-.htm

Global Occupational Hygiene Group (discussion forum from the American Industrial Hygiene Association)
http://groups.yahoo.com/group/globalocchyg-list

Glutaraldehyde, Aldehyde, and Solvent Sensitivity Listserver (gasslist-L)
http://www.ncchem.com/snftaas/gasslist.htm

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ABOUT THIS DOCUMENT

The Occupational Health and Safety Agency for Healthcare (OHSAH), which operated from 1998-2010, was a precursor to SWITCH BC. Conceived through the Public Sector Accord on Occupational Health and Safety as a response to high rates of workplace injury, illness, and time loss in the health sector, OHSAH was built on the values of bipartite collaboration, evidence-based decision making, and integrated approaches.

This archival research material was created by OHSAH, shared here as archival reference materials, to support ongoing research and development of best practices, and as a thanks to the organization's members who completed the work.

If you have any questions about the materials, please email hello@switchbc.ca or visit www.switchbc.ca