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## Design for the Environment (DfE)

Disinfectants are toxic by nature and often pose hazards to human health or the environment. The goal of the DfE program is to identify the least toxic disinfectants available. If a DfE logo is present on a disinfectant it will be:

- Least-hazardous class (EPA Category III or IV)
- Unlikely to contain carcinogenic, mammalian toxin or endocrine disruptor properties
- Unlikely to cause developmental, reproductive, mutagenic, respiratory or neurotoxic issues
- Must be readily biodegradable, and not impose aquatic toxicity or bioaccumulation
- EPA reviewed and approved
  - Has no outstanding conditional registration data issues
  - Has no unresolved efficacy failures
  - Has no unresolved compliance or enforcement actions
  - Has the identical formulation as the one identified in the DfE application review and approved by the EPA
- Does not require Personal Protective Equipment (PPE) for use

Source <http://www.epa.gov/pesticides/regulating/labels/design-dfe-pilot.html>



The slide contains a list of criteria for DfE disinfectants, a source link, and two logos. The 'Design for the Environment U.S. EPA' logo features a green globe with the text 'Design for the Environment' curved around it and 'U.S. EPA' below. The Virox logo is at the bottom center, and the AHP logo is to its right.

## Criteria for DfE Disinfectants

The labeled product must meet the following conditions; in addition to [FIFRA](#) labeling requirements:

- **Whole product Characteristics:** Must meet the DfE Standard
  - **pH:** To minimize potential for dermal and eye irritation or injury, product pH shall be  $\geq 2$  and  $\leq 11.5$ . Products with  $\text{pH} < 2$  or  $> 11.5$  may be considered for recognition if in vivo assays prove the product is not corrosive to the skin or to the eyes.
  - **Packaging:** DfE encourages the use of environmentally friendlier packaging, and asks partners to describe their efforts in this regard. Use of the tools provided by the Sustainable Packaging Coalition to revamp packaging would be considered a significant effort.
  - **Performance:** DfE approved disinfectants must be an approved EPA registered disinfectant. DfE approved disinfectants must also carry a category III or category IV rating.
  - **Auditing:** DfE approved disinfectants are subject to a third party review (NSF International) for both formulation composition and quality systems.
- **Actives:**
  - In 2009, OPPT and OPP staff screened antimicrobial active ingredients to identify the active ingredients acceptable for use in DfE-labeled products. The following 3 active ingredients passed:
    - Citric Acid
    - Hydrogen Peroxide
    - L-Lactic Acid
  - In 2012, OPPT and OPP staff re-evaluated the antimicrobial active ingredients and the list of acceptable actives has been expanded to include:
    - Ethanol
    - Isopropanol

To carry the DfE logo, the product and inert ingredients in the formulation must meet the [DfE Standard for Safer Cleaning Products \(PDF\)](#)



## EPA's DfE Standard for Safer Cleaning Products

Source Document: EPA's DfE Standard for Safer Cleaning Products

[http://www.epa.gov/dfepubs/projects/formulat/dfecriteriaforcleaningproducts10\\_09.pdf](http://www.epa.gov/dfepubs/projects/formulat/dfecriteriaforcleaningproducts10_09.pdf)

Excerpts (Pages v to vi):

- *The DfE standards are used to identify safer chemical ingredients - a DfE-labeled product contains the safest possible ingredients.*
- *The DfE logo offers a readily identified way to know that a product is as safe as possible for people and the environment. When you see the DfE logo on a product it means that the DfE scientific review team has screened each ingredient for potential human health and environmental effects and that—based on the best available information, EPA predictive models, and expert judgment—the product contains only those ingredients that pose the least concern among chemicals in their class. For example, if a DfE-recognized product contains a surfactant, then that surfactant will not be toxic to humans and it will biodegrade readily to non-polluting degradation products; many surfactants in conventional products biodegrade slowly or biodegrade to more toxic and persistent chemicals, which threaten aquatic life.*
- *Product formulators or manufacturers who become DfE partners, and earn the right to display the DfE logo on recognized products, have invested heavily in research, development and reformulation, to ensure that their ingredients and finished product align at the green end of the health and environmental spectrum, while maintaining or improving product performance.*



## Virox Technologies Inc. Receives Safer Detergents Stewardship Initiative (SDSI) Award

The Safer Detergents Stewardship Initiative (SDSI), EPA's Design for the Environment (DfE) Program recognizes environmental leaders who voluntarily commit to the use of safer surfactants. Safer surfactants are surfactants that break down quickly to non-polluting compounds and help protect aquatic life in both fresh and salt water. Nonylphenol Ethoxylates, commonly referred to as NPEs, are an example of a surfactant class that does not meet the definition of a safer surfactant.

Virox Technologies Inc. was awarded the Chemical Manufacturers and Product Formulators Champion Status, (the highest level of recognition offered under the SDSI) identifying the Accelerated Hydrogen Peroxide® (AHP®) technology as a sustainable technology and Virox Technologies Inc. as an industry leader.



Engineering Revolutionary Disinfectants  
for the War Against Microbes



## Another First for AHP!

AHP is the **FIRST** and **ONLY** EPA registered hospital disinfectant approved by DfE!!!

AHP is the **FIRST** and **ONLY** EPA registered hydrogen peroxide disinfectant approved by DfE!!!

### Accelerated Hydrogen Peroxide



The world's **FIRST & ONLY** disinfectant technology formulated for:



#### EVOLUTION OF AN ACTIVE

- 2014 AHP becomes the **FIRST** EPA registered hydrogen peroxide disinfectant to receive DfE Design for the Environment approval.
- 2012 The world's **FIRST** hydrogen peroxide based antimicrobial hand wash powered by AHP launches in Europe.
- 2011 AHP becomes Canada's **FIRST** ethylene concentrated disinfectant and hospital grade disinfectant with Ecologic certification.
- 2008 AHP receives FDA registration as the **FIRST** hydrogen peroxide based high level disinfectant to receive endoscope reprocessing permit to use.
- 2007 AHP is the **FIRST** disinfectant technology to receive Ecologic approval in Canada as a green certified disinfectant.
- 2007 AHP receives registration in Canada as the **FIRST** hospital surface disinfectant effective against *C. difficile* spores.
- 2006 AHP receives registration in the United States as the **FIRST** hospital grade surface disinfectant with 3 complete contact time and a Category II Safety being the lowest EPA toxicity rating.
- 2001 AHP receives registration in Canada as the **FIRST** hydrogen peroxide based high level disinfectant and hospital grade with a 14-day re-use claim.
- 1998 AHP receives registration in Canada as the **FIRST** hydrogen peroxide based hospital grade disinfectant and is awarded a general disinfectant label for effectiveness against non-enveloped viruses such as Poliovirus and Herpesvirus.



VIROX 1-800-387-7578 virox.com

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## AHP DfE Disinfectant

### Claims:

- **5 Minute Bactericide** including *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Salmonella enterica*, *Acinetobacter baumannii*, *Methicillin Resistant Staphylococcus aureus*, *MRSA*, *Enterococcus faecium*, *VRE*, *Klebsiella pneumoniae*
- **5 Minute Virucide** including Norovirus (Feline Calicivirus as Surrogate), Polio Type 1, Strain Brunhilde, Human Coronavirus, Rhinovirus Type 37, Human Rotavirus (Strain WA), Adenovirus type 5, Murine Norovirus (MNV)
- **30 Second Sanitizer** including *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Salmonella enterica*, *Acinetobacter baumannii*, *Methicillin Resistant Staphylococcus aureus*, *MRSA*, *Enterococcus faecium*, *VRE*, *Klebsiella pneumoniae*

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## DfE APIC Poster, Presented APIC 2014



Green and Safe Disinfectants, can these terms really coexist?



N. Omidbakhsh\*, Ph.D, F.Eng.; F. Ahmadpour, H.BSc. (B); N. Kenny, B.Sc.  
Virox Technologies Inc., Oakville, ON, Canada.

### Abstract

Disinfectant products are widely used in Healthcare settings. It is a common belief that these products are somewhat toxic to the user due to their toxicity against microorganisms. The objective of this study was to propose that this notion is not necessarily true and showcase new technologies that are able to achieve disinfection without harm to the user or the environment. A new technology based on Accelerated Hydrogen Peroxide (AHP) was assessed for its antimicrobial activity using EPA approved test methods, as well as its user safety and environmental fate compliance with the DfE Antimicrobial Practice Pilot Project.

### Background

Disinfectant formulations consist of antimicrobial active and surfactants. Antimicrobial active ingredients have inherent toxicity towards pathogenic microorganisms. In most cases, such chemicals also possess high mammalian toxicity, as well as medium to high environmental and aquatic toxicity. In general, the higher the antimicrobial activity of a product, the higher its toxicity will be. Green chemistry certification organizations such as GreenDeal®, EcoLogo®, and EPA's Design for the Environment have developed their own criteria for each of these toxicity endpoints. The inherent toxicity of most antimicrobial substances such as quaternary ammonium compounds, phenols, and chlorines are exemplary active with direct or indirect environmental fate problems, and therefore do not meet the DfE standards.

### Green Criteria

The DfE program has arguably the most stringent criteria accepting only three antimicrobial active ingredients as of date: hydrogen peroxide, lactic acid and citric acid. Table 1 shows the characteristics of these three DfE approved active ingredients. As a result, only a few disinfectants have satisfied DfE criteria and therefore certified as per Table 2.

Table 1. DfE approved antimicrobial actives and their attributes

DfE Approved Active or Solution	Safe and low irritant or Sensitizer	Biodegradable	Low VOC	Lack of Hydrolyzability	Health Safety	No Antimicrobial Resistance	Strong Antimicrobial Strength	Ease of Formulation
Citric acid	No	No	No	No	No	No	High	Easy
Lactic acid	No	No	No	No	No	No	High	Easy
Hydrogen Peroxide	No	No	No	No	No	No	High	Hard

Table 2. List of current DfE approved disinfectants

Product Name	Active Ingredient	Identification	Contact Heat & Claims	Virus/DfE
Specter	3.2% LACTIC ACID	EPA REG. 7460-1000-0100	Bactericide	Poliovirus
			Disinfectant	Disinfectant
Specter 1	2% LACTIC ACID	EPA REG. 7460-1000-0100	Bactericide	Poliovirus
			Disinfectant	Disinfectant
Consumer Non-Poison	8% Citric Acid	EPA REG. 7460-1000-0100	Disinfectant	Poliovirus
E-Destroyer	1.7% LACTIC ACID	EPA REG. 7460-1000-0100	Bactericide	Poliovirus
			Disinfectant	Disinfectant
Safest Hand Cleaner	7.2% LACTIC ACID	EPA REG. 7460-1000-0100	Bactericide	Poliovirus
			Disinfectant	Disinfectant
Aqua 1 8000	0.5% Hydrogen Peroxide	EPA REG. 7460-1000-0100	Bactericide	Poliovirus
			Disinfectant	Disinfectant

### Discussions and Conclusion

It is possible to develop a broad spectrum disinfectant product without compromising either antimicrobial efficacy or product safety, thereby providing healthcare and other facilities safe and effective disinfectant alternatives. It is challenging to formulate hydrogen peroxide-based disinfectants to meet the DfE criteria as most hydrogen peroxide effective stabilizers have poor environmental footprint. The presented Accelerated Hydrogen Peroxide technology (AHP) is the first hydrogen peroxide-based broad-spectrum hospital grade disinfectant product that meets the DfE criteria. With only 0.5% hydrogen peroxide as the active the formulation carries a 30-second sanitizing claim, and a 5 minute bactericidal and virucidal claim and proves effective against gram-positive & gram-negative bacteria, and enveloped & non-enveloped viruses including Norovirus. It also carries the toxicity rating (Category IV) allowed by the EPA due to its non-irritating properties to skin, eyes and respiratory system and therefore does not require the use of PPE.

Effectively combating HSA's while being environmentally preferred will require disinfectant manufacturing companies to shift their focus toward the use of more sustainable active and inert ingredients. This investigation has showcased several such products which can deliver the needs of infection prevention and control consistently without compromising the sustainability and environmental fate aspects.

Disclaimer: Authors of this poster are employees of Virox Tech. Inc.



<http://info.virox.com/apic-dfe-disinfectant-poster>

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