airandé

SUPERIOR DISINFECTION SOLUTIONS

THE FUTURE OF DISINFECTION IN LABORATORIES

Contamination: Risks to Laboratory Staff and Public Health

Contamination in laboratories poses significant risk to researchers, other lab workers, and to public health through laboratory-associated infections.

The microbiological and biomedical laboratory is an environment where the handling of micro-organisms or samples can contaminate not only workbenches and other surfaces in the laboratory but laboratory researchers and technicians:

- In the absence of disinfection, micro-organisms can colonize on surfaces and create a form of biofilm in which certain bacteria take refuge and resist biocides.
- Sewell (2006)[1] offers a summary of LAIs:

  Occupational exposure to the BBP, specifically HIV, HCV, and HBV was recognized early as a significant risk to laboratory workers, as well as other health care providers who handle or are exposed to blood and other potentially infectious material from infected patients.
- *Neisseria meningitidis*: Laboratory-acquired meningococcal disease is a documented hazard to laboratory workers that are working on cultures.
- *Francisella tularensis*: has been the third most common LAI over the past 35 years, occurring primarily in individuals who work in research laboratories. Manipulation of cultures on an open bench presents the greatest risk to laboratory personnel. The infectious dose by aerosol is approximately 10 to 50 organisms, while approximately 108 organisms are required by ingestion.
- Multidrug-resistant organisms: The emergence of vancomycinresistant and vancomycin-intermediate *Staphylococcus aureus* (VRSA and VISA) and other MDRO is another potential safety challenge for clinical microbiologists.
- Contamination of laboratory surfaces occurs and may pose a risk to laboratory workers. Therefore, it is prudent to decontaminate work surfaces at least daily, practice proper hand hygiene, and when appropriate, use barrier precautions to reduce skin and nasal colonization or infection.
- *Enterobacteriacae* group microorganisms such as Salmonella or *Shigella*, as well as *Brucella*, *Clostridium difficile*, *Escheria coli*, or *Klebsiella* have all been related with LAIs.[2]

The transmission of infectious agents in the laboratory can occur:

- Through contamination of the air when using laboratory techniques such as a vortex that can suspend air in culture media.
- Through cutaneo mucosa which sees micro-organisms from contaminated surfaces penetrate small lesions of the epidermis.
- Through the digestive tract when researchers and technicians bring surface-contaminated hands to their mouths.

  Infectious agents include all pathogenic bacteria, fungi, viruses, and parasites that may be transmitted to body secretions, fluids, and tissues, and work practices used in the laboratory.

1. Sewell, DL. (2006). Laboratory-Acquired Infections: Are Microbiologists at Risk?. Clinical Microbiology Newsletter. 28(1): 1-6.
2. Coelho and Diex, 2015

What do the experts say?

In the 2009 (5th) edition of the **Centre for Disease Control's** "Biosafety in Microbiological and Biomedical Laboratories", the authors noted that published reports of laboratory-associated infections (LAIs) around the start of the twentieth century.[1]

Pike's (1979) study of 4079 LAIs that resulted in 168 deaths. This study claimed that the ten most common causative agents of overt infections among laboratory workers were *Brucella spp.*, *Coxiella burnetii, hepatitis B virus (HBV)*, *Salmonella typhi*, *Francisella Tularensis*, *Mycobacterium tuberculosis*, *Blastomyces dermatidis*, *Venezualan equine encaphalitis virus*, *Chlamydia psittaci*, and *Coccidiodes immitis*.[2]

Harding and Byers (2000) revealed 1,267 overt infections with 22 deaths. Five deaths were of fetuses aborted as the consequence of a maternal LAI. *Mycobacterium tuberculosis*, *Coxiells burnetii*, *hantavirus*, *arbviruses*, *HBV*, *Brucella spp.*, *Salmonella spp.*, *Shigella spp.*, *hepatitis C virus*, and *Cryptosporidium spp.* accounted for 1,074 of the 1,267 infections.[3]

Sewell (2006) observed that laboratory-acquired infection is one of the leading occupational health hazards. On a laboratory worker's hands, carbuncles occurred. *Staphylococcus aureus* was isolated from pus samples of the carbuncles, with the same pulsed field gel electrophoresis band pattern with one of the recently studied strains in the laboratory. Incorrect or inadequate application of infection control measures may result in pathogen acquisition from the clinical samples, and wearing only gloves is not sufficient for the biosafety of laboratory workers in clinical diagnostic laboratories.[4]

Willemarck et al (2015) reported that according to the evidence in the literature worldwide, a lack of compliance with biosafety measures is identified in this online survey as a possible cause of bio-incidents and LAIs.

Discomfort when wearing additional personal protective equipment together with ignorance of the reason to comply with these additional PPE (inappropriate risk assess mentor training) are possible causes of this non-compliance.

...there is a general impression that not only a lack of training exists but also a lack of knowledge.

...not only with regard to bio-incidents, but also with regard to general aspects of biosafety...

...laboratory personnel must be able to manage these risks and should be aware of appropriate personal protection measures to be taken to protect themselves, their colleagues, the community and the environment.

... the authors found that only 45% of the LAIs were actually proven to have originated in the laboratory and that in 47% of the reported LAIs, the actual cause of the infection remains unknown. When the cause of the LAI was known, it was usually due to human error (98%), mainly by splashes, needle sticks and/or cutting accidents. Technical failures accounted for approximately 2 % of the cases (one case identified).[5]

Three important studies highlight the efficacy of vaporous hydrogen peroxide on the decontamination of laboratories. **Hall** et al (2007) found that mycobacterum tuberculosis that is routinely cultured in clinical and research laboratories is highly resistsant to disinfection. The authors concluded that hydrogen peroxide vapour was highly effective in deactivating both the M. tuberculosis micro-organism as well as *G. stearthermophilus*.[6]

Kaspari et al (2014) concluded that the results of this study provide important results in the field of hydrogen peroxide decontamination when analysing the effect on spores other than those of G. stearothermophilus.[7]

Wood et al (2016) found that vapourised H_2O_2 provided a simple and effective decontamination method that could be widely applied in the event of a *B. anthracis* spore release.[8]

1. Chosewood, LC and Wilson, DE. (eds). (2009). Biosafety in Microbiological and Biomedical Laboratories. 5th edition. Centre for Disease Control. (Atlanta, Georgia)
2. Pike, RM. (1979). Laboratory-associated infections: incidence, fatalities, causes, and prevention. Annu Rev Microbiol. 33:41-66
3. Harding, AL., Byers, KB. (2000) Epidemiology of laboratory-associated infections. In: Fleming DO, Hunt DL. (eds) Biological safety: principles and practices. 3rd edition. Washington, DC: ASM Press. 35-54
4. Sewell, DL. (2006). Laboratory-Acquired Infections: Are Microbiologists at Risk?. Clinical Microbiology Newsletter. 28(1):1-6.
5. Willemarck, N., Van Varenbergh, B., Descamps, E., Brosius, B., Dai Do Ti, C., Leunda, A., and Baldo, A. (2015). Laboratory-Acquired Infections in Belgium (2007-2012) – An Online Survey. Brussels, Belgium. Wetenschappelijk Instituut Volksgezondheid.
6. Hall, L., Otter, JA., Chewins, J., and Wengenack, NL. (2007). Use of hydrogen peroxide vapor for deactivation of *Mycobacterium tuberculosis* in a biological safety cabinet and a room. J Clin Microbiol. (45(3): 810-815.
7. Kaspari, o., Lemmer, K., Becker, S., Lochau, P., Howaldt, S., Nattermann, H., and Grunow, R.(2014) Decontamination of a BSL3 laboratory by hydrogen peroxide fumigation using three different surrogates for Bacillus anthracis spores. Journal of Applied Microbiology. 117: 1095-1103.
8. Wood, JP., Caffee., MW., Clayton, M., Griffin-Gatchalian, N., Touati, A., Ryan, S., Mickelson, L., Smith, L., and Rastogj, V. (2016) A simple decontamination approach using hydrogen peroxide vapour for Bacillus anthracis spore inactivation. 21(6): 1603-1615.

How to Manage Contamination in the Laboratory

Airandé – the complete H_2O_2 Disinfection System that allows Laboratory Researchers and Technicians to:

Eliminate contamination from the laboratory and reduce the risk of contamination through bacteria, viruses, spores, yeasts, fungi, and moulds.

Reduce the risks of contamination to laboratory researchers, technicians, and patients.

Use an approach to disinfection that is:

- broad spectrum in its action: bactericidal, virucidal, sporicidal, and fungicidal,
- environmentally friendly,
- compatible with most materials found in laboratories,
- efficient and cost effective, and that saves time and labour in their disinfection routine.

Why H_2O_2?

- Efficient (researched, developed, innovated, and validated by scientific tests and data).
- A full spectrum of disinfection activity.
- Eco-friendly, biodegradable: H_2O_2 decomposes into water and oxygen after use.
- Odourless.
- Not dangerous to users when used according to instructions.
- No residue effect.

H_2O_2 is More Effective Than Existing Disinfection Modalities

Summary of Disinfection Modalities:

	BACTERIA	YEASTS	FUNGUS	ENVELOPED VIRUSES	VIRUS	MYCOBACTERIA	BACTERIAL SPORES
ALDEHYDES*	●	●	●	●	●	●	●
ALCOHOLS	●	●		●			
PHENOLIC DERIVATIVES	●	●	●	●			
CHLORINE DERIVATIVES	●	●	●	●	●	●	
QUATERNARY AMMONIUM CATIONS	●	●		●			
BIGUANIDES	●						
PERACETIC ACID*	●	●	●	●	●	●	●
HYDROGEN PEROXIDE	●	●	●	●	●	●	●

*Aldehydes, Peracetic Acid, and H_2O_2 are the only full spectrum disinfection substances. But, not all full spectrum disinfection substances are safe:

- **Aldehydes** are highly toxic and irritating
- **Peracetic Acid** is corrosive, explosive at high concentration, malodorous, and must be handled with great caution.

Full Spectrum and Safe:

	BACTERIA	YEASTS	FUNGUS	ENVELOPED VIRUSES	VIRUS	MYCOBACTERIA	BACTERIAL SPORES
HYDROGEN PEROXIDE	●	●	●	●	●	●	●

This means H_2O_2 is the best alternative solution for disinfection

The Airandé Disinfection System

3 Objectives:

1

High-volume disinfection through airborne circulation of dry-fog of 5–15 microns in particle size (using Airandé DF-1 and 7.9% H_2O_2 solution).

2

Manual disinfection between patients or between high-volume disinfection cycles (using Airandé 3.25% H_2O_2 solution).

3

Disinfection and removal of contamination of the air by photo-catalysis (using the Airandé AP-13 air purifier).

Innovation, Engineering, Science, Manufacturing and Distribution

The Airandé Disinfection System is the result of innovation in clinical and scientific settings. This has drawn on the expertise of the very best thinkers and practitioners in the disinfection world.

Airandé has its Principal Scientific Adviser in Belgium. Its Global V-P, Research and Development is also located in Belgium.

The Design and Engineering of the System has been done across three continents: Australia, China, and Europe.

Manufacturing of different elements of the system is done in Germany, Australia, China, and the USA. All of our manufacturers and suppliers are accredited to ISO 9001:2015. Some are also accredited to ISO 13485:2016.

Airandé maintains a QMS system which is currently being reviewed and audited to allow the company to be certified under ISO 13485.

Airandé's focus on innovation, research, and development in the disinfection field is extremely important in achieving its goal of providing leadership in the science and management of disinfection. This means that Airandé will continue to work in collaboration with the leading microbiologists and disinfection scientists globally.

The Airandé Disinfection System

Airandé DF-1

Airandé H202 Solution 8
for use in the Airandé DF-1

Airandé AP-13 Air Purifier
for use with the Airandé Disinfection System

Airandé H202 Solution 3
for use as a Surface Spray between cycles

Airandé H2O2 Impregnated Wipes
for use on Surface Related Bio Film

The Airandé Disinfection System

The Airandé DF-1


Back view


Left view


Front view

Ensures optimal surface disinfection after manual cleaning

Extended spectrum of activity to remove contamination from a wide range of sources including bacteria, viruses, spores, and moulds

Disinfects spaces between 5m³ and 165m³

Limited down-time of the laboratory

Rapid diffusion: 11 min to 45 min

No volatile organic compounds

No residue

Ergonomic

Economical: 7ml/m³

Easy to use

- Reaches all surface areas
- Dry – not wet
- Captures and kills all sources of surface contamination – including bacteria, viruses, spores, and moulds

Traceability of use, date, operator, room ID, reason for disinfection: all downloadable through USB

Portable printer

The DF-1 comes with a easy-to-manage trolley. The DF-1 can be simply removed from the trolley and carried in a specially designed bag. This enables the operator to take the DF-1 into small spaces.

Airandé Solution 8

7.9% SOLUTION OF H_2O_2

- Used in conjunction with the DF-1
- Ready-to-use solution: no mixing or onsite dilution required
- Single-use ensuring purity of product
- No surface residue
- No residual humidity
- Biodegradable
- No corrosion on most materials

Airandé Solution 3

3.25% SOLUTION OF H_2O_2

- Used for manual cleaning of surfaces in between scheduled use of the DF-1
- Ready-to-use solution: no mixing or onsite dilution required
- No surface residue
- Biodegradable
- No corrosion on most materials
- No trace of NH4+, phenol, chlorine, biguamide, aldehyde, alcohol and VOC

The Airandé Disinfection System

Airandé AP-13 Air Purifier

The AP-13 utilizes needlepoint ionization, pulsating negative/positive ion field generator, corona discharge air freshener, and technology consisting of a special UV light and photo-catalyst target thereby creating an advanced oxidation plasma containing several friendly oxidisers.

The AP-13 is ideally suited for laboratories. Its plug-and-play, no-required-installation is an advantage, along with remote controls to prevent capricious settings changes.

The AP-13 can be used and kept on during working sessions. Many laboratory managers will choose to have an AP-13 in each laboratory room.

Airandé H2O2 Impregnated Wipes

H_2O_2 impregnated wipes that enhance the manual cleaning of contaminated surfaces.

The H_2O_2 penetrates deep into the surface materials of surfaces in laboratories and ensures that contamination is eliminated even from areas that are not visible to the naked eye.

What do you get when you buy an Airandé Disinfection System?

- 1 x Airandé DF-1
- 1 x Trolley DF-1-T (Fold-out work desk, Electrical cord, Portable printer)
- 1 x AP-13 Air Purifier
- 1 x Carry bag
- 6 x Bottles of Airandé Solution 8
- 12 x Bottles of Airandé Solution 3
- 6 x packs of Airandé BW-1 Wipes

2-year warranty on Airandé DF1, DF-1-T, and AP-13*

What do you get when you become a distributor of the Airandé Disinfection System?

A highly innovative product using leading edge technology

A competitively priced product

Backing of a company with expert knowledge about disinfection and bacterial control

Training in disinfection principles and protocols. And training in the use of Airandé disinfection products

*The catalytic reactor in the AP-13 has a warranty of 60 days. Otherwise the AP-13 has a warranty of 2 years.

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SUPERIOR DISINFECTION SYSTEMS

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