



BELLA MOSS
FOUNDATION

As professionals working in
the Veterinary Sector, what should
the Science and Experiences of
Covid have taught us?



Staff Training Material





Abstract

Covid has focused many minds in respect of infection control, biosecurity, zoonosis and nosocomial infections. If anything positive can come from the pandemic, perhaps it may be a 'light bulb moment' just as cleanliness was for Florence Nightingale so many years ago, teaching us all some important and uncomfortable home truths. Covid was not the first, nor will it be the last global pandemic. All of us in health care sectors have a duty of care to patients, staff and populations alike, to take basic infection control procedures.

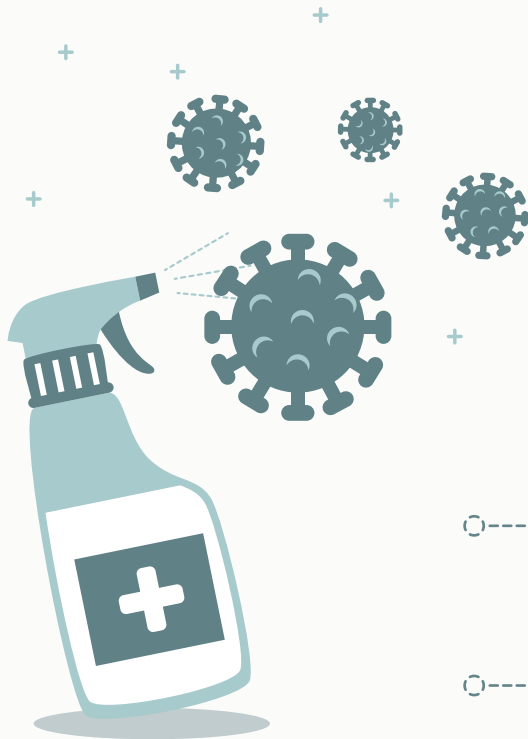
1.27 million

human deaths occurred worldwide in 2019 due to antimicrobial resistance



10 million

human deaths due to antimicrobial resistance are predicted by 2050



The critical need for improved levels of hygiene, especially within the healthcare sectors (together with responsible antimicrobial use), has never been greater.

80%

reduction in pathogen load is achieved through detergent cleaning alone, whilst combined 'disinfectant cleaning' does not maintain a surface clean for any longer than detergent alone.

> OPTIMAL OUTCOMES ARE ACHIEVED BY APPLYING A 'TWO PHASE PROCESS'

1

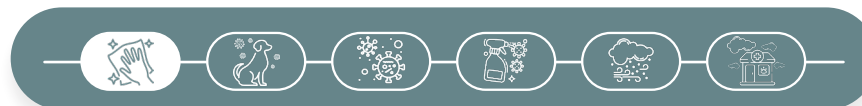
Removal of the bio-load by detergent cleaning

2

Application of an effective disinfectant.



Moreover, we cannot rely on human cleaning and disinfection alone in busy clinical settings. We must use procedures and techniques which can run simultaneously with 'on-going clinical activities' that are proven to be safe (to patients, staff and the environment) and effective (to national or international standards), within the specific clinical setting. We must test and measure outcomes, we must investigate nosocomial and zoonotic incidents. We must continue to learn and improve.





Introduction

Now that it seems most likely that the infection was derived from bats or other wildlife species in a 'wet market' in Wuhan, China, (Haider et al 2020), we are reminded that differing inpatients and outpatients each carry a variable endemic contagion risk to our facilities, staff and other patients (Wright et al 2008), and patients should be assessed and managed at all stages of their journey through our facility, on a contagion and infection risk control basis.

Covid is not the first, nor will it be the last, zoonotic pandemic infection.

>60%

of known infectious diseases in people can be spread from animals



They can be spread in a number of ways, including direct or indirect contact, vector-borne, foodborne or waterborne (MSD 2021).

Whilst some here in the UK take pride in being an island race, Covid has been a timely reminder that in these days of globalisation, high population densities and frequent international travel, infection and contagion control must be considered on a global sense, in which the weakest link in the chain creates the greatest risk.

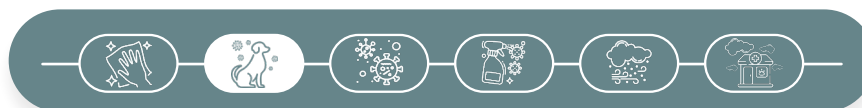
75%

of new or emerging infectious diseases in people come from animals.



As veterinarians – clinicians and business owners, we have a duty to our clients and our businesses to maintain effective control of contagious infections (both those we know about now, as well as those that are as yet unknown). Such infections are not only important to our clients, patients, staff and business, but sick animals are accepted to be the source of 75% of new emerging infectious diseases of humans (MSD 2021).

Whilst we have all been focusing on Covid-19, Laximinarayan (2022) reminds us of the 'forgotten pandemic of anti-microbial resistance'. Laximinarayan quotes Murray (2022) in estimating 1.27 million human deaths globally due to AMR in 2019, a figure which is almost identical to the combined global deaths, over the same period, caused by HIV and Malaria, whilst WHO figures (November 2019 to January 2022) for Covid 19 are four times higher, albeit over a longer time period.





Anti-microbial Resistance (AMR)

Despite all the hype of the last 5 years, the recent Lancet publication (Laximinarayan 2022) demonstrates clearly that

AMR is the silent pandemic, killing more people than Malaria or AIDS and close to Covid-19

So despite the infection control measures thrust upon us by the experience of Covid, we are still failing to meet the challenges of infection control and hence, as a spin off, of the AMR pandemic. Responsible use of antibiotics is essential but, more importantly, we must continue the drive to reduce the requirement for antibiotics by improved animal husbandry (in particular, in food producing species) and this can only be achieved by improved biosecurity and infection control, by improved standard operating procedures, better cleaning, disinfection and the monitoring of the outcomes of infection control.

> NOSOCOMIAL INFECTIONS AND CONTAMINATED SURFACES

Whilst we have all been excited and focused on Covid, we are reminded that in recent years the incidence of nosocomial infections in humans subsequent to hospital visits, was outed as a scandal (Boyce 2016).



In a London teaching hospital (French et al 2004)

70%

% of ward swabs failed for MRSA prior to cleaning.

66%

of swabs still failed for MRSA after traditional cloth and mop cleaning and disinfection.

1.6%

was the failure rate after disinfection by fogging with a peroxide-based disinfectant.

Gebel et al (2013) confirmed the role of contaminated surfaces in the transmission of pathogenic microorganisms causing healthcare-acquired infections.

> EFFECTIVENESS OF CLEANING AND DISINFECTION PROCEDURES

White et al (2007) demonstrated that the bacterial load is reduced by 80% from surfaces by detergent cleaning alone and disinfectant cleaning does not generally maintain a surface pathogen free for any longer than detergent alone (Dharan et al 1999), whilst a 'two stage cleaning', with detergent removal of bioload, followed by disinfectant treatment achieved the best results overall. Moreover, there is laboratory evidence suggesting that biocides used at a sub-lethal concentration may trigger the expression of biocide resistance and/or select bacteria resistant to antibiotics (Maillard & Denyer 2009, Karatzas et al 2008). In light of this, biocides are not recommended for use in situations where environmental conditions will compromise their efficacy, i.e. where excessive organic material remains present, as cleaning has not been undertaken prior to disinfection.

> HYGIENE CONTROL AND MONITORING

86,4%

of unannounced cleanliness audits in human hospitals, using bacterial swab culture (Anderson et al. 2011), revealed hygiene failure, while adenosine triphosphate (ATP) testing, a faster method providing immediate results at the patient's bedside, showed a failure rate of 84% (Schabrun & Chipchase 2006). The use of post cleaning hygiene monitoring using florescent markers, ATP or microbiological testing has proven valuable in improving cleaning efficacy (Carling et al 2016).





Anti-microbial Resistance (AMR)

> AUTOMATION OF DISINFECTION PROCEDURES

Dancer (2012), demonstrated that in any busy clinical situation, simple infection control procedures are abandoned, ignored or forgotten when staff are overworked. Indeed, all hygienic practices are consistently challenged on a busy ward. For this reason, the use of automated disinfection procedures, using aerosolisation of effective antimicrobial solutions is of great assistance, although no one should ignore the need for the regular use of detergents to remove organic material prior to disinfection.

Byrns and Fuller (2011) trialled various methods of aerosolisation of biocides for the sterilisation of spaces in buildings. Where effective biocidal agents were applied, they reported high levels of efficacy, noting the benefit of reaching and penetrating into areas which would not otherwise be sanitised, or that at the end of a busy day just get missed or forgotten about. However, the technique is not universally recommended unless the agent used is safe for staff and patients, or in situations where the facility can be emptied prior to application.

Many automated systems can only be used when clinical areas are empty of patients and staff, which inevitably limits their application, especially when applied in facilities with multiple patients which are rarely, if ever, empty. In contrast, where automated systems use effective agents that can safely be used with either patients and/or staff in situ, such that regular timed, automated delivery can be maintained, the optimal efficacy is achieved, although few antimicrobial solutions meet these exacting requirements (efficacy and safety).

Some disinfectant compounds comprising of a surfactant plus an antimicrobial substance such as a quaternary ammonium are designed to minimize bacterial contamination of surfaces by maintaining their antimicrobial activity on surfaces for weeks or months. To date, the ability of these compounds to prevent contamination of surfaces for prolonged time periods is unclear. Two studies have reported persistent antimicrobial activity of varying levels for differing time periods (Baxa et al 2011, Tamimi et al 2014). Further evaluation of organosilane-type compounds using a variety of application methods appears warranted.

Disinfectant application techniques, either by the use of aerosolisation or application of some disinfectants with a microfiber cloth, are demonstrated to have marked advantages over the use of a cotton-based cloth, as QAC compounds can bind to cotton, rendering the availability for disinfection partially limited (Engelbrecht et al 2013).

It should be remembered that, just as antibiotics (e.g. penicillins and cephalosporins) are available in 'generations', so too are many of the disinfectants. Categorisation and consideration of the efficacy and safety of a disinfectant product should not be based simply on the class of constituent chemical, but rather on external certification by a government approved laboratory in respect of: its patient and user safety, its efficacy (against standard pathogen types and models), as well as its environmental residue safety. Users should be aware of what constitutes efficacy, based on the requirements within their own geographical area.

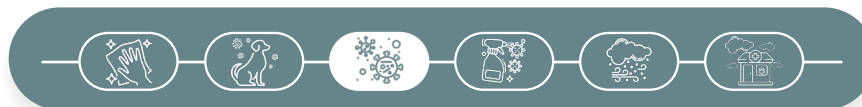
In the UK, standards require:

- > **Log⁵ kill of bacteria** (standard tests e.g. Staph., Pseudomonas, Mycobacterium, E. Coli.)
- > **Log⁴ kill of viruses** (standard tests e.g. FMDV, AI, Parvo, - enveloped and non-enveloped)
- > **Log³ kill of fungi and yeasts** (standard tests e.g. *Aspergillus* spp, Trichophyton, Candida)
- > **Log⁴ kill of bacterial spores**

Clinicians must be aware of the necessary contact time for their disinfectant under standard operating conditions (i.e. temperature and concentration), and must consider if this is achievable, e.g. the spraying of a dirty consulting room table and immediate wiping with a dry paper towel before the next patient is ushered in, may not be realistic or effective.

For busy clinicians managing excessive caseloads, the expectation of relying solely on human staff to complete effective cleaning and disinfection in the clinical workplace has proven flawed. In truth, effective disease control cannot be delegated to overstretched cleaning and nursing staff, as the importance of proper cleaning and disinfection is simply too important and the results of failure may be severe.

Facility cleaning protocols must emphasize the importance of periodic deep cleaning, including the chemical removal of the lipid surface layer. The frequency of both routine and deep cleaning should be based on the potential contamination risk and the impact of contamination in each clinical setting.





Disinfectant Efficacy against Covid and Why?

> NEW DISINFECTANTS AND APPLICATION TECHNIQUES

In these challenging times, any disinfectant used in veterinary practice must have proven efficacy against Covid-19, as well as all standard veterinary pathogens, relevant to the practice in question.

Coronaviruses are a large family of viruses. Some coronaviruses that infect animals can be spread to people and then spread between people, but this is rare. This is what happened with SARS-CoV-2 (i.e. Covid-19), which likely originated in bats. Such infections may cause cold-like illnesses in people. Others cause illness in certain types of animals, such as cattle, camels, and bats. The Centre for Disease Control (2021), has shown that a number of animals worldwide have been infected with COVID-19, including pets such as cats and dogs, farmed mink, and large cats, gorillas, and otters in zoos, sanctuaries, and aquariums. Reptiles and birds have not been affected by this virus. The UK Government has reported that Covid can infect a range of animals. Their published advice is as follows:

Animals can catch SARS-CoV-2. It is rare, and they may show only mild clinical signs and recover within a few days. We don't yet know all of the animals that can get infected. There is evidence that the following species can catch the virus that causes COVID-19:

Big cats

Coatimundi

Domestic cats

Dogs

Minks

Ferrets and polecats

Fruit bats

Hyenas

Primates

Pangolins

Pigs (these are less prone to catching SARS-CoV2)

Raccoon dogs

Rodents, including hamsters

White-tailed deer

There is growing evidence that mink, cats, white-tailed deer and hamsters can spread the virus through close contact with their own species in captivity.

Animal fur can act as a carrier (known as fomite transmission) for the virus that causes COVID-19 for short periods of time, in the same way as other surfaces.

Limited evidence suggests that COVID-19 can pass:

From infected humans to the listed animals after close contact or sharing their equipment or airspace; this is referred to as reverse zoonosis, a good case example is described by Koeppel (2022)

Between mink kept in captivity and then transferred to humans in close contact

From infected hamsters to humans in close contact

Between ferrets, raccoon dogs, white-tailed deer and mice infected by experimental testing

Between ferrets infected by experimental testing and transfer to humans

As veterinarians, we must be cognisant of the risk of covid infection in both domestic and other animals in order that we can reassure and protect pet owners, staff and business owners alike. We must do all that is possible and responsible to manage the risk so that the chances that any out-patient or hospitalised pet visiting our facility might contract covid and take the infection home to then transfer it to their owner is minimised. Likewise we must minimise the risk of staff being infected from any patient whether it be domestic, farm animal or wildlife.

In the article above, we have described the need for detergent cleaning of surfaces prior to disinfection, and we have highlighted with references the typically poor outcomes achieved when cleaning and disinfection is left in the hands of clinical staff, but that automated non-touch disinfection methods, (subsequent to cleaning), is the infection control method of choice.





Fogging

This is the application of a biocide / disinfectant solution (of external, quality-controlled government licensed laboratory proven efficacy) which sanitises large areas of a building quickly and effectively. It can kill off the virus and other biological agents in the air and on surfaces. The task involves spraying a fine mist from a spray gun which is then left to evaporate. Some fogging solutions require the air space to be cleared of patients and staff and for the operator to wear a chemical suit, gloves and an air-fed ventilator and sealed mask etc. The product used must be safe on equipment such as printers, computers, patient vital monitors, etc. The mist is exceptionally fine but is still effective in penetrating all areas to control the virus, this is particularly important when controlling air borne infections, e.g. Coronaviruses (including Covid-19), Kennel Cough, Cat Flu, Equine Influenza, Strangles, Psittacine Beak and Feather Disease, Newcastle Disease, Avian Influenza, Mycobacterium, Foot and Mouth Disease, Psitticosis, Distemper, Mycoplasma and many more.



Fogging in the Veterinary Environment

First check the efficacy of your disinfectant, request a copy of the efficacy test certificate.

Foggers can be plug-in electrical, battery-operated electrical, plugged-in compressed air, or static compressed air (typically ceiling suspended). Equipment can be staff-operated, or automated, i.e. to go off at certain times of day/night, and to run for a certain duration. Generally, a droplet size of 5-10µ is optimal in achieving a dry mist and dampness to surfaces, without creating surface fluid and thereby a risk to electrical equipment.

Pre requisites for a successful outcome from disinfection by fogging:

- 1 ...→ The disinfectant applied must be effective against all 'pathogens of interest'.
- 2 ...→ A disinfectant that is non-corrosive to metal, so that it can be delivered in appropriate fogging equipment.
- 3 ...→ Preferably a disinfectant that is safe to use by fogging, whilst patients and staff remain in or walk through the area being fogged, means that automated programmes are effective as they are not interrupted by clinical demands.
- 4 ...→ The disinfectant applied must be effective at the concentration at which it is administered by the fogger, (bear in mind that if a disinfectant is effective against pathogen A when used at 1:250, but is only recommended for use by fogging at 1:2000, then whilst it may be safely used by fogging at that concentration, it is not anticipated to be effective).

Few veterinary disinfectants meet the above criteria, critical review of the literature will be required to ensure that a safe and effective agent is being used.



➤ SO WHAT HAVE WE LEARNT ABOUT INFECTION CONTROL

It is more important than ever.

Any disinfectant must have proven efficacy against Covid, as well as all relevant veterinary pathogens.

Automated disinfectant delivery by fogging is the most efficacious delivery form for control of both Covid and all other pathogens which remain pathogenic on any solid surface, although prior detergent cleaning is important.

Fogging is pointless if the disinfectant used is not efficacious at the concentration recommended.

Very few veterinary disinfectants have proven efficacy against all relevant pathogens and can be safely delivered by fogging, however there are exceptions.

Cleaning and regular removal of the biofilm layer to maintain efficacy of disinfectant remains important.

Measuring and monitoring the outcomes of:- cleaning, disinfection, infection control, prevalence of nosocomial infection is essential.

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