

THE IDEAL DISINFECTANT

We've all heard the saying, "You can't see the forest for the trees." When focusing too much on a single detail, it's often difficult to accurately access the big picture. As an example, I would venture to guess that for the majority of those reading this article, the first thought that pops into your mind when thinking about or evaluating a disinfectant is; "What does it kill?" Now as appropriate as this question might be, does an overemphasis upon any particular aspect or characteristic of a disinfectant shackles one's ability to adequately assess its overall appropriateness? I would suggest it most certainly does, and in fact is the reason for so many "supposed" disinfectant failures. In this article I'm going to help you decipher and distill the world of disinfectants into a manageable toolset for evaluating the various options available today. In the course of doing so, we'll be reflecting upon, among other things, the following two major questions:

- (1) Is there a bigger picture to look at for understanding the role disinfectants play in reducing disease transmission in animal care facilities?
- (2) What are the properties of an ideal disinfectant, and does such a disinfectant actually exist?

Understanding these questions will provide the tools needed to easily and effectively evaluate the many disinfectant choices available today. In-turn, you will be able to better parse past and future conference recommendations and marketing information into the raw materials necessary for decoding and deciding what's best for your own facility.

Is there a bigger picture to look at for understanding the role disinfectants play in reducing disease transmission in animal care facilities?

Just as stereoscopic vision makes depth perception possible, a proper understanding of major environmental variables, along with the basic principles of disease transmission, are prerequisite to understanding disinfectants and their role as contributors to the bigger picture of combating disease transmission. Disinfectants by themselves are only part of the equation. Having been a veterinarian for 27 years now, it still surprises me the number of times facility and practice managers continue to miss the boat on this one simple principle. Failure to understand how environmental variables affect disease transmission, and/or failing to understand how infectious diseases are transmitted is a recipe for failure no matter what sanitation program you may be employing or what disinfecting options you may be considering.

A LOOK AT ENVIRONMENTAL VARIABLES

Stress is a leading contributor to disease, and animal care facilities are inherently stressful environments. Understanding some of the environmental contributors to stress is foundational to effectively minimizing disease transmission and creating a healthier environment. Major environmental contributors to stress include, among other things, ventilation, temperature, humidity, and space.

Ventilation: Proper ventilation is imperative to minimize spread of disease and reduce unwanted odors. As a rule-of-thumb, facilities should be capable of variably exchanging air 10 – 15 times per hour, and variably adjusting the ratio of recycled air to fresh air. Therefore a 10,000 CF facility should have an air-handler capable of moving 100,000 – 150,000 CF of air per hour, with the ability to adjust the proportions of recycled air to fresh air. Isolation wards should always be ventilated on a separate system from the rest of your facility, and some sort of quality air filtration system and/or air sanitizing program should be employed throughout the entire facility. Because hard surface disinfectants have little effect on air quality it is important to recognize that numerous microorganisms are known airborne pathogens, and the very act of cleaning itself (when using high pressure sprayers) aerosolizes microorganisms and debris. Clean fresh air equals healthier happier animals!

Temperature: To minimize stress, ambient temperatures should be maintained above 60⁰ F and kept below 80⁰ F (15-27⁰ C) at all times, however, as a rule-of-thumb, temperatures should ideally be kept in a range normally considered comfortable for staff, animals, and the public (68⁰-75⁰ F).

Humidity: Relative humidity should be maintained in a range between 30% and 70%. If your floor is still wet 10-15 minutes after cleaning, your facility humidity level is likely too high and should be promptly adjusted.

Space: Because facilities differ radically in age and design, overcrowding and other housing variables like size of space, proximity to other animals, visibility of other animals, design comfort, light levels, and sounds, can all add to stress levels and act as an ongoing and huge potential contributor to infectious disease transmission regardless of the sanitation program being employed. If it's not what a pet is used to at home, then stress will definitely be a factor affecting any animal staying in your facility. Did you know a sneezing cat can project aerosolized particles up to 5' away from where it sneezes?

BASIC PRINCIPLES FOR MINIMIZING DISEASE TRANSMISSION

Minimizing transmission of infectious diseases involves an awareness of numerous principles affecting how successfully microorganisms are transmitted. Overlooking any of these principles will alter your level of success at combating infectious disease transmission in your facility.

- An effective and diligent program must be in place as recommended by your consulting veterinarian for monitoring the health of animals entering a facility and the current health status of animals already in your facility. This program should minimally include mandated core vaccinations with ample opportunity given for conferred immunity prior to an animal's stay.
- Stress levels of the population, environmental variables such as ventilation, temperature, humidity, and space; and age and facility design as already mentioned, all play significant roles warranting ongoing attention.
- It's also important to recognize the various vehicles for spread of contagions. Microorganisms are transmitted directly from animal to animal through feces, urine, saliva, and via aerosol transmission (hard surface disinfectants offer little help here), and indirectly through a process called "fomite" transmission; whereby employees and visitors pick up

contaminated material from one animal, and unwittingly transmit it to other animals on hands, feet, hair, and clothing.

- The trafficking management of animals within a facility has significant potential for transmission of infectious disease if not managed and monitored correctly. This is an area I've often found to be completely overlooked in some sanitation programs.
- Other variables are more obvious and would include, function and capabilities of sanitizers and disinfectants, equipment being used for cleaning and disinfecting, quality of employee compliance with labeling directions, and a facility's husbandry practices for care of its animals.
- Biofilms are an emerging topic of interest and warrant mention because failure to understand the protectant effect biofilms confer upon microorganisms may result in failure of a sanitation program at controlling disease transmission. Biofilms are aggregates of microorganisms adhering together in a matrix of self-produced extracellular polymeric substances referred to as slime. This slime is a mixture of extracellular DNA, proteins, and polysaccharides, and is extremely resilient to penetration by numerous hard surface disinfectants. If a sanitizer or disinfectant can't get at a microorganism, it can't kill the microorganism. To highlight the importance biofilms play in disease transmission, the CDC has suggested biofilms contribute to over 2 million infections, 90,000 human deaths, and \$4.5 billion dollars in excess human healthcare costs each year.

Now that you have an understanding of how environmental variables contribute to disease transmission, and you also understand how infectious diseases themselves are transmitted, it's now time to move on and discuss disinfectant characteristics themselves and the role these characteristics play in reducing disease transmission in animal care facilities.

What are the properties of an ideal disinfectant, and does such a disinfectant actually exist?

Before diving into this section, let me first make a comment about customer perception. If you were to poll several hundred first time visitors to your facility, three dominant themes would emerge that control customers' perceptions about your facility: What's it look like? What's it smell like? And how am I treated? You cannot afford to underestimate the power of these three perceptions. The first two of which are directly dependent upon your particular sanitation program and the products you choose to accommodate that program in your facility.

Let me begin by saying, the "ideal" or perfect disinfectant does not actually exist. This is because the extremes of safety and efficacy are often at odds with one another in use applications and during product development. A flamethrower may do an excellent job removing unwanted microorganisms, but the immediate and long term effects and damage created in the process would be completely unacceptable. Being able to define what an "ideal" disinfectant should look like however, will help you sort out the many options available for sanitizing and disinfecting your facility and allow you to adequately evaluate any product on the market for its suitability as part of your

facility's overall sanitation program. Keeping in mind, there's much more involved than just, "What's it kill?" What you're looking for is balance. As you evaluate products, avoid the extremes! Use the list that follows as a comparison metric against which you will be able to evaluate the many disinfectant options you'll encounter in the marketplace. Following are characteristics of an "ideal" disinfectant:

PROPERTIES OF AN IDEAL DISINFECTANT

- Neutral pH (preferably in the range of 6.5 to 7.5). The pH scale is a measurement of how acidic or basic a substance is and ranges in scale from a numerical value of 0 to 14. The lower the number the more acidic a substance (hydrochloric acid has a pH of 0), the higher the number the more basic or caustic a substance is (sodium hydroxide has a pH of 14). The farther one moves away from neutrality (pH of 7.0), the greater the likelihood a substance will burn, corrode, or irritate; and the harsher a chemical will be on the surfaces it is applied, and the more dangerous it could be as an irritant to animals and people. Water has a neutral pH of 7.0.
- Excellent cleaning ability. Though cleaning is not generally considered, in itself, a process of disinfection; it is estimated that the combined effects of the removal of the medium in which contagions grow, along with a reduction in actual microorganism counts, and the direct cellular actions surfactants have upon microorganisms, account for reducing overall microorganism contamination by up to 90%. Cleaning ability should rank near the top of your list of concerns in choosing a disinfectant as it accounts for upwards of 90% of your ability to control contagions. As a rule-of-thumb, if you can smell it, you haven't cleaned it well enough.
- A 1:64 concentrate (2 ounces of solution per gallon of water). Though super-concentrates (1:128 and 1:256 solutions) do have a place for use, those solutions do not contain enough material after diluting for effective widespread cleaning ability and odor control. Super-concentrates also lack dye concentrations sufficient for satisfactory color upon dilution and are therefore easily wasted, especially in facilities lacking automated dilutors; as personnel often pour solutions until they see a satisfactory color. It's just human nature!
- Cost effective. Ready-to-use solutions are not cost effective options for widespread usage considerations. And as already suggested, super-concentrates, due to waste and inadequate cleaning ability, may not be genuinely suitable solutions for widespread usage consideration either.
- One-Step Functionality. You should ideally be looking for products with the ability to clean, disinfect, and deodorize in a single step; without rinsing or pre-cleaning being necessary for demonstrated efficacy. There is obviously a time and place for rinsing, as any substance will

accumulate over time, but the key here is in having a product able to function in spite of rinsing or pre-cleaning being necessary.

- Facility Sparing. Products you choose need to be compatible with the various materials commonly found in animal care facilities, like stainless steel, galvanized steel, carbon steel, aluminum, copper, vinyl, etc. With significant money invested in your facility, you don't want to destroy your investment by using products with the capacity to easily damage your facility.
- Hard water compatibility. Hard water is water that has a high mineral content. This mineral content makes some disinfectants less efficacious. If your facility is in an area with hard water, check labeling before simply assuming a particular disinfectant is appropriate for use in hard water.
- Ability to function in an organic load. This is an often easily overlooked characteristic of a disinfectant. I still run into facilities using chlorine bleach who believe they're using a product that will "kill everything," not realizing that bleach use requires pre-cleaning, as bleach is significantly inactivated by the presence of organic debris.
- Environmentally friendly. As animal care facilities utilize significant amounts of disinfectants, choose solutions as environmentally friendly as possible. Many don't realize how environmentally unfriendly some products are. Take bleach (sodium hypochlorite) as an example again. Bleach combines with organic substances to create carcinogenic byproducts (thiohalomethanes, etc.). Not good news for the environment! These facts are putting pressure on numerous state government and local municipalities to rethink chlorine use and the levels permitted for various applications. We could in fact see an emerging movement toward banning chlorine use altogether.
- Safe. You want to use products in your facility generally regarded as safe for use around animals and people. But remember, safety is often in conflict with efficacy. The key here is balance. Utilize the entire metric of this article when evaluating a disinfectant and strive for as much balance as possible.
- Ease of Use. Time is money, and the more steps it takes to do a job, the more it generally costs a facility to do that job. Products like powders that are cumbersome to handle and dilute, or products requiring pre-cleaning, add unnecessary confusion and expense to a sanitation program. You want to utilize products easy to use and safe to use.
- Pleasant Fragrance. Remember what I said earlier about customer perception. What's it look like? What's it smell like? And how am I treated? If an odor bothers you, you can bet it also bothers animals who have a much more heightened sense of smell than we do.

Odors create a negative impression of your facility and also add unwanted stress to animals as well as to your staff.

- Spectrum of Activity. Without a doubt you want to utilize products having a superior spectrum of activity against the major pathogens of concern within the animal care industry. Having said this however, it should be clear to each of you as you've been reading through this article that this single characteristic alone is an insufficient basis for choosing a disinfectant. You need a complete and balanced package.

In summary, the ideal disinfectant doesn't actually exist because the extremes of safety and efficacy are often at odds with one another in usage applications and during product development. Even still, numerous products are available today that are appropriate for use in animal care facilities and come close to the metric given in this article for identifying what an ideal disinfectant should look like. By keeping this list in mind, you'll be equipped to easily evaluate disinfecting options and decide what's best for your own particular facility. Remember that balance is key, and don't forget there's a much bigger picture to consider in developing an overall sanitation program than just, "What's it kill?"

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Dr. Seitz has a diverse business background through a variety of business affiliations. After serving in the U.S. Naval Air Corps, he attended college graduating from Michigan State University with his Doctorate in Veterinary Medicine and began private practice. He then went on to develop and build a veterinary product distributorship for one of the nation's largest Pet Product Distributors. Following that success, he moved to New England to take a position with a billion dollar a year medical supply manufacturing company and was instrumental in their efforts to build and develop a dominate presence among the veterinary community throughout the United States. He then left that position to start Alpha Tech Pet, Inc. in 1989, with a focus on developing, manufacturing, and marketing various environmental products for use in the animal care industry. Since that time he has established a strong presence in the marketplace with sales of nationally branded items throughout the United States. He owns a veterinary practice, is the managing partner of a commercial real estate operation, and is actively involved in various other entrepreneurial start-up ventures. He also serves on the New England Board of Governors for Hope International, a Christian non-profit organization committed to microenterprise development, helping the poorest of the poor around the world start small businesses. Dr. Seitz is married with two children and believes solidly in commitment to strong family values. His favorite activities outside of work are reading the Bible, spending time with his family, golf, and serving in the church in which he and his family attend.