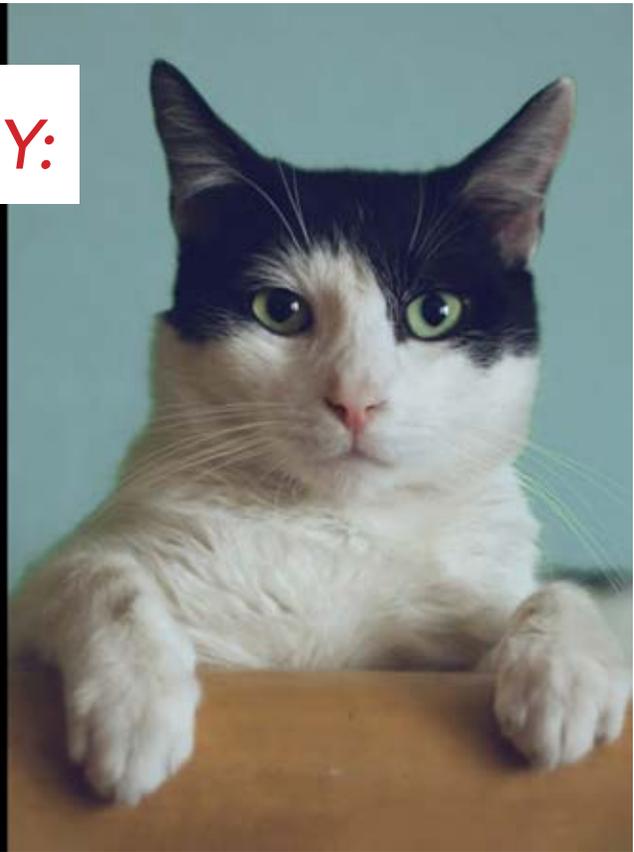


BEHIND THE STUDY:

URIs in Felines  
SIGNIFICANTLY  
DECREASED WITH  
UV Air Disinfection

By Annette Uda



Upper respiratory infections (URIs) in an animal shelter's kitten nursery decreased 87.1% when ultraviolet (UV) germicidal irradiation air disinfection systems were used, according to a recent study published in the *Journal of the American Veterinary Medical Association (JAVMA)*. The three-year, retrospective observational field trial was conducted at the Arizona Humane Society in Phoenix, Arizona using HVAC and upper air UV disinfection systems.

Airborne transmission of viral and bacterial pathogens has not been adequately addressed in disinfection protocols in animal facilities, despite respiratory pathogens posing a considerable threat to animal health in such environments. The study concluded that, considering the impact UV air disinfection had,

the airborne component of feline respiratory infections may be more significant than previously recognized.

**Study Background**

Because the use of UV germicidal irradiation in animal shelters had not been previously reported, the purpose of the study was to evaluate the effectiveness of UV air disinfection on reducing the incidence of URIs in a feline kitten nursery. The three-year field trial, conducted at a clean and modern animal care facility, began during kitten season in 2016 when no UV was in operation. From July through November 2017, the UV systems were operated intermittently in four-week cycles and then, as it became clear to the shelter staff after the 2017 season that infection rates had decreased significantly, the UV systems were operated continuously

throughout the 2018 kitten season.

Kittens were estimated to be four to eight weeks old; sometimes nursing queens were also in the nursery. Two UV air disinfection systems were installed, one in-duct (working in the HVAC system) along with one standalone upper air UV unit, which produced a combined UV dose calculated to eliminate more than 99% of targeted bacteria and viruses, including influenza virus and feline calicivirus, as well as *Bordetella bronchiseptica*, MRSA and distemper. Throughout the study, standard operating protocols for cleaning the nursery were maintained and airflow through the HVAC system was constant.

**Disease Transmission**

By way of background, the degree to which diseases are transmitted by the air may not be well understood

As we've come to understand for humans in the wake of a historic pandemic (and as this animal shelter study helps make clear for animal care), the impact of airborne transmission is considerable.

because other routes such as direct contact and ingestion may be predominant. However, there is ample evidence that many pathogens can cause infection via inhalation and they can also be transported in the air before being deposited on fomites where they can then lead to direct contact infections.

As described in the published study, "Aerosols are suspensions of solid or liquid particles that range in size between 0.01 and 100 µm (microns), may contain hair and shed skin cells, and may be produced by coughing, sneezing, vocalization, and breathing." Aerosolized droplets can remain

airborne for extended periods of time and pathogens that settle on surfaces can be re-aerosolized by air movement through HVAC systems, high-pressure washing of cages and even just walking.

As noted in the study, the three pathogens that cause URIs (feline herpesvirus-1, calicivirus and *B. bronchiseptica*), which are of great concern for animal care facilities, are known or suspected to be transmitted through the air.

Since this animal shelter study was conducted, a human pandemic has led to increased awareness and understanding of aerosols and airborne

transmission. During a presentation for Harvard Medical Grand Rounds on September 10, 2020, Dr. Anthony Fauci, Director of National Institute of Allergy and Infectious Disease (NIAID), discussed "some misunderstanding between droplets and aerosolized particles" and that aerosol and particle physicists "have told us that we've really gotten it wrong over many, many years and that particles greater than 5 microns still stay in the air much, much longer than we thought. When we used to say, empirically, that greater than 5 microns it drops to the ground and 5 microns it might be aerosolized, as we know now that this is just not the case. Bottom line is there is much more aerosol than we thought."

A micron, also known as micrometer, is a size one-thousandth of a millimeter or one twenty-five-thousandth of an inch. As points of reference, a human red blood cell is approximately 7 microns in size, while a cross-section of human hair is around 75 microns, give or take 20 microns or so depending on the hair. If you read the packaging on your air filters, it will most likely also refer to the size of microns it can trap.

When animals and humans cough or sneeze, some of the expelled droplets, which contain viruses, may be larger in size and quickly drop to surfaces where they can be eliminated with normal surface cleaning procedures, but the smaller droplets can travel farther and stay in the air longer. The significance of what Dr. Fauci shared in his presentation is that they may not



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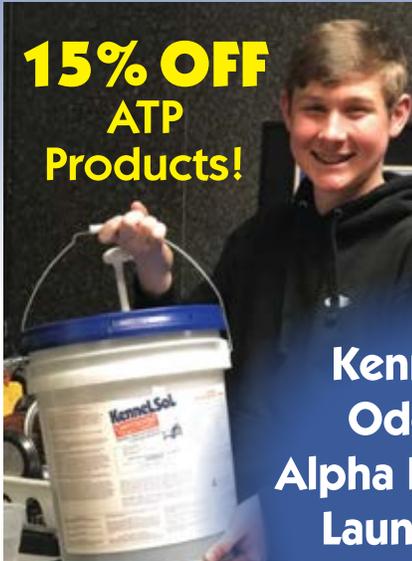
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need to be as small to travel farther and may linger in the air longer than what had been the accepted rule.

As we've come to understand for humans in the wake of a historic pandemic (and as this animal shelter study helps make clear for animal care), the impact of airborne transmission is considerable. Not covered in the published study is a look at why the airborne route in animal care may have been given short shrift.

For example, a 1977 study of aerosol transmission of feline caliciviruses<sup>1</sup> is still relied on to support the premise that the airborne route plays no significant role in transmission of the infection. But, taking a look at that now four-decades-old study, the low volume sampling methods used were unlikely to have succeeded, rendering the conclusion doubtful. Moreover, just two years later, a 1979 study demonstrated that feline calicivirus could cause infection by the airborne route.<sup>2</sup> But reliance on the 1977 study persists even today.

Sometimes it takes decades to shift commonly held views. But, for Fauci, who has been director of NIAID since 1984, that shift came in 2020. Perhaps this air cleaning study could be that perception shift for animal care.

As the JAVMA shelter study concludes, "The airborne transmission of feline respiratory infections may be more important than has been previously recognized." Further, the study's lead author, Dr. Robyn A. Jaynes, has also expressed, "Even in well-ventilated spaces already outfitted with air filters, like the subject kitten nursery, more may need to be done to clean the air."

## Study Results and Beyond

The study's big takeaway, of course, is that URIs decreased a remarkable 87.1%, but additional, unpublished data was just as notable. During the 2017 kitten season, when the systems were operated only intermittently, there was an overall 76.6% reduction in URIs, compared with the year prior when no UV was in operation. In short, as the study further concludes, air disinfection using UV germicidal irradiation systems "may be an effective adjunct to standard infection prevention and control protocols in reducing the risk of transmission of respiratory pathogens among kittens in nurseries and shelters."

Finally, another aspect only lightly touched on in the study, but worthy of future study, is the impact of air cleaning with UV in terms of costs. While costs were not evaluated in the present study,

the authors did note that "because the incidence of URIs was reduced when the UV systems were used, the cost of the systems per kitten per stay could be lower than the cost of care per sick kitten per stay after a nominal payback period. The purchase and installation of the UV systems are one-time costs, and the cost to power the systems is minimal. ■

*For the formal details and analysis, be sure to read "Effect of ultraviolet germicidal irradiation of the air on the incidence of upper respiratory infections in a kitten nursery," by Robyn A. Jaynes, DVM, Melissa C. Thompson, DVM, and Melissa A. Kennedy, DVM, PhD, in the November 1, 2020, issue of JAVMA.*

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