Viral Transmission and Filtration Capabilities of CONMED’s Smoke Evacuation Technology

Dear Valued Customer,

With the recent focus on viral transmission across the globe, the purpose of this letter is to provide insight to the literature that exists regarding the potential transmission of disease through surgical smoke in open and laparoscopic procedures, and to clarify the filtration capabilities of the CONMED’s Smoke Evacuation products.

A wealth of literature exists studying the potential transmission of biological material through surgical smoke generated from electrosurgery devices, lasers, and ultrasonic scalpels. Whole, intact virons have been isolated from smoke created by laser tissue ablation, and the virons ability to cause infection has been documented. Researchers have identified HIV DNA and intact strands of HPV DNA in laser smoke. Another study found the presence of infectious viral genes, infectious viruses, and viable cells in surgical smoke. In addition to viruses and their constituents, viable bacteriophage, cellular clumps, and erythrocytes have been identified in laser smoke. Intact virons have also been uncovered from smoke generated from electrosurgery with demonstrated ability to cause infection.

Researchers have studied the transmission of infection through surgical smoke. In a study by Baggish et al, researchers demonstrated that transmission of the HIV DNA recovered from surgical plume to cultured cells was possible. While the possibility of transmission has been demonstrated in vitro, cases documenting pathogen transmission in vivo are less common. One case of surgeon contracting laryngeal papillomatosis after treating a patient with anogenital condyloma with laser tissue ablation strongly suggests transmission through surgical smoke. The HPV types contracted by the surgeon matched those of the patient they treated, and no other methods of exposure other than inhalation of surgical plume were identified as risk factors. Contraction of verrucae (a highly contagious wart treated by laser ablation) by laser operators in unusual sites such as the anterior nares of the nasal cavity have been documented and suggest transmission via surgical smoke. A study of surgeons treating warts at the Mayo Clinic showed that, while prevalence was not elevated in the group relative to the general population, 13% of surgeons contracted warts of the nasopharynx, which is an uncommon infection site in the general population.

Smoke Evacuation in the OR may minimize the risks posed by creation of surgical smoke during both laparoscopic and open procedures. A study by Matchette et al concluded that the average particle size carrying viable bacteriophages in laser smoke had a mean aerodynamic diameter of 7 - 55 µm. CONMED’s smoke evacuation product line, including the Buffalo Filter line of smoke evacuators and filters, contain filter media known as Ultra Low Penetrating Air (ULPA) media. This media is validated to capture particles down to 0.1 µm at 99.999% efficiency. Although it is true that some viruses can be in the sub-0.1 µm range, these types of ultra-fine organisms or particles are beyond what traditional test equipment is able to detect. Therefore, our filter claim is removal of particles from 0.1 to 0.2 µm at 99.999% efficiency. However, it is widely accepted in our industry that as particles smaller than 0.1 µm...
challenge the filter, they are easier to capture as they are less motive in the airstream. In other words, the particles do not impact or penetrate the filter at the same velocity as larger particles because their mass is not large enough to capture the air speed velocity, making them easier to trap.

Biologic material is a known component of surgical smoke. The aerodynamic size of COVID-19 has been reported in the range of 0.06 – 0.14 µm; HIV viruses has been reported as 0.12 µm; HPV has been reported as 0.055 µm; and Hepatitis C has been reported as 0.06 µm in diameter. Based upon this published data, capture of even these sub-0.1 µm particles is possible.

In conclusion, more literature is needed investigating the risks of viral transmission via surgical smoke. While it is not feasible to remove 100% of surgical smoke, using smoke evacuation during surgery can reduce these risks associated with exposure to surgical smoke. The US FDA has reviewed the safety testing and validation of our devices, as has Health Canada and the Notified Bodies in Europe. We have satisfied their requirements and can substantiate our claims of risk reduction.

Best regards,

CONMED – Advanced Surgical