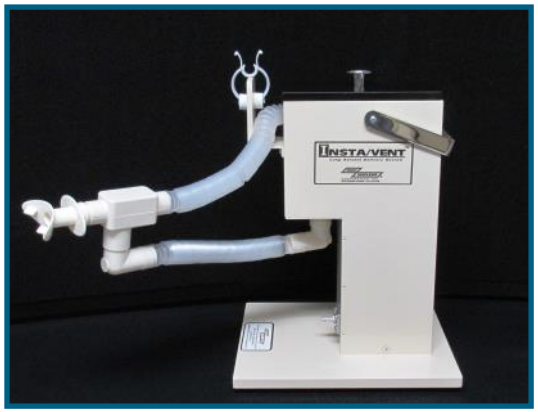
TIP SHEET: COVID-19 SAFETY DURING RADIOAEROSOL DELVERY 2.0

SYSTEM DESIGN



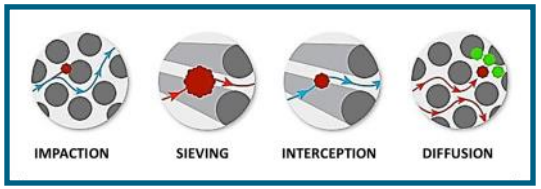
- Radioaerosol delivery systems are closed systems. A closed system is a system where only energy can be exchanged with its surrounding, but not matter. Matter cannot be exchanged because it contains particles which cannot cross the boundary of the system[1]. In the case of ventilation studies, energy would be airflow entering and exiting the system and matter would be particles trapped inside the administration kit by a HEPA filter.
- One of the biggest and most easily attained benefits of implementing a closed system, whether in research, pilot or large scale, is in reducing the risk of contamination by viruses or other adventitious agents[2].

BREATHING TECHNIQUE

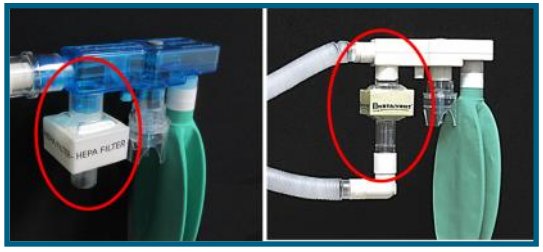
- With Medi/Nuclear's Aero/Vent™ and Insta/Vent™ Radioaerosol Delivery Systems, just normal tidal breathing is required, rather than deep breathing or a breath hold, which are likely to invoke coughing in a sick patient.
- Not only is normal, tidal breathing more comfortable for a patient, and therefore likely to improve compliance, it also allows the very small particles to be delivered to the alveoli.
- Research has shown that when drugs inhaled at a slow inspiratory rate and those at a faster rate are compared, faster inhalation was less effective because more drug impacted in the oropharynx and was lost[3].

FILTRATION

- At roughly 0.1 µm, Covid-19 virus particles are very small, but they don't travel alone. Covid-19 particles are exhaled with salivary/mucous droplets starting from approximately 0.5 µm in size[4].
- Aero/Vent™ and Insta/Vent™ radioaerosol administration kits come with a proprietary viral HEPA filter, as standard.
- According to the Centers for Disease Control, by definition, a High Efficiency Particulate Air (HEPA) filter is **at least 99.97% efficient** at capturing particles 0.3 µm in size. This 0.3 µm particle approximates the most penetrating particle size (MPPS) through the filter. **HEPA filters are even more efficient at capturing particles larger and smaller than the MPPS. Thus, HEPA filters are no less than 99.97% efficient at capturing human-generated viral particles associated with SARS-CoV-2[5].**
- HEPA filters do not simply strain (sieve) particles. They physically remove them from the air stream using a combination of processes (Impaction, Sieving, Interception, Diffusion)[4]. Depending on their size, particles may move rapidly, colliding and sticking to filter fibers, continue on their path using inertia, until they stick to the sides of fibers, or bounce off each other, moving in completely random patterns until they hit and stick to filter fibers. Together, these processes create a 'dynamic collision trap' as particles pass through the network of air channels between fibers at various speeds[4].



MEDI/NUCLEAR'S PROPRIETARY HEPA FILTER



- All of Medi/Nuclear's radioaerosol administration kits, as well as select Xenon administration kits **AND** respiratory nebulizing devices, utilize a proprietary viral HEPA filter.
- HEPA filter testing was performed by Nelson Laboratories, which provides a more severe challenge to most filtration devices than would be expected in normal use[6]. As required, results confirmed **at least 99.97% trapping efficiency** of particles 0.3 µm in size.
- HEPA filter testing performed in Medi/Nuclear's aerosol lab has shown **99.9825% trapping efficiency, under normal patient use**.
- According to research performed by the National Aeronautics and Space Administration (NASA), when used alone, HEPA-rated media provides superior performance for **removing virtually 100% of particulates[7].**
- Those doubting this should keep in mind that very few, if any, particles will pass through a HEPA filter but should they, not every exhaled particle will be virus laden or carry a significant viral load. If desired, a second HEPA filter may be added. HEPA filters are available at 20/case, using model #2890 .

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PATIENT DOSING

- Radioaerosol dosing can be performed in a room other than the scanning room, reducing possible contamination of the camera.
- Should a sick patient cough during dosing, the air source may be turned off and dosing resumed when the patient is ready.
- After a procedure, before removing a face mask or mouthpiece, have the patient continue breathing room air via the circuit for an additional 20-30 seconds (4-5 breaths). This will maximize the clearance of any remaining activity in the tubing and reduce the possibility of inadvertent contamination to the patient, Nuclear Tech, or room by allowing particles to be captured in a HEPA filter.
- When there is a high incidence of infectious disease, or a patient's condition is unknown, it is wise to treat all patients as being potentially infected and utilize available safety precautions.

PATIENT INTERFACE

- When Covid-19 is suspected or unknown, a secure, properly fitted air cushioned **face mask (#MN5045) with head harness (#MN9676)** are recommended. The face mask will cover a patient's face and mouth, and allow any coughs to go through the circuit and into the HEPA filter, without contaminating internal shield components. **Note:** Aero/Vent™ and Insta/Vent™ administration kits are available with air cushioned face mask.
- **Merely placing a face mask on a patient's face may not allow the edges to seal securely.** To properly apply a face mask, 1) place it on the bridge of the nose and then 2) carefully roll it down toward the chin.
- A **face mask harness (#MN9676)** is recommended as it will help to secure the face mask, reducing possible contamination from a poorly fitted or loosely held face mask.
- Should a mouthpiece be needed, Medi/Nuclear's scuba style **Safety Shield™ Mouthpiece (#MNMP500)** with protective cap, is suggested. As compared to a straight mouthpiece, the scuba style 1) provides better protection against leakage from the corners of a patient's mouth, 2) is less likely to slip from a patient's mouth, and 3) features bite wings to open the teeth slightly for improved airflow. The cap can be used to catch contaminated saliva during mouthpiece removal and then to cover the mouthpiece for a safer disposal.
- When using a mouthpiece, be sure to properly apply a **nose clip (#MN1050)** to prevent leakage from the nose. To place a nose clip properly, ensure the nose pads are located on the lower part of the nose, keeping nostrils closed tightly. If a patient is placing the nose clip, check to make sure it is located properly. This will enhance safety and speed up dosing.

CLEANING/DISINFECTING

- Cleaning and disinfecting Aero/Vent™ and Insta/Vent™ Radioaerosol Delivery Systems is a simple process that may be performed following each patient.
- Administration kits can be quickly removed from a shield and are fully disposable, reducing the possibility of cross-contamination.
- Lead shield surfaces are non-porous and may be gently wiped down internally and externally with rubbing alcohol or other disinfectant, and then left to air dry.

REFERENCES

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