May 2022

Virus-Safe Schools— Going Biologic

School administrators have taken extraordinary measures to safeguard school building occupants during the pandemic. However, we have learned much in the last two years about viruses and schools. Our approach to better protect those in our buildings must utilize this better understanding of viruses and consequent risks to school building occupants.

The following concepts are important for school administration:

1. HOW VIRAL DISEASE IS AND IS NOT SPREAD IN THE SCHOOL

Virus spreads through **inhaling another person's breath**. It typically doesn't infect through touching desks or doorknobs or even shaking someone else's hand.

The Centers for Disease Control estimated that over $250 per student has been spent annually in wiping down and re-wiping surfaces in school rooms. The belief was that touching surfaces someone else had touched and then touching your mouth was the primary root of exposure. It isn't. The virus typically spreads by inhaling a significant quantity of another's exhaled bronchial fluid which contains the virus. The greatest risk is inhaling biologically contaminated air in a schoolroom, not contaminated surfaces.*

We don't discourage responsible cleaning of often touched surfaces, or certainly hygienic handwashing. However, the focus must shift to monitoring and controlling breathing zones.

*Johns Hopkins School of Public Health found that 75% of teachers reported spending significant professional time wiping down their classrooms. This use of educator's time is a serious consideration for school administration.

Mask the building before masking people.

2. A BIOLOGIC APPROACH TO SAFE SCHOOLS

Safe school room air is not typically influenced by more restrictive air filters, or engineering adjustments to the traditional ventilation system. School facility managers **need to get "biologic."** They must calibrate risk and response on a room-by-room basis in terms of actual risk of infection through exposure to contaminated air.

Contamination is **not generated outside the school room**. Again, exhaled breath from others in the room is the primary source of contamination and risk. The bronchial fluid necessary to spread infection will virtually never survive passing through a ventilation system and thereby contaminating another room or area.

The bronchial fluid containing the virus dissipates rapidly, rendering the virus harmless. In outdoor air it quickly disintegrates. Upgrading air system filters or incorporating UV radiation or ionization systems inside a school air handling structure has value. However, these steps by themselves may not influence the burden of bronchial fluid threatening room occupants. Enhanced air exchange may be beneficial if room air circulation is also monitored; otherwise, **turning up the volume of air exchange may increase risk**.

There is clear research documenting that where air volume has been enhanced without monitoring circulation, it may pass over those infected, creating a "super-spreader" event. Those "down wind" from the increased air exchange volume may be placed at greater risk. **There must be documented sensitivity to in-room circulation.**

3. DETERMINING RISK

The relative risk of any school room, assembly area, music room, athletic area, or classroom etc., can be determined by calibrating the probability of inhaling another's breath. This is accomplished by **measuring the differential of carbon dioxide between the school room and the atmosphere outside the school**. A school can quickly and inexpensively determine relative risk within a room or area if the correct procedures are followed.

There is a protocol for determining the probability of inhaling someone else's exhalations within a given space (room or area), defined as **Differential Carbon Dioxide Proxy Analysis or dCO2**. Essentially, using an established procedure, the CO2 burden is calibrated outside the school building and then, shortly after a classroom or any inside area is vacated, a series of additional CO2 readings are taken. The test results are entered into an algorithm and **each room or area can be rated for viral exposure potential**. The dCO2 process is described and illustrated at the ERC website (envrc.org).

DISCUSSION

With enhanced understanding of viruses in general, especially SARS Covid 2, the procedure for identifying potential risk in a school room becomes straightforward.

It is probable that through dC02 the school room will be identified as generally safe. Building occupants, parents, and the community may then be assured of relative safety. If the readings indicate a probability of risk, procedures for safeguarding the area can be implemented and relative safety obtained. Remediation typically relates to adjusting air exchange/circulation, controlling humidity and adjusting occupancy.

It will be valuable for school facility managers to share information regarding how they responded to areas of risk. For instance, if a choral group has used separation, reduced class size, or enhanced room air exchange/circulation, and can document improved safety, their procedures should be shared with other schools. This process would be especially significant as it relates to athletics and physical education, assembly areas, the use of musical wind instruments, theatric presentations, social events, lunchrooms, etc.

We believe straightforward protocols must be put in place to facilitate schools returning to normal. It begins with determining the relative risk of viral exposures.

DO "MASKS" WORK?

Yes! Masks block and rupture exhaled bronchial fluid containing the SARS virus, but they also frustrate education. The human face is far more than a context for the spoken word. It powerfully communicates. When communication is frustrated by muffled speech and a blocked out face, the educational process is diminished. In situations of defined risk, masks are important, but to the extent possible they should not be institutionalized in schools. The schools, not occupants, should be "masked" when possible.

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