RESPIRATORY RESEARCH, INC.
1167 Raintree Drive Charlottesville, Virginia 22901 USA
www.respiratoryresearch.com (434) 825-7627 fax (++1) 512 233-2281 info@respiratoryresearch.com

What About Salivary Contamination?

Particles formed in the lung must be able to escape through the narrow and turbulent portion of the vocal cords and glottis, turn the 90° corner of the retropharynx and then on through the mouthpiece of the EBC collector. During this process, larger particles are much more likely to get trapped as they round corners. Only particles that have low enough inertia to turn 90° corners can pass out of the lung, through the mouth, and enter the EBC collection system. Although we would love to have particles > 5 microns derived from the lung entering the condensation chamber, such particles do not even make it to the mouth.

However, particles formed in the mouth do not have those corners to navigate. Large particles that might be formed in the mouth are more likely to flow directly out into the mouthpiece of the collector without being trapped by impaction. We don't want these particles entering the condensation chamber. Thus the RTube™ has a 90° turn built into it to minimize contamination by larger particles that could not be coming from the lung.

In intubated subjects, data reveal increased amounts of protein in EBC compared to orally breathing controls, suggesting one of the following: 1) more particles are generated in intubated subjects, 2) particles generated and collected in condenser are larger in intubated subjects, 3) the airway lining fluid contains more proteins in subjects so far examined, either because of the disease process or because of the irritant effect of the endotracheal tube.

Recommendations for minimizing oral contamination.

Gross salivary contamination is not a common problem in EBC collections. Unfortunately, that does not mean that oral secretions are not entering into the sample. Indeed, we believe that for oral EBC collections, the mouth unequivocally contributes to the EBC sample-it must, as it is part of the airway. Simple absence of amylase measured by activity assay cannot be used to confidently exclude any oral contribution. But for most samples, the contribution of oral secretions to the volume of the sample is tiny. Not surprisingly, saliva does contain many/most, perhaps even all of the mediators that have been identified in EBC. Of course, presence in saliva does not mean that the mediator arose in the saliva. Even amylase is formed in the lower airway to some extent.

We believe that having patients swallow their accumulated saliva is perhaps useful in presenting gross contamination. In this regard, some patients allow saliva to flow freely into the mouthpiece of any EBC collector. If the collector has no way to trap that saliva, it will in some part enter the collected sample.

The RTube excludes gross salivary contamination by means of a large saliva trap. Gravity will tend to move saliva downward, while the exhaled breath moves upward through the RTube condenser.

For additional protection from saliva, the RTube can be readily fitted with a filter of any size you wish. We supply 0.3 micron filters that allow no gross saliva contamination at all. These filters also of course trap larger particles, and therefore may decrease the concentrations in EBC of substances of interest. Theoretically, a size-particle filter will tend to increase the proportion of EBC solute that emanated from the lungs in comparison to the mouth.

The filter (which can be placed between the mouthpiece and the condenser) has no effect on volatile constituents of EBC, such as pH, ammonia and acetic acid. It has minimal if any effect on nitrogen oxides.

Some people have discouraged the use of filters for EBC. We believe there is simply not enough data available to discourage their use, and that investigators should perform sufficient controls and validations to assure the system is optimal. In this regard, the flexibility of the RTube allows attachment of just about anything you might want: flow meters, end-tidal CO_2 monitors, filters, ventilator circuits, exhaust gas bags, etc.

Please contact us at info@respiratoryresearch.com with any questions or thoughts you may have.