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At What Temperature Should We Keep the Aluminum Sleeves?

One of the important design features of the RTube™ is that it can be used at any temperature. You can chill the aluminum sleeve in a home freezer (-4 to -17°C), a refrigerator (+4°C), or in laboratory freezers at -20°, -40°, -80° or any other temperature you so choose. The colder temperatures modestly increase the volume of EBC collected in a given time period.

The temperature of collection may be important for certain EBC constituents although little data have been published in this regard. Almost assuredly, the optimum temperature of collection for one mediator/constituent will be different than others. A one-temperature machine therefore may be limiting. The RTube allows you to start with any temperature you would like.

Some theoretical issues regarding temperature are discussed below.

Stable non-volatile compounds will be unaffected by temperature. Sodium, urea, heavy metals, and many others fit into this category. Although colder temperatures increase volumes of EBC collected, it has not been yet shown whether this greater volume per minute dilutes the sample further or allows enhanced collection of the mediator of interest.

Volatile water-soluble components of EBC theoretically may be affected by collection temperature. If the condenser is very cold (initial temperature less than -20°C in practice), EBC is collected as a solid (ice crystals or snow). This may limit the amount of exhaled volatiles that can be subsequently absorbed into the EBC, once formed. It is important in this context to realize that EBC consists of components that must be thought of completely independently: nonvolatiles and volatiles. When studying pH (which is determined primarily by volatile constituents) we recommend temperatures within 10° of 0°C)

The optimum temperature of collection for volatile unstable compounds (for example hydrogen peroxide) has not yet been reported.

For unstable non-volatile compounds, again the optimum temperature of collection is not yet reported. Although it seems reasonable to collect at the coldest possible temperature, some investigators have stated concern that recurrent freeze-thaw can damage certain molecules. We are not sure that this concern is reasonable, but nor do we have data to say otherwise. Whenever EBC is collected as a solid, there will be multiple freeze-thaws, indeed, probably with every breath.