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## How Does EBC Compare to Induced Sputum?

There are publications comparing these two techniques from certain angles. For example, EBC pH has been compared to induced sputum cellularity in asthma, COPD and bronchiectasis (with excellent correlations of EBC pH with sputum eosinophilia in asthma and neutrophilia in COPD and bronchiectasis). EBC hydrogen peroxide has likewise been compared to induced sputum cellular indices with excellent correlations. EBC aldehydes have been compared directly to aldehydes in induced sputum, with poor correlations noted.

It should be remembered that induced sputum is a very different material than EBC. Nonetheless the techniques do have parallels: both techniques risk oral/salivary contamination and both samples arise from unclear levels of the airway.

Induced sputum is probably considered non-invasive, but it is not completely without risk to the patient. If done cautiously in patients without severe airway obstruction, and with beta agonist pretreatment, induction of sputum is usually quite safe. However, it does commonly lead to bronchoconstriction, and reports of hospital admissions secondary to complications of sputum induction exist. Induction usually requires inhalation of hypertonic (occasionally hypotonic) saline while having the patient cough repeatedly. This process, in addition to triggering cough and bronchospasm, likely also leads to pro-inflammatory substance release from nerves and epithelium. Indeed, induction of sputum is thought to lead to a prominent transient neutrophilia in the airway (which can be identified if sputum induction is performed 4 hours after the initial induction.)

On the other hand, EBC can be considered truly and unequivocally non-invasive. Supplying an EBC sample is no more dangerous than playing a clarinet. Although inhaling through the mouth during collection may lead to mild airway drying effects, much of the population of the planet are chronic mouth breathers for 24 hours per day, so it is hard to believe that a 10 minute period of oral breathing is likely to cause much difficulty (of course, always be cognizant of patients' amazing abilities to not follow "rules"). One can collect EBC samples repeatedly during a day with confidence that no important alteration of the airway environment is occurring. This allows EBC to be used as an endpoint in clinical trials in which acute effects are sought.

Technically, the collection of EBC is certainly simpler and safer than sputum induction. How about the assays? Sputum assays provide cellularity, which is something that EBC cannot do. But the mucoproteins in induced sputum may prohibit effective assays for many specific proteins. Although this concern is of substantially no import in EBC, the extensive dilution of EBC compared to its airway lining fluid components makes many assays insufficiently sensitive to be used in the EBC setting. There are regularly new and better assays that will make EBC an increasingly useful body fluid sample.