Reviewer’s report

Title: Monitoring of oxidative and metabolic stress during cardiac surgery by means of breath biomarkers: an observational study

Version: 1 Date: 2 July 2007

Reviewer: Anton Amann

Reviewer’s report:

General

The present manuscript deals with the chemical analysis of exhaled breath for the monitoring of the status of patients during cardiac surgery. A particular focus is on the spotting and quantification of oxidative stress as well as effects of ischemia and reperfusion during and after extracorporeal circulation (ECC).

The authors determined the time course of three different compounds, acetone, isoprene and pentane during cardiac surgery. The formulation of the problem and the hypotheses are clear and succinct. Acetone is considered as a marker for glucose metabolism and lipolysis, and pentane as a marker for lipid peroxidation. The isoprene concentration in exhaled breath is dependent on cardiac output, and its use for medical monitoring is still open to discussion (perhaps making it necessary to correct for effects of cardiac output in the future). The exhaled breath samples have been collected in a capnometer-controlled manner, with subsequent investigation by gas chromatography (GCMS) with preconcentration by solid-phase microextraction (SPME). Samples have been taken after intubation, after sternotomy, and 30min, 60min, 90min, 120min, 150min postoperatively. All concentrations are normalized with respect to the concentration determined 120min postoperatively. In this way every patient serves as his/her own control.

The main results are:

· the concentration of acetone increased slightly after sternotomy and markedly after end of ECC,
· the concentration of isoprene increased significantly after sternotomy and decreased to initial values at 30min after end of ECC,
· the concentration of pentane increased markedly after sternotomy and dropped below initial values after end of ECC.

In the discussion, the authors compare their results with the results of other research groups. Interesting parallels arise with the clinical papers of van den Berghes, which could demonstrate a correlation between patient-outcome and the blood glucose levels.

I do not know of any other work which describes the time course of concentrations of volatile compounds in exhaled breath during operations in an
equally detailed and careful manner. The discussion and the conclusions are very well balanced, the results are adequately supported by the data. In addition, the manuscript is very well written. I am sure that this manuscript will set a benchmark for future studies on exhaled breath analysis during cardiac surgery. Therefore I highly recommend the manuscript for publication in the “Journal of Cardiothoracic Surgery”.

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Major Compulsory Revisions (that the author must respond to before a decision on publication can be reached)

none

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Minor Essential Revisions (such as missing labels on figures, or the wrong use of a term, which the author can be trusted to correct)

none

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Discretionary Revisions (which the author can choose to ignore)

What next?: Accept without revision

Level of interest: An article of outstanding merit and interest in its field

Quality of written English: Acceptable

Statistical review: No, the manuscript does not need to be seen by a statistician.