Reviewer's report

**Title:** Can Modern Infrared Analyzers Replace Gas Chromatography to Measure Inhaled Anesthetic Vapors Concentrations?

**Version:** 1  **Date:** 7 October 2007

**Reviewer:** Philip Peyton

**Reviewer's report:**

General

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

1. **Documentation of reliability and precision of GC (and IR):**

   The paper seems to report the scatter in agreement of individual measurements by GC and IR across a range of gas concentrations and species. My major concern with this study is the authors' assumptions regarding the use of GC as a standard for the assessing the accuracy of IR. The paper seems to largely ignore the issue of reproducibility (precision) of either GC or IR, which makes interpretation of the results difficult.

   For example, the authors state that the standard deviation (SD) of repeat GC measurements is said to be 2-3% by Dr. Eger. However, they don't document the precision of their own GC measurements, which would be a simple thing to do, taking multiple samples from a given preparation at each concentration. There appears to be considerable scatter in GC measurements along the x-axis in Figure 1.

   If the SD of GC = 3%, so 2XSD = 6% either side of the true value. Therefore up to 6% of the scatter in agreement with IR may arise from the GC standard itself. Where differences between IR and GC of around 10-20% are being found, should not multiple measurements from each sample be made at each concentration to narrow these GC confidence limits?

   At each concentration, how many repeat measures were made (if any)? What are the confidence limits for a given measurement by either GC or IR?

   They, quite rightly, used the first and last 10 mL of each gas sample for GC analysis and rejected the measurement if these differed by more than 1mm. Perhaps they can tell us how much proportional scatter in GC measurements 1mm represents.

2. **Details of IR sampling:**
How was data obtained from the IR device? Was it simply read from the screen of the analyzer? How many digits of precision (at the low concentrations particularly) does this provide?

How stable was the measured concentration of gas sampled from the glass syringe during this process? How did they deal with the problem of the negative pressure generated within the syringe during sampling (this would occur rapidly, since the sampling rate of the IR device is about 200 mL/min). This would potentially cause significant artefact. Inevitable sticking of the plunger of the syringe during sampling would lead to considerable variation in measured partial pressure, and would not be fair test of the device.

Did they consider using analog download of their IR concentration data to computer memory for inspection and analysis of their concentration waveforms?

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

Methods:

The authors say that they calibrated the GC against secondary (cylinder) standards which had been themselves been calibrated against a primary volumetric standard. I accept this although the details of the preparation of the primary standard are not given. Grammatical corrections:

Title: Change to “… Anesthetic Vapor Concentrations?” or “concentration of anesthetic vapors?”.

P10. Last paragraph. “clinically” not “clinical”.

Figures:

Fig 1 “Company limits”? Explain this term in the Figure legends as well as the text, please.

Discretionary Revisions (which the author can choose to ignore)

What next?: Unable to decide on acceptance or rejection until the authors have responded to the major compulsory revisions

Level of interest: An article whose findings are important to those with closely related research interests

Quality of written English: Acceptable
Statistical review: Yes, and I have assessed the statistics in my report.

Declaration of competing interests:

I have a non-financial interest insofar as I have published a method using an IR device instead of GC for measurement of anaesthetic gases (as quoted in the text).