Title	Modelling of Inhalation Exposures to Pharmaceutical Agents
Author(s)	Mc Donnell, Patricia
Publication Date	2011-09-09
Item record	http://hdl.handle.net/10379/2226

Exposure Assessment Training

Introduction

A training exercise in carrying out exposure assessments using the exposure model to provide reliable and accurate assessments was carried out at the commencement of this research. The initial exposure model developed by Cherrie and colleagues (1996) was used for carrying out these exposure assessments, using a training exercise has previously been carried out by multiple assessors (Semple *et al.*, 2001).

Methodology

This task involved estimating the personal inhalation exposures of operators carrying out forty four various jobs involving exposures to a range of chemicals: toluene, asbestos, man made vitreous fibers (MMVF), respirable dust, and polycyclic aromatic hydrocarbons (PAHs). Details were provided outlining the tasks, work environments and chemical substances. In addition guidance material was provided on model input parameters, including intrinsic emissions and handling factors. The assessments were carried out 'blind' to the actual measured values. Training involved a brief introduction to the assessments by an experienced exposure assessor who had previously assessed the current exposure scenarios.

The assessments were recorded in a formatted spreadsheet which was provided at the beginning of the training exercise. Prior to commencing the assessments, the minimum acceptable standard in relation to accuracy was specified.

- A correlation coefficient of greater than 0.80 between the log transformed estimated and log transformed measured values. Correlation coefficients were determined to assess the capability of the model to separate high from low exposures concentrations.
- Model bias i.e. the ratio of their geometric mean estimate to the geometric mean measured value should be <4. This was determined to assess accuracy; bias values greater than 1 show an overall overestimation of the exposure and less than 1 show an underestimation (Semple *et al.*, 2001)

Once all exposure assessments were completed, the completed spreadsheet was analysed independently by a trained exposure assessor at the Institute of Occupational Medicine (Dr. Anne Sleeuwenhoek). A summary of correlation coefficients and Model bias across the forty four jobs or exposure scenarios is presented in Table 1.

Results

Table 1: Correlation coefficients and Model Bias across the exposure scenarios

Substance	**Correlation coefficient**	**Model Bias**
Toluene	0.98	0.91
Asbestos	0.88	1.26
MMVF	0.61	0.99
Dust	0.94	0.65
PAH	0.74	2.97
All substance types	0.83	1.2

Results for toluene, asbestos and dust are above the acceptable standard of 0.80 (range 0.88-0.98). The ability to assess between low and high exposures was less desirable for the MMVF and PAH tasks. The correlation coefficients for these tasks ranged from 0.61-0.74. Averaged over the substance types, the log-transformed estimate showed a good association with the log of the measured value (0.83).

The degree of accuracy (i.e. how close the estimated is to the measure value) was assessed using the ratio of the geometric mean of the estimate to the geometric mean of the measured/observed value; these results are also presented in Table 1. For the toluene, MMVF and dust the estimates are all within a factor of 1 of the measured values. Dust was underestimated, and was 65% of the measured value, while asbestos was slightly overestimated by 26%. Only for PAH was there a significant overestimation. The results show that the estimates are all within a factor of 3. Overall the above results were deemed acceptable, as the estimates were found to correlate well with the actual measured exposure data.

Conclusions

From these results, the assessor was deemed to be trained to an acceptable standard of accuracy and consistency in using the exposure assessment model. This was considered an important training exercise to complete before continuing to carry out exposure assessments with the source receptor exposure model.