Design of measurement strategies for workplace exposures

I write in response to the article by Hans Kromhout, which sets out the case for exposure monitoring and proposes robust strategies for collecting data. He acknowledges that exposure monitoring may be expensive, but justifies it on the grounds that it is needed to ensure worker protection and data can be used for multiple purposes (hazard evaluation, control, and epidemiology). All this ignores the variety of competences and numbers of firms who use chemicals in the workplace.

We agree that good quality exposure data are extremely valuable for assessing the effectiveness of control measures, studies on health effects related to use of specific substances, and for long term epidemiological studies. Now that workers do not normally remain in one job all their working life and move from one job to many jobs in different industries, the lack of well validated exposure measurements is a concern. It will limit our ability in the future to carry out meaningful epidemiological studies.

In my paper I estimate that over 1.5 million firms are using chemicals. It is not realistic to suggest that all these firms should be carrying out the type of sampling regimes the article suggests would be astronomical and there is no capacity to collect, analyse, and interpret all the samples that would be generated. Recognising this and that small firms needed help to apply the risk assessment requirements of the Control of Substances Hazardous to Health (COSHH) Regulations, led HSE, in collaboration with industry and trade unions, to develop the COSHH Essentials.

COSHH Essentials is not intended to replace the collection of well validated exposure data, where that is justified; rather it is intended to help firms, particularly small and medium sized firms, to properly control the chemicals they are using. Inevitably a generic system like COSHH Essentials which groups chemicals, has to err on the side of caution, but the controls recommended by COSHH Essentials were peer reviewed by an expert group established by the British Occupational Hygiene Society and have the support of the industry and trade unions. COSHH Essentials has been used now for over three years by many firms. We have not had complaints that the controls are over precautionary. Thus we reject the implication in the article about COSHH Essentials that “all advised control measures will arguably be even more costly in the long run, a classic case of being ‘penny wise but pound foolish’”.

The article misrepresents the purpose of the expert system, Estimation and Assessment of Substances Exposure (EASE). This was developed to help meet the requirement under the Dangerous Substances Directive for a risk assessment on new substances. As workplace exposure data cannot be collected on new substances prior to release to the marketplace, EASE was developed to provide an exposure estimate for use in risk assessment. It is entirely appropriate that this should be precautionary. It is not a weakness as the article implies. EASE is not intended as a tool to help employers control exposures in the workplace.

The aim of chemical control is the protection of employees’ health. This is best achieved with a range of tools. EASE has a valuable contribution to make before substances are released into the marketplace; COSHH Essentials is proving to be a valuable and welcome tool for many small and medium sized firms, helping them to establish suitable controls. The recently launched electronic version will be of even greater help to many small firms. In other circumstances structured data collection is needed. These tools all have a valuable role to play. They should be viewed as complementary, not as alternatives as the article suggests.

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Author's reply
I would like to reply to the comments made by Dr Michael Topping with regard to my article on measurement strategies for workplace exposures. His response is focused on my introductory words on the development and promises of tools like COSHH Essentials and EASE.

His main point is that I would ignore the variety of competences and number of firms who use chemicals in the workplace and that proper evaluation (with actual measurements of workplace exposures) would come with astronomical costs and would not be possible due to lack of expertise. Together with the editor of the Annals of Occupational Hygiene, I question whether the introduction of tools like COSHH Essentials has contributed to the collapse of full time training of occupational hygiene professionals in Britain through lack of demand for expertise. As I pointed out in my paper, measurement strategies that involve workers in the sampling procedure can be very cost efficient and have been shown to be working. The claim that nobody has been complaining about controls being over precautionary after using COSHH Essentials is disingenuous. For instance, what if a company, after applying COSHH Essentials is advised to take expensive control measures, while actual measurements show that exposure levels are well under the occupational exposure limits? With COSHH Essentials erring on the safe side, this will likely often be the case.

The comment that I would misrepresent the purpose of the EASE expert system is false. Dr Topping forgets to mention that EASE was developed not only for new substances but also for existing substances. In addition I am aware of training courses that have been given in my own country where EASE was propagated as a tool to evaluate substance exposure in workplaces. If this expert system is only to be used for risk assessment purposes, HSE should start labeling it with the phrase “not intended to be used as a tool to help employers control exposures in the workplace”. However, in the documentation that came with my version of EASE we can read “Modelled data may be derived from the general purpose predictive model for exposure assessment in the workplace described in this paper and called EASE”.

The real problem with tools like EASE and COSHH Essentials is that they are not properly evaluated before they are launched into the occupational health arena. Peer review by an expert group established by the BOHS and support of industry and trade unions cannot replace the necessary scientific rigour of testing reproducibility and validity and having these studies peer reviewed in scientific journals. Testing validity long after introduction of a tool, as happened with EASE, would not have been tolerated when EASE would have been, for instance, a medical diagnostic tool, or even closer to home an analytical method to measure styrene. HSE is apparently not too happy with the accuracy of EASE either, since I am informed that a project is underway to create a more valid expert assessment tool.

Even though Dr Topping justifiably suggests that the tools should be seen as complementary, the place of “structured data collection” remains unclear in his letter. One can deduce from the described use of EASE and COSHH Essentials that proper assessment of exposure by measurements would only have to take place at larger firms. Unfortunately, as we all know, that is not where the majority of workers perform their jobs. In my view, tools like EASE and COSHH Essentials should be used in the initial judgement step, and proper evaluation should always follow to prevent unnecessary investments or ill advised control measures. Given the enormous variability we have to take into account when evaluating chemical risks, we should never exclusively rely on generic tools that lack precision, and much worse, accuracy.

Finally, I would like to suggest renaming COSHH Essentials into “Where there is no expert”. While staying in less developed countries, I cherished my copy of Where there is no doctor. Nowadays, I frequent my GP who
has access to more precise and accurate diagnostic tools. To me it is unthinkable that poor man's tools are being used to evaluate chemical hazards in a well developed country such as the UK.

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BOOK REVIEWS

Aviation medicine and the airline passenger

Edited by: Cummin and Nicholson (£65.00) 2002. Edward Arnold Publishers Ltd. ISBN 0 340 80637 0 (hardback)

Books on aviation medicine and physiology tend to be written by specialists for specialists. This book is by specialists for generalists and will be of value to all doctors asked by patients for health advice prior to flying. It will also be useful, in advance it is hoped, to doctors asked to help with a patient on board a commercial flight. A distinguished group of authors has been assembled: some from the aviation medicine field and some from other relevant specialties including obstetrics, paediatrics, cardiology, and respirary medicine. Twenty four chapters are provided: each of about 8–10 pages.

The book begins with an interesting account of the ethical and legal aspects of “Good Samaritan” activity. This is full of sensible advice: the inebriated doctor should disqualify himself from assisting in an emergency! How true. More seriously, the doctor agreeing to act should seek contractual immunity from the captain and if this is refused, the refusal should be recorded in writing. The need to keep clinical notes is obvious but could be forgotten.

A very valuable chapter on immunisation is provided. This provides much more than a schedule: details of diseases are added. The use of examples is not strong and a male teacher is undertaking voluntary work in Russia for 2 years which is used as a basis for a discussion of diphtheria, is helpful.

Chamberlain has provided an authoritative account of obstetric and gynaecological incidents. To the non-practising doctor few things are likely to cause greater alarm than an emergency delivery en route. Seeking aid from a midwife is undoubtedly good advice. The advice of getting advice from an obstetrician on the ground is stressed: I doubt that I would have thought of that faced with my first delivery since medical school. The advice is practical throughout and easy to follow.

I looked for a discussion of how to deal with a patient who had a tension pneumothorax: assuming, probably wrongly, that I could make such a diagnosis in an airplane without a chest x-ray and face a patient with an increasingly distressed patient. I was very encouraged by the advice: the inexperienced doctor may well be best advised to do nothing unless he is certain of the diagnosis. If you have to act, consider intercostal space in mid-clavicular line, and a simple valve constructed from the rubber fingers of a glove are the things to remember. Pain in the ear is common and well discussed, as is toothache also produced by expansion of pockets of air. In the latter discussion I could not find advice on anaesthesia: the doctor may be asked to suggest medication and guidance should be provided.

In conclusion, this is an outstanding book that should be widely read.

R L Maynard

Late lessons from early warnings: the Precautionary Principle 1896–2000


This book, which is available free of charge, is a collection of well written accounts of cases where early warnings of impending or possible disaster were ignored. The purpose is, I think, to encourage regulators to apply the Precautionary Principle and by so doing prevent further disasters. The cases considered range from overfishing and the destruction of the Californian sardine industry (see Cannery Row by John Steinbeck) and the asbestos-mesothelioma disaster to MTBE as a substitute for lead in petrol and “mad cow disease”. In each case the lack of attention paid to early signals is stressed. A few rather more controversial cases are included: hormone growth promoters, PCBs, and benzene in gasoline as an environmental hazard. A great deal of useful, in some cases invaluable, information is provided.

In some of the cases it is clear that greater notice should have been taken of early warnings. In others the picture is a little less clear. For example, Professor Jim Bridges, in considering the EU decision to ban growth promotors with steroid activity, points out that the decision was taken in response to public concern and against the advice of the EU’s own scientific committee and the World Health Organisation. Are we to make of this? Similarly, the evidence that exposure to ambient concentrations of benzene is damaging to health is not strong. The authors, wrongly, or at any rate account their account deals only with “false negatives” and state that they failed to find good examples of “false positives”. This is a very odd statement. How could examples of “false positives” be found if the requirement is to find examples of action taken that later proved to be unnecessary? How could you tell? It is at least possible that many drugs are rejected, wrongly, or at any rate do not reach the market as a result of worrying findings, for example, mutagenicity screening. Whether such drugs would have caused harm is unknowable.

The authors provide an interesting discussion of the Precautionary Principle. This principle has caused a great deal of debate and we seem little nearer to a clear definition of how it should be applied. 1996.

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In conclusion, this is an outstanding book that should be widely read.

R L Maynard
easy and, though practices such as stake-
holder involvement help, judging the public’s
attitude to risk is difficult. We are all
“unscientific” in our attitudes to risk—at least
I find myself inconsistent about personal
risks. Engaging the public in policy making is
the challenge of risk management in all
countries.

In conclusion then, this is a useful book
that provides much for regulatory toxicolo-
gists to ponder on. It is clear that the authors
feel that regulators often get things wrong:
unscientific in our attitudes to risk—at least
“unscientific” in our attitudes to risk—at least
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the challenge of risk management in all
countries.

History of aerosol science
Edited by Othmar Preining and E James Davis
(pp 438; 49.42 Euro) 2000. Vienna: Verlag
Austro Frenkac der Österreichischen Akademie der Wissen-
schaften. ISBN 3-7001-2915-7

The History of aerosol science is a symposium
volume that provides a written record of the
First Symposium on the History of Aerosol
Science, held from 31 August to 2 September,
1999 in Vienna, Austria. The symposium was
held in the sumptuous surroundings of the
Theater Building of the Austrian Academy of
Sciences. The high cultural standing of the
event can be judged from the front cover of
the book, which carries a reproduction of La
Grandes Familles by Rene Magritte, and the
Appendix which contains the musical score of
Haze, Fume and Spray by Meinhard Ruden-
hauer. This was an original work composed
for the opening of the symposium.

The symposium volume contains a preface
by Othmar Preining of the Clean Air Commis-
sion of the Austrian Academy of Sciences, and
three sections reflecting different aspects of
the history of aerosol science. The first
section, comprising 11 chapters, covers the
historical development of aerosol science. The
second section contains biographies of 12
individual scientists who exerted a major
impact on the development of the subject. The
third section examines the role played by 16
national and international aerosol organisa-
tions and their journals. The text finishes with
an epilogue by Othmar Preining. Indices are
provided for subjects, proper names, and
author addresses.

The historical section opens with two fasci-
nating chapters, the first on aerosols in art by
Peter Brimblecombe and the second on aerosol
science up to the year 1900 by Rudolf
Husar. Chapters then follow in quick suc-
session providing biographies of Michael Far-
day, John Tyndall, John Aitken, Ludwig
 Lorenz, Gustav Mie and Peter Debye, Robert
Brown, Ehrenfest, Georgiis Agricola, William
Gilbert, James Clerk Maxwell, Ludwig Boltz-
mann, Lord Rayleigh, Norman Davies, Jean
Bricard, Ted Rich, Ken Whitby, Bernard
Vonnegut, Issal Gallily, and Alexei Shehukin.
The biographies are authoritative and well
referenced but give no appreciation of the sci-
entific advances made because they focus on
the personalities and not the technical devel-
lopments. Despite the importance given to the
contribution made to aerosol science by
Nicolai Fuchs, no biography is presented,
except being indexed in more chapters than
any other aerosol scientist. A strange omission
for someone credited with being the father of
aerosol science.

There is some valuable review material
here, particularly on the ambient aerosol
studies in California and the health aspects of
ambient aerosols in the USA. Regrettably,
the global climate impacts of aerosols get no
significant treatment in this historical presen-
tation. The national summaries could have
provided much more review material, describ-
ing what has been learnt in the different
countries about aerosol science. This would
have made the book a much more useful vol-
ume.

The book is riven with contradictions.
The preponderance of new results burying old
theories must be balanced against the new
discoveries that can only be made with the
latest state of the art instrumentation. The
balance between personal science and team
science is discussed in many places. The dif-
culties of accommodating independent char-
acters in directed research teams and the
bureaucracy associated with government and
other research organisations are highlighted.
The successes of directed research pro-
grames, apart from those in California, are
not addressed. The text plays down the
importance of directed research into chemical
warfare, nuclear power, and other commercial
areas, and emphasises the role of pure aerosol
science. It is not clear whether the editors feel that this “small
science” model is valid for aerosol science in the
future.

This is a specialist book aimed at those
interested in the motivation, idiosyncrasies,
and background of some of the most influen-
tial scientists that have contributed to the
development of aerosol science. It will have its
greatest appeal as a symposium volume and
as an aide memoir to those involved. It will
not be of much interest to students and
researchers, except perhaps to those deeply
involved in pure aerosol science research.

R G Derwent

NOTICES

27th International Congress on
Occupational Health: The
Challenge of Equity in Safety
and Health at Work, Ilguassu
Falls, Brazil, 23–28 February
2003

The Congress will have about nine keynote
conferences, approaching different angles of
the Central Theme; those themes will then be
discussed in depth by Panels (60), where dif-
ferent opinions will be debated. There will be
about 60 mini-symposia organised by the
ICOH Scientific Committees and Work
Groups; facilities for the presentation of 1000
posters; and about 500 free papers. Interest
groups may schedule meetings in Congress
areas.

Conference Secretariat
Tel/Fax: (5541) 353 6719
Email: icoh2003@com.br
Website: www.icoh2003.com.br

First World Congress on
Work-Related and
Environmental Allergy (1st
WOREAL), and Fourth
International Symposium on
Irritant Contact Dermatitis (ICD),
Helsinki, Finland, 9–12 July
2003

Congress on Work-Related and
Environmental Allergy
• Work related and environmental aspects of
respiratory and skin allergy
• Specific issues related to pathophysiology
and skin allergy
• Management and prevention of allergy

Irritant Contact Dermatitis Symposium
• Occupational irritant dermatitis
• Prevention of irritant dermatitis
• Alternative methods for the assessment of
irritants
• Irritant dermatitis from cosmetics

Satellite events
• Satellite Symposia, 9 July 2003
• Allergy School, 9–10 July 2003
• 7th International NIV A Course on Work-
Related Respiratory Hypersensitivity, 11–15
July 2003

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