Table 2 Odds ratios of 16 cases (more daughters than sons within a family) compared with 27 controls (43 sons) for exposure variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Odds ratio (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spraying days 1990</td>
<td>18/4 (1.72-10.96)</td>
</tr>
<tr>
<td>(30 days)</td>
<td></td>
</tr>
<tr>
<td>Cross current sprayer</td>
<td>1/7 (0.15-0.89)</td>
</tr>
<tr>
<td>(10 days)</td>
<td></td>
</tr>
<tr>
<td>Herbsicide sprayer (5 days)</td>
<td>3/6 (1.10-1.67)</td>
</tr>
<tr>
<td>(Manual) knapsack sprayer</td>
<td>2/2 (1.05-0.66)</td>
</tr>
<tr>
<td>(5 days)</td>
<td></td>
</tr>
<tr>
<td>Metsulfol (spraying)</td>
<td>1/3 (1.05-0.16)</td>
</tr>
<tr>
<td>Azinphos-methyl (0/1)</td>
<td>4/4 (1.11-1.73)</td>
</tr>
<tr>
<td>Paraquat (0/1)</td>
<td>&gt;5/6 (&gt;5.6-13.4)</td>
</tr>
</tbody>
</table>

*Paraquat was used by all families with more daughters compared with 74% in the control group.*

ratio for gravidity (OR 1:35, 95% CI 0.92-1.99) was not significant and adjustment did not influence the regression coefficient or standard errors of variables of interest, only crude ORs are given.

For the 43 families a relation was found between the number of days with use of a herbicide sprayer (days/y), a cross current airblast sprayer (days/y), and a knapsack sprayer (days/y) and the number of daughters within a family. When comparing families with more daughters than sons (16 families), the number of spraying days a year was 37 compared with 25 for the other families, 7.6 v 3.3 days/y for the herbicide sprayer, 16 v 5.4 days/y for the cross current airblast sprayer, and 7.1 v 3.0 days/y for the knapsack sprayer. In families with more daughters use of the specific pesticides Azinphosmethyl (insecticide), Metiram (fungicide), and Paraquat (herbicide) was higher. Table 2 shows the results of the ORs.

**Discussion**

Overall sex ratio was not different from the expected ratio of 0.51. James hypothesised that high concentrations of testosterone at the time of conception produce boys, and high concentrations of gonadotrophin produce girls. Among the offspring of DBCP applicators a highly significant excess of daughters was found. As exposure to pesticides in fruit growing typically includes multiple exposition to many different compounds, similar to that found for DBCP, it is not possible to predict the direction of a shift in sex ratio induced by exposure to pesticides among farmers. As the number of subgroups is small it is impossible to draw firm conclusions, but some of the results are of interest. From our results there are some indications that exposure to pesticides in agricultural work affects offspring sex ratio. The shift towards daughters in the most recent period (sex ratio of 0.33) was remarkable. Also the finding that spraying frequency, frequency of use of specific equipment, and use of some specific pesticides are related to a shift towards more daughters within a family may point to an exposure effect. One should be careful in interpreting these results. The fact that use of several pesticides is related to sex ratio does not necessarily imply that individual pesticides are causally related to sex ratio.

Fruit growers use a complex mixture of agents and the use of one agent is often correlated with the use of another. It is unlikely that the shift in sex ratio is caused by the introduction of particular pesticides as all pesticides have been applied to some extent during the study period. Because application methods and quantities changed considerably over time, the introduction of certain techniques seems a more plausible explanation for this finding. It is possible that certain underlying mechanisms, effects may not be caused by exposure of the male worker only, as most women live near the orchard and they often participate during particular activities like pruning, thinning, and harvesting. No seasonal trends were found in this analysis as was found for time to pregnancy. Our finding that there might be a difference in time to pregnancy for boys and girls as well, may indicate that both sex ratio and time to pregnancy are interlinked. Further studies should explain why exposure variables associated with time to pregnancy are not related to sex ratio.

In conclusion, we think that the suggestion by James to analyze sex ratio is a useful one and should be explored further. To consider both sex ratio and time to pregnancy simultaneously may have advantages in elucidating occupational hazards of (pesticide) exposure. Our results do show that other variables, like number of families with predominantly daughters or sons, which are indicative of a shift in sex ratio, might be more powerful because they use another sampling unit (family instead of a crude stratification by exposure). Especially in this study among agricultural workers an analysis on a family level might be relevant because the exposure might be aggregated at the family level as well. In general, it seems useful to explore the time to pregnancy and sex ratio, the presence of families with a predominance of one of the sexes as little is known about the underlying biological mechanisms as well as the statistical properties of these indices.

**References**


**NOTICE**


A one day meeting organised jointly by the SCI Health and Safety Group, RSC Toxicology Subject Group, and the Institute of Occupational Hygiene. The meeting will examine the theoretical and practical difficulties in assessing the toxicity of solvent mixtures and effecting control of exposure. Data from experimental studies, occupational exposures and poisoning incidents will be reviewed with an aim of understanding the nature of mixed solvent toxicity. The second half of the meeting will concentrate on industrial experiences, and will consider techniques for assessing and controlling exposures to mixtures of solvents in the workplace.

For further information please contact: SCI Conference Office, 14/15 Belgrave Square, London SW1X 8PS. Tel: +44 (0)171-235-3681; Fax: +44 (0)171-823-1698.

**BOOK REVIEWS**

*Book review editor: R L Maynard*

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(Price and availability are occasionally subject to revision by the Publishers.)


Occupational physicians who are interested in standards applied in other countries will be interested in this, the 1994 edition of the
MAK and BAT values used in Germany. A valuable introductory chapter on the significance and use of MAK values is included: much basic regulatory toxicology can be learnt from this section.

Many compounds have been allocated MAK values and these are listed in an easy to read table. Formally, and notes on carcinogenesis, reproductive toxicology and vapour pressure of the compounds are included. Carcinogens are treated separately and here again the discussion is helpful, with lists of carcinogens and suspected carcinogens provided.

Should you buy this book? It is dubious whether doctors practising occupational medicine in the United Kingdom will think this book valuable: for international companies with branches in Germany it is essential.

R L MAYNARD


This volume is an English translation, originally published in German, of the conclusions of a Deutsche Forschungsgemeinschaft Working Group charged with recommending BAT (biological tolerance values) and EKA (exposure equivalents for carcinogenic substances) values. Over the past 10 years, the Working Group has compiled 51 BAT values. This volume contains the documentation for 22 substances and includes 19 BAT and 3 EKA values. The editors have plans to publish further volumes covering the remaining substances.

In setting biological exposure values, the Working Group distinguishes between those substances for which a BAT can be set that will prevent adverse health effects and those for which they take the view that it is not possible to establish a safe level. In this case as a limit value cannot be set, biological exposure equivalents (EKA), which are based on the relation between airborne exposure and the concentration of the substance in blood or urine are reported. Data are presented for alkalii chromates, cobalt, and pentachlorophenol.

This volume describes the mechanism used by the Working Group for arriving at a BAT value. The scientific literature for each substance is scrutinised and summarised according to an agreed protocol. Documentation is given for a BAT assessment, fluoride, and a range of substances (including carbon disulphide, dichloromethane, phenol, and tetra-chloroethane). It is evident that in many cases, the data are very limited, and that some BAT values that have been proposed might be more accurately described as exposure based rather than health based. The BAT values for at least six substances are listed as "provisional" because in the opinion of the Working Group there are insufficient data to set a health based limit.

This is a useful volume that shows the scientific basis and process adopted in Germany for setting BAT values. Of course, it cannot help notice, however, that for a number of substances reported in this volume, the data are over 10 years old. It is a pity the authors did not take the opportunity to update their submissions before publishing this English edition.

This book will be of interest to occupational health professionals, physicians, hygienists and technical policymakers interested in the interpretation of biological monitoring and effect monitoring data and in the setting of health guidance values and benchmarks.

H K WILSON


This book provides concise, accurate, and up to date definitions of terms encountered frequently in the clinical, social science, and research literature about substance abuse.

Psychological, social, clinical, and pharmacological aspects are all included in text that is easy to read with ample cross referencing, making the book acceptable to the international multidisciplinary readership for which it is intended. Terms that are mis- used frequently and that have a multifaceted interpretation, such as "dependence" and "withdrawal" are explained particularly well.

Some readers may find certain definitions rather simplistic or too complex but this is to some extent inevitable within the confines of a small reference text written for a wide audience. For example, clinical details are comprehensive but include terms such as "dysarthria", "hyperacusis" and "nyctagmus", with which the non-clinician may be unfamiliar. Others may feel that to define "needle-sharing" as "the use of syringes . . . by more than one person . . ." falls outside the objective of the lexicon "to define what is not self-explanatory".

This book is likely to prove particularly useful to those who require clear, contemporary definitions for purposes of teaching, professional discussion, or policy making.

Students of medicine, nursing, and allied sciences and those for whom English is not their first language will find it a helpful reference source. It is a pity that the authors chose to exclude slang terms; a guide to these would have been helpful, interesting, and probably entertaining!

S M BRADBURY


This is the latest edition of Hunter's famous textbook about diseases of occupational health. Many people reading this review will have seen or will possess an earlier edition. If you do have an earlier edition, hold on to it. You will need it for the section on the history of occupational diseases that has sadly had to be jettisoned from this edition because of lack of space. Nor should you imagine that this textbook is all you need for the practice of occupational medicine; as the Editors make quite clear in the Preface, this book is only about occupational diseases (their causation, features and treatment), it does not pretend to cover all the other facets of the practice of occupational medicine. Also, although there is brief mention made of the effects of harmful environmental exposures, the book does not cover this aspect in any detail.

This is a weighty tome: 2 kg on my kitchen scales. I confess to an aversion to large textbooks, so it took some time and effort from my point of view, to get the review editor to induce me to take the plunge into this book. When I did, I was pleasantly surprised. Overall, this is a good book and an improvement upon recent previous editions. It presents a review of knowledge on the whole spectrum of occupational diseases, with some useful background material on mechanisms and medico-legal aspects (including compensation) rather than just reviews of occupational diseases.

I hope this book and my review will set some readers on the road to reading this book. I can imagine there are many who need this book. If so, perhaps this book can be brought down in price? Or perhaps one edition can be produced that includes more occupational diseases; perhaps this is a sign of the times. Candidates for the Associate of the Faculty of Occupational Medicine will find it useful but perhaps do not need their own copies. Personally, I think I will use this book from...