Oral Presentation

Pesticides

0493 IMPROVING EXPOSURE ASSESSMENT METHODOLOGIES FOR OCCUPATIONAL EPIDEMIOLOGICAL STUDIES ON PESTICIDES

^{1,2}John Cherrie*. ¹Institute of Occupational Medicine, Edinburgh, UK; ²Institute of Biological Chemistry, Biophysics and Bioengineering, Heriot Watt University, Edinburgh, UK

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Retrospective assessment of occupational exposure to pesticides in epidemiological studies is challenging. The exposures are complex and may occur by skin contact, inadvertent ingestion and by inhalation. There is considerable variation in exposure within and between persons from use of pesticides, with weather, season and crops all affecting use. Product formulation and the type of application equipment may change over time. The use of personal protective equipment, which may have variable efficacy, has also changes over time. The general lack of historic environmental and biological monitoring measurements forces epidemiological researchers to rely on self-reports and exposure models. This presentation will briefly introduce the topics for discussion along with the questions for the panel and delegates so that they can consider these during the session presentations.

These questions are as follows:

- What methods have you successfully used epidemiological studies?
- What were the difficulties/weaknesses you encountered?
- What improvements could be made, both in methodologies and in data availability?
- How should the planned research best interact with the occupational epidemiology community?

* Authors reserve the right to update the discussion questions

Oral Presentation

Pesticides

0494 A REGULATORY PERSPECTIVE ON THE NEED FOR IMPROVING EXPOSURE ASSESSMENT FOR EPIDEMIOLOGICAL STUDIES ON PESTICIDES

Paul Hamey. Health and Safety Executive, York, UK

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Manufacturers intending to market pesticides are required to perform and submit extensive toxicology studies in animals to support risk assessments which demonstrate an absence of harm to human health in order to gain authorisation to supply their products. While such data provides necessary reassurance it is acknowledged that there are uncertainties in extrapolating from animal models to humans and in addition some human diseases lack appropriate models.

Epidemiological studies therefore are regarded as an important alternative source of information that may either support

animal data based risk assessments or indicate potential concerns not previously identified. For this reason within the UK the epidemiological literature has for some time been routinely considered with the aim of identifying any emerging concerns. More recently EU data requirements for pesticides have been amended to require applicants to conduct literature searches and to formally evaluate relevant epidemiology data. An additional recent action by the EFSA has been the commissioning of a systematic review of pesticide epidemiology published 2006–2012.

A large and growing database of epidemiology relating to pesticides exists. However, despite the regulatory efforts mentioned above the impact of such data on regulatory outcomes is negligible. Identification of specific pesticides and levels of exposure are often cited as significant limitations of studies. The regulatory requirements, limitations in the existing data, and suggestions for potential improvements will be discussed.

Oral Presentation

Pesticides

0495 OVERVIEW OF THE EXPOSURE ASSESSMENT METHODOLOGICAL ISSUES FOR EPIDEMIOLOGICAL STUDIES ON PESTICIDES

Hans Kromhout. Institute for Risk Assessment Science (IRAS), Utrecht University, Utrecht, The Netherlands

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Accurate assessment of (occupational) exposure to pesticides is hard to achieve. Applicators often apply multiple products and active ingredients over the course of a growing season. Which active ingredient is applied will also depend heavily about the pest at hand. Exposure to pesticides is therefore often to a mixture of active ingredients when assessed at annual or lifetime scale. Recollection of this information can become rather problematic when it covers multiple decades especially in the absence of spraying calendars or other recorded data. Also, applicators might have reasonable knowledge of tradenames and active ingredients, but farmworkers exposed via re-entry tasks like harvesting, pruning etc. in treated crops might only remember a pungent smell of a particular active ingredient or the crop they worked in. In middle- and low-income countries this might even become more problematic given that considerable proportions of applied pesticides may originate from unauthorised sources and sometimes reach local retailers via illegal cross-country trade. Re-packaging, lack of information in local languages and illiteracy will enhance these problems. In epidemiological studies several exposure assessment approaches have been applied including self-reports by farmers and applicators, crop-exposure matrices, semi-quantitative algorithms based on detailed information provided by study subjects and less frequently by measuring exposure and biomonitoring. In this presentation an overview of and trends in methods for assessment of exposure to pesticides in agricultural cohort and cross-sectional studies as well as community-based (case-control) studies will be presented. The (lack of) validity of different methods and approaches will be considered.

Oral Presentation

Pesticides

0496 IMPROVING OCCUPATIONAL EXPOSURE ASSESSMENT METHODOLOGIES FOR EPIDEMIOLOGICAL STUDIES ON PLANT PROTECTION PRODUCTS

Karen Galea. *Institute of Occupational Medicine, Edinburgh, UK*

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This presentation will introduce and describe the rationale for a new comprehensive study which aims to better understand the reliability of assessment of human exposure to pesticides in previous occupational epidemiological investigations, and to use this information to recommend improvements in scientific practice for the future. This is to be achieved by assessing the reliability and external validity of the surrogate measures used to assign exposure within individuals or groups of individuals, which are frequently based on self-reported data on exposure determinants like spraying methods and frequency of spraying or job/crop exposure matrices. In addition we will evaluate the size and effects of recall bias on misclassification of exposure to pesticides and associated health effects. The presentation will introduce the methodology that the project will use to achieve these aims and objectives. Existing and newly collected (biological) monitoring exposure data from several existing epidemiological studies and historical records, along with new studies in various working populations in Europe and elsewhere will be used to examine the performance of exposure assessment approaches. Urinary metabolites of pesticides will be selected with due consideration on the extent of use within the study populations, validity of biomonitoring methods etc. The performance of the various exposure assessment methods will be compared and contrasted within existing epidemiological studies. Discussion on the proposed methodology will be invited as part of the symposium panel and delegate discussion session.

Oral Presentation

Neurological Effects

0497 HEAD TRAUMA IN SPORT AND NEURODEGENERATIVE DISEASE: AN INTRODUCTION AND REVIEW OF THE EPIDEMIOLOGICAL EVIDENCE

^{1,2}Neil Pearce*, ³Valentina Gallo, ⁴Damien McElvenny. ¹London School of Hygiene and Tropical Medicine, London, UK; ²Centre for Public Health Research, Massey University, Wellington, New Zealand; ³Queen Mary, University of London, London, UK; ⁴Institute of Occupational Medicine, Edinburgh, UK

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A number of small studies and anecdotal reports have been suggested that sports involving repeated head trauma may have long-term risks of neurodegenerative disease. There are now plausible mechanisms for these effects, and a recognition that these problems do not just occur in former boxers, but in a variety of sports involving repeated concussions, and possibly also in sports in which low-level head trauma is common. These neurodegenerative effects potentially include increased risks of

impaired cognitive function and dementia, Parkinson's Disease, and amyotrophic lateral sclerosis. Many would argue for taking a precautionary approach and immediately banning or restricting sports such as boxing. However, there are important public health issues in terms of how wide the net should be cast in terms of other sports, and what remedial measures could be taken. This in turn requires a major research effort involving both clinical and basic research to understand the underlying mechanisms leading from head trauma to neurodegenerative disease, and epidemiological studies to assess the long-term consequences.

Oral Presentation

Neurological Effects

0498 BIOMARKERS OF CONCUSSION

^{1,3}Valentina Gallo*, ²Damien McElvenny, ³Neil Pearce. ¹Queen Mary, University of London, London, UK; ²Institute of Occupational Medicine, Edinburgh, UK; ³London School of Hygiene and Tropical Medicine, London, UK

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Concussion is a frequent occurrence in many contact sports and among soldiers, but also a possible inevitable consequence of accidents. Currently, the diagnosis of concussion is based on clinical symptoms, and it is difficult to predict prognosis. Biomarkers could be of invaluable help in informing the neuropathological events underlying concussive episodes. Specifically, they could contribute defining the diagnosis, the recovery process, and the long-term effect in presence or absence of chronic traumatic encephalopathy. For diagnosis and recovery, the neurofilaments and tau protein are promising biomarkers. No markers for CTE have been developed to date. The identification of biomarkers of diagnosis and recovery is particular important as most current research suggests that the risk of long-term symptoms following concussion is highest in individuals who have received repetitive concussions before the brain has recovered properly.

Oral Presentation

Neurological Effects

0499 LONG-TERM HEALTH OUTCOMES AFTER EXPOSURE TO REPEATED CONCUSSION IN ELITE LEVEL RUGBY UNION PLAYERS

¹Tom McMillan*, ²P McSkimming, ¹J Wainman-Lefley, ¹LM Maclean, ³J Hay, ¹A McConnachie, ^{3,4}W Stewart. ¹Institute for Health and Wellbeing, University of Glasgow, Glasgow, UK; ²Robertson Centre for Biostatistics, University of Glasgow, Glasgow, UK; ³Department of Neuropathology, Queen Elizabeth University Hospital, Glasgow, UK; ⁴Institute of Neuroscience and Psychology, University of Glasgow, Glasgow, UK

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Interest and concern about late effects of concussion in contact sports has been growing, although research on long-term health outcome is limited. There has been particular concern with regard to neurodegenerative changes that might become evident

very late after injury. In this presentation studies on late health outcome will be briefly reviewed and a recently published study on long term outcome in rugby union players will be presented. In this study, outcome in relation to exposure to repeated head injury was investigated in retired Scottish international rugby players and controls in relation to general and mental health, life stress, persisting complaints, cognitive function, disability and markers of chronic life stress (allostatic load).

Although the estimated number of concussions was high in the retired rugby players (median=7; IQR 5–40), and subtle group differences were detected on two of the cognitive tests (verbal learning and fine co-ordination of the dominant hand), group differences in mental health, social or work functioning were not found late after injury, and there were not associations between the number of concussions and cognitive function.

There is a need for prospective group comparison studies on representative cohorts.

Invited

Occupational Medicine (SCOM/Modernet)

0500 INVITED KEYNOTE: WHO WOULD HAVE THOUGHT IT? THE UNFORESEEN PROBLEMS OF DISRUPTIVE TECHNOLOGIES

^{1,2}Anthony Seaton*. ¹University of Aberdeen, Aberdeen, UK; ²Institute of Occupational Medicine, Edinburgh, UK

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Increasing exploitation of Britain's coal resources and the manufacture of steel in the 18th century led to the invention of the steam engine, liberating factories from dependence on water power and enabling transport by railway and steam ships. The application of these technologies and the ideas of Adam Smith on the use of capital led to the Industrial Revolution and Britain's dominance in world trade through the 18th and 19th centuries. However, in large part this was based on gross exploitation of human and other resources throughout Britain and its Empire.

The most obvious health consequences of coal affected miners; accidental deaths and lung disease. The latter became a matter of intense medical dispute right through to the late 20th century. Less obvious at first were the health consequences of air pollution, which made an impact on medical thinking only in the mid-20th century. Even less obvious were more subtle consequences of coal exploitation. The production of coke for making steel was found to cause lung cancer in coke oven workers. Secondary use of the volatile derivatives from coke and coal gas manufacture led to the organic chemical, rubber and plastics industries, from which mankind has derived enormous benefits but which in turn have led to health hazards among workers, from bladder cancers to leukaemias and neurological diseases.

Most serious of all have been the ecological consequences of the use of coal and its successor, oil, to which similar effects on workers can be ascribed. Of these, the most important is climate change which threatens the end of civilisation. This was not foreseen until the very late 20th century. Now we are facing similar threats from other disruptive and primarily beneficial technologies – the world-wide web, robotics,

artificial intelligence, genetic engineering and nanotechnology. Can we foresee these problems and act to reduce the risks?

Invited

Musculoskeletal

0501 LIFETIME ACHIEVEMENT AWARD – INVITED KEYNOTE: WHY HAVE WE FAILED TO PREVENT BACK PAIN IN WORKING POPULATIONS?

David Coggon. MRC Lifecourse Epidemiology Unit, University of Southampton, Southampton, UK

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Low back pain (LBP) is a major cause of disability globally, and has been linked consistently with occupational activities that load the spine mechanically. However, randomised controlled trials of ergonomic interventions have failed to produce expected reductions in the disorder. Moreover, social security statistics from Britain reveal an eightfold rise in incapacity for work attributed to LBP during 1950–95 at a time when the physical demands of work were reducing.

To shed further light on this apparent paradox, a study (CUPID) was set up to assess differences in the prevalence of musculoskeletal pain and associated disability among workers carrying out similar occupational tasks in different cultural environments, and to explore explanations for any variation. Data were collected by questionnaire from 47 occupational groups (nurses, office workers and others) in 18 countries, with a follow-up survey after a mean interval of 14 months in 45 of the groups.

Analysis of baseline data indicated major variation in the prevalence of disabling LBP, with somewhat higher rates in nurses than office workers, but much larger differences between similar occupations in different countries. The variation was not explained by established risk factors, but correlated strongly with differences in the prevalence of disabling wrist/hand pain. Moreover, baseline extent of regional pain at anatomical sites outside the low back strongly predicted the prevalence of disabling LBP and associated sickness absence at follow-up, explaining much of the variation between occupational groups. These observations, which accord with findings from successive European Working Conditions Surveys, suggest that large international differences in the prevalence of LBP do not depend on causes specific to the spine, but are driven by factors that increase propensity to musculoskeletal pain more generally. Furthermore, a study of migrants from South Asia to the UK indicates that such propensity is environmentally determined, and can increase soon after moving to a new country where rates of pain are higher.

Based on current evidence, it can be hypothesised that while mechanical loading may cause minor strains that trigger episodes of LBP, the severity and persistence of symptoms is driven more by culturally-determined psychosocial factors that affect musculoskeletal pain more generally. If so, while ergonomics has an important role in enabling people to work more comfortably and to remain productive when limited by back pain, the key to reducing the continuing high burden of LBP may lie in understanding what drives differences in general propensity to musculoskeletal pain.