Health Surveillance

Presentation by Dr Kelvin Wooller at the AFOEM Annual Training Meeting on Saturday 12th May 2018
Session Description

This presentation is designed to provide guidance in the conduct of health surveillance programs in an occupational setting.

Local and international standards and guidelines for Biological Monitoring (also known as Biomonitoring) will be noted.

Environmental issues will be discussed.
Learning Objectives

• Define biological monitoring and its relationship to environmental monitoring (workplace and community).
• Identify sources of occupational exposure standards and guidelines for biological monitoring.
• Understand the dose/response concept.
• Appreciate the practical aspects of specimen collection.
• Ensure that understandable advice on the significance of the results of biological monitoring is given to both workers and management.
Part 1  Resources and Basic Principles
Keeping your Knowledge Current

- Know your information resources
- Credible quick response to queries from
  - Worker, Union, Management, Community
  - Government
  - Medical Defence
  - ‘Fake News’
Management of Worker Exposure

- According to the Deepwater Horizon Response Unified Command’s website, as of June 14, 2010, over 1,262,000 gallons of dispersants had been used as part of BP’s oil spill clean up efforts.

- Risk
  - Human
  - Environment
Online Searching

Occupational Safety and Health online
How to find reliable information

Third edition
2016

Free PDF
http://www.ldoh.net/

“carefully written, comprehensive and up-to-date book on how to find reliable occupational health and safety information online”.

Reviewed in Occupational Medicine February 2018
Useful Environmental Resources

- Fourth National Report on Human Exposure to Environmental Chemicals
- Updated Tables March 2018
Useful Literature Resources

Journal of Occupational and Environmental Medicine (ACOEM)

Perspective
USA
Wellness

Occupational Medicine Forum

Available
Print
Online

Biomarkers of oxidative stress in electroplating workers exposed to hexavalent chromium

PubMed
This study evaluates levels of biomarkers of oxidative DNA damage and lipid peroxidation in 105 male workers at 16 electroplating companies who had been exposed to hexavalent chromium (Cr(VI)). The study participants were 230 non-smoking male workers, comprising 105 electroplating workers who had been exposed to chromium and 125 control subjects who performed office tasks. Personal air samples, spot urine samples, hair samples, fingernail samples and questionnaires were used to quantify exposure to Cr(VI), oxidative DNA damage, lipid peroxidation and environmental pollutants.
Useful Literature Resources

Journal of the Society of Occupational Medicine

Perspective European Australian

Case Reports

Available Print Online

Discount AFOEM
Useful Literature Resources

NIH U.S. National Library of Medicine

PubMed

28 million citations biomedical literature

Reading Room
Useful Biological Monitoring Resources

American Conference of Governmental Industrial Hygienists

2018

TLVs® and BEIs®
Based on the Documentation of the Threshold Limit Values for Chemical Substances and Physical Agents & Biological Exposure Indices

2018
Guide to Occupational Exposure Values
Compiled by ACGIH®

Hard Copy Only
Useful Biological Monitoring Resources

• Quick reference resource
• Practical guidance on the selection and interpretation of tests
• Recommendation on best test
• Referenced
• Print or download

Edited by Harold E Hoffman, MD, Scott D Phillips, MD and Robert B Palmer, PhD
OEM Press 2012
Useful Biological Monitoring Resources

German Research Foundation

List of MAK and BAT Values 2017

Guidance on Significance and Use of MAK and BAT values

Most comprehensive listings

Includes rationale

Free Download
Wiley Online Library

Author(s): Deutsche Forschungsgemeinschaft
Useful Biological Monitoring Resources

- General Biological Monitoring
- Specific Exposures
  - Inorganic lead
  - Metallic mercury
  - Inorganic arsenic
  - Thallium
  - ACGIH BEIs

Department of Consumer and Employment Protection
Government of Western Australia 2008
Useful Occupational Resources

- **safe work australia**

  Hazardous Chemical Information System (HCIS)
  - Search Hazardous Chemicals
  - HSIS Consolidated List

- **GUIDANCE ON THE INTERPRETATION OF WORKPLACE EXPOSURE STANDARDS FOR AIRBORNE CONTAMINANTS**
  - APRIL 2013

- **HEALTH MONITORING FOR EXPOSURE TO HAZARDOUS CHEMICALS GUIDE FOR MEDICAL PRACTITIONERS**
  - FEBRUARY 2013
Useful Occupational Resources

California Department of Public Health Occupational Health Branch

- Many publications for workers and employers with emphasis on hazards in agriculture
- Pesticide Illness Presentation for Physicians (with Speaker Notes) (2004)
Useful Occupational Resources

- **Guide to Pregnancy and Work**
  - Advice for Pregnant Employees
  - Potential Workplace Hazards
  - Risk Assessment
  - Pregnancy Policies in the Workplace
    AFOEM 2017

- **Reproductive and Developmental Hazard Management**
  ACOEM Guidance Statement 2016
Useful Occupational Resources

- Managing Individual Exposure to Lead in Australia – A Guide for Health Practitioners
  - Lead exposure - Health effects
  - Blood lead levels - Testing, managing, prevention
    National Health and Medical Research Council 2016

- Workplace Lead Exposure
  ACOEM Position Statement 2016
Useful Occupational Resources

- Cancer Epidemiology including Clusters

The Australasian Faculty of Occupational Medicine
May 2003

Monograph Series 2015
Principles of Toxicology

- Toxicity – Innate Property of a Substance
- Hazard – Potential for Exposure
- Risk – Probability of exposure

- Individual Variation

![Graph showing individual variation](image)
Dose and Dose Response

LOAEL = Lowest Observed Adverse Effect Level
- Lowest dose with adverse effect
  (statistically significant)

NOAEL = No Observed Adverse Effect Level
- Highest dose with no adverse effect
  (not statistically significant)
Acute Toxicity - $\text{LD}_{50}$

$\text{LD}_{50}$ = dose associated with 50% death of treated animals
Toxicokinetics

- Absorption
- Distribution
- Metabolism
- Elimination
Timing of Specimen Collection

Kinetics of Excretion - $\frac{1}{2}$ Life

- Whole Body
  - Slow – methyl mercury, lead, cadmium (persistent)
- Expired Air
  - Fast – solvents
- Blood
  - Metabolism, storage
- Urine
  - Reabsorption in the nephron – passive or active process
Elimination Kinetics

First Order

Zero Order
Searchable Toxicology Databases

HSDB Hazardous Substances Data Bank.
Peer-reviewed toxicology data for over 5,000 hazardous chemicals

TOXLINE
4 million references of effects of drugs and other chemicals

OCCUPATIONAL EXPOSURE TO CHEMICALS
Links jobs and hazardous tasks with occupational diseases and their symptoms

ChemIDplus Chemical Dictionary
LactMed Breastfeeding
DART Developmental and Reproductive Toxicology Database
HOUSEHOLD PRODUCT SAFETY Household Products Database
Susceptible Populations

- Children
- Pregnant
- Breast feeding
- Impaired
- Older
Moving the Big Pots

Loading

Transporting
Making the Big Pots
Big Pots Hazards
Who is at Risk?

At School

At Play
References

Safety and Health Awareness for Oil Spill Cleanup Workers (free download)
National Institute of Environmental Health Sciences
Occupational Safety and Health Administration (OSHA) https://www.osha.gov/Publications/Oil_Spill_Booklet_05.11_v4.pdf

Occupational Safety and Health online: How to find reliable information (free download)

Fourth National Report on Human Exposure to Environmental Chemicals (free download)
Updated Tables March 2018 https://www.cdc.gov/exposurereport/index.html

Department of Health and Human Services Centers for Disease Control and Prevention (CDC) See Website
National Center for Environmental Health

Journal of Occupational and Environmental Medicine See Website
American College of Occupational and Environmental Medicine (ACOEM)

Occupational Medicine See Website
Journal of the Society of Occupational Medicine

U.S. National Library of Medicine See Website

TLVs and BEIs: Guide to Occupational Exposure Values
American Conference of Governmental Industrial Hygienists
References

Clinical Practice of Biological Monitoring
Eds H Hoffman et al. OEM Press
https://www.oempress.com/category/s?keyword=hoffman

German Research Foundation

Risk-based health surveillance and biological monitoring
Government of Western Australia 2008

safe work aust https://www.safeworkaustralia.gov.au/ Search Website
Hazardous Chemical Information System (HCIS)
Guidance on the interpretation of workplace exposure standards for airborne contaminants. April 2013
Health monitoring for exposure to hazardous chemicals: guide for medical practitioners. February 2013

The National Institute for Occupational Safety and Health (NIOSH) https://www.cdc.gov/niosh/index.htm See Website

California Department of Public Health https://www.cdph.ca.gov See Website
Occupational Health Branch

Guide to Pregnancy and Work (free download)
AFOEM 2017
References

**Reproductive and Developmental Hazard Management** (free download)
ACOEM Guidance Statement 2016

**Managing Individual Exposure to Lead in Australia – A Guide for Health Practitioners** (this and other free downloads)
National Health and Medical Research Council 2016

**Workplace Lead Exposure** (free download)
http://www.acoem.org/uploadedFiles/Public_Affairs/Policies_And_Position_Statements/Guidelines/Position_Statements/Workplace_Lead_Exposure.pdf
ACOEM Position Statement 2016
References

Occupational Cancer: A guide to prevention, assessment and investigation (free download)
The Australasian Faculty of Occupational Medicine. May 2003

Occupational exposures to carcinogens in Australia. Workers’ compensation claims paid in Australia 2000-2012 (free download)
Cancer Council Western Australia

U.S. National Library of Medicine

ToxTutor  https://toxtutor.nlm.nih.gov/

Toxnet  https://toxnet.nlm.nih.gov/
Health Surveillance

Part 2  Planning and Implementation
Planning a Health Surveillance Program

• Interface with Wellness Programs
  - Smoking Cessation / Workplace Exposure Control

• Workplace wellness programs: Do they work?
  - Need to be evidence based

From Evidence to Practice: Workplace Wellness that Works

Review by:
Institute for Health and Productivity Studies
Johns Hopkins Bloomberg School of Public Health
2015
Planning a Health Surveillance Program

• Workplace Inspection

• Routes of Exposure
  - Ingestion
  - Inhalation
  - Dermal

• Measurement of Workplace Exposure
  - Workplace
  - Individual
  - Surface
Planning a Health Surveillance Program

- Who is concerned?
- Who is **not** exposed?
- Who is exposed?
  - How many?
  - Sampling?

- Occupational Exposures
  - Solvents
  - Isocyanates
  - Heavy Metals
  - Asbestos
  - Silica

Phosphate smelting furnace
Advantages of Biological Monitoring

- Integration of all exposures
  - Main job, second job
  - Hobbies, environmental sources
- All routes of exposure including dermal
- Internal exposure when using PPE
- Adverse effects
  - Liver enzymes, haem synthesis
- Individual differences
Limitations of Biological Monitoring

- Limited range of tests
- Specimen contamination
- Metabolism
  - Chemical or its metabolite/s
- Timing
  - Short $\frac{1}{2}$ life
- Requires cooperation
- Interpretation may be difficult
- Expensive
Environmental Exposures - Food

Food

- Local
  - Pesticides
  - Heavy metals

- Imported
  - Pesticides
  - Heavy metals

Kitchen Garden

Goa Market
Environmental Exposures - Water

Surface Water

Yackashima National Park
Environmental Exposures - Water

Surface Water

Mongolia
Environmental Exposures - Water

Surface Water

Dry stone creek bed in Western Australia
Environmental Exposures - Water

Surface Water

Adelaide Water Supply from the Murray River
Environmental Exposures - Water

Ground Water

Spring in Afghanistan

Old Well in Geraldton
Environmental Exposures - Water

Ground Water

Coorang Soak
Environmental Exposures - Water

Stored Water

Galvanised (seams – lead)

Concrete

Steel alloy * (seams – sealant)

Pre-painted steel #

Polyethylene (Poly)

* Zincalume®  # Aquaplate®)
Some Hazardous Occupational Exposures

- Volatile Organic Compounds (VOCs) or ‘Solvents’
- Isocyanates
- Heavy metals
  - Lead, mercury, arsenic
- Pesticides
- Asbestos
- Silica
Hazardous Occupational Exposures

Silica Dust

Granite

 Manufactured stone
Agricultural Industry Hazards

Cotton

- Extensive range of approved pesticides
- Integrated pest and disease management
- Minimise pesticide usage
- Best practices for aerial and ground boom spray application
Occupational Exposure – Physical Factors

- Ultra-violet radiation
- Vibration
- Heat

Heat waves from a controlled burn

I did it my way!
Principles for Identifying Suitable Biological Monitoring Tests

- Identification of suitable biological media depending on mechanisms of excretion
- Identification of chemical exposure or suitable metabolites
- Mixed exposure – metals, solvents, pesticides
Biological Monitoring Tests

- Background levels
  - Metals
  - Solvents – metabolic and dietary sources
- Level of exposure
- Measure dose and/or effect
- Limitations on the usefulness of tests
  - Sensitivity, specificity, timing
**Principles of Specimen Collection**

<table>
<thead>
<tr>
<th>When to Collect</th>
<th>v</th>
<th>Half-life</th>
</tr>
</thead>
<tbody>
<tr>
<td>During Exposure</td>
<td></td>
<td>&lt;2 hours</td>
</tr>
<tr>
<td>During/End of Shift (last 2h)</td>
<td></td>
<td>&lt;5 hours</td>
</tr>
<tr>
<td>Prior to Next Shift</td>
<td></td>
<td>5 – 10 hours</td>
</tr>
<tr>
<td>End of Shift at End of Work Week</td>
<td></td>
<td>10 – 100 hours</td>
</tr>
<tr>
<td>Not Critical (after period of exposure)</td>
<td></td>
<td>Weeks</td>
</tr>
<tr>
<td>When to Repeat Collection</td>
<td>v</td>
<td>Half-life</td>
</tr>
<tr>
<td>---------------------------</td>
<td>---</td>
<td>-----------</td>
</tr>
<tr>
<td>1 Day</td>
<td></td>
<td>&lt;5 hours</td>
</tr>
<tr>
<td>1 Week</td>
<td></td>
<td>5 – 50 hours</td>
</tr>
<tr>
<td>1 Month</td>
<td></td>
<td>2 – 8 days</td>
</tr>
<tr>
<td>3 Months</td>
<td></td>
<td>1 – 6 weeks</td>
</tr>
<tr>
<td>6 Months</td>
<td></td>
<td>6 – 12 weeks</td>
</tr>
<tr>
<td>1 Year</td>
<td></td>
<td>&gt;12 weeks</td>
</tr>
</tbody>
</table>
Analytical Laboratories

- Accreditation and Quality Control
- Documentation of methods/interpretation
- Subcontracting to other laboratories
- Reporting
- Timeliness
- Support for specimen collection and transport
- Specificity and variability of analytical methods
- Assistance with interpretation
Collection of Biological Specimens

- Is the sample **from the Worker**?
- Is the sample **Contaminated**?
  - Blood
  - Urine
- Is it a **usable Urine sample**?
  - Is concentration normal?
Collection, Transport and Reporting of Biological Specimens

- Identify specimen
- Timely transport to laboratory
- Accredited laboratory
- Timely reporting
- Interpretation
It was a hot day and we were glad to stop for lunch in the park.

After lunch I went to the shopping centre in search of you know what.
The Stall Story

Found what I needed!

Stall clean and no graffiti

but

What was that on the wall?
It is always a **hot day**, especially in summer and you may experience **heat stress**.

Dehydration makes **heat stroke** more likely.

Are you adequately hydrated?

What colour is your urine?

Did you pass the test?
Interpretation of Test Results

- Is the test interpretable?
- If NOT, do NOT order
- Explain why

Industrial Action
Some Practical Issues

- Effective Communication with Workers and Unions
- Reporting to Management Issues
  - Confidentiality
- Communication with
  - General Practitioners
  - Other Team Members
References

*From Evidence to Practice: Workplace Wellness that Works* (free download)
Review by: Institute for Health and Productivity Studies.
Johns Hopkins Bloomberg School of Public Health 2015

*Cotton Pest Management Guide 2017-18* (free download)
Part 3  Case Reports and Discussion
Anaphylactic reaction in a hairdresser due to sensitization to persulphates

Occupational rhinoconjunctivitis caused by the common indoor plant, *Hoya compacta*

Sensitization to cow’s milk protein in a dairy worker

Sensitization to xylanolytic enzymes: an underestimated health hazard among bakers
Anaphylactic reaction in a hairdresser due to sensitization to persulphates

Background:

**Persulphates** present in permanent hair dyes and bleaching products. May be present in dental cement.

**Irritant dermatitis** common (10 – 20%) in hairdressers.

**Allergic dermatitis:** p-phenylenediamine, toluene-2.5-diamine, persulphates and glyceryl monothioglycolate

**Asthma and rhinitis:** persulphates, p-phenylenediamine, latex and natural henna

A. Kleniewska et al. *Anaphylactic reaction in a hairdresser due to sensitization to persulphates*. Occupational Medicine 2016; 66: 584–585
Anaphylactic reaction in a hairdresser due to sensitization to persulphates

Hairdresser for 30 years. After 15 years developed sneezing and urticaria and erythema on hands and forearms after using bleaching products. Symptoms were better when not at work. She also became allergic to latex gloves and thereafter only used vinyl gloves.

Prior to hospital admission she had undertaken routine dental treatment over several months. During this time procedures using dental cement containing persulphates was used. Latex gloves were not used. She eventually developed facial oedema, erythema and severe dyspnoea during dental treatment and was admitted to hospital where an anaphylactic reaction was confirmed.

Investigations confirmed allergy to persulphates and latex. Dermatitis resolved after she left work.

X. Mun et al. Occupational Asthma Due to Persulfate Salts: Diagnosis and Follow-up. CHEST 2003; 123:2124–2129
Case Reports: from Occupational Medicine
Journal of the Society of Occupational Medicine

Occupational rhinoconjunctivitis caused by the common indoor plant, *Hoya compacta*

Allergic reactions to *Hoya compacta* (wax plant) not previously reported.

Greenhouse gardener developed rhinoconjunctivitis after working 4 months with *Hoya compacta*. Another employee developed rhinoconjunctivitis after working 2½ years.

Plant service company employee who mainly worked with *Hoya compacta* and *Ficus benjamina* (weeping fig) developed rhinoconjunctivitis after working 1 year.

Positive skin prick tests and histamine release tests showed Type I IgE mediated sensitization to *Hoya compacta*.

Sensitization to cow’s milk protein in a dairy worker

Dairy industry worker for 17 years making butter, cheese and dried milk.

For last 10 years made dried milk without PPE. After 2 years developed eczema on face and upper limbs which improved when not at work. Made worse after eating dairy products. Eventually stopped eating dairy products.

Developed anaphylaxis after drinking milk by mistake.

Skin prick tests positive for casein, lactalbumin and lactoglobulin. Serum specific IgE tests were positive for casein but negative for lactalbumin and lactoglobulin.

Sensitization to xylanolytic enzymes: an health hazard among bakers

Xylan is a polysaccharide and is a major component of plant cell walls. Xylanases converts water-insoluble hemicellulose into a soluble form which binds with water in the dough making it less sticky and improves the bread structure. Allergens in bread making include flour and enzymes, especially α-amylase.

Case Report:
Baker with 6 years exposure who suffered from work-related respiratory, ocular and skin symptoms.

Investigations:
Skin prick tests with common and occupational allergens were negative. Spirometry and methacholine challenge normal to flour exposure. After 20 min exposure to flour adjuvants, developed cough, itching and wheezing and fall in FEV₁ and positive metacholine challenge. Xylanolytic enzymes IgE positive.


Carbon monoxide poisoning in wood pellet storerooms

Occupational asthma caused by an epoxy amine hardener

Subclinical chronic left ventricular systolic dysfunction resulting from phosphine poisoning

Rhabdomyolysis with acute tubular necrosis following occupational inhalation of thinners
Carbon monoxide poisoning in wood pellet storerooms

**Background:** Chemical degradation of wood pellets in storage facilities may result in emission of significant levels of carbon monoxide.

Unconscious man found in a wood pellet storeroom. Rescued by firemen and paramedics who gave CPR but he subsequently died. Carbon monoxide level of 600 ppm was detected in the area CPR given. Rescuers complained of dizziness, headache, nausea and fatigue. Initial levels of carboxyhaemoglobin in the rescuers were estimated to be higher than 10%. Treated with 100% oxygen until carboxyhaemoglobin levels normal.

Rescuers should be equipped with carbon monoxide detectors and use self-contained breathing apparatus prior to entering areas with elevated carbon monoxide levels.

Occupational asthma caused by an epoxy amine hardener

Floor layer developed work-related asthma after using a volatile epoxy hardener based on isophorone diamine (IPDA) for ~3 years.

Symptoms occurred 3 – 5 hours after exposure and lasted 2 – 4 days. Used salbutamol up to 10 times a day for symptom control.

Investigated ~1 year after developing symptoms. Diagnosis was confirmed through specific inhalation challenges.

NB Cross sensitivity can occur between isophorone diamine and isophorone diisocyanate (used in paints that have high resistance to UV and abrasion).

Subclinical chronic left ventricular systolic dysfunction resulting from phosphine poisoning

32-year-old male crew member of a cargo ship, accidentally exposed to the fumigant phosphine.

Developed gastric symptoms then, bilateral pneumonia, acute nephritis, mild LFT abnormalities, electrolyte imbalance and leucopenia. Two other crew died from acute pulmonary oedema.

Received supportive treatment and discharged after 3 weeks asymptomatic.

Further investigation after 4 months revealed subclinical left ventricular dysfunction. This confirmed previous reports.

Rhabdomyolysis with acute tubular necrosis following occupational inhalation of thinners

‘Thinners’ are mixtures of organic solvents such as toluene, xylene, acetone, hexane, benzene and methyl isobutyl ketone. Cleaned the interior surface of a 4000 L steel water tank with thinners. No PPE.

Became unwell, with headache, body pains and weakness. After 4 days developed oliguria, grossly abnormal LFTs and elevated serum creatinine kinase levels. Renal biopsy confirmed acute tubular necrosis. Haemodialysed for 7 days. Discharged after 4 weeks with biochemical levels returning to normal apart from creatine kinase which remained elevated.

Diagnosis: Rhabdomyolysis with acute tubular necrosis and renal failure probably due to high acute exposure to toluene.

How Do I Diagnose and Treat Workers With Injuries From Hydrofluoric Acid?

What Conditions Should Be Assessed in Evaluating Individuals Who Work in Confined Spaces?

What Is the Mediterranean Diet and How Can It Be Used to Promote Workplace Health?
What Is the Mediterranean Diet and How Can It Be Used to Promote Workplace Health?

Typical diet Greece, Southern Italy, coastal Croatia and Spain

- +++ Fat – olive oil
- +++ Carbohydrate – fruit, vegetables, legumes, nuts
- ++ Protein – fish, seafood, poultry, eggs, yoghurt
- + Protein – red and processed meat
- + Sugar
- Wine with meals
What Is the Mediterranean Diet and How Can It Be Used to Promote Workplace Health?

Benefits - Reduction in Risk

- CHD Mortality 20 – 40%
- CVD Mortality 25 – 45%
- Diabetes Incidence 25 – 30%
- All cause mortality 17 – 25%

Mediterranean Diet

- Acceptable in Wellness Program Trials
- Safe, Appealing, Long term adherence

M. Korre et al. What Is the Mediterranean Diet and How Can It Be Used to Promote Workplace Health? JOEM. 2016. 58 (3): 111 – 113
ACOEM Position Statement: Workplace Lead Exposure

## Reference Blood Lead Levels (BLL) for Adults in the U.S.

<table>
<thead>
<tr>
<th>Blood lead concentration (μg/dL)</th>
<th>μg/dl</th>
<th>μmol/l</th>
</tr>
</thead>
<tbody>
<tr>
<td>60</td>
<td>80</td>
<td>3.9</td>
</tr>
<tr>
<td>50</td>
<td>70</td>
<td>2.4</td>
</tr>
<tr>
<td>40</td>
<td>60</td>
<td>2.9</td>
</tr>
<tr>
<td>30</td>
<td>50</td>
<td>2.4</td>
</tr>
<tr>
<td>25</td>
<td>40</td>
<td>1.9</td>
</tr>
<tr>
<td>20</td>
<td>30</td>
<td>1.4</td>
</tr>
<tr>
<td>15</td>
<td>25</td>
<td>1.2</td>
</tr>
<tr>
<td>10</td>
<td>20</td>
<td>1.0</td>
</tr>
<tr>
<td>5</td>
<td>10</td>
<td>0.5</td>
</tr>
<tr>
<td>1.2</td>
<td>5</td>
<td>0.2</td>
</tr>
<tr>
<td>0.1</td>
<td>1.2</td>
<td>0.1</td>
</tr>
</tbody>
</table>

- **OSHA’s Medical Removal BLL:**
- **OSHA’s Return to Work:**
- **ACGIH Biological Exposure Index:**
- **OSHA’s NEP – lead (2008):**
  - Level for BLL testing every 6 months (AOEC, 2007)
  - California DPH Medical Guidelines (2009)
  - Healthy people 2020, OSH Objective 7 (2010)

**Recent Research Findings:**
- PbB 10 – 20 μg/dl
- Increased cardiovascular risk

---

**Case Definition for an elevated BLL:** CSTE (2015), ABLES/NIOSH/CDC (2015), CDC Nationally Notifiable Condition (2016)

**Level not to exceed during pregnancy:** AOEC (2007), California DPH Medical Guidelines (2009), CDC (ACCLPP, 2010)

2009-2010 average BLL among adults (National Report on Human Exposure to Environmental Chemicals)
ACOEM Position Statement: Workplace Lead Exposure

**Recommendations**

<table>
<thead>
<tr>
<th>Baseline Testing</th>
<th>For all workers with significant lead exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Testing Frequency</strong></td>
<td><strong>μg/dl</strong></td>
</tr>
<tr>
<td>PbB every 2 months for first 6 months</td>
<td>1.2</td>
</tr>
<tr>
<td>Aim: Pregnant workers PbB &lt;5 μg/dl</td>
<td>5</td>
</tr>
<tr>
<td>Other workers PbB &lt;15 μg/dl</td>
<td>10</td>
</tr>
<tr>
<td><strong>Blood Lead Level</strong></td>
<td>≥5 – 9 μg/dl – workplace inspection</td>
</tr>
<tr>
<td>10 – 19 μg/dl</td>
<td>PbB every 2 months – repeat workplace inspection</td>
</tr>
<tr>
<td>PbB every 6 months when &lt;10 μg/dl#</td>
<td>30</td>
</tr>
<tr>
<td>PbB &gt;10 μg/dl – remove if pregnant: return &lt;5 μg/dl#</td>
<td>40</td>
</tr>
<tr>
<td>&gt;20 μg/dl#</td>
<td>Remove – repeat workplace inspection</td>
</tr>
<tr>
<td>Return &lt;15 μg/dl#</td>
<td>60</td>
</tr>
<tr>
<td>≥30 μg/dl</td>
<td>Remove Immediately – repeat workplace inspection</td>
</tr>
<tr>
<td>Return &lt;15 μg/dl#</td>
<td>80</td>
</tr>
</tbody>
</table>

* includes females trying to become pregnant
# confirmed = repeat in 1 month
Anaphylactic reaction in a hairdresser due to sensitization to persulphates.

Occupational asthma due to Persulfate salts: Diagnosis and follow-up.
X. Mun et al. CHEST 2003; 123:2124–2129

Occupational rhinoconjunctivitis caused by the Common indoor plant, Hoya compacta.

Sensitization to cow's milk protein in a Dairy Worker.

Sensitization to xylanolytic enzymes: an Health Hazard among Bakers.

Xylanases and their application in the Baking Industry.
References

Carbon monoxide poisoning in Wood Pellet Storerooms.  

Occupational asthma caused by an Epoxy Amine Hardener.  

Subclinical chronic left ventricular systolic dysfunction resulting from Phosphine Poisoning.  

Rhabdomyolysis with acute tubular necrosis following occupational Inhalation of Thinners.  

What is the Mediterranean Diet and how can it be used to Promote Workplace Health?  
M. Korre et al. JOEM. 2016. 58 (3): 111–113

ACOEM POSITION STATEMENT: Workplace Lead Exposure. (free download)  
http://www.acoem.org/uploadedFiles/Public_Affairs/Policies_And_Position_Statements/Guidelines/Position_Statements/Workplace_Lead_Exposure.pdf
Community Concerns

Asbestos

- Example of asbestos cement siding and lining on a post-war temporary house in Yardley (UK).
- Nearly 40,000 houses were built between 1946 and 1949.
- Photo 2016
- 70 years old
- **Concern or Risk**
  - Passers by?
  - Residents?
  - Renovation?
Community Concerns

Garden

- **Imidacloprid** *
  (Confidor®)

- **Spinetoram** (Yates Success™ ULTRA Insect Control)

- **Carbaryl** (Richgro Caterpillar, Grasshopper & Millipede Insecticide)

- **Pyrethrum** (Hortico Insect Killer)

For further information see Safety Data Sheet of manufacturer

* A systemic neonicotinoid insecticide to be withdrawn by Australian retailers by end 2018 due to concerns regarding bees. No evidence of decline in Australian bee populations according to Pesticides and Veterinary Medicines Authority.
Community Concerns

Termite Control

- Non-repellent
  - Fipronil (Termidor®)
  - Imidaclorpid (Confidor®)
- Repellent
  - Chlorpyrifos and Bifenthrin
- Stainless Steel Mesh
- Baits
- Other

For further information see Safety Data Sheet of manufacturer
Community Concerns

Mobile Phones, Base Stations and Power Lines (RF)

Thermographic image after 15 min call

Tracey Nicholls
Community Concerns

Fire Foam Contamination
Community Concerns

Fire Foam Contamination

F18A Hornet  Hunter Estuary Wetlands  Bottled Water
Community Concerns

Mould in Buildings

Post Katrina
Community Concerns

Coal Transport from Upper Hunter Mines to Newcastle for Export

Coal train near Singleton

Newcastle Coal Terminals

Coal train near Newcastle
Community Concerns

Rail Transport of Zinc / Lead Ore for Smelting and Export

Smelter
Port Pirie
Nyrstar smelter stack

Mine
Broken Hill
Rasp Mine

Export
Newcastle
Shiploader (Conports)
References

Mobile phones and health

Mobile phone base stations and health
Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) [For further information See Website]

Per- and Polyfluoroalkyl Substances (PFAS) and Your Health
https://www.atstdr.cdc.gov/pfas/overview.html
Agency for Toxic Substances and Disease Registry (ATSDR) For further information See Website

Health Based Guidance Values for Per- and Poly- Fluoroalkyl Substances (PFAS)
Australian Government Department of Health 2017 For further information See Website

Review of the New South Wales Environment Protection Authority's Management of Contaminated Sites (free down load)
Macquarie University 2016
References

Damp Indoor Spaces and Health (free download)
https://www.nap.edu/catalog/11011/damp-indoor-spaces-and-health

WHO guidelines for indoor air quality: dampness and mould (free download)
World Health Organization 2009.

NSW Chief Scientist & Engineer August 2016

Coal Mine Dust Exposures and Associated Health Outcomes: A Review of Information Published Since 1995: CURRENT INTELLIGENCE BULLETIN 64 (free download)
National Institute for Occupational Safety and Health 2011

High-Volume Hydraulic Fracturing and Human Health Outcomes: A Scoping Review
R. Wright and R. Muma. JOEM. 2018. 60 (5): 424- 429
Part 5  Forgotten Exposures
Forgotten Exposures

Traditional or natural aboriginal medicine

Aboriginal children (Balgo WA) participating in National Iodine Study 2004

Study found WA children iodine deficient
Forgotten Exposures

Lifestyle

Alice Springs
Todd River
Forgotten Exposures

Thursday Island

Indigenous

Cape York

Tourists
Forgotten Exposures

Indigenous (New Guinea)
Indigenous Diet

Fiji

New Guinea
Forgotten Exposures - Farmers

Occupational Pesticide Illness Prevention Program

Fact Sheets and Reports

Preventing Illness from Pesticide Drift

Pesticide Illness: A comprehensive educational curriculum for health care providers
Forgotten Exposures

Californian Migrant Farmworkers

(California Rural Legal Assistance)

- Pesticides
- Heat stress
Forgotten Exposures

Poultry Slaughter and Evisceration *

Biological Hazards
Chemical Hazards
Physical Hazards
Ergonomic Hazards
Traumatic Injury and Safety Hazards
Reported Health Effects

* see NIOSH
Forgotten Exposures

Offshore Workers

Ultraviolet Radiation and Skin Cancer Risk in Offshore Workers


North Sea Gas Platform
Time for a Seachange?

1. Lasthib
2. Paul Toogood
3. Tourism NT
4. W. Bulach
5. Evad37
Forgotten Seachange Exposures

Leaving the city for a better Lifestyle?

Self-sufficiency?

Fewer hazards?

Still working?

Retired?

Returning to the city?
References

Occupational Pesticide Illness Prevention Program
https://www.cdph.ca.gov/Programs/CCDPHP/DEODC/OHB/OPIPP/Pages/OPIPP.aspx
California Department of Public Health

Poultry Slaughter and Evisceration: Biological, Chemical and Physical Hazards *
https://www.cdc.gov/niosh/topics/poultry/slaughter.html

Campylobacter Infection and Exposures Among Employees at a Poultry Processing Plant — Virginia
Health Hazard Evaluation Report April 2012 *

* For further information See NIOSH PULTRY INDUSTRY WORKERS Website

Ultraviolet Radiation and Skin Cancer Risk in Offshore Workers.

Occupational Exposure to Carbon Nanotubes and Nanofibers (free download)
Current Intelligence Bulletin 65. 2013
https://www.cdc.gov/niosh/docs/2013-145/

Environmental impact of multi-wall carbon nanotubes in a novel model of exposure: systemic distribution, macrophage accumulation, and amyloid deposition (free download)
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4598201/
A. Albini et al. International Journal of Nanomedicine. 2015:10 6133–6145