

Managing Occupational Health and Safety Risks

Lecture Title:
From Chemistry to Biology

Lecturer: Mark Lia

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**Undergraduate Diploma in
Occupational Health and Safety**

The Hierarchy of Control

1. Identify Hazards (Chemical Register, SDS)
2. Assess the Risk (Risk Matrix, Severity X Probability)
3. Design of Controls (Hierarchy- Engineering/Substitution/PPE)
4. Implementation (Train/ Inform/ Communicate)
5. Monitor to verify (Air monitoring, Health Surveillance, Training Evaluation)
6. Review to improve



Air Monitoring - Why, What, How

- **WHY MONITOR?**

- **To determine if Workplace Exposure Limits (WELs) are being met**
- **To verify that controls are effective**
- **To identify areas where controls are failing**
- **To provide data for risk assessment updates**
- **To demonstrate compliance with legal requirements**
- **To provide evidence for health surveillance programs**



WHAT TO MONITOR?

- **The substance should be monitored if:**
- **It has a Workplace Exposure Limit (WEL)**
- **There is potential for exposure to exceed the limit**
- **Controls are critical to preventing exposure**
- **Workers are showing symptoms or effects**
- **The process or controls have changed**

Priority substances for monitoring:

- **Carcinogens, mutagens, reproductive toxins (CMRs)**
- **Respiratory sensitizers (isocyanates, flour dust)**
- **Substances with low WELs (e.g., lead, silica, welding fume)**
- **Substances where exposure is hard to predict**

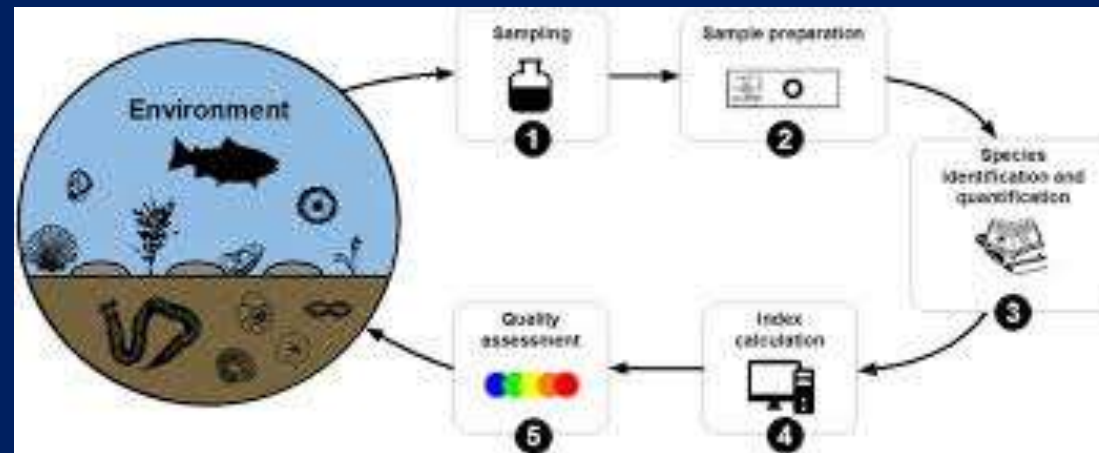
How to Monitor

Strategic	Compliance	Verification
Initial surveys to characterize exposure levels	Regular monitoring to check WEL compliance	After control changes to verify effectiveness
Baseline data for comparison	Personal sampling (on the worker) rather than static	After process changes
Identification of high-exposure tasks	Full-shift sampling for 8-hour TWA	Periodic re-assessment (typically annually or as specified)
	Short-term sampling for STEL compliance	

Biological Monitoring

What is Biological Monitoring??

Biological monitoring measures the uptake of a substance into the worker's body, rather than the concentration in the air



Air Monitoring vs Biological Monitoring

Air Monitoring	Biological Monitoring
Measures exposure	Measures uptake
In air	In blood, urine, breath
All routes? Inhalation only	All routes combined
Instantaneous or time-weighted	Integrated over time
Doesn't account for PPE	Accounts for PPE effectiveness
Doesn't account for absorption	Accounts for individual variation

WHEN IS BIOLOGICAL MONITORING APPROPRIATE?

- Where skin absorption is a significant route
- Where PPE is relied upon for protection
- Where air monitoring is technically difficult
- Where substances accumulate in the body (e.g., lead, cadmium)
- Where there is a Biological Exposure Limit (BEL) or guidance value

EBOLA

<https://www.youtube.com/watch?v=XCr0de-JYs0>

How did it spread?

What did healthcare workers do
to control it?





HEALTH SURVEILLANCE

Health surveillance is the systematic monitoring of workers' health to detect early signs of adverse effects from exposure to hazardous substances.



WHAT IS HEALTH SURVEILLANCE?

Health surveillance is NOT the same as general health screening.

It is targeted at workers who are exposed to specific hazards that can cause identifiable adverse health effects.

It includes:

- **Pre-placement assessment to establish baseline**
- **Periodic assessments (annual or as specified)**
- **Post-exposure or exit assessments**
- **Biological monitoring (as covered)**
- **Clinical examinations**
- **Lung function tests**
- **Skin examinations**



WHEN IS HEALTH SURVEILLANCE REQUIRED?

- Where there is a known identifiable adverse health effect
- Where the effect can be detected at an early stage
- Where detection is likely to lead to effective prevention
- Where exposure is significant and ongoing



TYPES OF HEALTH SURVEILLANCE:

Type	Example
Respiratory surveillance	Lung function tests (spirometry) for workers exposed to respiratory sensitizers (isocyanates, flour dust)
Dermaatological Surveillance	Skin Examination for workers exposed to skin irritants or sensitizers
Biological Monitoring	Blood levels for lead workers
Urinalysis	Urinary metabolites for solvent workers

Responsibilities

Employer:

- **Identify workers who need surveillance**
- **Arrange for competent health professional (e.g., occupational health physician, nurse)**
- **Act on results to protect workers**
- **Keep health records (40 years after last exposure)**



Responsibilities

- **Employee:**
 - **Participate in health surveillance when required**
 - **Report symptoms to employer or health professional**
 - **Follow advice from health professional**



Case Study- Sprayer

A small automotive refinishing workshop employs 6 spray painters. They use isocyanate-based paints in a spray booth with a ventilation system. The ventilation system was installed 8 years ago and has never been tested. Three painters have recently reported coughing, wheezing, and shortness of breath that worsens on workdays and improves on weekends.



- **What immediate actions should you take as the consultant?**
- **What monitoring should be conducted and why?**
- **What health surveillance is needed for these workers?**
- **What training would you recommend for the spray painters?**

Case Study 2- Construciton Site

A construction site has 15 workers cutting concrete blocks indoors. The work generates silica dust. The only controls are disposable dust masks and an open door for ventilation. No air monitoring has been conducted. Workers have not been trained on silica hazards. One worker has started coughing and reports difficulty breathing.



What are the immediate actions required?

What type of monitoring is needed?

What health surveillance should be in place?

What control measures should be implemented following the hierarchy?



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