Sampling Strategies

HSCI 466B
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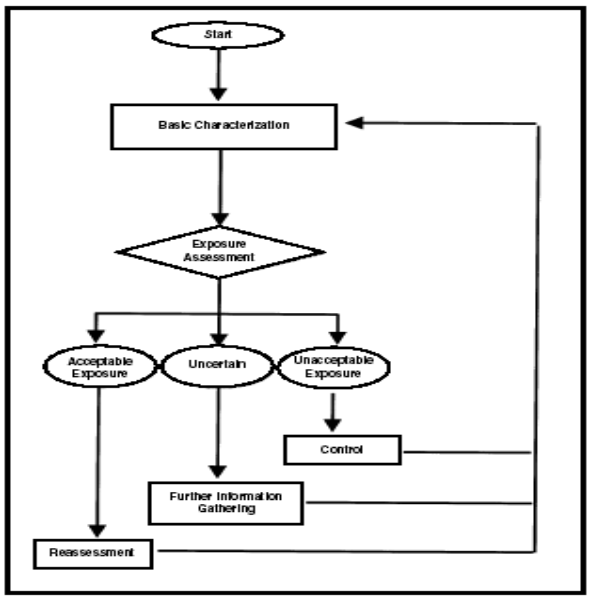
Introduction

- Basic problem
- Recognition of exposures
- Significance of exposures
- Overexposure
- Control of exposure
- Professional judgment



Basic Characterization

- Qualitative evaluation
- Characterize workplace
- Characterize work force
- Characterize agents
- Identify homogeneous exposure groups

Basic Characterization - Workplace

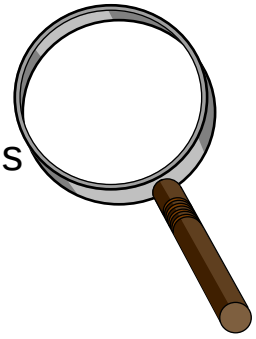
- Process and operation descriptions
  - Texts, references, past experience
  - Similar operations or processes
- Chemical agent inventory
- Physical agent inventory
- Biological agent inventory

Basic Characterization – Work Force

- Job titles and descriptions of jobs
  - Be cautious of job titles
- Task analysis
  - Direct observation
- Number of workers involved

Basic Characterize - Agents

- Health effects data
- Regulations
- Exposure limits and guidelines



Homogeneous Exposure Groups

- Job description approach
- Task-based approach
- Chemical-based approach
- Process and job-based approach
- Process/job/task approach
- Data analysis

Qualitative Risk Assessment

- Prioritization among homogeneous exposure groups

Exposure Rating

- Past monitoring data
- Similar operations
- Professional Judgement

Health Effects Ratings

- Chronic versus acute effects
- Reversible versus irreversible effects
- Potential consequences
- Employee or public concern

Homogenous Exposure Group Ranking

- Exposure Ranking
- Health Effect Ranking

Exposure Monitoring

- Monitor actual exposures during a given time period, diagnose critical sources of exposure in the workplace

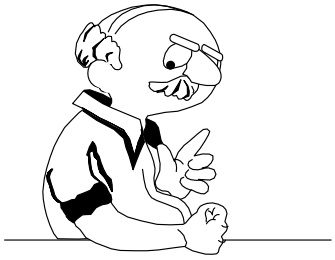
Routes of exposure

- Sources of exposure
- Exposure pathways
- Critical pathways (most important)

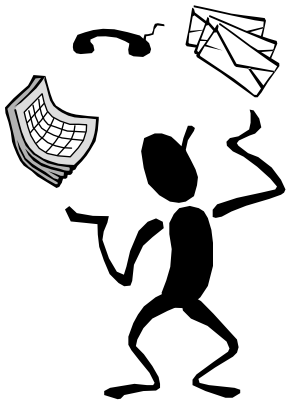
Monitoring

- Objectives
  - Baseline
  - Diagnostic
  - Compliance
- Methods
  - Personal
  - Area

Interpretation and Decisions

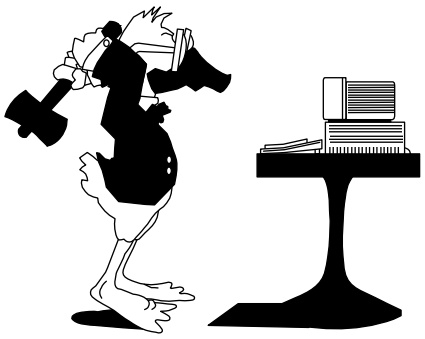


Evaluate Exposure Data



Professional Judgement

- Experience
- Consensus



Statistical tools

- Descriptive statistics
- Probability plots
- Tolerance limits
- Confidence intervals on mean exposure
- Control charts

Descriptive Statistics

- Mean
- Standard deviation
- Range
- Detectable observations

Probability Plots

- Normal probability
- Lognormal probability

Tolerance Limits

- 95 % of population is within a certain range of values.

$$\overline{X} \pm Ks$$

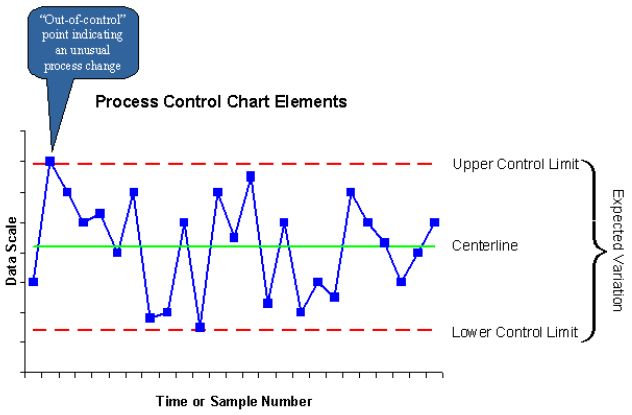
- K taken from chart, depends on p and n.

Confidence Interval on Mean

- The population mean is within 2 SD of sample mean (95 % confidence interval)
- Use t-table, p = 0.5α, N-1 degrees of freedom
- Spreadsheet helps analysis

$$\overline{X} + \frac{t_{0.5\alpha} s}{\sqrt{N}} \qquad \overline{X} - \frac{t_{1-0.5\alpha} s}{\sqrt{N}}$$

Control Charts



Recommendations and Reporting

- Maintain a record of exposures
- Form a baseline for future evaluation

Tools

- Written report of results
- Archive of reports
- Effect of PPE and other controls
- Communication to
  - Management
  - Workers
  - Other EH&S Professionals

Reevaluation

- Periodic review
  - recommendations from previous studies
- Employee health complaints
- Process changes
- Health surveillance needs
- New health effects data
- New regulations