



Medical Monitoring of Worker Enzyme Exposure in the Detergent Manufacturing Industry

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Why Enzymes in Detergents?

- Cleaning and stain removal
- Breaking water insoluble substances into smaller, water soluble fragments
- Enzyme types:
 - Proteases (soil, grass, blood)
 - Amylases (starch)
 - Lipases (greases)
 - Cellulases (fabric protection)



Short History

- Pancreatic enzymes in laundry wash patented in 1931 (Dr. Rohm)
- First detergent with Protease 1951
- 1960's occupational asthma problems
- 1970 enzyme granulates (prills)
- 1971 Amylases introduced to laundry
- Mid 1970: liquid enzymes....
- 1980's introduction of modern medical monitoring methods



How has Safety been achieved?

- Enzyme Hygiene Program
 - Equipment Capability
 - Training of employees
 - Program Ownership, Commitment, Behavior
 - Tracking and Measurement of Exposure
 - Effective Medical Monitoring



Training of Employees, Ownership, Behavior

- Possible adverse health effects of enzymes/illness symptoms
- Meaning of sensitization
- Individual performance expectations
- PPE use
- Special situations (spills, equipment problems)
- Behavior observation system



Tracking and Measurement of Exposure

- Airborne Enzyme Concentrations
 - Air Sample collection
 - Location of samplers
 - Analysis of samples: total dust plus ELISA technique for enzyme content
 - Quality Assurance – maintenance/calibration of sampling equipment
 - Data long term analysis (OEG/Trends)



Medical Monitoring Objectives

- Protecting individual health by early detection of adverse changes
- Assisting in evaluation of exposure control measures
- Contributing to improvement(s) of employee protection



Medical Monitoring: (Pre-placement and every 12 months)

- Medical History with particular reference to Allergy, Asthma, Lung diseases and medication taken
- Respiratory Questionnaire
- Lung Function Assessment
- Immunological Tests
- Physical Examination at the discretion of the Occupational Physician



Outcomes of Medical Monitoring

- Normal findings
- Positive immunological test to enzyme with no other adverse finding – employee may continue to work with enzymes with increased protection/ surveillance
- Respiratory Questionnaire abnormal data – immediate further assessment by physician



Outcomes of Medical Monitoring (Cont.)

- Impaired lung function on spirometry – should be re-tested within one month or at Occupational Physician's judgment. Continued downward trend should be assessed as to need for removal from exposure
- Clinical symptoms of enzyme induced respiratory disease – fitness for work assessment must be done by Occupational Physician



Basic Tools in Medical Monitoring

- Respiratory Questionnaire
- Pulmonary Function Test
- Immunological Monitoring



Respiratory Questionnaire

- Good description of symptoms
- Nurse participation welcome
- Pre-employment/periodical
- Evaluation by Nurse



Spirometry

- Standardized procedure/protocol
- Forced expiratory manoeuvre
- Test indices FVC, FEV₁, FEV₁/FVC ratio and PEFR
- Reproducible tests



Immunological Tests

- Demonstrate development of specific IgE, i.e. immunological response following exposure to allergen
- Immunological response does **not** mean disease
- Skin Prick Test
- Serological test procedures



Skin Prick Test

- Performed by trained and competent nurse (standards applicable for allergy clinics)
- Negative control (saline, to identify non-specific reactions)
- Positive control (histamine, to confirm normal skin reactivity)
- Standardized reagents



Skin Prick Test Technique

- Drop of reagent placed on the arm
- Skin lifted with tip of a hypodermic needle or tip of lancet pressed into skin and withdrawn
- Excess solution wiped off
- Test site inspected at 15 minutes
- Positivity: at least 3 mm of wheal diameter with flare (or at least 3 mm greater than response to the negative control)



Serological Test Procedures

- Most common RAST, UniCAP, ELISA
- Blood collection, venepuncture
- Only accredited laboratory can be used
- Quantitative results



Advantages of Skin Prick Test

- Less invasive than serology
- Immediate results
- Inexpensive



Advantage of Serology Tests

- Quantitative results
- Usable with patients taking medication which could interfere with Skin Prick Test (e.g. antihistamines)
- Usable in individuals with skin diseases



Conclusions

- It is not difficult to make of enzymes the best controlled occupational allergen
- Good communication with employees absolutely necessary
- Legal compliance of OH programs must be guaranteed



Sector Cooperation

- In Safety and Health, all competitors are on one boat
- Industry associations role
- AISE initiatives
- Communication with authorities