



International Association for Soaps,  
Detergents and Maintenance Products

# Enzyme Safety Management

A series of web based training and Information  
Sessions developed and presented  
by the AISE Enzyme Safety Task Force



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## Webinar 5: **Medical perspectives of working with enzymes**

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## Content

- Introduction
- Health Effects resulting from exposure to airborne enzymes
- Medical surveillance
- The complexity of the relationship between occupational enzyme exposure and sensitization/allergy
- Conclusions
- Questions





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# Introduction



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## What are enzymes?

Specialized proteins found in all living organisms

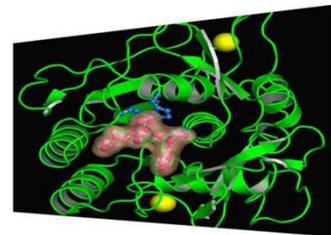
Enzymes are not themselves living substances

Catalyzers of chemical processes

Used as components in detergents and processing aids in the manufacturing of bioethanol, food etc.



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Enzymes are specialized proteins that are found in all living organisms. Without enzymes, plants, animals or human beings would not be able to exist. The enzymes are not themselves living organisms, but they are vital for the processes that occur inside an organism. Enzymes act as catalyzers of chemical processes which means that for instance a process that would otherwise require a high temperature or a low pH to run, will due to the catalytic action of an enzyme be able to run at body temperature and neutral pH. Today enzymes are produced industrially and they are used as components in for instance detergents, and as processing aid in the manufacturing of bioethanol as well as in other industries.

## Enzyme Allergy – the history

- 1963 the first enzyme containing consumer detergent product was launched.
- 1969 Medical journal The Lancet publishes an article raising concern about enzymes in detergents
- Federal Trade Commission questions the safety of enzymes, both in regards to workers as well as consumers.



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The first enzyme containing consumer detergent was launched in 1963. The enzyme products, which were added to this and the other very early detergents, were formulated only as a powder, so they were very dusty products. In 1969 the first report was published in The Lancet that the enzymes used in the detergents might cause respiratory allergy. This was followed up by the Federal Trade Commission in the US, who questioned the safety of the enzyme products both in regards to workers and consumers health.

## Enzyme Allergy – the history

1971 Studies by independent bodies showed that enzymes in detergent products do not present a risk to consumers.

1971 The US health authorities publish a report concluding that detergent enzymes are safe for consumers.



In regards to workers improvements had to be made

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The concern was followed up by studies from independent bodies who investigated the extent of the issue, and in 1971 a report concluded that enzymes in detergents do not present a risk to the consumers.

Later that year the US FDA came to the same conclusion, that consumers are safe when using enzyme containing detergents.

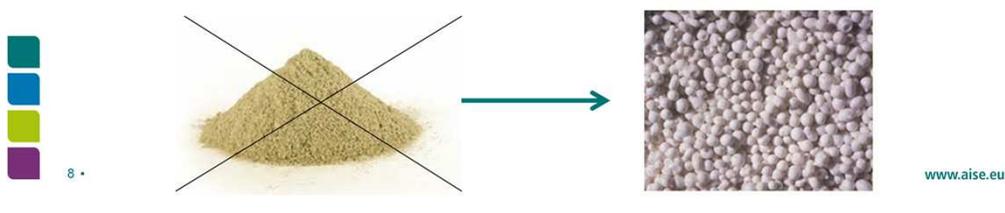
However, workers safety was still an issue, and it was clear that improvements had to be made.

## How was the situation changed?

### Enzyme and detergent manufacturers made changes in production and handling of enzyme- and detergent products:

- development of low-dust encapsulated enzymes
- improvements of manufacturing sites
- improvement of industrial hygiene practices and procedures
- implementation of medical surveillance and exposure monitoring

### Still an issue!



The situation was improved via a close collaboration between the enzyme suppliers and the detergent manufacturers, which is still running and which this series of webinars is a result of.

Improvements were made simultaneously on several fronts:

The formulation of the enzyme products was changed from the very dusty powder into low-dust encapsulated enzymes, which are granules where the enzyme protein is kept inside. Thereby, the enzyme protein will not be released to the surroundings as long as the encapsulates are intact.

Keeping the enzyme encapsulates intact was one of the issues that was addressed when improving the manufacturing sites.

Also industrial hygiene practices and procedures were improved and medical surveillance and exposure monitoring was implemented during those years.

Although a lot of improvements were made and good practices were installed in the early 70'ties, it is still an issue to be aware of, and without a constant focus on the prevention of enzyme allergies, we may see a situation where the number of enzyme allergies increases due to unawareness by for instance new employees, or management.

# Health Effects resulting from Occupational Exposure to Airborne Enzyme



## Health effects resulting from occupational exposure to airborne enzyme

- In general enzymes have a low order of toxicity.
- The main safety concern associated with enzymes is the potential induction of respiratory allergies (similar to other well known allergens like pollen, house dust mites and animal dander).
- Enzymes are proteins and like many other proteins they are potential inhalation allergens. They are able to provoke allergies = hypersensitivity reactions of the body to foreign substances.
- The inhalation of enzyme dust or aerosols may provoke the development of respiratory allergies like hay fever or asthma.



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It is fair to emphasize that enzymes generally have a low order of toxicity, that is, there are only two toxicological end points, that needs to be addressed, and these are respiratory allergy which is an intrinsic hazard for all enzymes, and skin irritation, which is an intrinsic property of enzymes belonging to the class of proteases.

It is a fact that due to this rather favorable toxicological profile of enzymes, they are often substituting more harsh chemicals.

Having said that, the main safety concern associated to enzymes is their potential to induce respiratory allergy.

As mentioned previously, enzymes are proteins, and like many other proteins they are potential allergens capable of inducing respiratory allergy. This characteristic is also known from common allergens like pollen, house dust mites and animal dander, and may result in the development of respiratory allergy symptoms like hay fever or asthma.

## Health effects resulting from occupational exposure to airborne enzyme

- Enzymes are only able to cause allergy via inhalation (Type I, respiratory allergy)
- Enzymes do not cause allergy via skin contact (Type IV, atopic dermatitis)
- Enzymes have not been associated with food allergy
- Enzymes are neither worse nor better than common allergens



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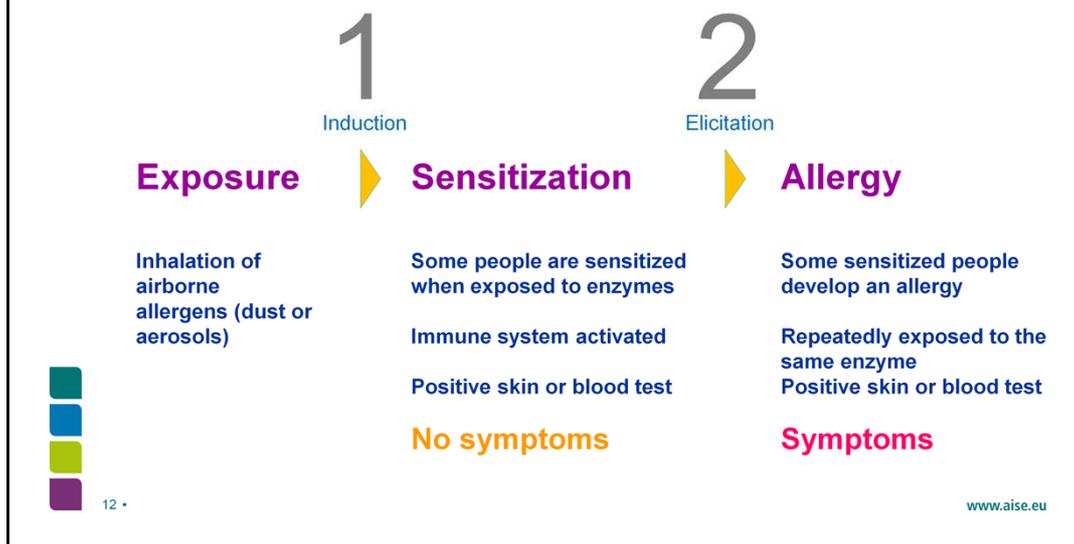
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Respiratory allergy, which is also called Type 1 allergy, is the only sort of allergy that can be caused by enzymes.

Enzymes do not cause allergy via skin contact, and enzymes have not been associated with food allergy.

In general, enzymes are neither worse nor better than the common allergens.

## The development of respiratory allergy is a 2-step process



It is essential to understand that developing a respiratory allergy is a two step process. It all starts with the individual being exposed to airborne allergens in the form of dust or wet aerosols. If this exposure is sufficiently high and lasting for a sufficiently long period of time, the individual may become sensitized. This is the induction step.

A sensitized person does not show any allergy symptoms, but the immune system has been activated and specific IgE antibodies have been generated. The presence of the specific IgE antibodies can be detected by a skin test or a RAST analysis of the blood. If a sensitized person is repeatedly exposed at sufficiently high level and for sufficiently long time, allergy symptoms may develop, and the person is now allergic. This is the elicitation step.

The difference between being sensitized and being allergic is whether or not allergic symptoms have appeared. A sensitized person has no symptoms and sensitization is not a disease, whereas an allergic person will have allergic symptoms when exposed to the allergen in question.

Sensitization is the early warning that an allergy may develop. However, by correct intervention allergy development may be prevented.

Recent literature suggests that for enzymes the exposure level required for elicitation of an allergy is higher than the exposure level required for inducing a sensitization.

## Allergy symptoms

Upon repeated exposure to enzymes sensitized workers may develop workplace related clinical symptoms.

Symptoms of allergy:

- Itching and redness of the mucous membranes
- watery eyes/nose
- sneezing
- hay fever
- hoarseness or shortness of breath
- coughing
- tightness of the chest
- asthma

Awareness of allergy symptoms related to enzyme exposure is an essential aspect of safe handling of detergent enzymes.



The symptoms may develop during or after working hours, and will decrease or disappear after exposure ceases.

Intervention may prevent the development of severe allergy symptoms.

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If a person develops an enzyme allergy, it will be a workplace related allergy, and the symptoms may develop during or after working hours.

In most cases the symptoms will disappear when the exposure ceases.

The symptoms are identical to those symptoms that are known from allergies towards common allergens, and they are listed in the slide shown on the screen.

As you can see the symptoms shown on the list are shown in order of increasing severity.

This is also normally the order of appearance. That is, the first symptoms to appear will normally be the less severe symptoms like watery eyes or sneezing.

If the individual is continuously exposed to the allergen for a long period of time, more and more severe symptoms may appear, and in some very few cases the symptoms may become chronic.

For this reason it is of great importance that intervention takes place as soon as possible and preferably before any symptoms appears.

Intervention can prevent the development of severe symptoms and that symptoms may become chronic.

## Individuals with elevated risk of allergy development

People who are allergic to common allergens are defined as atopic.

Atopic individuals may have an additional risk of allergy development when they are exposed to enzymes – but the impact of atopy is still under discussion.

Smokers apparently have an increased risk of becoming sensitized and developing allergy symptoms.

Individual susceptibility may vary from time to time, e.g. actual or recent infections.



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Some people are defined as atopic, which means that they have allergy towards one or more of the common allergens like pollen. For years it has been discussed whether atopic individuals are at higher risk for developing allergy, but until now there is no really clear answer to this. Smoking has been identified as a factor increasing the risk of becoming sensitized and of developing symptoms. In addition to this it appears that individual susceptibility may vary from time to time. Thus, returning to work after a recent infection seems to increase the risk of becoming sensitized or of developing symptoms.

## Other health effects resulting from occupational exposure enzyme

### Skin:

Some enzymes may induce irritation of skin (e.g. redness of skin) after intensive contact.

Only protease enzymes may induce irritation of skin.

The irritation of skin is local and will disappear after skin contact to the protease enzyme has ceased.

Enzymes do not induce skin allergies!



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Some enzymes are able to cause skin irritation.

These enzymes all belong to the class of proteases, which is the class of enzymes that can degrade protein.

Any other class of enzymes does not possess this characteristic.

The irritation will appear as redness of the skin, and only after intensive contact.

The irritation is local, and it will disappear after the skin contact to the protease enzyme has ceased.

Skin irritation should not be mistaken for a skin allergy, as enzymes do not cause skin allergies.

## Enzyme allergy is an occupational health risk

Enzyme allergy is exclusively an occupational health hazard for people working in the enzyme making or enzyme handling industries.

There is no evidence that consumers using enzyme containing products are at risk. The use of enzymes in laundry products is safe!



An enzyme allergy is exclusively an occupational health hazard for people working in the enzyme manufacturing industry or for workers handling enzymes as raw materials in for instance the detergent manufacturing.

Several studies have shown that consumers using the enzyme containing products on the market today are not at risk.

Hence, an enzyme allergy is the result of an occupational exposure and the cause of it should always be found in the working environment.

# HEALTH SURVEILLANCE



## Objectives of Health Surveillance

- Protecting individual health by detecting adverse changes at early stage
- Medical assessment and consulting of employees regarding behavioral safety
- Assisting in evaluation of exposure control measures
- Collecting data to detect and evaluate hazards to health



The definition of Health surveillance is the periodic medical examination of workers who potentially are exposed to enzymes.

The objectives of health surveillance related to enzyme exposure are:

To protect the health of the individual employees by identifying as early as possible, any adverse effect which may be caused by the exposure to enzymes

To give guidance based on a medical assessment on how to continue working in an environment where enzyme exposure may happen

To assist in the evaluation of measures taken to control enzyme exposure

To collect and maintain objective data to detect and evaluate hazards to health

## Pre-employment/pre-placement testing

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



Before starting to work in an environment where enzyme exposure can not be excluded a pre-employment or pre-placement testing should be conducted.

Such pre-employment testing should include:

- A medical history with particular reference, for example, to asthma, allergic rhinitis, allergies, chronic lung disease and any medication.
- A respiratory questionnaire should be completed
- An assessment of lung function should be made
- An immunological tests for instance a skin test or serological tests should be performed.
- A physical examination may be carried out at the discretion of the occupational health professional.

Subjects with significant findings such as a history of asthma, allergic rhinitis or other respiratory disease or poor lung function should be assessed very carefully.

On the basis of history and examination findings, the Occupational health professional will make suitable recommendations in accordance with local legislation regarding the employee fitness to work with enzyme products and of any adjustments or special requirements.

## Regular Testing of employees

During the first 24 months, individuals should have six-monthly health surveillance

After that, health surveillance should be conducted every 12 months

The review should include:

- Periodic Respiratory Questionnaire
- Pulmonary Function Test
- Immunological Test



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During the first 24 months of employment, individuals should have six-monthly health surveillance and thereafter a minimum of every 12 months.

The review should include:

Periodic Respiratory Questionnaire

Lung function test

Immunological Test

## Outcome 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 findings – immediate further assessment by physician
- 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 enzyme exposure
- Clinical symptoms of enzyme induced respiratory disease – fitness for work assessment must be done by Occupational Physician
- Employees should be trained to recognize symptoms that may be related to enzyme exposure and encouraged to report such symptoms to the occupational health center



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The outcome of the regular testing may be divided into the following options:  
Those with normal findings may continue to work until the next regular examination.  
Those who have developed a positive immunological test result to enzyme and have no other adverse findings may continue to work with enzymes, although increased frequency of surveillance of such workers may be appropriate.  
Those with abnormal findings to the respiratory questionnaire, which could be due to enzymes, and those with impaired lung function require immediate further assessment and should be re-tested within a month or as assessed by the occupational health professionals.  
Those who show a continuing downward trend in lung function should be assessed as to the need for removal from further work with enzymes.  
Employees with clinical symptoms of enzyme induced respiratory disease should have their fitness to work assessed by the occupational health professional.  
Employees should be trained to recognize symptoms that may be related to enzyme exposure and encouraged to report such symptoms to the occupational health center.

## Data interpretation and follow-up

Root cause analysis

Identification and correction of individual contributory or causative factors

Each case of sensitization should be evaluated by a workplace investigation conducted by an OHS specialist

Group results/data of immunological monitoring



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The results of an individual's immunological tests should be given to each employee. They are of practical relevance for the individual employees, since they may permit the identification and correction of individual contributory or causative factors such as failure to follow job safe practices.

Each case of sensitization should be evaluated by a workplace investigation conducted by an occupational health specialist.

Group results of immunological test also assist in the evaluation of workplace control measures. Group data should be used to monitor the effectiveness of hygiene and engineering programs at factories and within individual departments. Such data will help to prioritize areas for improvement.

## Basic tools in medical monitoring

- Respiratory Questionnaire
- Pulmonary Function Test
- Immunological Monitoring



*AISE: Guidelines for the safe handling of enzymes in detergent manufacturing (2015)*  
[Safe handling of enzymes - AISE](#)

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## Respiratory questionnaire

Good description of symptoms

Nurse participation welcome

Pre-employment/Periodical

Evaluation by nurse and/or  
OH- specialist

Example of questionnaire given in  
*AISE: Guidelines for the safe handling of  
enzymes in detergent manufacturing (2015)*  
[Safe handling of enzymes - AISE](#)



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**Annex 2 – Periodic Respiratory questionnaire**

**MEDICAL IN CONFIDENCE**

(PLEASE PRINT)

Your health history is most important in evaluating your health. Please complete this questionnaire as accurately as possible and return it directly to Occupational Health. All questions by placing a tick in a YES or NO box and by printing the words or numbers answer or require.

Last Name: \_\_\_\_\_ First Name: \_\_\_\_\_ Employee number: \_\_\_\_\_  
 Department: \_\_\_\_\_ Job Title: \_\_\_\_\_ Date of Birth: \_\_\_\_\_

	Yes	No	For medical use only
1. Since your last examination has your chest ever felt tight or your breathing become difficult?			
2. Since your last examination have you had wheezing or whistling in your chest?			
3. Since your last examination have you had an attack of shortness of breath that came on during the day when you were not doing anything strenuous?			
4. Since your last examination, have you had wheezing or shortness of breath that came on with exercise?			
5. Since your last examination, have you had an attack of feeling of tightness or heaviness of breath at rest?			
6. Which of the following statements best describes your breathing? a. I never or only rarely get trouble with my breathing. b. I get regular trouble with my breathing, but it always gets completely better. c. My breathing is never quite right. d. Since your last examination, a doctor told me that I have			

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It is anticipated that applicants for a job will complete a general health questionnaire at pre-placement, and that this questionnaire will include questions relating to previous employment and any exposures to chemicals, fumes or dust.

The intent of the pre-placement respiratory questionnaire is solely to detect existing respiratory symptoms, and to give a good description of such symptoms.

Also at the regular or periodical testing a questionnaire should be completed to follow up on any changes since the last testing.

In the AISE Guidelines for the safe handling of enzymes in detergent manufacturing examples of such pre-employment and periodical questionnaire is given.

The questionnaires are based on the questionnaire published by the International Union Against Tuberculosis and Lung Disease (IUATLD) in 2001.

The occupational health specialists should assess the significance of any reported symptoms and should identify any smokers.

## Spirometry

Standardized procedure/protocol

Conducted by trained and competent staff

Parameters to be measured :

- Forced Expiratory Volume in 1 second, FEV1
- Forced Vital Capacity, FVC
- Ratio between FEV1 and FVC, FEV1/FVC.
- Peak Expiratory Flow Rate, PEFR



Reproducible tests

Interpretation of results by trained and competent person

Detailed description given in AISE: Guidelines for the safe handling of enzymes in detergent

<sup>25</sup> manufacturing (2015) [Safe handling of enzymes - AISE](#)

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When performing a lung function test using spirometry it is important that an accepted standardized procedures and protocol is followed to reduce measurement errors. A detailed description of such procedure can be found in the AISE guideline on safe handling of enzymes.

Spirometry should be conducted by trained and competent staff, since testing and interpretation require both skill and training.

The parameters to be measured are: Forced Expiratory Volume in 1 second, FEV1, Forced Vital Capacity, FVC, and the ratio between FEV1 and FVC.

The forced expiratory volume in 1 second is the volume of air that can be forcibly blown out in one second, after full inspiration.

The average values of this parameter will in healthy people depend mainly on sex and age as well as on height and mass. Values of between 80% and 120% of the average value are considered normal.

Forced vital capacity is the volume of air that can be forcibly blown out after full inspiration.

The ratio between FEV1 and FVC should in healthy adults be approximately 70–85%, declining with age.

In obstructive diseases like asthma the ratio between FEV1 and FVC is reduced – often down to 45%.

Peak Expiratory Flow Rate, PEFR, is the maximal flow (or speed) achieved during the maximally forced expiration. It is measured in liters per minute or in liters per second. A minimum of three trials should be completed to check for reproducibility.

Once acceptable and reproducible spirometry results have been obtained, the results should be interpreted by a trained and competent person.

## Immunological Monitoring

Demonstrate sensitization i.e. the development of specific IgE, immunological response following exposure to allergen

Immunological response does not mean disease

Skin Prick Test or  
Serological Test Procedures



Detailed description given in AISE: Guidelines for the safe handling of enzymes in detergent manufacturing (2015) [Safe handling of enzymes - AISE](#)

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The purpose of immunological monitoring is to monitor the appearance of sensitization among the workforce, that is to monitor the development of specific IgE antibodies. It is important to remember, that sensitization is not a disease. It is an indication that a person has been exposed, and may be on its way to develop an allergy. By monitoring the immunological status of the employees it is possible to prevent the development of an enzyme allergy by intervention.

Two methodologies are generally used for monitoring the immunological status among employees, these are:

Skin Prick Test or  
Serological Test, which is an analysis of a blood sample.

A detailed description of both methods can be found in the AISE guideline on safe handling of enzymes.

## Immunological Monitoring

	Skin Prick Test	Serology
<b>Advantages</b>	<ul style="list-style-type: none"> <li>• Immediate results</li> <li>• May be more sensitive for some allergens</li> <li>• Relatively inexpensive</li> </ul>	<ul style="list-style-type: none"> <li>• Quantitative</li> <li>• No risk of adverse reactions</li> <li>• Serial sampling possible</li> <li>• Serum can be stored and used for subsequent baseline investigations</li> <li>• Less training of Occupational Health staff required</li> </ul>
<b>Disadvantages</b>	<ul style="list-style-type: none"> <li>• High level of skill/training required for standardization and reproducibility</li> <li>• Possibility of adverse reaction (local irritation)</li> <li>• Not quantitative</li> <li>• Affected by some medications and skin condition</li> <li>• Requires initial training of occupational health staff</li> <li>• Possible medico-legal restrictions in some countries</li> </ul>	<ul style="list-style-type: none"> <li>• Requires special preparation of reagents</li> <li>• Reliant on specificity of reagents</li> <li>• Results not immediate</li> <li>• Invasive blood sampling required</li> <li>• Risks associated with handling and transportation of biohazardous material</li> <li>• Expensive</li> </ul>



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Both methods for monitoring the immunological status among employees are robust methods.

However, both methods also have advantages and disadvantages of which the most important are listed in this table.

For skin prick testing it is a big advantage that the result is obtained almost immediately, and that the method is relatively inexpensive.

The disadvantages of this method are, that it requires a high level of training and skills of the staff that conducts the test, and another disadvantage is that the method does not produce a quantitative result. The response obtained will be a yes or no response in regards to sensitization towards the allergen in question.

For serological testing the major advantages are that the result obtained is quantitative, that analysis for more allergens can be conducted on the same blood or serum sample, and that the serum sample can be stored for analysis at a later point in time.

The latter could be relevant, if it at some point becomes necessary to investigate for sensitization towards another allergen than previously investigated for.

The serological testing does not require specially trained nurses or staff on-site, but it will require the serum samples to be transported to an accredited or certified laboratory.

Using an accredited or certified laboratory is important, as otherwise false positive or false negative responses may be obtained.

It is a disadvantage of the serological testing that the result of the testing is not obtained immediately.

Also the fact that the serological testing is relative expensive can be considered a disadvantage.

## The complexity of the relationship between occupational enzyme exposure and sensitization/allergy



## The complexity of the relationship between enzyme exposure and sensitization/allergy

### Lack of knowledge due to:

- *No animal- or in vitro model exist for establishing a No Adverse Effect level.*
- *Data on human enzyme exposure are based on 4-8 hours area measurements.*
- *The contribution of peak exposures and low levels of long term exposure to sensitization is poorly understood.*

### What we do know:

- Control of exposure leads to reduced number of sensitization with low risk of symptoms.
- Occupationally exposed workers may become sensitized, but only a limited number develop symptoms.
- The expression of symptoms occurs at similar or higher exposure levels than those that cause sensitization.
- A No Effect Level do exist, but it cannot be established with the knowledge and technologies available today.



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The relationship between airborne exposure to enzymes and the development of sensitization or allergy is today only poorly understood.

The reasons for this lack of knowledge are many, but among the most important are the facts that:

We do not have any animal models which could be used to provide information on this relationship or to provide information on No Effect Levels.

Most data on human exposure to enzymes are based on exposure monitoring for 4-8 hours in a specific area.

This type of data do not allow for peak exposures to be identified, and hence the contribution of such peak exposures is not really accounted for, although it is generally recognized that peak exposures play a vital role for both sensitization and allergy development.

On the other hand, we do have some knowledge on the relation between airborne exposure to enzymes and the development of sensitization or allergy:

We know for sure that when the exposure is in control, this will lead to a reduced number of sensitizations and resulting in only a low risk of symptoms.

It has been shown that among the exposed workers some may become sensitized, but only a limited number of these sensitized persons will develop an allergy.

In addition, it appears that the development of allergy occurs at higher exposure levels than the exposure levels required for developing sensitization.

## Relationship between enzyme exposure and sensitization/allergy in detergent manufacturing

### Managing the Risk of Occupational Allergy in the Enzyme Detergent Industry

**Table 1. Overview of health surveillance experience**

Year	No. of factories	No. of workers	Uptake <sup>1</sup> (%)	Incidence <sup>2</sup> (%)	Prevalence <sup>3</sup> (%)	Symptoms <sup>4</sup> (%)
2006	107	22100	96.0	0.99	8.6	0.11
2007	109	23668	95.6	0.76	8.1	0.08
2008	114	23976	94.4	1.04	7.8	0.26
2009	106	22686	97.0	0.82	7.3	0.05
2010	106	24773	94.9	0.97	8.5	0.05

<sup>1</sup> Percentage of the workforce that participated in surveillance programs.

<sup>2</sup> Percentage of new cases of sensitization during the calendar year.

<sup>3</sup> Percentage of total cases of sensitization in the exposed workforce.

<sup>4</sup> Percentage of cases exhibiting any evidence of rhinitis, conjunctivitis, impaired lung function, asthma; not necessarily linked to an occupational causation.



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**Table 2. Overview of air monitoring experience**

Year	No. of factories	No. of readings	No. above action standard	Incidence <sup>1</sup> (%)
2006	82	288318	1592	0.55
2007	83	276193	1344	0.49
2008	89	267147	2546	0.95
2009	90	306986	2400	0.78
2010	95	344853	1715	0.50
Mean	88	296681	1919	0.65

<sup>1</sup> Proportion of readings above the action standard (i.e., 60 ng/m<sup>3</sup> or lower; typical occupational action standards for enzymes are 6 to 15 ng/m<sup>3</sup>)

*Journal of Occupational and Environmental Hygiene, 12: 431–437*

In 2015 a study conducted by AISE and the American sister organization ACI was published showing exposure data and health surveillance data from more than 100 detergent producing factories over a period of 5 years.

From this very comprehensive study it can be seen, that when exposure is in control, the incidence rate of new sensitizations, that is the percentage of new sensitizations per calendar year, will be down to approx. 1%.

Among those 1% of newly sensitized individuals only 10% will develop an allergy to enzymes, or to put it in another way, only approx. 0.1% of the workforce will risk developing an enzyme allergy.

# Conclusions



## Conclusions

- A health surveillance program should be established when occupational exposure to enzymes may occur.
- The health surveillance program can identify workers that have become sensitized.
- Intervention and close follow-up on sensitized workers may prevent them from developing allergy or that allergy symptoms already present becomes more severe or even chronic.
- A health surveillance program with high participation rate may provide group results that can help documenting a healthy workplace – or to identify area specific issues related to
  - Equipment
  - Processes
  - Ventilation
  - Behavior
  - Etc.
- Good communication with employees is absolutely necessary to harvest all the benefits from a health surveillance program.



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The main conclusions to be drawn from this presentation are:

A health surveillance program should be established when occupational exposure to enzymes may occur.

The health surveillance program can identify workers that have become sensitized. Intervention and close follow-up on sensitized workers may prevent them from developing allergy, and in case allergy symptoms are already present, that these symptoms become more severe or even chronic

A health surveillance program with high participation rate may provide group results that can help documenting a healthy workplace – or to identify area specific issues related to

Equipment  
Processes  
Ventilation  
Behavior  
Etc.

Good communication with employees is absolutely necessary to harvest all the benefits from a health surveillance program.

Without a good and positive contact with the employees they may not want to participate in a health surveillance program or to come forward if they should experience any allergy symptoms.

# Questions?



**On behalf of the AISE Enzyme Safety Task Force**

**Thank you for visiting this presentation**

**We will appreciate your feedback or further questions  
to:**

**[webinar@aise.eu](mailto:webinar@aise.eu)**

