



*"OSH+ for the European Agriculture sector - Stimulating growth in rural areas through capacity building for providers
(and beneficiaries) of occupational medicine and OSH services"*

C2-Training Course for Occupational Medicine physicians

Module 7 - Respiratory diseases for employees working in
Agriculture

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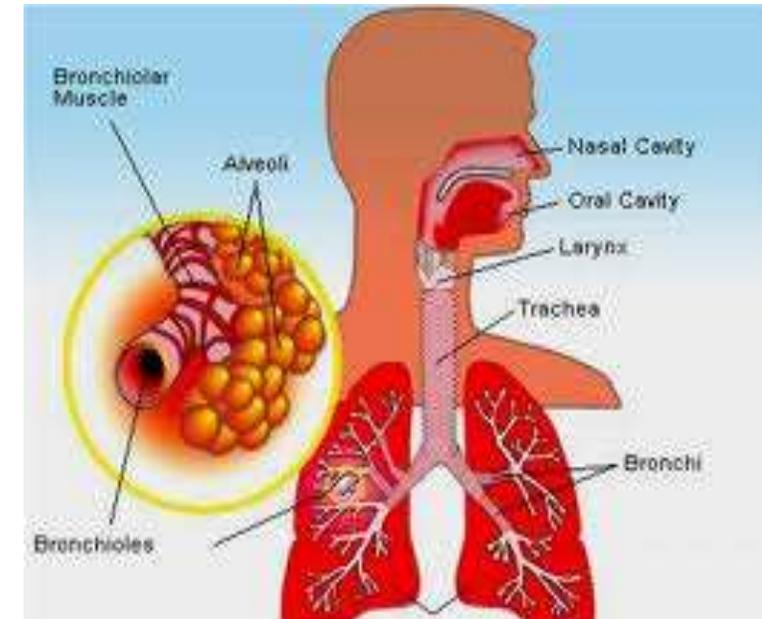
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**RESPIRATORY DISEASES
FOR EMPLOYEES
WORKING IN AGRICULTURE**

The respiratory system - the first barrier

- Consisting of the upper and lower airways;
- The body's first barrier (external-internal interface) at the contact with biological, physical & chemical elements in the environmental atmosphere;



Occupational diseases of the respiratory system

- The consequence of exposure to biological, chemical, physical factors in the working environment **within a determined time**;
- Are either **caused** or **aggravated** by the **working environment**;

Occupational diseases of the respiratory system in agriculture

- Allergic or non-allergic rhinitis;
- Allergic or non-allergic asthma;
- Extrinsic allergic alveolitis;
- Byssinosis;
- Occupational chronic laryngitis;
- Laryngeal and lung cancer;
- Pulmonary fibrosis;
- COPD;

The economic impact of the occupational diseases of the respiratory system

- **Direct costs** of medical care;
- **Indirect costs** of lower levels of employees' productivity and decreased labor efficiency;
- Rehabilitation / Return-to-Work and compensation costs



Individual impact of the occupational diseases of the respiratory system

- The inestimable costs of lowering the quality of life;
- Job loss;
- Decrease/loss of the working capacity (workability);
- Unpaid financial losses.



Risk Factors in Agriculture (I)

- Belong to a wide range and are intricate;
- For example there are > 250 agents involved in the complex immunological process of asthma and rhinitis in rural areas

Risk Factors in Agriculture (II)

Classified by molecular weight (MW):

- With high MW: *proteins and enzymes, vegetable proteins*
- flour, cereal powder, rubber, leather, talc, bacteria, fungi,
insects, pesticides;
- With low MW: *Isocyanates, metals, wood dust, cleaning*
products.

The pathway of penetration - mechanisms

By air,

→ *Allergenic and/or irritant* particles penetrate into the airway and lungs

→ activate the body's defense mechanisms;

- frequently, immune mechanisms;
- sometimes, only direct irritation mechanisms
(non-specific inflammation).

Occupational allergic diseases

→ Occupational allergic rhinitis;

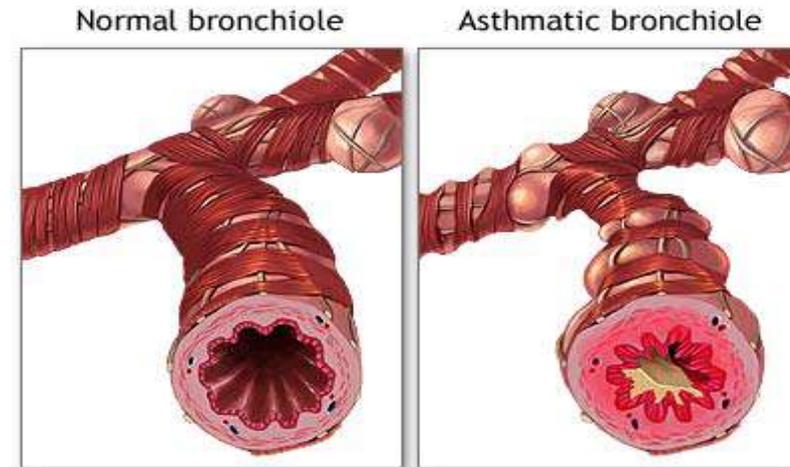
→ Occupational allergic asthma;

- the pathogenic mechanism : Ig E – mediated specific immune response
- symptoms and progression of disease

*are the same as for non-occupational allergic asthma or rhinitis

Common Allergens Involved

- In rhinitis - upper airways (nose);
- In asthma - lower respiratory tract
(trachea, bronchi, bronchiole, alveoli);

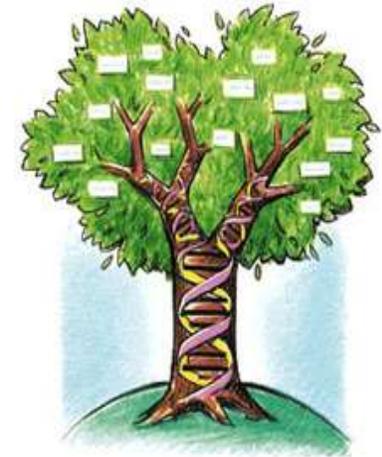


ADAM.

- Specific immune response to sensitizing agents (allergens).
by **thickening, narrowing and inflammation** of airway mucosa

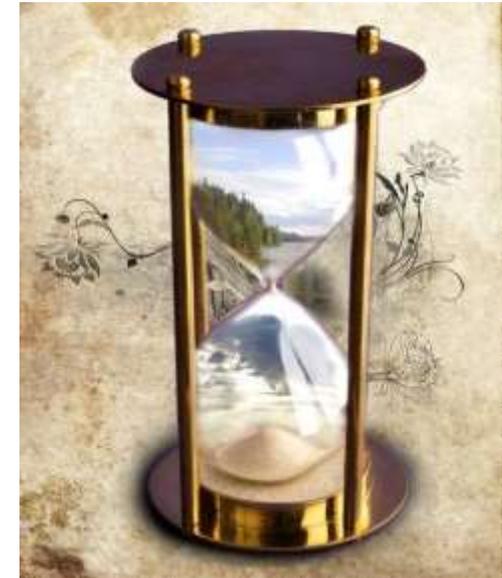
Predisposing factors in occupational allergic respiratory diseases

- 1. **Host intrinsic determinants:** employees' genetic profile;
- 2. ***Bronchial hyperreactivity, atopy***
(i.e. the relative risk for asthma - 3.4% ↑);
- 3. ***Pre-existing allergic asthma and/or rhinitis;***
- 4. **Previous exposure to allergic/irritating factors from other workplaces.**



Allergens involved in agriculture

- **Long time exposure**
from **18 months up to 5 years**;
- The **exposure level** is the
main determinant of professional asthma.



The immune response

- **With each exposure, the sensitivity to the allergen appears**
untill an important **allergic response** is developed;
- After the first allergic specific response,
even the **slightest exposure can trigger the same response.**

Allergens in major subsectors of Agriculture

Aquaculture

Crustaceans, crabs:

→ Trigger an answer only to already atopic host;

Algae:

→ Cyanobacteria (96% in fresh water);

→ Chlorophyta (temperate climate areas)

in the blooming period produce toxins

*trigger asthma exacerbations in workers who already have asthma!



Shellfish (mollusks) farms

Snails (terrestrial species):

→ the dust gathered together with the shells



Oysters, mussels, shrimps, shells:

→ inhalation of dust from shells;

→ contamination with toxins.



Pisciculture

- Usually they are inhaled allergens;
- Only for some fish species;
- Also the bait worms' larvae, beetles, locusts, crickets, flies, butterflies (fishing);



Sericulture (silk farm)

→ The silk worm itself;

→ The silk worm's larvae



Sericulture is the cultivation of silkworms to produce silk



Apiculture

→ The Hymenoptera venom
(bees, bumblebees);

→ The beehive;

→ The hive dust;



→ The pollen of the apiary area flora;

*especially lime tree, acacia, lavender



Poultry farm

- Feathers and bird mites;
- Feather dust;
- Ammonia gas



Cattle, sheep breeding

- Proteins (e.g. albumine), enzymes, endotoxins, ammonia (produced by farm animals);
- Mites (*Dermatophagoides* spp.), parasites (*Dermeestidae* spp.), bacteria and fungi
(which colonizes animal hair or farm construction);
- Pollens, herbs (*Bromus*, *Phleum pratens*, *Holcus*, *Cynodon dactylon*, *Ambrisia retroflexus*)
- Cereal powder, latex.





*Morțicuț carpatin de veghe la ferma
oilor (foto Isidor Chioce).*



*Ciobanul Mărușu la 114 ani (AIEF, foto R.
Vulcănescu, august 1963, nr. 6-71).*





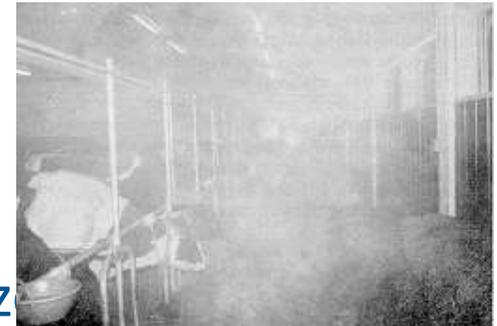
Agrophytotechnic (I)

→ Cereals powder:

-Found in barns, flour mills, granaries,
silos grain product on the ground, fan or straw;

-Most often cereals: wheat, barley, rye, oats, corn,
sesame, soy, sunflower;

→ Hyphomycete: Penicillinum, Phycomycete: Rhiz
Basidiomycetes: Ustilago



Agrophytotechnic (II)

- **Bacteria and fungi from the air:**
 - Depending on the type of crop harvested and the storage conditions (high humidity).
- Artropodes: Eurygaster, Pyrale, Bronchus lentis
- Alternaria spp
- Aspergillus (>3000 species)
- Cladosporium; Fusarium; Epicoccum
- Hyphomycete: Penicillinum, Phycomycete: Rhizopus,
- Basidiomycetes: Ustilago



Agrophytotechnic (III)

- **Mites** – extremely small insects, which feed on organic material; are found wherever there is dust:
 - Storage mites - organic products;
 - Red mites - in some greenhouse crops;
 - fungi: Trichoderma
 - parasites: Hyphomycete: Botrytis, Paecilomyces

- Kitchen cockroaches;
- Pollen from crops.



Horticulture (I)

→ Mites;

→ acarienii roșii (*Panonychus ulmi*)

→ acarienii McDaniel spider mite (*Tetranychus macdanieli*)

→ Molds

→ *Plasmopara viticola*



Horticulture (II)

→ Fungi;

→ Hyphomycete: Botrytis

→ Epicoccum, Stemphylium

→ Phycomycete: Rhizopus; Mucor

(fungul “de zahăr”)

→ Pollens;

→ *Distichlis spicata*; *Dactylis*



Silviculture (I)

→ Domestic wood dust:

-x4 times more irritating >> plastic dust;

-Hardwood dust (40 species);

-Softwood dust (conifers);

→ Fungi;

→ *Alternaria, Chaetomium, Cladosporium, Bipolaris,*

→ *Fusarium, Ulocladium; Trichoderma koningii* (cherestea)

→ *Chrysonilia sitophila* (buşteni);

→ *Mucor species; Penicillinum*



Silviculture (II)

→ Pollens;

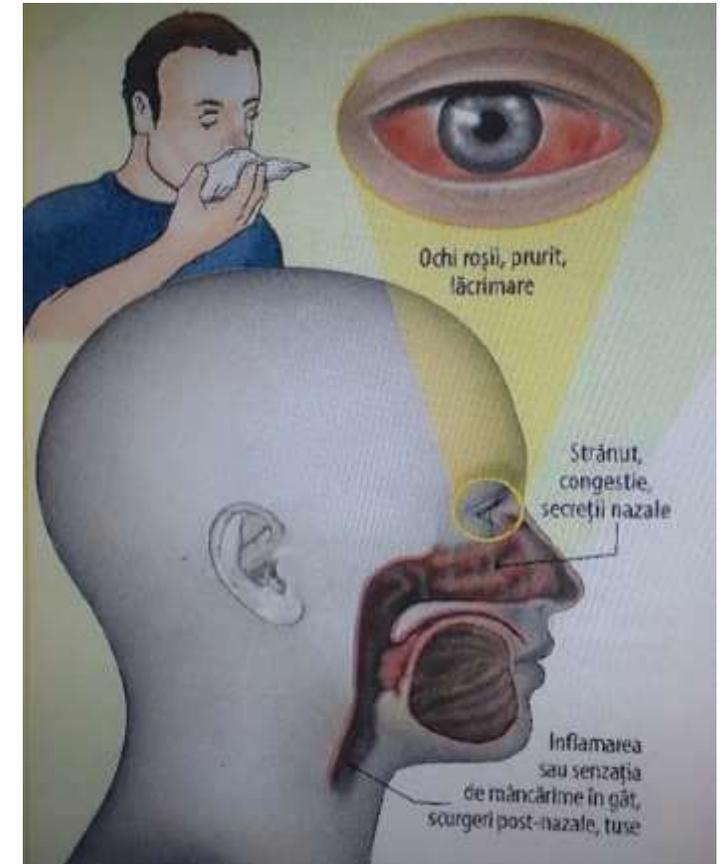


→ Other allergens:
-Insects, lichens, resin.



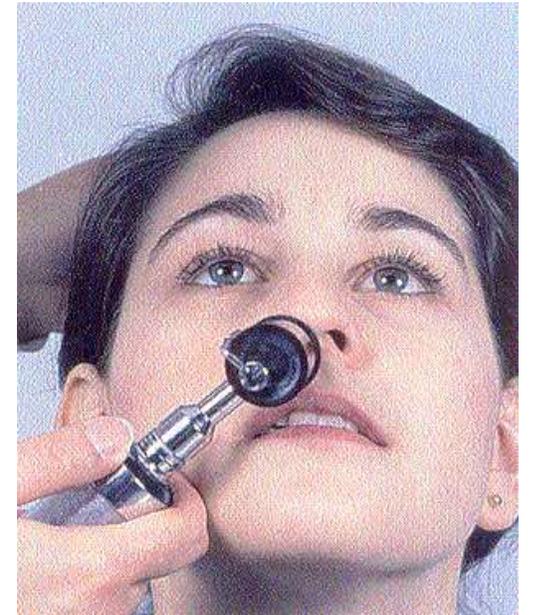
Allergic rhinitis symptoms

- **Watery rhinorrhea;**
- **Sneezing (in bursts);**
- **Nasal obstruction;**
- **Nasal pruritus;**
- Epistaxis, odor disorders;
- Pruritus faringo palatinus, **cough;**
- Eye pruritus, lacrimation, conjunctival hyperemia;
headache.



Medical consult in rhinitis

- Anamnesis (detailed discussion with the worker);
- ENT consult (anterior and posterior rhinoscopy, ENT fibroscopy);
- Blood and nasal eosinophil profile;
- Immunological tests
 - *prick-skin test or serology test (RAST)

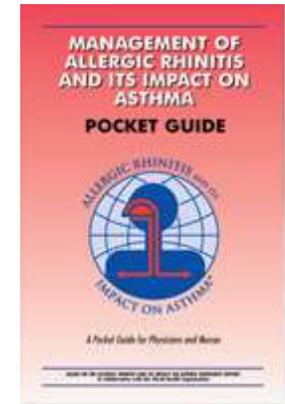
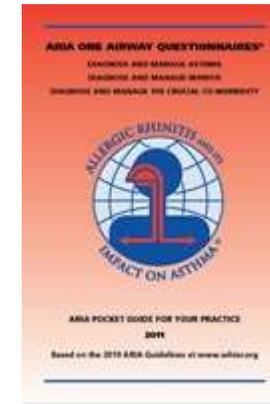


Types of occupational rhinitis

- Allergic: seasonal (hay fever, pollinosis) and perennial;
- Non-allergic: infectious, perennial (+/- hypereosinophilia), atrophic, vasomotor, and mixt;
- Episodic rhinitis: triggered by respiratory irritants, cold air.

Occupational rhinitis treatment

- Remove trigger factor(s);
- Decongestants, local saline solutions;
- Topic corticosteroids;
- Antihistamines (systemic or topic);
- Non-allergic polyps resection
- Allergic polyps resection if voluminous



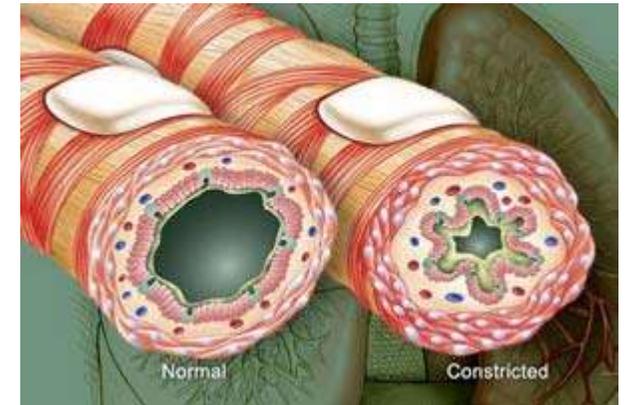
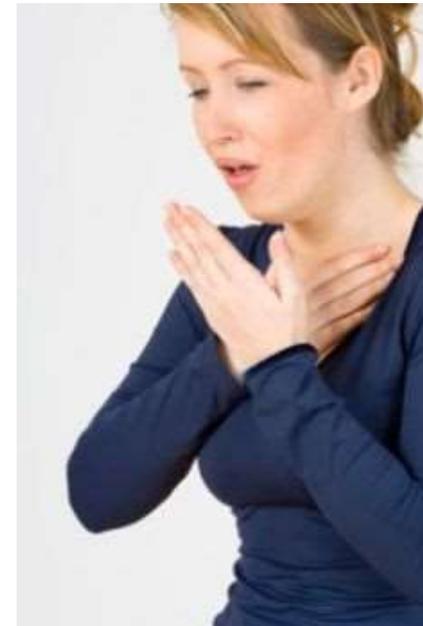
* according to ARIA guidelines - ARIA "The Allergic Rhinitis and its Impact on Asthma"

Rhinitis precedes asthma

- Occupational rhinitis precedes or coincides very often with the occurrence of occupational asthma!
- ↑ risk of asthma in the first year after rhinitis occur, especially for high MW allergens;
- alarm for asthma screening;
- test spirometry with bronchodilator !

Occupational asthma symptoms

- **Paroxysmic dyspnea;**
- **Wheezing;**
- **Cough;**
- **Chest constriction;**
- **Limiting daily work activity.**



Symptomatic pattern in occupational allergies (I)

→ *Early symptoms* - may worsen upon entering the workplace;

→ *Delayed symptoms* - after leaving the workplace

(at home, at night, at weekends, or even on holidays).

Symptomatic pattern in occupational allergies (II)

- It is important the **association** of:
 - **asymptomatic periods** ~ periods without occupational exposure;
 - **symptomatic periods** ~ periods with occupational exposure;
- Symptoms' **recurrence** → diurnal somnolence, reduction of normal physical activity, absenteeism.

Diagnosis in occupational asthma

- Detailed anamnesis;
- Clinical examination;
- Spirometry with bronchodilator test;
- PEF-metter (peak expiratory flow);
- Prick-skin tests or serology for specific allergens;
- Eosinophil profile (blood, sputum);
- In selected patients chest X-ray;



Key points in diagnosis of occupational asthma (I)

→ **Silentium auscultator**

can point to an asthma exacerbation or persistent/fixed obstruction (chronic asthma) ;

→ **Localised wheezing** can point to other diagnostic:

bronchial tuberculosis, inhaled foreign body, retro-neoplastic bronchial stenosis



Key points in diagnosis of occupational asthma (II)

- *Spirometry* – does NOT validate or exclude occupational asthma ;
- ***PEF-metry* at workplace and outside workplace for minimum 2 weeks**
- serial PEF-metry (minim 4 times/day, 3 weeks) is **highly specific and sensitive** test for occupational asthma
- **Work-place test** : serial measurement FEV1 –
if negative in work environment, exclude occupational asthma



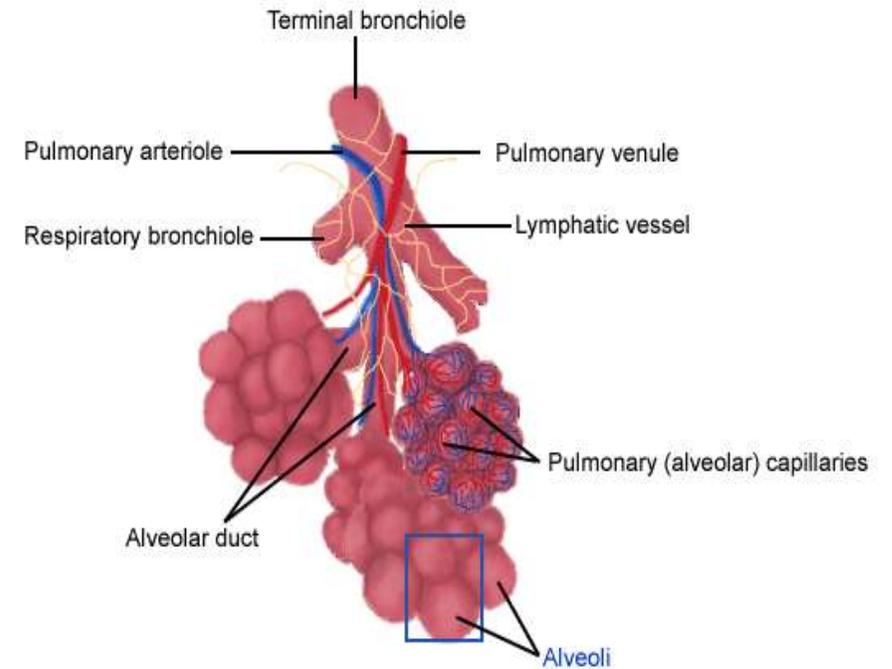
Treatment of the occupational asthma

- Remove trigger(s);
- Rescue and/or controller medication (based on GINA guideline);
- Inhaled short-acting bronchodilators
- Inhaled corticosteroids
- Combined inhaled corticosteroids and long-acting bronchodilators;
- Oral antihistamines;
- Antileucotrienes (if they associate allergic rhinitis);
- Oxygen supplement and/or nebulized bronchodilators, systemic corticoids;
- Immunotherapy;



Extrinsic Allergic Alveolitis (EAA)

- Hypersensitivity pneumonitis;
- It involves "non-allergic" immune mechanisms at repeated exposure to fine-dispersed organic powders;



EAA in poultry farm

→ “Bird Breeder’ Lung /Disease”:

- Avian proteins (IgA);
- Intestinal mucus;



EAA in zootechnyc subsector

“Farmer Lung Disease” caused by:

- Bacteria, fungi, molds;
- Hay, straw, forage, cereals, manure;
- Clima systems;
- Soy-beans feed.



EAA in agrophytotechnic subsector

Fungi and molds :

→ **Miller's lung;**



→ **Cheesemaker's lung;**



→ **Mushroom grower's lung;**



→ **Potato grower's lung;**



→ **Wine grower's lung**



→ **Malt cultivator and processor's lung**



(moldy hop, barley);

→ **Baggasosis** (bagasse from sugar cane processing, waiste);



EAA in sericulture

→ Sericulturist lung

- unknown antigen



EAA in horticulture

- Molds, fungi :
- Horticultor's lung (gardener);



- Fertilizers and contaminated plant residues;
- "Forest" compost used by orchid growers;



EAA in silviculture

The disease of wood cutters / workers

- **Maple decortificant disease;**
- Sequoia related disease;
- **Wood-cutters (lumberjack) disease;**



Suberosis

- Cork workers (harvesting cork);
- Cork handling (using corks for bottling wine).



Acute Extrinsic Allergic Alveolitis (EAA)

→ From 4 to 6 hours

after exposure to high concentrations of antigen;

→ Produces: general malaise, chills, fever, occulo-nasal catarrh, irritable cough, dyspnea;

→ Symptoms disappear spontaneously in a few hours / days;

Subacute Extrinsic Allergic Alveolitis (EAA)

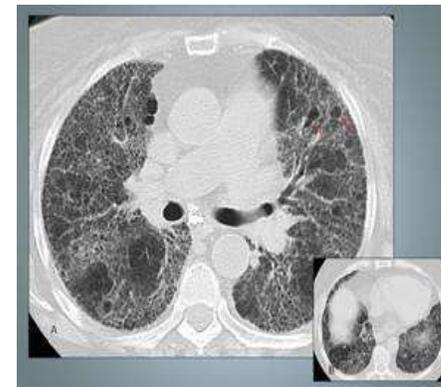
- Insidious debut - usually after an acute episode;
- Productive cough, exercise dyspnea, anorexia, weight loss (clinic is like a bronchitis);

Chronic Extrinsic Allergic Alveolitis (EAA)

- Determined by **continuous or repeated exposure** to the antigen;
- Dyspnea which is progressively aggravated by effort,
- Dry or productive cough, anorexia, weight loss;
- Similar to pulmonary fibrosis (which is actually the following stage of disease progression).

Diagnosis of Extrinsic Allergic Alveolitis (EAA)

- Anamnesis;
- Clinical examination;
- Spirometry;
- Diffuse alveolo-capillary diffusion;
- Chest CT > X-ray;
- IgG precipitating antibodies;
- Broncho-alveolar lavage;
- Bronchial and/or pulmonary biopsy;



Treatment of Extrinsic Allergic Alveolitis (EAA)

- Main treatment – prophylaxis (primary prevention) – excellent results if remove the trigger;
- Immunological therapies;
- Systemic corticosteroids



Byssinosis

- «Tuberculosis of cotton fillers»;
- There are variable time-exposure to natural textile powders:
 - > 10 years - for cotton (leaves, stem, seeds);
 - months - for in, hemp, jute (stem);
- Non-specific immune mechanism;



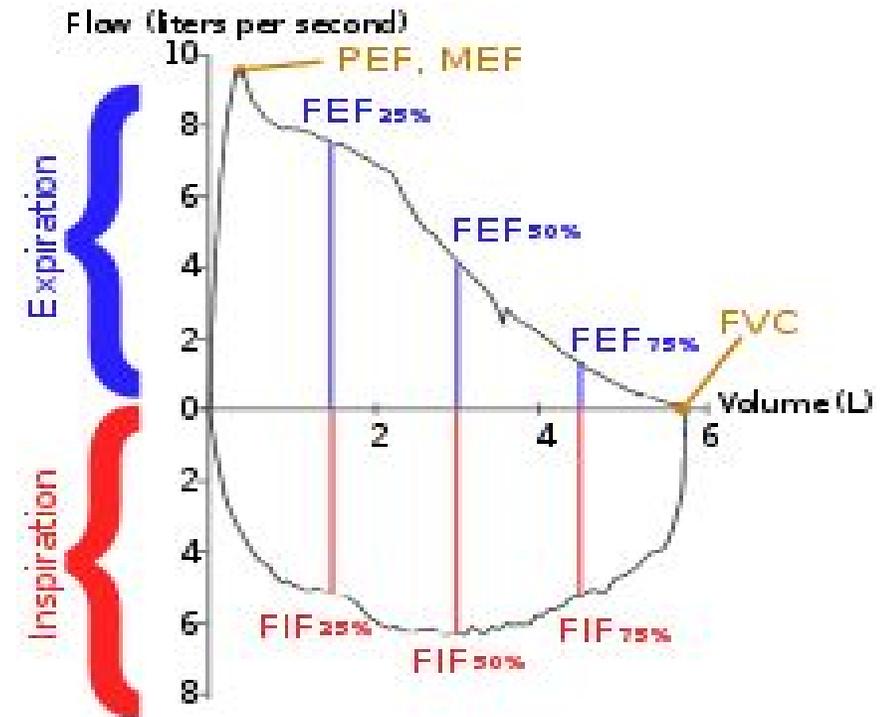


Byssinosis - symptoms

- Chest pain, dyspnea, dry cough;
- «Monday Syndrome»;
- Chronicity obstructive chronic bronchitis;

These symptoms are directly proportional to the impairment of pulmonary function (spirometry)

* WHO charts for diagnosis and monitoring



Occupational chronic laryngitis

- Pathology: chronic inflammation of the larynx mucosa;
- Etiology: long-term exposure to smoke (burning fossil fuel), organic and inorganic dust, volatile or aerosolized substances
- Symptoms: hoarseness, odynophagia, dry cough;
- Diagnosis: indirect / direct laryngoscopy;
- Treatment: remove of trigger;



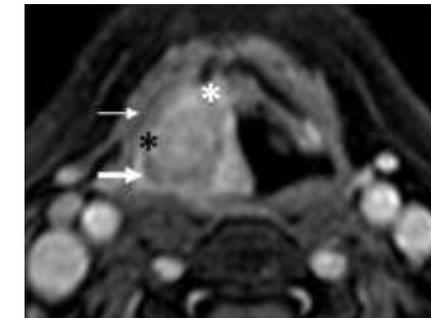
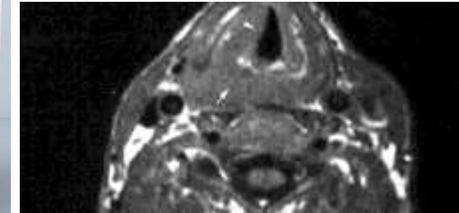
Laryngeal cancer in agriculture

- Pathology: Squamous type; men > women
- Etiology: pesticides (insecticides, herbicides, fungicides);
- Symptoms: dysphonia, dysphagia, inspiratory dyspnea, stridor, aspiration, sputum with blood,
↓ weight, physical asthenia, halitosis;
- Complications: tumors (latero-cervical), ophthalmic;



Diagnosis of the laryngeal cancer

- Laryngoscopy – biopsy;
- CT scanner, MRI;
- Treatment:
 - Surgery;
 - Radiotherapy;
 - and / or
 - Multiple chemotherapy.



Lung cancer in agriculture

- Pesticides (i.e. Diazinon);
- The incidence in agriculture ↑ because of the ↑ level of prevalence of smoking;
- Symptoms: persistent cough, loss of appetite, ↓ weight, hemoptysis;
- Screen for lung cancer
if recurrent pneumonias in the same territory or
pleural effusion apparently parapneumonic



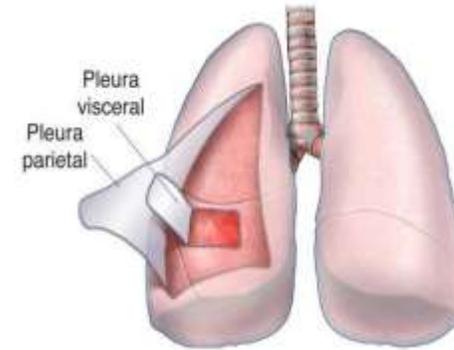
Diagnosis of the lung cancer

- Chest X-ray, or HRCT with contrast i.v.;
- Bronchoscopy - biopsy, broncho-alveolar lavage, brostage;
- Surgical pulmonary biopsy;
- Treatment:
 - Surgery;
 - Radiotherapy;
 - Multiple chemotherapy.



Mesothelioma in agriculture

- It is a malignant tumor of the pleura;
- Etiology: asbest exposure;
 - Types: amphibol type: crocidolite, amosite, antofilite;
- Workers in constructions, roofs, asbestos pipes;
- Latency: up to 40 years;
- Thoracic pain, dyspnea, cough;

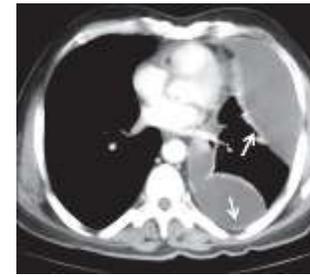


Diagnosis of the mesothelioma

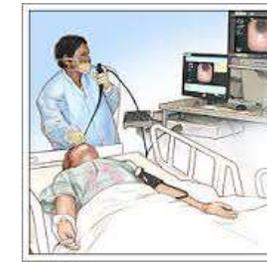
→ Chest X-ray;



→ Chest HRCT;



→ Thoracentesis, transthoracic pleural biopsy, video-assisted thoracoscopy, thoracotomy;



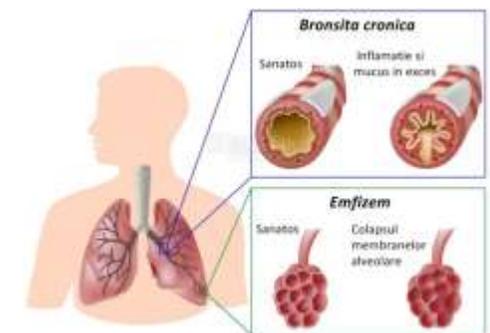
→ Bronchoscopy - differentiation of metastatic lung adenocarcinoma.

→ Genetic tests for individualised treatment options



Chronic Obstructive Pulmonary Disease (COPD) in agriculture

- **Organic and inorganic dusts, gases and smokes;**
- Prevalence: **15% occupational;**
- It is directly proportional to the prevalence of smoking or pollutants exposure;
- Induces an airflow limitation;
- Loss of elasticity of the bronchial wall;



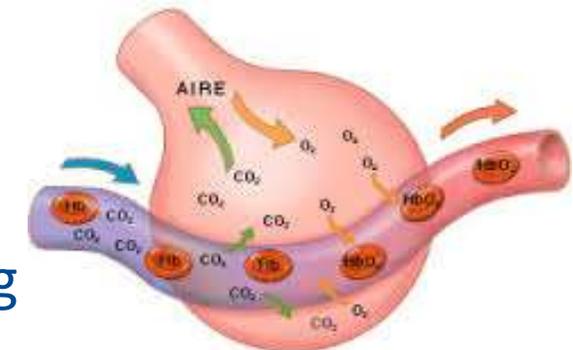
Diagnosis of the COPD

- Anamnesis - specific pattern:
 - Chronic productive cough: at least 3 months/year, at least 2 consecutive years;
 - Persistent, progressive dyspnea
- Spirometry;
- Radiography;
- Inhaled therapy with bronchodilators +/- corticoids as per GOLD guidelines ;
- Oxygen supplement, antibiotics (macrolide) in acute exacerbations;
- Periodic monitoring;



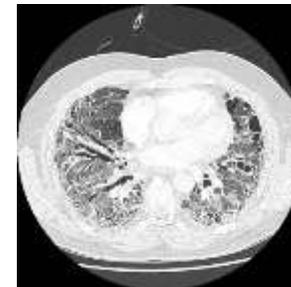
Occupational lung fibrosis

- Fibrous scars of the pulmonary parenchyma
- “ground-glass” opacities; “honey-combing” lesion;
- Affects alveolar-capillary gas exchange;
- Etiology: Pollutants exposure, Fungi (green-houses), progression of an EAA;
- Symptoms: Dyspnea, chronic cough, physical asthenia, ↓ weight, musculo-skeletal pain, clubbing



Diagnosis of the lung fibrosis

- CT scan, radiography, spirometry, bronchial-alveolar lavage, pulmonary biopsy;
- Treatment:
 - Exclude contact with trigger;
 - Oral corticosteroids, immunotherapy;
 - Oxygen therapy, non-invasive ventilation;
 - Lung transplantation (severe, non-responsive fibrosis);



Ideal treatment in respiratory occupational diseases

- 1st option = Remove of the “guilty” agent - less feasible option many times;

- 2nd option = Remove the worker from the trigger source: the sector, area or job itself * relocation measures

- 3rd option = monitor exposure level; advise use of protective measures; asses medically every 6-12 months through specific questionnaires, functional respiratory tests, imaging tests, specific tests.

Results of relocation

→ **Usually** the improvement or recovery is significant, **if**

- the duration of exposure is minimal
- the worker has used technical protection measures (masks, protective equipment)
- the worker followed medical treatment option;

→ **Sometimes** the disease progresses over time even after the cessation of exposure;

Adherence to treatment

- Assess symptoms
- Use specific questionnaires (CAT, mMRC, Borg scale as per GOLD and GINA guideline recommendations)
- Plan follow-up visit
- Ensure understanding techniques for inhaled therapy options
- Advise smoking cessation
- Resend to respiratory medicine specialist if worsening symptoms or new symptoms occur
- Ensure using protective measures
- Give first emergency treatment in acute exacerbations

Inhaler devices in respiratory medicine



Emergency treatment

- Antihistaminic medication
- Inhaler medication (salbutamol)
- Nebuliser if available (salbutamol solution, dexamethasone, saline solution)
- Systemic corticoids (dexamethasone, HHC)
- Automatic epinephine injector (EpiPen)
- Cold water or blanket when anaphylaxia

Prophylaxis of occupational respiratory diseases

- Avoid exposure to triggers;
- Periodic specialized evaluation: clinical, investigations, questionnaires;
- Counseling for smoking cessation;
- Compliance to the long-term treatment.





Thank you!