

Is Occupational Asthma Under-diagnosed?

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Annual Refresher Course for Family Physicians

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Workshop

Conflict of Interest Disclosure

- I currently have not and did not have in the past any affiliation with/or financial interest of any nature in a business corporation or receive remuneration, royalties or research grants from business corporations in relation to the subject of this presentation

Learning Objectives

At the end of this workshop, participants will be able to:

- Use a stepwise approach to diagnose Occupational Asthma (OA)
- Recognize some factors that might delay the diagnosis of OA
- Learn how to improve the diagnosis of OA

Outline

- Review of different types of OA
- Recognize the causes of a delay in diagnosing OA
- How to improve the diagnosis of OA
- Clinical cases

Work Related Asthma - WRA

Definition of OA (ACCP):

“De novo asthma or the recurrence of quiescent in remission asthma (i.e. childhood asthma) Induced by either sensitization to a specific substance (e.g. inhaled protein) or by a chemical at work which is termed sensitizer-induced OA, or by exposure to an inhaled irritant at work which is termed irritant-induced OA”

Sensitizer-Induced OA

- **90%**
- **Latency period**
- **IgE** – mediated - to **HMW** sensitizers
- Incidence – 13 to 178 new cases/million workers
 - HMW - (>10kd) - flour, animal protein, fungi, enzymes, plants, latex, cannabis)
 - LMW - (<10kd) - chemicals (diisocyanates), metals (chromium), wood dust (red cedar)
 - Most HMW (complete Ag) and some LMW (from functional haptens) through IgE-dependent mechanisms

Sensitizer-Induced OA

- Environmental risk factors – level of exposure
 - Dose response relationship
- Individual risk factors
 - **Atopy** (↑risk of OA 8-fold in bakers but no Δ in onset of symptoms)
 - **Occupational Rhinitis (OR) - in 84.5% of cases OR precedes OA**
 - previous Airway Hyper-Responsiveness – (AHR) \neq risk factor

Irritant Induced OA (IIOA) - RADS

- 5-18% of OA
- **Without a latency period** - within 24 hours after exposure
- Accidental high exposure (or repeated low exposure to an irritant)
- Other phenotypes of IIOA:
 - WTC attacks - 2001
 - Graniteville (SC) derailment released 54 metric tons of chlorine - 2005

10 months after the acute exposure

- **LMW** chemicals
 - Chemicals (diisocyanates, epoxy, ammonia...)

Features of IIOA - RADS

Criteria for RADS (Brooks et al.	Modified Criteria for RADS
History of new-onset of asthma	History of new-onset asthma or recurrence of childhood asthma
Symptoms onset related to single high-level exposure (accidental)	Symptoms onset related to one or more high-level exposures
Onset of symptoms <24 hr after exposure	Symptoms can begin >24 hr (up to several days) after exposure
Exposure to very high concentration of gas, fume, or spray with known irritant properties	List of exposures includes highly irritant dust (e.g. WTC collapse)
Airway hyper-responsiveness or reversible airflow obstruction	Airway hyper-responsiveness or reversible airflow obstruction
Symptoms persistent >3 months	Symptoms persistent >3 months
No previous lower respiratory tract symptoms	Previous disease associated with smoking or atopy may be difficult to rule out

	OA with Latency	RADS / IrIA
Latency period	Present	Absent
Diagnosis	History PFT – Methacholine PEFR IgE HMW	History PFT – Methacholine LMW
Pathology	Similar to Asthma Activation of T-Lymphocytes Eosinophilic inflammation B-cell – IgE – Mast cell - Histamine	<u>Acute</u> : epithelial shedding and hemorrhage <u>Chronic</u> : regeneration of epithelial cells; few lymphocytes and neutrophils; increased collagen deposition and thickness of basement membrane
PFT	Better reversibility to BD	Less reversibility to BD

Work Exacerbated Asthma - WEA

- Exacerbated but not caused by work environment
 - 21.5% of working asthmatics (Prevalence 13-58%)
- Wide range of frequency and severity of WEA
- PEFr, Methacholine, Induced sputum – off vs at work
- SPT, sIgE (62% pos. bakery workers with OA, 28% with WEA)
- Diagnostic criteria (Quebec) – Objective deterioration
- **Underdiagnosed**

Diagnosis of OA

Occupational asthma suspected:

- 16-18% of adult-onset asthma is OA (mean age 38 y)
- Assess exposure
 - Occupational and clinical history
 - Material Safety Data Sheet - MSDS
- History of asthma onset or aggravation after a job change
- No good response to therapy
- *Chronology of Symptoms* at work and/or at night and improved on weekends and holidays (Non-OA – 41%↓ on weekends, 54%↓ on holidays)
- Early, Late and Dual response
- OA patients have more sick days compared to NOA patients
and more ER visits

Diagnosis of Occupational Asthma

- Steps to confirm OA
 - **Clinical and Occupational history** (PPV – 63%)
 - Spirometry and Non-Specific Bronchial responsiveness (**NSBR**) Methacholine confirms Asthma
 - Specific Inhalation Challenge (**SIC**)
 - **at work**
 - In the lab

Diagnosis of Occupational Asthma

- **Peak Expiratory Flow Rates - PEFr** ↓ 20%
(sensitivity – 64%, specificity – 77%)
- **Immunological markers**
 - Skin Prick Test - SPT
 - Specific IgE - sIgE
- **Biological markers** – airway inflammation
 - Induced sputum (<2% of eosinophils)
 - Fractional Exhaled Nitric Oxide (FeNO) ↑
after SIC

Causes of the delayed diagnosis of OA

- **Lack of awareness and under-reporting (patients, employers and healthcare professionals)**
- **Missing Occupational history including exposure history (MSDS)**
- Symptomatic outside of work as well
- Symptoms presenting only outside of work
- Delay or no testing done and no Specific Inhalation Challenge - SIC
- Delay in Pneumology or Occupational medicine consultations
- 4 – year delay in the diagnosis of OA

Case # 1

- *39y male*

SOBOE

Nasal congestion and sneezing

No wheezing, chest tightness or frequent cough

No chest tightness, wheezing or cough

Occupational History

What do you do ? Works in a bakery for the past 15 years

How do you do it ? Operates mixers and ovens

Are you concerned about any exposures or health hazards on and/or off the job ?

- not really

Co-workers or other exposed ?

- no one seems to be sick

Safeguards and satisfaction? likes the job

- PMHx:
 - N/C
 - No history of asthma, (none in his family)
 - Allergies – None known
 - Smoking – never
- O/E:
 - Normal

- Chest X-ray - normal
- Skin Prick Tests (SPT):
 - Wheat flour - ++
 - Oat flour - +++
 - Rye flour - +++
 - Soya flour - +++
 - Barley flour - ++
 - Corn flour - ++
- Flow rates - N

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CARDIO-RESPIRATORY PHYSIOLOGY**

**ÉPREUVES DE ROUTINE
ROUTINE TEST**

Last Name:		First Name:	
Identification:		Sex:	male
Age:	39 Years	Physician:	DR. ROHAN
Height:	168 cm	Resp. Therapist:	M-T AMBAYEC RRT γ
Weight:	103 kg	Medication:	NONE RESP
Diagnosis:	ASTHMA	Smoker:	NEVER

	Pred	Pre	%Pred
Date	28/10/2008		
FEV 1	3.60	3.03	84.1
FVC	4.32	4.09	94.6
FEV1&F	82.72	74.08	89.6
MMEF	4.28	2.16	50.4
PEF	8.79	7.22	82.2
FEF 50	4.81	2.69	55.9
FIF 50		3.22	
TLC	6.34	6.24	98.4
VC	4.51	4.43	98.3
ITGV	2.99	2.49	83.3
ERV	1.35	0.68	50.4
RV	1.83	1.81	99.0
IC		3.75	
TLCOSB	31.63	32.66	103.2
VA	6.19	5.64	91.1
PIMAX	113.09	- 75	
PeMax	148.05	+ 140	

PFT DONE IN AM. MIP= -75 cm H₂O, MEP=140 cm H₂O. SPO₂ R/A=98 %. HR=72 .

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RESPIRATORY PHYSIOLOGY**

BRONCHOPROVOCATION (METHACHOLINE)

Last Name:
Identification:
Age: 39 Years
Height: 168 cm
Weight: 103 kg
Diagnosis: ASTHMA

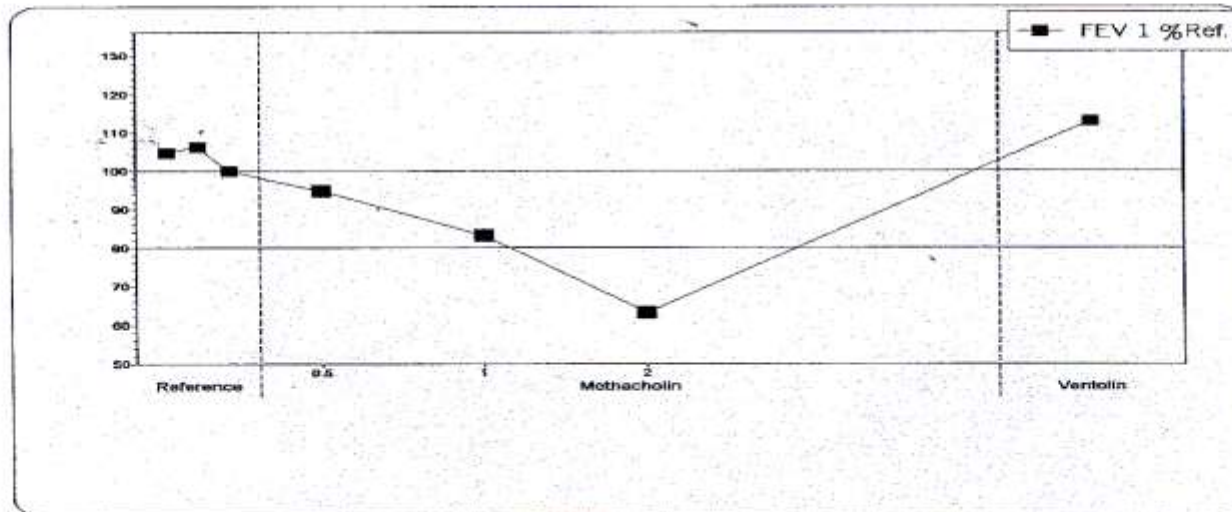
First Name:
Sex: male
Physician: DR. ROHAN
Resp. Therapist: M-TERESA AMBAYEC RRT
Medication: NONE RESP
Smoker: NEVER

mta

Date 28/10/2008

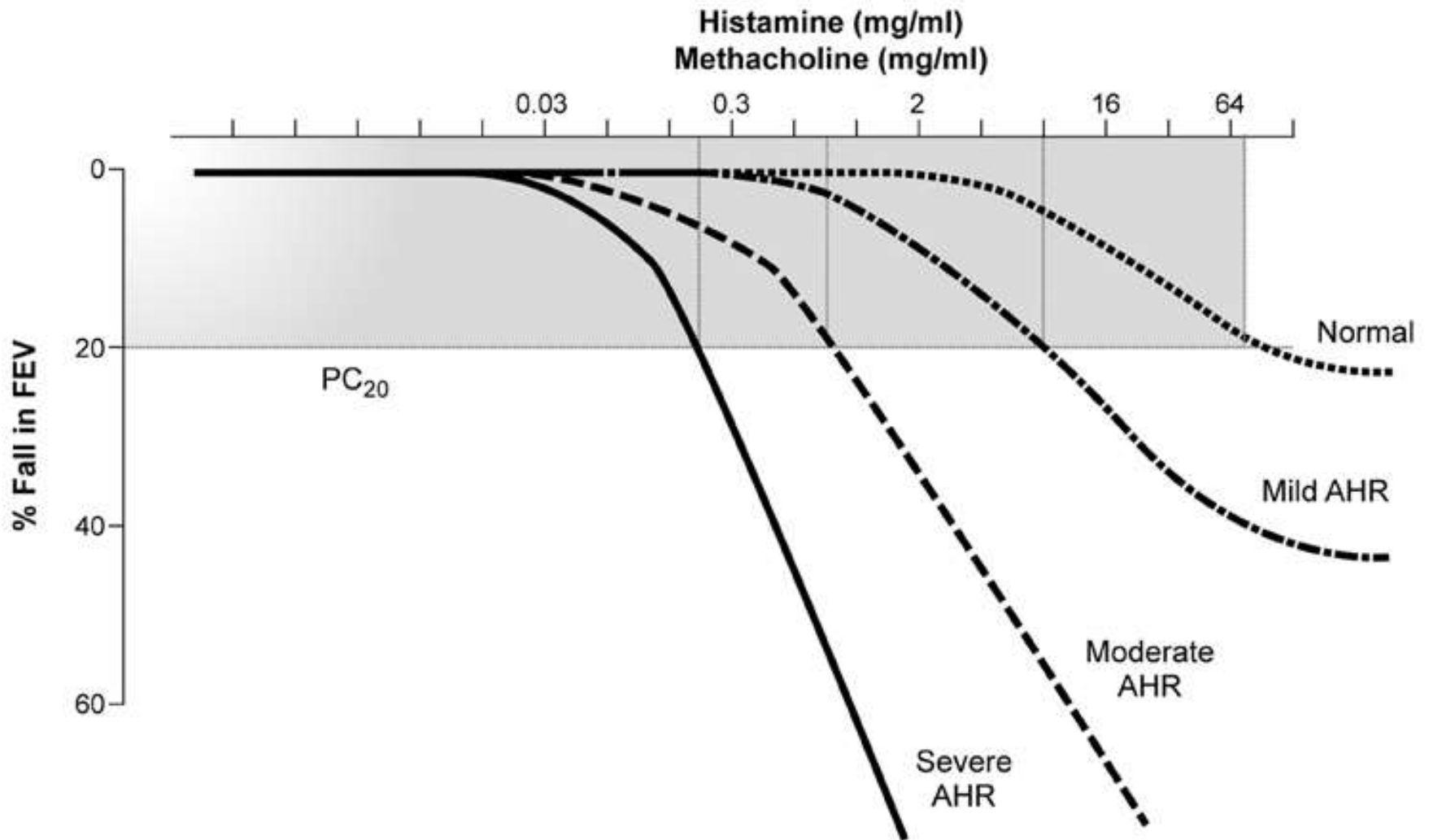
	Pred	Act1	Act2	Act3	Act4	Act5	Act6	Act7
Step		R1	R2	R3	P4	P5	P6	D7
Conc				0.9 %	0.5 mg/ml	1 mg/ml	2 mg/ml	2 Puffs
FEV 1	3.60	3.03	3.07	2.89	2.74	2.41	1.83	3.27
	Pred	Act8	Act9	Act10	Act11	Act12	Act13	Act14
Step								
Conc								
FEV 1	3.60							

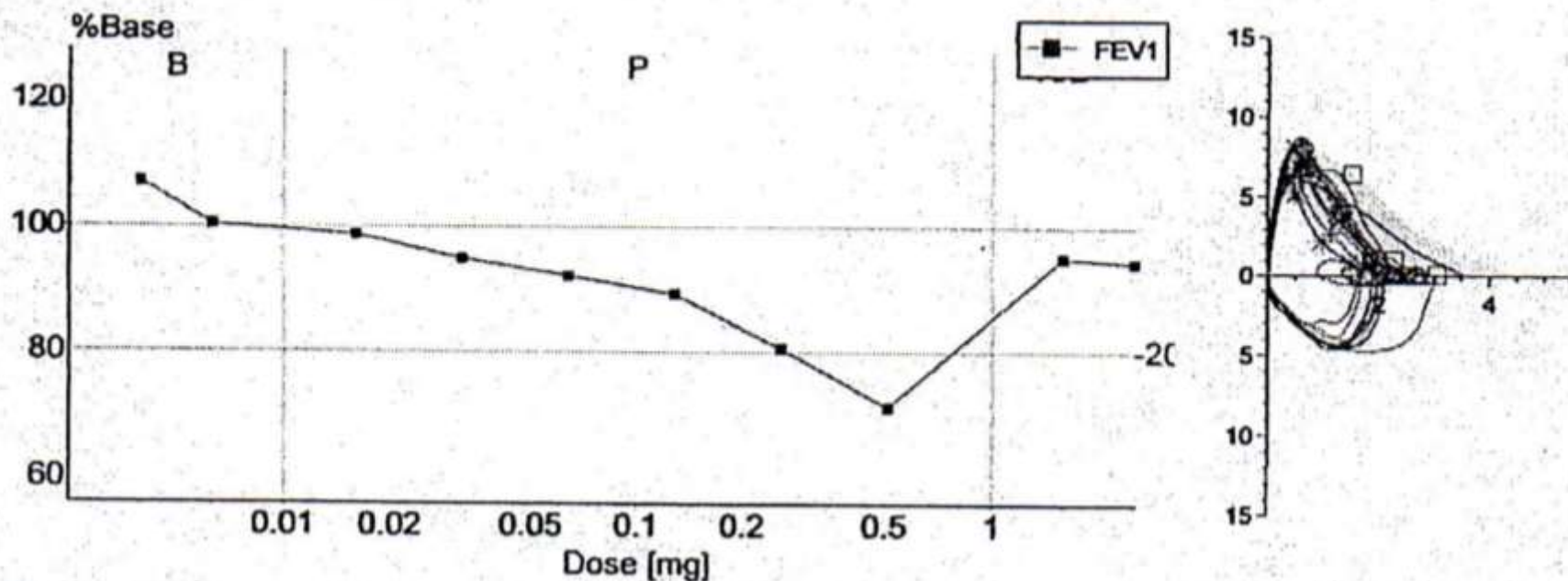
PC[-20] FEV 1: 1.11 mg/ml Conc.





Measuring Airway Responsiveness





Threshold dose

PD/PC[-20] FEV1 : = 0.262 mg Methacholin

CATEGORISATION OF AIRWAY RESPONSE TO METHACHOLINE

PD ₂₀ (mg)	PD ₂₀ (mcg)	PC ₂₀ (mg/ml)	Interpretation
>0.400	> 400	> 16	Normal
0.100-0.400	100 - 400	4 - 16	Borderline Airway Hyper responsiveness
0.025-0.100	25 - 100	1 - 4	Mild Airway Hyper responsiveness
0.006-0.025	6 - 25	0.25 - 1	Moderate Airway Hyper responsiveness
<0.006	< 6	< 0.25	Marked Airway Hyper responsiveness



Ex
Me

Comments:

PEFR (ml)

FEV1 (L)

Weekends: 480 ml

3.80

Mondays: 470 ml

3.20

Thursdays &

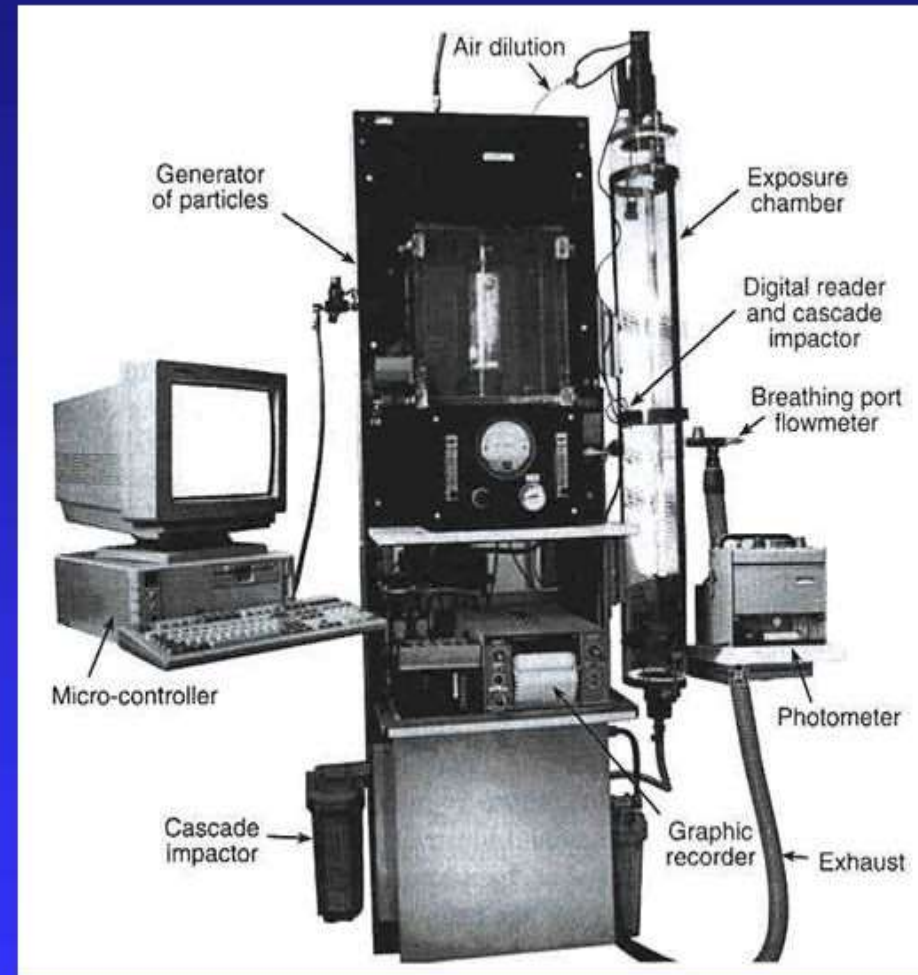
Fridays: **390 ml**

2.80

Tests de provocation bronchique spécifiques en laboratoire



Réaliste



Générateur de particules ou d'aérosols

Management

- ICS with LABA
- Removal from the exposure vs exposure reduction
- Respiratory protection devices (RPD)
- **Change the Job**

Case #2

- *A 58-year-old structural technician suddenly became symptomatic after a tank entry (not using self contained breathing apparatus he noticed an air leak in his full-face mask).*

He presented with sudden SOB, wheezing, coughing and was taken to ER.

He experienced 3 other episodes within the next year so he quit his job because of difficulty to control his asthma.

- *He recalled that for the past 5 years he had frequent similar though milder reactions which improved spontaneously when he was not exposed at work.*

Occupational History

What do you do ? For 25 years as a structural technician mostly in aviation

How do you do it ? Various structural repairs, tank sealing...

Are you concerned about any exposures or health hazards on and/or off the job ?

- became concerned after several ER visits, using epoxy resins, glues, solvents (MEK)...

Co-workers or other exposed ?

- Does not know

Safeguards and satisfaction? likes the job

What went wrong?

- Not recognizing a continuous exposure resulting in respiratory symptoms despite regular annual visits to F.Dr.
- ER did not advise the patient about possible dangers of his exposures at work
- F.Dr. did not follow on a red flag arising from work exposures and ER visits
- Respiriology consultation was only requested after the patient stopped working
- The respirologist asked for an Occupational medicine consultation (after 2 years being off work)

Management

- Difficulty to control the patient's asthma
- Investigation is on-going
- The patient does not want to go back to work as a structural technician
- Investigation at work not possible two years after quitting his job

Key points

- **Early diagnosis** and avoidance of offending agent(s) can **avoid chronicity** (currently, 75% of workers are left with permanent asthma (though often mild) after **1 year** from the onset of the symptoms)
- **16 – 18 %** of adult-onset asthma is OA
- **Occupational history** – (WHACS)
- Initiate investigation while your patient is still at work
- Open a CNESST file by referring the patient to an OLDC (CMPP) once you suspect an OA
- 6 months to declare after you suspect the Dx of OA
- *“Sneezing before wheezing”*

References

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- MSDS (Material Safety Data Sheet) – www.msdsolnline.com
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• www.atsdr.cdc.gov
- Environment Canada – www.ec.gc.ca
- CNESST www.reptox.cnesst.qc.ca
- IRSST www.irsst.qc.ca
- Public Health Montréal-Centre – www.santepub-mtl.qc.ca

Thank you

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