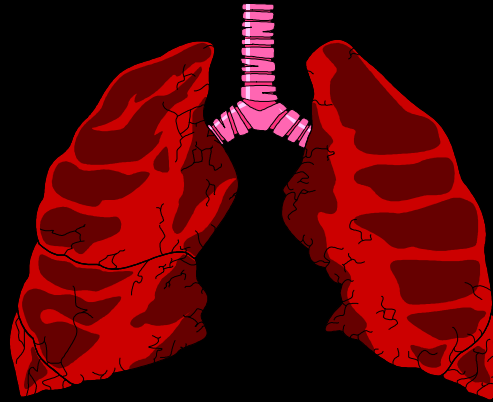


Environmental Management of Asthma: Asthma Triggers



Webinar for
Michigan Center for Clinical Systems Improvement
(Mi-CCSI)

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June 2015

Asthma Triggers

- **A variety of stimuli or “triggers” can cause airway inflammation (swelling) and bring on an asthma flare**
- **Eliminating or reducing exposure to these triggers will decrease the need for asthma medications and reduce symptoms**

Asthma Triggers

Description:

- Agent or factor that contributes to asthma severity
- Additive in nature
- Variable sensitivity
- Trigger locations: home, school, workplace, outdoors, car, entertainment
- Step-wise levels of control:
 - Keep bedroom “asthma-safe”



Categories of Triggers

- Allergens
- Irritants
- Respiratory Infections (colds)
- Exercise
- Weather Changes
- Stress
- Other Triggers



Classification of Environmental Triggers

Allergens		Irritants
<u>Indoor</u>	<u>Outdoor</u>	
• Animals • Dust mites • Cockroaches • Molds	• Pollens -- Trees -- Grasses -- Weeds • Molds	• Environmental tobacco smoke • Combustion by-products - wood smoke • Outdoor air pollutants • Scented or unscented consumer products • Cold air

Indoor Asthma Triggers

Why Indoor Air?

- >90% of time is spent indoors – “Annette Funicello Phenomenon”
- Outdoor air pollutants come inside
- Pollutants are added to indoor air
- Health effects
 - ◆ Respiratory irritants
 - ◆ Allergens
 - ◆ Fetal effects
- Reducing exposure to indoor allergens and irritants can reduce asthma symptoms
- Prevention is an important asthma management tool



Triggers - Allergens



- “An allergy is a condition in which the body’s immune system overreacts to a foreign substance that has been breathed in, swallowed, touched, or injected.”¹
- Allergic reaction - body identifies a normally harmless object as an invader and reacts.¹
- Approximately 70% to 90% of children with asthma have allergy², and 50% of adults with asthma have allergies.¹

¹Plaut, T, Asthma Guide for People of All Ages, 1999, p. 58.

²Pediatric Asthma Guide for Managing Asthma in Children, 1999.

Pets: Leashing the Dander

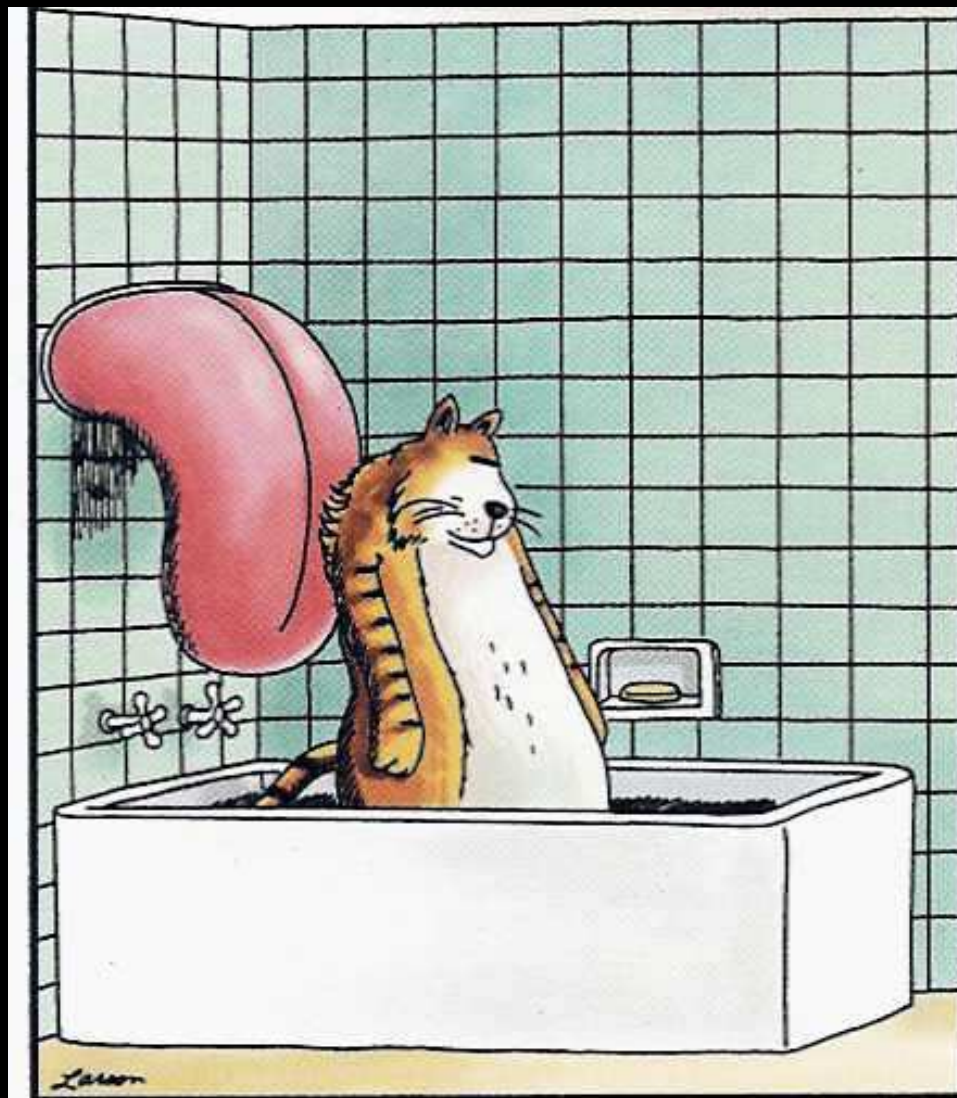
- **Dander, urine, feces, and saliva**
- **Allergens are present even in homes and public places that do not contain animals.**
- **Keep pet out of main living areas and bedrooms.**
- **Install HEPA air cleaners in main living areas and bedrooms.**
- **Avoid furry and feathered pets and products made with feathers - e.g., pillows and comforters**



Pets: Leashing the Dander



- Use a vacuum cleaner with integral HEPA filter and double-thickness bags
- Remove pet from home, if necessary
- www.petfinder.org - website for adoption/ foster care, will not destroy animals if no home is found
- Even if clean aggressively after removal, allergen levels fall over a period of weeks to months
- Controversial: Some studies have found pet washing ineffective



Cat showers

Rodents



- Rodent proteins are potent sources of allergens
- Major allergens are found in urine
- Rodent allergens accumulate in high quantities in the litter, which is a major source of airborne allergen
- NCICAS
 - ◆ 33% inner city homes
 - ◆ 21% rat sensitivity
 - ◆ 21% in bedroom
 - ◆ Related to missed school, ER visits, hospitalizations

Managing the Mites



- *The #1 indoor allergen*
- Perennial with seasonal increases in summer and fall
- Major allergen contained in fecal pellets
- Particles settle quickly after disturbance such that most mite exposure occurs when we are in intimate contact with them
- Make bedroom “asthma safe”
 - ◆ Encase mattress, pillow, and box springs in allergen-impermeable cover
 - ◆ HEPA air filter in bedroom
 - ◆ Reduce clutter
 - ◆ Clean and dust weekly
 - ◆ Replace carpets with linoleum or wood

Managing the Mites



- Reduce indoor humidity to $< 50\%$ (air conditioning or a dehumidifier - esp. in basement - may be helpful)
- Use humidifiers/vaporizers with caution
- Wash bed linens weekly in hot water ($\geq 130^{\circ}$ F).
- Minimize upholstered furniture
- Replace blinds with shades or easily washable curtains
- Hot wash/freeze soft toys
- Remove carpets from the bedroom, and carpets in other rooms laid on concrete

Cockroaches



- Cockroach saliva, feces, skin shedding, and dead bodies decay and become airborne
- Levels in bedroom may be most associated with sensitization and disease
- Significant levels have been found in inner-city schools
- Cockroach is the dominant indoor allergen in many urban areas – sensitivity found in 30-50% of inner-city children with asthma
- Exposure and sensitivity is BEST predictor of asthma morbidity in the NCICAS (asthma study)

Controlling Cockroaches



- Block their entrances - caulk or seal cracks in plaster, flooring
- Dry them out - reduce humidity
- Do not leave garbage or food exposed
- Use poison bait, gel, or traps to control
- Use professional extermination services, if necessary – keep person with asthma out
- Thorough cleaning after extermination
- Extermination of neighborhood dwellings
- Possible to reduce allergen levels but not reduce disease due to the degree of infestation

Molds



- Reproduce by making and releasing spores, which range in size from 2 to 100 micrometers
- Spores become airborne when released by the mold or when disturbed through physical contact
- Mold allergy is related to asthma and asthma severity in children and adults
- Mold allergy is related to rhinitis
- High humidity and dampness in home permit the growth in heating, ventilating, and air conditioning (HVAC) units, dehumidifiers, damp insulation, plaster/drywall, and carpets

Managing Molds

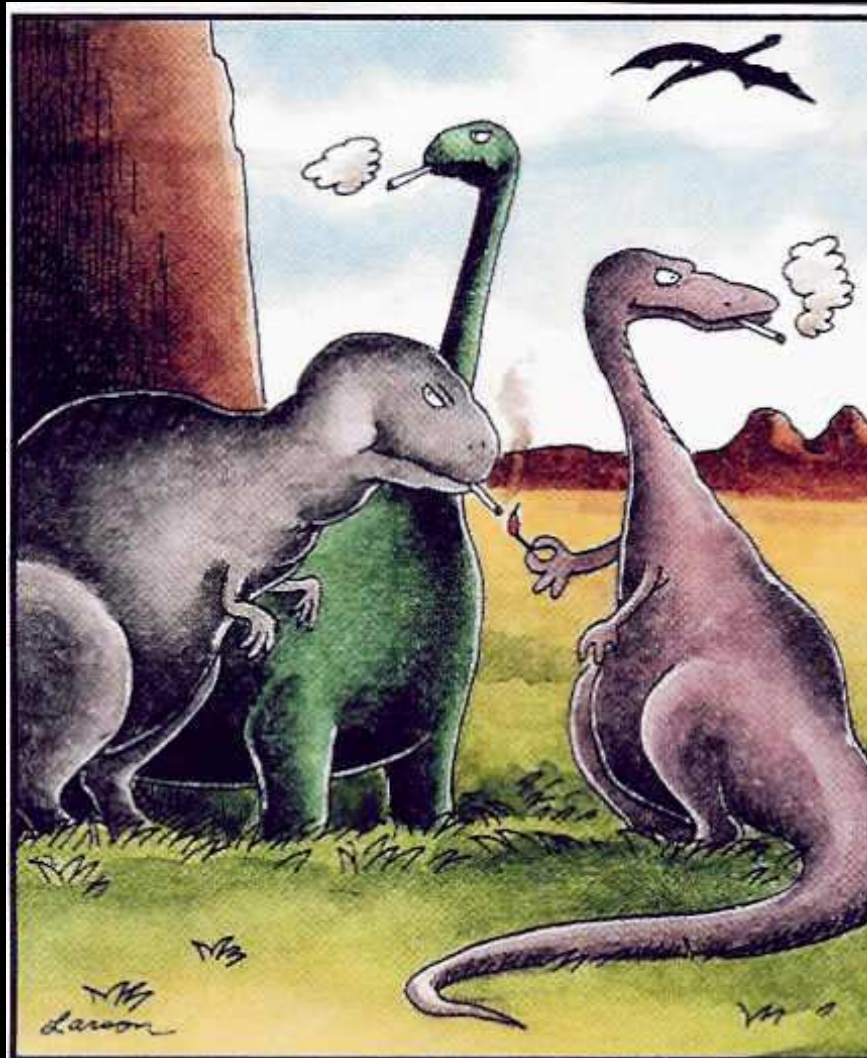


- **Repair leaks, clean moldy surfaces**
- **Reduce indoor humidity to $< 50\%$**
- **Avoid carpeting on cement floors**
- **Use bathroom and kitchen exhaust fans**
- **Avoid handling wet leaves, compost piles, wet newspapers, garden debris or soil**
- **Professional mold testing may be indicated**

Triggers - Irritants



- **Airway irritants are those inhaled substances that trigger inflammation and resulting bronchospasm in the hyperresponsive airways of those individuals with asthma (i.e., no IgE involvement).**



The real reason dinosaurs became extinct

Tobacco Smoke

- Tobacco Smoke-Universal Irritant
 - ◆ Active (Primary)
 - Direct assault on lungs (and throughout the body)
 - ◆ Passive (Secondary)
 - Environmental Tobacco Smoke (ETS)



Non Smokers' Movement of Australia, 1997 - 2001.

U.S.Environmental Protection Agency. Fact Sheet: *Respiratory Health Effects of Passive Smoking*" 1993

Tobacco Smoke

- **Tobacco Smoke - effects of active and passive (ETS) exposure on asthma patients:**
 - **Contains more than 4,000 substances (over 40 are carcinogenic)**
 - **Profound irritation of the upper airway**
 - **Increased incidence of lower respiratory tract infections**
 - **Increased frequency of asthma exacerbations**
 - **Can lead to development of asthma in pre-school age children**

Tobacco Control Measures

- Realistic, supportive approach
- Impact of health care professional's warning - Do not smoke
- Educate about negative health effects of ETS exposure
- Practical plan of control:
 - Smoke outdoors
 - Use "smoking jacket"
 - Never allow smoking in car
 - Choose smoke-free child care settings



Cotinine

- Cotinine* is a major metabolite of nicotine
- Exposure to nicotine can be measured by analyzing cotinine levels in the blood, saliva, or urine
- Nicotine is highly specific for tobacco smoke so serum cotinine levels track exposure to tobacco smoke and its toxic constituents
- Recent study (Mannino, et al. CHEST 2002) found that children with asthma with high levels of smoke exposure (compared to those with low levels) were more likely to have moderate or severe asthma

**CDC Fact Sheet – Exposure to Environmental Tobacco Smoke and Cotinine Levels, 2002.*

Cotinine Levels

- 0.050 ng/mL limit of detection
- 0.050 – 0.115 ng/mL low level
- 0.116 – 0.639 intermediate level
- 0.640 – 20 ng/mL high level



Identifying Other Irritants



- Other sources of smoke (e.g., fireplaces, unvented stoves or heaters, wood burning stoves, kerosene heaters, camp fires, etc.)
- Avoid outdoor fires, incl. leaf and grass fires
- Outdoor or industrial pollutants
- Other irritants (e.g., perfumes, cleaning agents, sprays, cold air, etc.)

Chemical Odors



Given off from a variety of materials:

- Paint
- Solvents
- Pesticides
- Adhesives
- Particleboard
- Vinyl flooring and tiles
- Dry-cleaned clothes
- Toner from photocopiers
- Cleaning agents used in home



Work-Related Asthma

- Definition: asthma caused by exposure to an agent encountered in the work environment
- Recognize patterns of symptoms:
 - ◆ Timing of symptoms
 - Improvement during vacations or days off may take a week or more
 - Symptoms worsen as work week progresses
 - ◆ PEF variability of >20% between work and non-work suggests occupational asthma
 - ◆ Complete cessation of exposure to agent (not always realistic)

Outdoor Asthma Triggers

Polishing off the Pollens



- Limit exposure during season by staying indoors with windows closed
- Monitor local weather forecast - monitor pollen count
- Use air conditioning, if possible
- Optimize antihistamines and other allergy meds
- Bathe the body - wash hands, face, and hair after being outside

Rhinitis



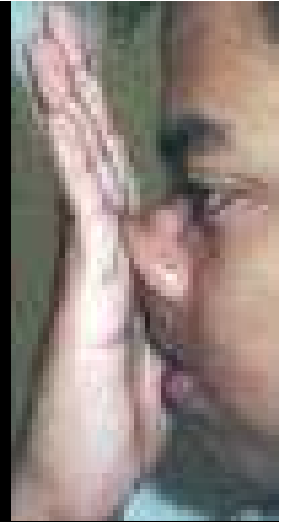
- **Studies indicate that inflammation of the upper airway contributes to lower airway hyperresponsiveness and asthma symptoms**
- **“Unified airway” disease**
- **Treatment of the upper respiratory tract is an integral part of asthma management**
- **Symptoms include sneezing, runny or itchy nose or congestion**
 - ◆ **Exam: clear discharge, crease in nose, dark circles under eyes**

Rhinitis

- Allergic rhinitis - inflammation of tissue lining the inside of the nose
- Provoked by allergens and can be seasonal (grasses, weeds, and trees), or year-round (molds, dust mites, animal dander)
- May increase sensitivity to other triggers
- Treatment: avoid offending allergens, nasal irrigation with saline, oral antihistamines and decongestants, inhaled nasal steroids



Signs and Symptoms of Allergic Rhinitis



- Itchy, watery eyes
- Red eyes
- Itchy nose
- Sneezing
- Postnasal drip
- Sore throat
- Sinus headaches
- Nasal obstruction
- Congestion
- Allergic shiners
- Allergic crease
- Watery, profuse nasal discharge
- Ocular symptoms
- Fatigue

Joint Task Force Recommendations

“Nasal steroids provide the most effective symptom relief of allergic rhinitis.”

Correct technique is important:

- Shake well
- Tilt the head forward (nose over toes)
- Direct the nozzle away from the midline (point to outside of the nose) to avoid contact with the septum
- Use saline sprays before, not after, corticosteroid spray



Joint Task Force on Practice Parameters in Allergy, Asthma and Immunology, November 1998.

Pharmacologic Treatment

Type

- Antihistamines
- Intranasal steroids
- Cromolyn sodium
- Decongestants
- Antihistamine/
decongestant
combinations

Primary Action

- Block histamine receptor
- Exert local anti-inflam. effects
- Stabilize mast cell membrane
- Cause vasoconstriction
- Combines action of both
antihistamine & decongestants

Antihistamines

GENERIC:

- Fexofenadine HCl
- Cetirizine HCl
- Levocetirizine
- Desloratidine
- Loratadine
- Diphenhydramine HCl
- Chlorpheniramine
- Azelastine (nasal sprays)
- Olopatadine (nasal spray)

TRADE NAME:

- Allegra, Allegra D
- Zyrtec, Zyrtec D
- Xyzal
- Clarinex
- Claritin, Claritin D
- Benadryl
- Chlor-Trimeton
- Astelin, Astepro
- Patanase

Nasal Steroids

GENERIC:

- Fluticasone propionate
- Mometasone furoate
- Budesonide
- Triamcinolone acetonide
- Flunisolide
- Ciclesonide
- Beclomethasone dipropionate
- Azelastine & Fluticasone

TRADE NAME:

- Flonase (OTC)
- Nasonex
- Rhinocort, Rhinocort Aqua
- Nasacort, Nasacort AQ (OTC)
- Nasalide, Nasarel
- Omnaris, Zetonna (aerosol)
- QNasl (waterless)
- Dymista (comb. antihistamine & corticosteroid nasal spray)



Benefits of Allergy Testing

- Skin prick tests are most common:
 - ◆ To confirm hypersensitivity to a wide variety of allergens
 - ◆ Are the most convenient and specific screening method for detecting IgE (allergy) antibodies
 - ◆ Are less sensitive but more specific than intracutaneous tests
 - ◆ Are not necessarily diagnostic - should correlate with patient's clinical history
- Positive skin test results are useful for demonstrating sensitivity to the patient and the patient's family, and for improving compliance.
- Blood tests (RAST) are also available



Allergen Immunotherapy



- Consider when:
 - ◆ Clear evidence of a relationship between symptoms and exposure to unavoidable allergen to which patient is sensitive
 - ◆ Allergic response all year or during a major portion of the year
 - ◆ Difficulty controlling the allergy with pharmacologic management
 - ◆ Significant potential benefit from immunotherapy (e.g., children >5years and young adults)
- Sub-lingual (oral) immunotherapy (SLIT) also available:
 - ◆ Pollen specific: Grastek, Ragwitek
 - ◆ Start 3 months before season, take daily through season
 - ◆ First dose in office (observe for 30 minutes), then administered daily at home, need Epi-pen available

Allergen Immunotherapy

- Effective for patients with:
 - ◆ Allergic rhinitis
 - ◆ Allergic conjunctivitis
 - ◆ Allergic asthma
 - ◆ Stinging insect hypersensitivity
- Most patients need a combination of therapies.
- Weekly for 18 weeks while building, then monthly for 3-5 years
- Current evidence suggests that the mechanism may involve immune deviation from a Th2 to a Th1 cytokine response to the allergen.



Weather Changes



- **Effect of weather is not the same in all seasons:**
 - ◆ **Fall - noticeable effect on asthma, esp. following the first cold mass to come in the fall**
 - ◆ **Summer - lowest number of ED visits because weather is least variable though high pollen and air pollution**
 - ◆ **Spring - some day to day variability though not as extreme as fall - high tree pollen**

Weather Changes



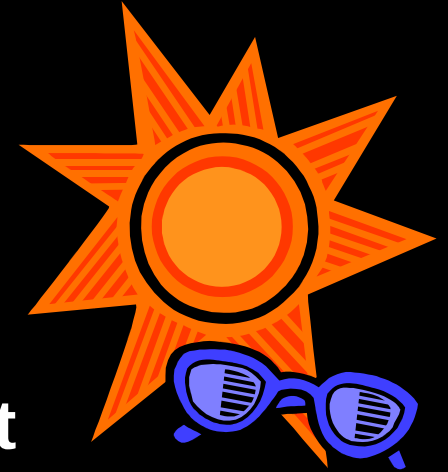
- Cold air - airway irritant (esp. for those with EIB)
- Hot, humid air - patients report some SOB with increased humidity though mechanism unclear - molds?
- Wind - pollen and mold spores become airborne and more likely to be breathed in by susceptible individuals

Air Pollution



- Consider the effect of weather on pollution:
 - ◆ “Inversion”: a weather system where air sits still
 - ◆ Concentrates all the airborne pollutants
 - ◆ When heat and sunlight react with pollutants, creates a large amount of ground-level ozone - a well known asthma trigger
 - ◆ More likely to occur in larger cities
 - ◆ Pollutants worsen asthma - act as irritants

Watching the Weather



- **Watching the Weather**
 - ◆ **Monitor the daily local weather forecast**
 - ◆ **Monitor pollen count and smog index**
 - ◆ **Limit exertion in cold, dry air**
 - ◆ **Wear a scarf or mask over the nose and mouth when outside in very cold weather**
 - ◆ **Stay indoors with windows closed on peak pollen days and especially on windy days during pollen season**
 - ◆ **Keep symptom diary**

Other Common Asthma Triggers

**Exercise, GERD,
Respiratory Infections
and Pregnancy**

Exercise Induced Bronchospasm (EIB)

- **Approximately 90% of individuals with asthma have exercise as a trigger**
- **Caused by loss of heat and water from the airways during exercise resulting in transient airflow obstruction**
- **Diagnosis: exercise challenge or PEF or FEV₁ (15% decrease before and after exercise at 5 min. intervals for 20 - 30 min. is compatible with EIB).**
- **Symptoms: cough, SOB, chest pain/tightness, wheezing or endurance problems during exercise**

Ways to Reduce EIB

- Avoid exercise if symptoms are present
- Pre-medicate per doctor's instructions
- Adequate warm-up - at least 10 - 15 minutes
- Modified exercise
- Avoid triggers that may cause or worsen EIB, i.e., cold air, high pollen count
- Adequate cool down - at least 10 minutes
- Breathe through nose, if possible, to warm air
- Exercise regularly
- Get adequate rest and drink plenty of fluids



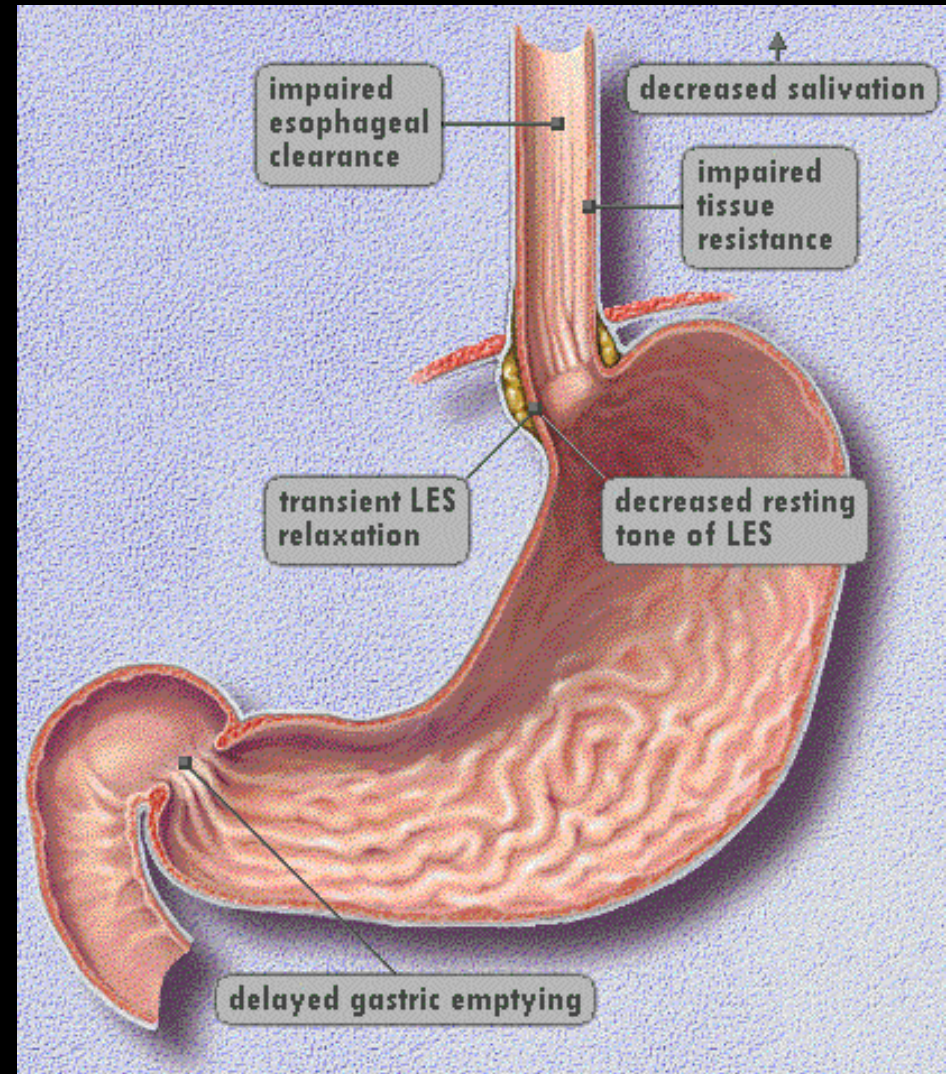
GERD



- **Gastroesophageal reflux disease (GERD) - acid from stomach contents stimulates nerve endings in esophagus causing chronic cough**
- **Symptoms include heartburn and sour taste**
- **Acidic materials may also enter the airways and trigger the asthma reaction - possible cause of nocturnal asthma**

Possible Causes of GERD

- Combination of conditions that increase the presence of acid reflux in the esophagus
- Transient relaxation of the sphincter, delayed gastric emptying, decreased salivation and impaired esophageal clearance
- Lifestyle factors



Risk Factors for GERD

- Smoking
- Large meals
- Fatty foods
- Caffeine
- Pregnancy
- Obesity
- Body position
- Drugs
- Hormones



How Does GERD Trigger Asthma?



- Refluxed material gets past the upper esophageal sphincter, it can aspirated into the larynx and tracheobronchial tree
- Pulmonary symptoms may be caused by:
 - ◆ Direct aspiration of acid into the bronchial tree (micro aspiration of stomach contents – usually during sleep)
 - ◆ Indirectly - acid leaking from the lower esophagus stimulates the vagus nerve which triggers bronchoconstriction (even if symptoms of GERD are not grossly apparent)
 - ◆ Combination of two is also very likely

GERD Treatment



- Don't smoke or drink alcoholic beverages – they increase stomach acid production and cause irritation
- Avoid caffeine and chocolate – caffeine is a muscle relaxant and weakens the LES tone
- Avoid carbonated drinks, citrus, onions, tomatoes, fatty and fried foods, peppermint, and spicy foods
- Wait 2 – 4 hours after eating before bending over, lying down or going to sleep

GERD Treatment

- Thick feedings – infants
- Elevate the head of your bed 6 – 8”
- Wear loose clothing
- Eat smaller meals more frequently
- Weight loss, if appropriate
- Use appropriate pharmacotherapy
- Surgery for refractory cases – Nissen fundoplication



Respiratory Infections



- Risk for Patients with Asthma
 - ◆ May increase airway hyper-responsiveness for weeks
- Prevention/Control
 - ◆ Proper nutrition and rest
 - ◆ Annual influenza vaccine – injection, not nasal spray
 - ◆ Hand washing
 - ◆ keep hands away from face
 - ◆ Avoid those with active respiratory infection
 - ◆ Use antibiotics when appropriate for bacterial infections

Asthma in Pregnancy

Effect of Pregnancy on Asthma

- **Multiple studies have examined the outcome of asthma in pregnancy**
- **Asthma status during pregnancy:**
 - ◆ **Worsens in 1/3 of women**
 - ◆ **Stays the same in 1/3 of women**
 - ◆ **Improves in 1/3 of women**

Asthma Medications in Pregnancy

- **Most asthma medications are as safe to use in pregnancy as in the non-pregnant state.**
- **Budesonide is preferred ICS because more data are available on its use in pregnant women.**
- **Other ICS may be continued in patients who were well controlled on by these agents prior to pregnancy.**
- **Little data on LTM during pregnancy but reassuring animal data; LABA safety profile similar to albuterol (safety data available).**
- **It is safer for pregnant women with asthma to be treated with asthma medications than to have asthma symptoms and exacerbations.**

Asthma Medications in Pregnancy

- **Goal: Maintaining sufficient lung function and blood oxygenation to ensure adequate oxygen blood supply to the fetus is essential.**
- **For most medications used to treat asthma and rhinitis, there are little data to suggest an increased risk to the fetus.**
- **Treating asthma is paramount:**
 - ◆ **Inhaled meds preferred to oral agents**
- **Medications with some possibility of risk to the fetus include:**
 - ◆ **Decongestants, some antibiotics, live virus vaccines, iodides, brompheniramine, epinephrine**

Asthma Medications in Pregnancy

- Most asthma medications are as safe to use in pregnancy as in the non-pregnant state.
- Keys to asthma control during pregnancy:
 - ◆ Taking asthma medications as prescribed
 - ◆ Avoiding asthma triggers
 - ◆ Following an asthma action plan
- A pregnant woman with asthma should be seen regularly by her provider, more frequently if her asthma is not controlled.
- The known risks of uncontrolled asthma are greater than the known risks of asthma medications for both the mother and the unborn child.

Asthma in Pregnancy - Summary

- Asthma during pregnancy can be controlled.
- Pregnant women with asthma can have outcomes similar to the general population.
- Providers try to limit medications during pregnancy, but there are therapies for asthma that are considered safe in pregnancy.
- It is safer for pregnant women with asthma to be treated with medications than for them to have asthma exacerbations.

Questions?

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- Phone: 616-685-1432
- E-mail: meyersok@mercyhealth.com
- Websites: www.asthmanetworkwm.org
www.GetAsthmaHelp.org

- ◆ Download the Guidelines at:

- <http://www.nhlbi.nih.gov/guidelines/asthma/asthgdln.pdf>

- ◆ Download the Summary Report at:

- <http://www.nhlbi.nih.gov/guidelines/asthma/asthsumm.pdf>