Environmental Management of Asthma 2017: Asthma Triggers

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

Karen Meyerson, MSN, RN, FNP-C, AE-C

Director, Commercial Care Management

Priority Health

November 8, 2017

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

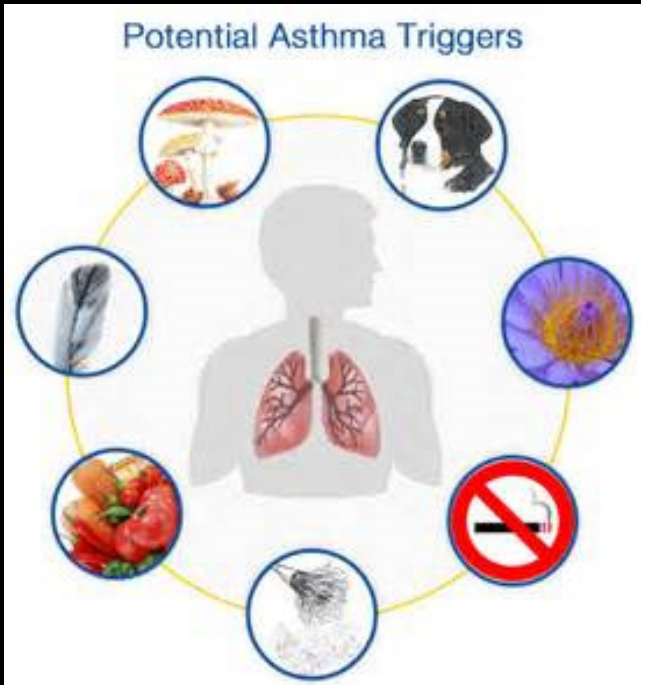
Asthma Triggers

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



Non-pharmacological interventions

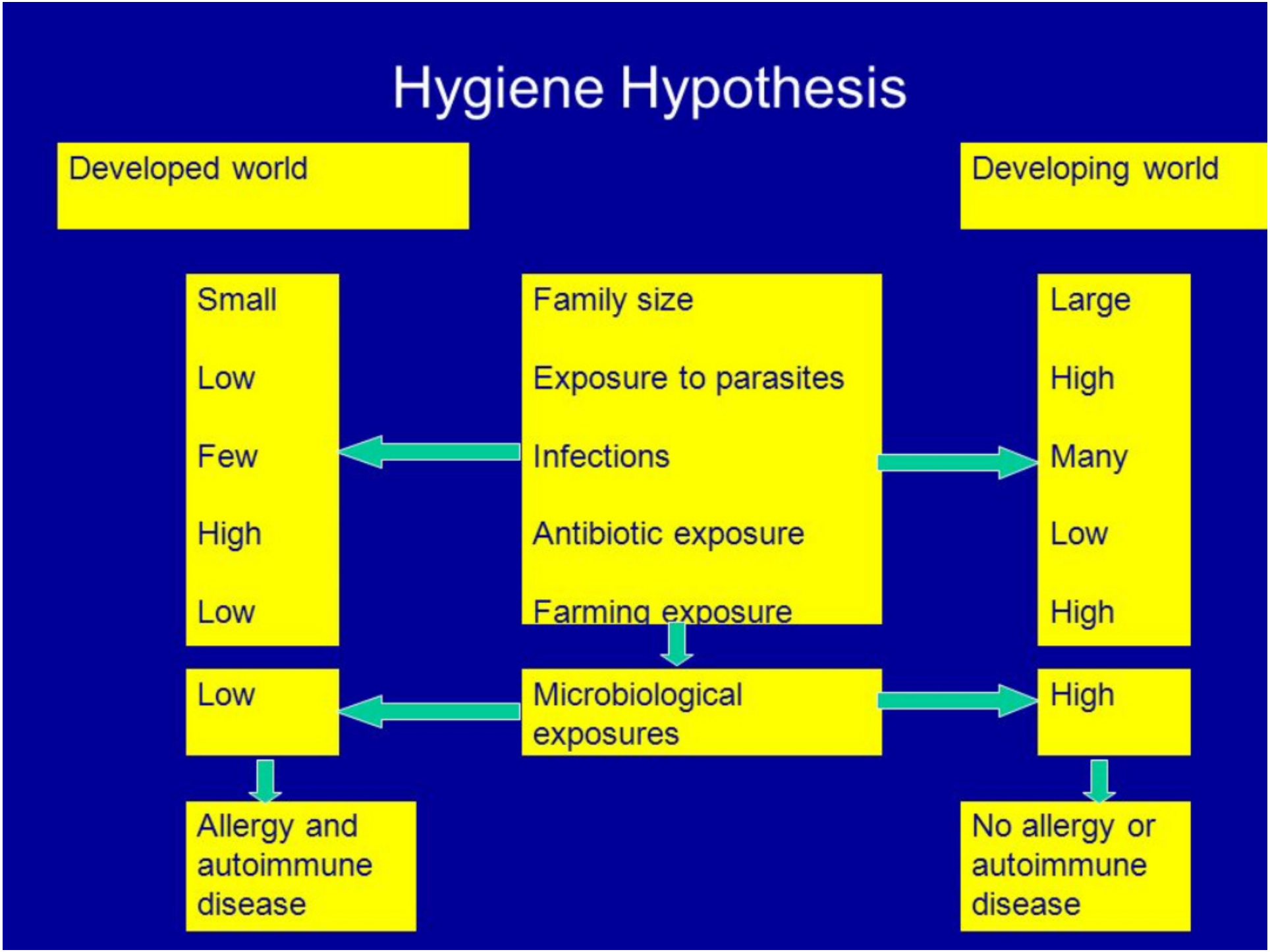
- Avoidance of tobacco smoke exposure
  - Provide advice and resources at every visit; advise against exposure of children to environmental tobacco smoke (house, car)
- Physical activity
  - Encouraged because of its general health benefits. Provide advice about exercise-induced bronchoconstriction
- Occupational asthma
  - Ask patients with adult-onset asthma about work history. Remove sensitizers as soon as possible. Refer for expert advice, if available
- Avoid medications that may worsen asthma
  - Always ask about asthma before prescribing NSAIDs or beta-blockers
- Remediation of dampness or mold in homes
  - Reduces asthma symptoms and medication use in adults
- Sublingual immunotherapy (SLIT)
  - Consider as add-on therapy in adult HDM-sensitive patients with allergic rhinitis who have exacerbations despite ICS treatment, provided FEV1 is 70% predicted

UPDATED 2017

This slide shows examples of interventions with high quality evidence

Non-pharmacological interventions

- Allergen Immunotherapy
- Vaccinations
  - Annual influenza vaccination
- Hygiene hypothesis
- Weight reduction
  - Include weight reduction in treatment plan for obese patients with asthma
- Breathing exercises
  - May be a useful supplement to asthma pharmacotherapy
- Dealing with emotional stress
  - Arrange a mental health assessment for patients with symptoms of anxiety or depression
- Avoidance of indoor allergens and outdoor air pollutants/weather conditions


Hygiene Hypothesis
Developed world
Developing world
Small
Low
Few
High
Low
Family size
Exposure to parasites
Infections
Antibiotic exposure
Farming exposure
Large
High
Many
Low
High
Low
Microbiological exposures
High
Allergy and autoimmune disease
No allergy or autoimmune disease

Why the Amish Don’t Get Asthma

Why the Amish Don't Get Asthma

- Amish children exposed to barnyard germs have much lower rates of asthma than kids raised in more sterilized environments
- Microbes activate their immune systems and protect them against asthma
- Study compared Amish to Hutterites of North Dakota – share genetic backgrounds and simple lifestyles
- *Difference* is in how they farm
- Much lower rates in Amish (2-4%) than Hutterites (14-20%) who live on industrialized farms (with electricity) and cows are housed in huge barns farther away from houses

Chatila, T. N Engl J Med 2016; 375:477-479

Classification of Environmental Triggers

Allergens		Irritants

Indoor
• Animals
• Dust mites
• Cockroaches
• Molds
	Outdoor
	• 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

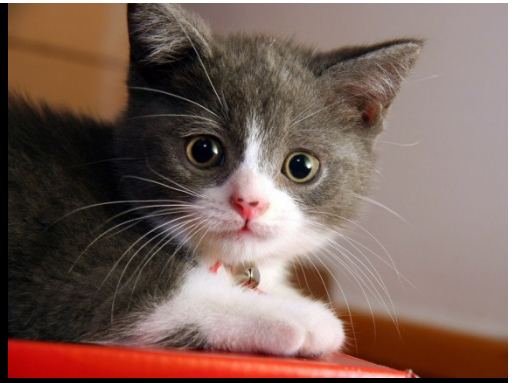
Triggers - Allergens

- 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.
- Allergic reaction - body identifies a normally harmless object as an invader and reacts.
- Approximately 70% to 90% of children with asthma have allergy[2], and 50% of adults with asthma have allergies.

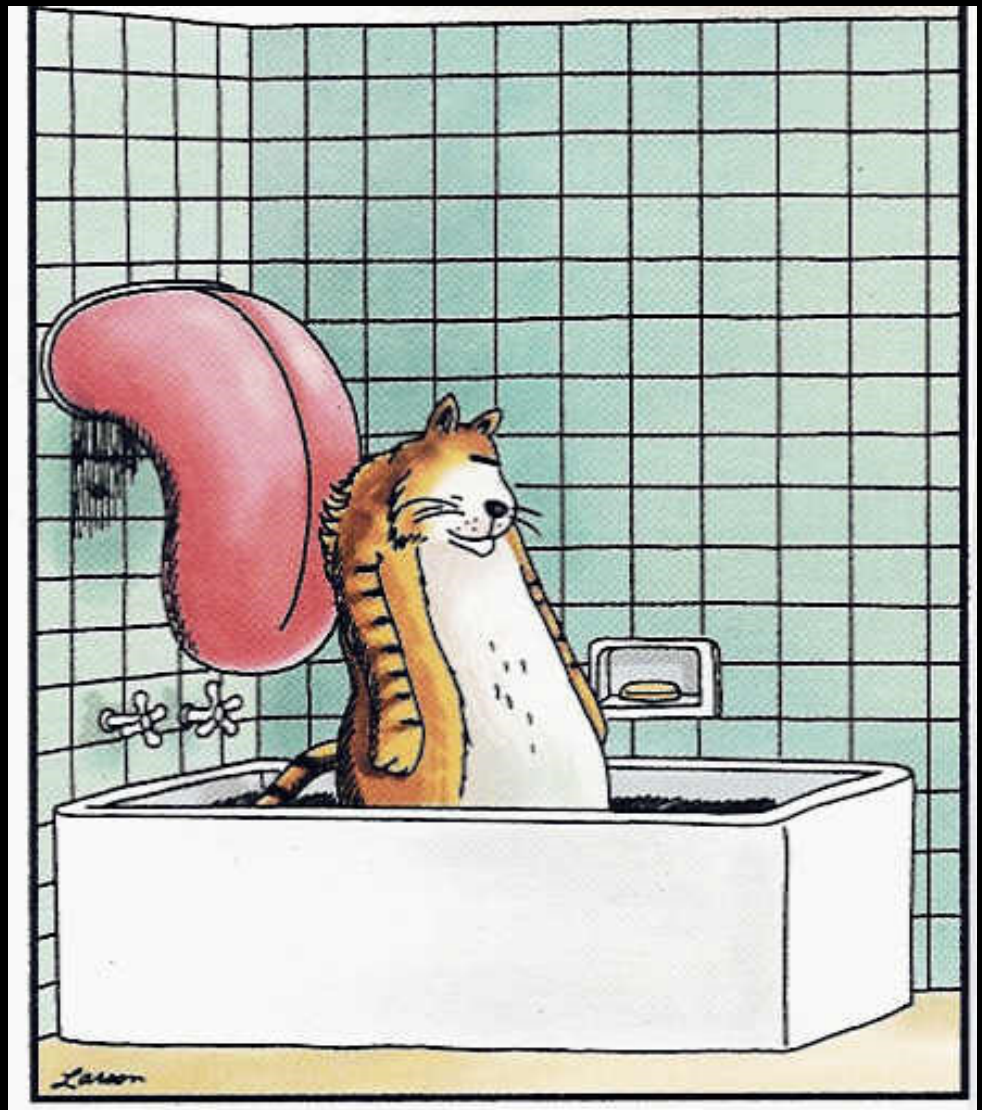
Pets: Leashing the Dander

- 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 integrated 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

J Allergy Clin Immun, Aug 03

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 (≥130°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

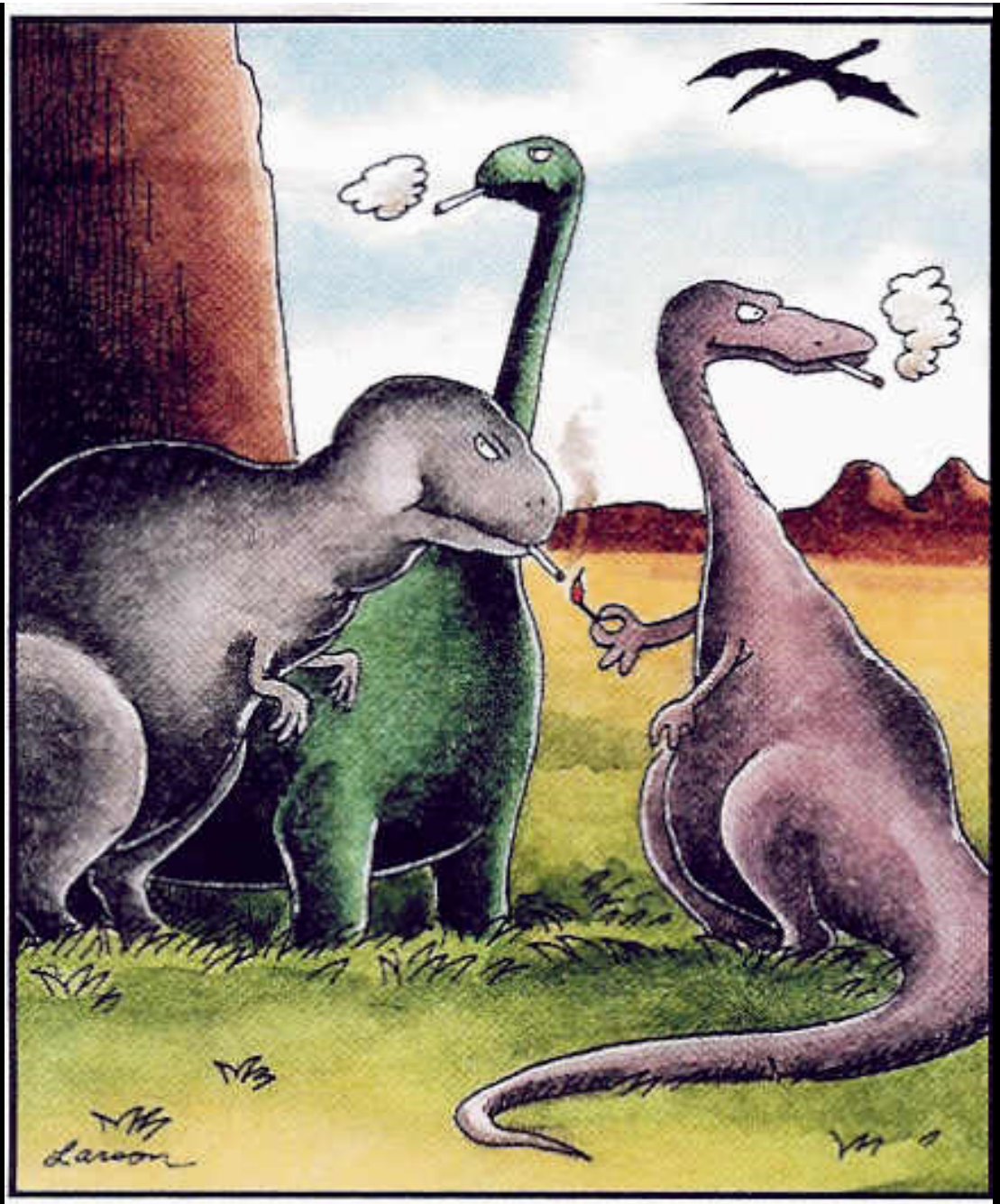
- Reproduce by making and releasing spores, which range in size from 2 to 100 micrometers
- Spores become airborne when released by the mold or when disturbed through physical contact
- Mold allergy is related to asthma and asthma severity in children and adults
- Mold allergy is related to rhinitis
- 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

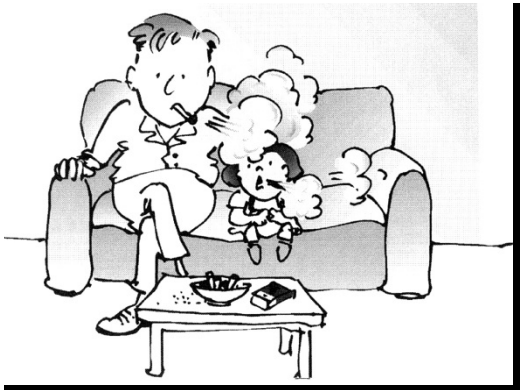
- Airway irritants are those inhaled substances that trigger inflammation and resulting bronchospasm in the hyperresponsive airways of those individuals with asthma (i.e., no IgE involvement).



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)



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
- Can enter the body of a nonsmoker
- Exposure to nicotine can be measured by analyzing cotinine levels in the blood, saliva, or urine
- Preferred measure of exposure over nicotine because cotinine remains in the body longer
- Nicotine is highly specific for tobacco smoke so serum cotinine levels track exposure to tobacco smoke and its toxic constituents
- Studies have 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, 2013.*

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

Emitted 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

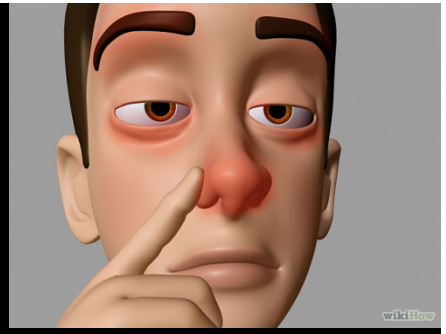
- Definition: asthma caused by exposure to an agent encountered in the work environment
- Recognize patterns of symptoms:
  - Timing of symptoms
    - Improvement during vacations or days off may take a week or more
    - Symptoms worsen as work week progresses
  - PEF variability of >20% between work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

Outdoor Asthma Triggers

Polishing off the Pollens

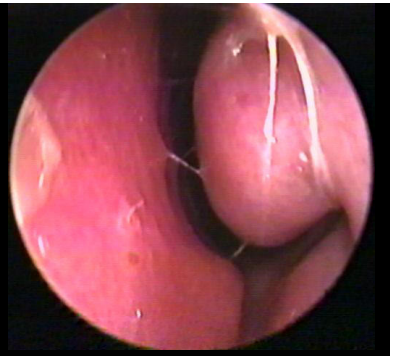
- Limit exposure during season by staying indoors with windows closed
- Monitor local weather forecast - monitor pollen count
- Use air conditioning, if possible
- Optimize antihistamines and other allergy meds
- Bathe the body - wash hands, face, and hair after being outside

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



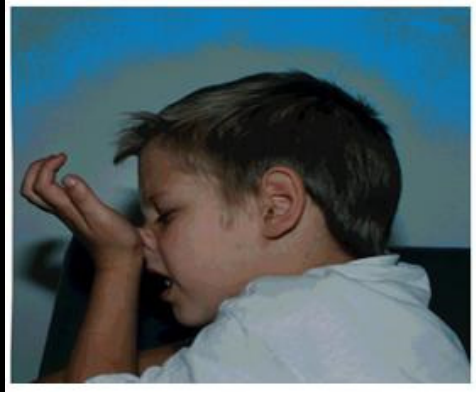
- Allergic rhinitis - inflammation of tissue lining the inside of the nose
- Provoked by allergens and can be seasonal (grasses, weeds, and trees), or year-round (molds, dust mites, animal dander)
- May increase sensitivity to other triggers
- Treatment: avoid offending allergens, nasal irrigation with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

The allergic salute



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

Pharmacologic Treatment

Type	Primary Action
• Antihistamines	• Block histamine receptor
• Intranasal steroids	• Exert local anti-inflam. effects
• Cromolyn sodium	• Stabilize mast cell membrane
• Decongestants	• Cause vacoconstriction
• Antihistamine/ decongestment combinations	• Combines action of both antihistamine & decongestants

Antihistamines
Oral & Nasal

GENERIC:	TRADE NAME:
• Fexofenadine HCl	• Allegra, Allegra D
• Cetirizine HCl	• Zyrtec, Zyrtec D
• Levocetirizine	• Xyzal
• Desloratidine	• Clarinex
• Loratadine	• Claritin, Claritin D
• Diphenhydramine HCl	• Benadryl
• Chorpheniramine	• Chlor-Trimeton
• Azelastine (nasal spray)	• Astelin, Astepro
• Olopatadine (nasal spray)	• Patanase

Inhaled Nasal Corticosteroids (INCS)

GENERIC:

- Fluticasone proprionate
- Mometesone furoate
- Budesonide
- Triamcinolone acetonide
- Flunisolide
- Ciclesonide
- Beclomethasone dipropionate
- Azelastine & Fluticasone

TRADE NAME:

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

Benefits of Allergy Testing

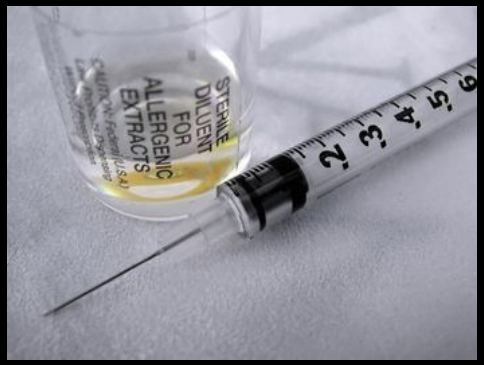
- Skin prick tests are most common:
  - To confirm hypersensitivity to a wide variety of allergens
  - Are the most convenient and specific screening method for detecting IgE (allergy) antibodies
  - Are less sensitive but more specific than intracutaneous tests
  - Are not necessarily diagnostic - should 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®, Oralair®, Ragwitek®
  - Start 3 months before season, take daily through season
  - First dose in office (observe for 30 minutes), then administered daily at home, recommend Epi-pen on-hand

Allergen Immunotherapy

- Effective for patients with:
  - Allergic rhinitis
  - Allergic conjunctivitis
  - Allergic asthma
  - Stinging insect hypersensitivity



- Most patients need a combination of available 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

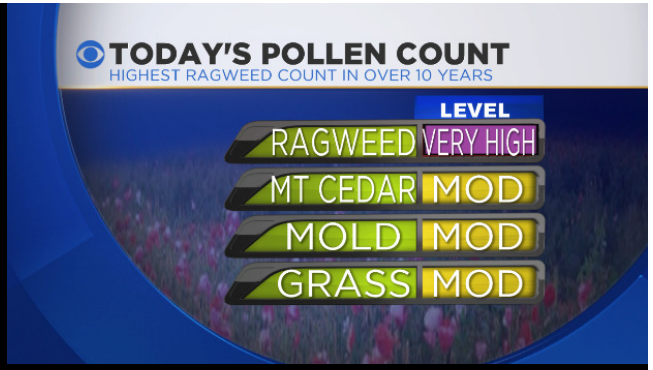
Weather Changes

- 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

- Obesity
- Exercise
- GERD
- Respiratory Infections
- Pregnancy

Obesity-Asthma Link

- Not clear whether obesity contributes to asthma or asthma contributes to obesity
- Asthma & obesity contribute to inflammation and seem to have a synergistic effect
- When people with asthma who are obese lose weight, asthma status improves
- Maternal obesity in pregnancy is associated with higher risk of asthma in children
- Obesity is a risk factor for asthma and obesity is also associated with increased asthma severity

Asthma & Obesity

- Asthma is more difficult to control in obese patients – different type of airway inflammation, often have comorbidities (OSA, GERD)
- Lack of fitness and reduction in lung volume due to abdominal fat may contribute to dyspnea
- Diagnosis & Management:
  - BMI for all patients with asthma
  - Confirm diagnosis with objective measures (spirometry)
  - Inhaled corticosteroids (ICS) – although response may be reduced, may respond to LTRAs
  - Weight reduction – improves asthma control, lung function, health status and reduces medication needs

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 FEV_1 (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

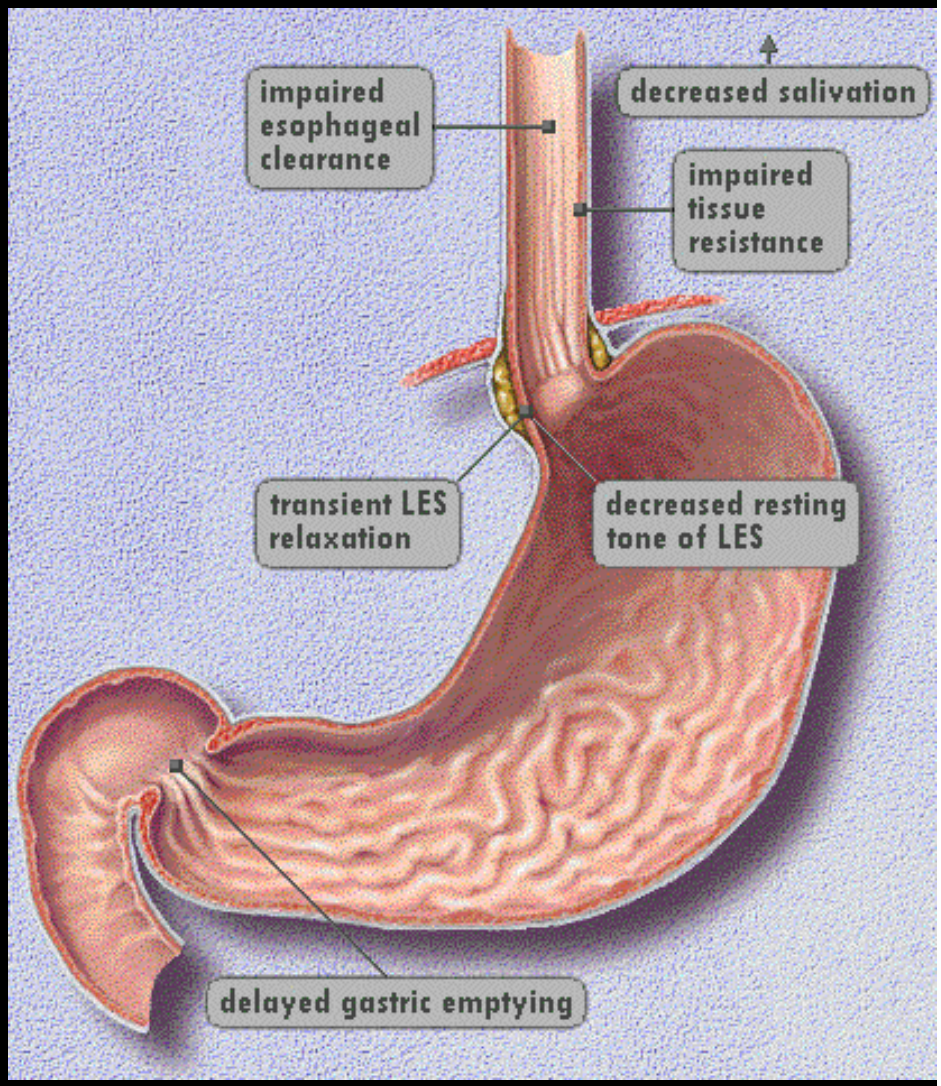
- Avoid exercise if symptoms are present
- Pre-medicate per doctor's instructions
- Adequate warm-up - at least 10 - 15 minutes
- Modified exercise
- Avoid triggers that may cause or worsen EIB, i.e., cold air, high pollen count
- Adequate cool down - at least 10 minutes
- Breathe through nose, if possible,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

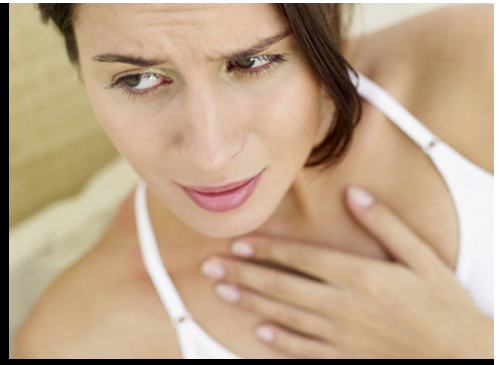
- Combination of conditions that increase the presence of acid reflux in the esophagus
- Transient relaxation of the sphincter, delayed gastric emptying, decreased salivation and impaired esophageal clearance
- Lifestyle factors



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 LTRA 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?

- **Karen Meyerson, MSN, APRN, NP-C, AE-C**
  - **Phone:** 616-464-4816
  - **E-mail:** Karen.Meyerson@priorityhealth.com
  - **Websites:**
    - **www.GetAsthmaHelp.org**
    - **Expert Panel Report-3 (EPR-3) Guidelines:**
      - http://www.nhlbi.nih.gov/guidelines/asthma/asthgdln.pdf
    - **GINA (Global Initiative for Asthma) Guidelines:**
      - http://ginasthma.org/