Allergies in the School: What Can We Do?

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Reactions of the Immune System against

• The External World – “Allergy”
  – Hayfever
  – Asthma
  – Eczema (atopic dermatitis)
  – Food allergy
  – Anaphylaxis

• The Internal World – “Autoimmune”
  – Type I diabetes (vs. Type II diabetes)
  – Crohn’s disease, ulcerative colitis

Hygiene Hypothesis

• Changes of lifestyle in industrialized countries have led to a decrease in infections and are associated with a rise in allergic and autoimmune diseases
  – Strachan, 1989

Germ Exposure Reduces Allergy

Inverse Relation between the Incidence of Prototypical Infectious Diseases (Panel A) and the Incidence of Immune Disorders (Panel B) from 1950 to 2006.

Leaders in Allergy & Asthma Care for Over 40 Years
2. Allergic rhinitis and conjunctivitis

Nasal itching

Mouth breathing

Allergic shinners


Products of Mast Cell Degranulation

- Histamine
  - Itching
  - Sneezing
  - Vascular permeability
  - Glandular secretion
- Prostaglandin D2
  - Increased vasodilation
  - Vascular permeability
- Cysteinyl leukotrienes
  - Increased vasodilation
  - Decreased mucociliary clearance
  - Increased goblet cell secretion
  - Promote eosinophilia
  - Promote fibrosis/remodeling

Pathophysiology of Allergic Inflammation: Clinical Disease

Early Inflammation

Late Inflammation

What Is Histamine?

- Mediator stored in mast cells and basophils
- Accounts for many symptoms of Allergic Rhinitis, Urticaria
- Effects of histamine
  - Induces vascular permeability
  - Vasodilation
  - Stimulates sensory nerve endings

Allergic Rhinitis

- IgE-mediated nasal response to allergen
- Release of chemical mediators from nasal basophils, eosinophils, mast cells
  - Mucosal edema from vasodilation
  - Hypersecretion
  - Nasal itch
  - Sneezing
  - Associated ocular symptoms
Types of Allergic Rhinitis

- Seasonal (rose fever, hayfever)
  - Symptoms occur from inhalant allergies
  - Typically spring and fall pollens, molds
- Perennial
  - Chronic symptoms from perennial allergens
  - Dust, mite, mold, animal danders
- Occupational
  - Exposure to allergens in the workplace

Where does pollen come from?

- Trees: Early – mid spring
- Grasses: Late spring – early summer
- Weeds: Late summer - fall

Maple - catkins

Kentucky Blue (June) Grass - inflorescence

Skin Testing

Diseases Associated with AR

- Asthma
- Chronic Sinusitis
- Otitis Media
- Acute Sinusitis
- Pharyngitis
- Laryngitis
- Snoring and Sleep Apnea

Allergic Rhinitis and its impact on Asthma (LMA) [Product Name]. Accessed 3/18/05.
Antihistamines: Think Non-Sedating!

• Why use Benadryl?
• Non-sedating
  – Rapid onset
  – Long-acting
  – High margin of safety

AR Treatment Guidelines: AAFP

• Antihistamines
  – Most often used for immediate symptom relief
• Decongestant drugs
  – Relieve nasal congestion but not other AR symptoms
• Intranasal corticosteroids
  – Provide relief of symptoms of nasal allergy in both seasonal and perennial AR
• Immunotherapy – “Allergy shots”
  – Considered a long-term, disease-modifying treatment requiring months to years of treatment

3. Acute hives and angioedema: Causes and Treatment

• Acute vs Chronic (> 6 weeks)
• Common triggers of acute
  – Virus
  – Allergen (environment, food, meds)
  – Contact
  – Physical (heat, pressure, cold, dermatographia)
• Treatment
  – H1- and H2- blockers

4. Stinging Insects

• Types of bees
  – Honeybee – leaves a stinger!
  – Yellow jacket
  – Wasp
  – Hornet

Stinging Insects: Reactions

• Local Reactions – Common, “Normal”
• Systemic reactions – Bee Stings
  – Uncommon in kids!
• Avoidance: Don’t dress or smell like a flower!
5. Vocal Cord Dysfunction
The great masquerader...

• VCD is the uncontrolled closing of the vocal cords with inspiration.
  – Symptoms mimic asthma
  – May occur alone or along with asthma
  – It may be difficult to tell the difference between the two conditions

Vocal Cord Dysfunction (VCD)

VCD - The great masquerader...

• Occurs in both men and women but may be more common in women who are high achievers
• Has an abrupt attack but recovers quickly.
• May be able to speak during an attack, but often has a hoarse voice.
• Has more problem breathing in than out.
• May have a dry cough
• Usually has normal lung function test
• May not respond to asthma treatment

Vocal Cord Dysfunction
– Abdominal Breathing – What can it hurt?


• Mild – one organ system: Upper Resp, Skin, GI
  – Antihistamines
    • Benadryl vs. Non-sedating options
    • Safety profile
• Severe – Two organ systems = ANAP
  – Options in Epinephrine Auto-injectors
• Prevention and Preparation

7. What is Anaphylaxis?

• How to recognize?
• How to treat?

• Food allergies – strategies to manage
  – Is this a “disability?”
What You Should Know About Anaphylaxis

- Anaphylaxis is a serious allergic reaction that is rapid in onset and may cause death.
- It is an IgE-mediated reaction
- Early identification and treatment is important

Common Causes of Anaphylaxis

- Food
  - Most common: peanuts, tree nuts, milk, egg, wheat, fish, and shellfish
  - Any food can cause a reaction
- Medication
- Insect stings: yellow jackets, honeybees, wasps, hornets (and fire ants, not in Colorado)
- Latex: natural rubber products

Symptoms of a Severe Allergic Reaction

- Skin: itching, hives, swelling
- GI: oral, nausea, vomiting, diarrhea
- Respiratory: Rhinitis, cough, wheeze, SOB
- Cardiovascular: Lightheaded, LOC
- CNS: Anxiety, sense of doom
  - Any of these signs or symptoms may be present

Recognize ➔ Treat

- History: Exposed to a known allergen
- Findings: Involvement of two organ systems
  - Skin: itching, hives, swelling
  - GI: oral, nausea, vomiting, diarrhea
  - Respiratory: Rhinitis, cough, wheeze, SOB
  - Cardiovascular: Lightheaded, LOC
  - CNS: Anxiety, sense of doom
- TREAT with Epinephrine! - Time matters!

Options in Epinephrine Auto-injectors

Two Doses
Another Product is Coming...

Treatment of Anaphylaxis: Prevention and Preparedness

- “Prevention is worth a pound of cure”
- Identification
  - Family notifies school personnel about a student's history of anaphylaxis and the specific food(s)
  - Nurse, teacher, associate personnel
- Environment to prevent accidental ingestion
  - Avoid shared foods
  - Have “special situation” option available
  - Is allergen-free environment realistic?

Let’s Be Prepared: Recognition is Essential

- School staff education
  - Familiar with the signs and symptoms of allergic reactions, anaphylaxis
- Understand that reactions can start with mild symptoms and progress quickly

Epinephrine is First Aid!!!

- Emphasize to school staff and parents:
  - Epinephrine is the treatment of choice.
  - DELAY in the administration is associated with more severe reactions, including fatal/near fatal reactions
  - Epinephrine is relatively safe, ANAP kills!
  - Err on the side of caution and treat with epinephrine if unsure about severity of reaction
  - Antihistamines are second-line treatment and do not stop or prevent anaphylaxis.

Readiness to Self-Carry?

- Ability to demonstrate appropriate and correct use of self-injectable epinephrine
- Ability to recognize the symptoms of anaphylaxis
- Student's comfort level with self-carrying and using SIE
- Previous history of anaphylaxis
- Consider co-morbid conditions such as developmental delay, ADHD, autism spectrum disorder, and depression.
Let's Be Prepared: Anaphylaxis Action Plan (AAP)

- A HCP writes AAP, a medical order, for use by a school nurse.
  - District should use template for AAP
- The nurse distributes and trains AAP to non-licensed "delegates" responsible for the care of the child.
- AAP must be written in practical lay terms (4th-5th grade)
  - "If you see this_______, then do this"
- AAP should list
  - Allergens to avoid
  - Specific symptoms that require specific treatment
  - When to use of epinephrine and activate EMS


Emergency Medical Tx: AAP has it all!

- MILD: ONE organ system -> Maybe antihistamine, ALWAYS observe
  - Oral: itch, swelling
  - Skin: itch, hives, mild swelling
  - Gutt: nausea, discomfort
  - Nose: runny, stuffy, sneeze
- NOT-MILD: MORE THAN ONE organ system -> ANAPHYLAXIS
  - Skin: significant hives, swelling
  - Gutt: Repeated vomiting, significant discomfort/cramping
  - Nasal: runny, stuffy, sneeze
  - Airway: Tight throat, hoarse voice, trouble swallowing, short of breath, wheezing, coughing
  - Heart: Pale/gray/blue color, faint, weak, dizzy
  - Mental: confused, anxious, sense of impending doom

- When to use Epi?
  - "Likely eaten" vs. "Definitely eaten"
  - Severe ("NOT MILD") Symptoms recognized

More on Emergency Medical Tx:

- Activate 9-1-1
- Stay with patient
- Lay flat, elevate legs
- May repeat Epi if response is poor - 5 minutes
  - Benefit may wane after 15-20 min
- Notify Emergency Contacts
- Transport to ER for observation – Delayed/Biphasic

Dealing with Fear and Anxiety: It’s all about Communication

- Common in both parents and children
  - Grandparents often show lack of understanding, compassion
- The internet
  - fuels fear and
  - leads to inappropriate expectations

Dealing with Fear and Anxiety: It’s all about Communication

- To deal with inappropriate expectations, reassure parents that school has
  - Practical strategies to keep child safe, but must be feasible.
  - Reasonable accommodations without negatively impacting child or others in the school community.
- School nurse communication to HCP is essential
  - Get on the same page regarding concerns and expectations
  - Work to correct misperceptions that drive unreasonable demands
Why Parents are Anxious

- There can be invisible “hidden ingredients” in foods.
- Labels and ingredients can change without warning.
- Items with advisory labels can contain allergens.
- Trace amounts can cause severe allergic reactions.

What about Kissing?

- Problem: Passionate kissing after a partner ingested peanut
- Ten individuals, 2 tablespoons of peanut butter
  → Saliva was collected at various time points and after brushing teeth or rinsing alone
- Levels of Ara h 1 varied considerably immediately after ingestion
  → Undetectable in 1/10 persons immediately after ingestion
  → Undetectable in 5/7 @ 1 hr post-meal
  → Undetectable in all subjects within 4.5 hours without any intervention
- None of the immediate interventions (brushing teeth and/or rinsing) consistently reduced Ara h 1 levels to below detection

Skin Exposure to Food Allergens

- Isolated skin contact on intact skin does not cause severe or systemic reactions, just local skin reactions can occur.
- Soap and water, and commercial hand wipes are effective for cleaning hands or surfaces, e.g., table tops.
- Hand sanitizers are NOT effective in removing allergen protein residue.
- Adults touch their eyes, noses, and mouths regularly, and young children frequently place their hands and objects in their mouth.

Inhaled Exposure to Food Allergens

- Proteins not odors cause allergic reactions.
  → Odors originate from volatile organic compounds.
- Exception: Inhaling vaporized proteins from active cooking can cause severe allergic reactions (e.g., shrimp)

Food Allergies

- Prevalence 8% Schools kids
- 38.7% of food-allergic children have a history of a severe reaction
- Nearly 25% of reactions requiring epinephrine had no prior history of life-threatening allergy.

Food allergies in College

- Greenhawt conducted online survey with University of Michigan undergraduates
  → 40% of students with food allergy actively avoided the known food allergen
  → 75% did not maintain self-injectable epinephrine
- “At risk” for serious reactions in a less supervised setting
- Can we teach better self-management skills at an earlier age?
Food Allergy

- Where do we get into trouble?
  - Lack of AAP
  - Delayed recognition of symptoms
  - Poor management of anaphylaxis – failure to follow AAP
- How do we avoid trouble?
  - Avoidance: simple methods to reduce the likelihood of ingestion
  - Education about recognizing and treating anaphylaxis
  - Establishment and review of school procedures for allergy management
- Create policies to be proactive and preventive
- Goal: Safe and healthy kids learn

The Child’s Concerns: The Emotional and Social Impact

- Fear of adverse events and death
- Fear of ridicule, bullying
- Social isolation
- Limitations in activities
- Limited food choices
- Being a burden to others
- Not enough education to others about allergy

Key Points about Food Allergy Reactions

- 1st time allergic reactions happen in school
  - Nearly 25% of reactions requiring epinephrine had no prior history of life-threatening allergy.
- Fatal and near-fatal reactions are rare but do occur
- Early recognition and treatment of anaphylaxis can be life saving
- Food allergies have social and emotional impact on children and families

Key Points about Food Allergy Reactions

- Prevention
  - Avoidance
  - Communicate
  - Teach
- Emergency Preparedness
  - Recognize Allergy and ANAP
  - Epi
  - Activate 9-1-1

Protocols to Cover All Settings

- School protocols must safeguard children with life-threatening food allergies in all school settings
  - Classrooms
  - Cafeterias
  - Buses
  - Gymnasiums, sporting events, recess
  - Special subject classrooms
  - Clubs: music, theater, etc.
  - Field trips, outings

Strategies: “Child-specific” for those with KNOWN history of food allergy

- Identification of students with life-threatening allergy
- AAP
  - Updated, reviewed, accessible
  - With parent understanding to be shared with all responsible for students care
- Epinephrine auto-injectors accessible
  - Child-specific auto-injectors provided by family
  - Second available dose
- Non-licensed staff trained to recognize signs/symptoms of anaphylaxis and administer auto-injector when school nurse is not available
Strategies: No “Child-specific” for those with First-Time Reaction

- Staff training to recognize signs/symptoms of allergic reactions and anaphylaxis
  - Immediate contact of school nurse and/or 911 (especially if nurse not immediately available)
  - First aid: administer auto-injector when school nurse is not immediately available
- Standing epinephrine orders
  - Stock epinephrine OR
  - Non–child-specific auto-injectors provided by school
    - Accessible but secure location

Strategies for ALL: KNOWN or UNKNOWN allergies

- District policy on food allergy management in the school setting
- School physician prescription and standing medical orders for non-patient-specific epinephrine
- Annual universal staff training in anaphylaxis recognition and management, familiar to all staff
- Training in use of epinephrine auto-injector for identified staff

References

- NASN: Food Allergy and Anaphylaxis Tool Kit (www.nasn.org/ToolsResources/FoodAllergyandAnaphylaxis)
- Allergy and Asthma Network: Mothers of Asthmatics (www.aama.org)
- American Academy of Pediatrics (www.aap.org)
- American Academy of Allergy Asthma & Immunology (www.aaaai.org)
- American College of Allergy, Asthma & Immunology (www.acaai.org)
- Asthma and Allergy Foundation of America (www.aafa.org)
- Food Allergy Research & Education (www.foodallergy.org)
- Kids with Food Allergies Foundation (www.kidswithfoodallergies.org)
- National Association of School Nurses (www.nasn.org)
- NIAID: Guidelines for the diagnosis and management of food allergy in the United States (www.niaid.nih.gov/topics/foodallergy/clinical/Pages/default.aspx)

9. Environmental allergies in the classroom

- Exposure increases risk for
  - An allergic reaction
  - An asthma exacerbation, or
  - A reaction to food

Exposure to Environmental Allergens in Schools

- The number of pet owners at school correlates with cat and dog allergen levels.
  - Commonly present at levels that might induce asthma in children allergic to these pets
- Clothing is the primary transfer mechanism and source of pet allergens.
- House dust contains the important allergens
  - Cat, dog, dust mite, cockroach, mouse, and molds
- Carpeting and upholstered furnishings are reservoirs

Methods to Reduce Allergen Load

- Reductions in dust reservoirs
- Regular and thorough cleaning and maintenance
- Improvements in ventilation
- Control of excess moisture
- Pest control
Exposure to Environmental Allergens in Schools

- Moisture: visible and quantify humidity
- Dust mite levels are associated with climatic, geographic, and building-related factors.

Molds

- Many studies report positive associations between asthma and exposure to molds in schools
- IgE-mediated and non-IgE-mediated inflammation
  - Particulates derived from molds contain allergens and a variety of biologically active molecules (e.g., b-1,3-glucans).
- Accurate quantification is difficult
  - Measure and compare airborne levels, indoor vs. outdoor
  - Food (cafeteria), water (sinks), carpet, socio-economics (inner city, low income, race)

Exposure to Environmental Allergens in Schools

- Cockroach allergen is the predominant indoor allergen in the inner city (multicenter study)
  - Food (cafeteria), water (sinks), carpet, socio-economics (inner city, low income, race)
  - Signs of current infestation noted in schools with higher levels

Impact of Indirect Exposure to Dander

- Asthmatic children, diagnosed cat allergy but did not have direct contact with pets
  - evaluated after they returned to school after summer break
- Classrooms >18% of the students owned 1+ cats
  - Significant decrease in PEFR
  - More asthma symptom days
  - Increased use of asthma medication
  - Vs. classes with fewer cat owners (18%)

Impact of Indirect Exposure to Dander

- School exposure contributes to
  - Allergy sensitization to cat and dog
    - Dose-dependent, higher levels of allergen associated with higher rates of sensitization
  - Bronchial hyper-reactivity
    - a marker of tendency to asthma
  - Incidence of asthma in classroom

Methods to Reduce Allergen Load

- Reducing allergen load on clothing of children with pets is not practical
  - Change clothes upon arrival to school
  - Eliminate pets from the homes of classmates OR
  - Ask children to avoid contact with pets before school
- Remove open shelves, upholstery, carpets, curtains, and plants, AND cleaning increased


### Achieving Low-Allergen Schools

- Extensive renovation, installation of a new ventilation system, ventilated floors, cleaning habits, and pet-avoidance measures (i.e., families and personnel avoiding direct and indirect contacts with pets)
- Reduced cat and dog allergen levels in a day care facility
  - Cat: 6-fold reduction
  - Dog: 10-fold reduction

### Molds and Moisture Remediation

- Renovations and repairs of moisture-damaged classrooms and buildings were found to be effective at reducing mold exposure in schools and were associated with improvement in building occupants’ symptoms.
- Improvements in ventilation (e.g., increased air-exchange rates) might also affect relative humidity and concentrations of airborne viable molds
  - Improved indoor air quality and reduced asthma symptoms
  - Dehumidification with HEPA filtration reduced airborne fungal spore counts.

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### Australia: “low-allergen” school

- Designed to reduce exposure to dust and hazardous chemicals
  - Reduce potential dust reservoirs
  - Improve ventilation
  - Introduce materials with lower emissions of volatile organic compounds and dust particles
  - Use central vacuuming and radiant heating systems.
- The levels of dust mite and cat allergens tended to be lower in the low-allergen school, but differences between schools did not reach statistical significance.

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### 10. On being part of the Healthcare Team: The role of the School Nurse

- School nurses are “school allergy champions”
  - Know the school and district resources
  - Best understands the challenges
  - Are best equipped to work within the culture of their schools
- Oversee food allergy protocols, AAP’s
- Educate of school staff, students, and parents
- Improve community understanding and acceptance of food allergies.

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### Our Goals

- To provide practical evidence-based strategies
- To keep students safe and
- To assist them in maintaining quality of life
- Without needlessly restricting or negatively impacting others.
- Healthy and safe children learn better!