DRUG ALLERGY EVALUATION

SATURDAY/9:45-10:45AM

ACPE UAN: 0107-9999-20-009-L01-P 0.1 CEU/1.0 hr
Activity Type: Knowledge-Based

Learning Objectives for Pharmacists:
Upon completion of this CPE course participants should be able to:
1. Differentiate what defines a true IgE-mediated drug allergy in comparison to an adverse reaction.
2. Utilize a systematic approach when evaluating patients with suspected drug allergy.
3. Describe the most common drug allergies seen in clinical practice.
4. Devise a plan to approach a patient with multiple drug allergies.

Speaker: Deanna McDanel, PharmD, BCPS, BCACP
Deanna McDanel is a Clinical Pharmacy Specialist in Ambulatory Care at the University of Iowa Hospitals and Clinics (UIHC). She obtained this position after graduating with a PharmD degree from the University of Iowa College of Pharmacy in 2001. She subsequently completed an ASHP-Accredited Specialized Residency in Primary Care at the University of Iowa Hospitals and Clinics in 2002. She has been a Board Certified Pharmacotherapy Specialist since 2004 and a Board Certified Ambulatory Care Pharmacist since 2012. In her career, she has worked in geriatrics and in a pharmacotherapy clinic managing patients with diabetes, hypertension, and hyperlipidemia. Her current clinical practice sites include the Anticoagulation, Drug Allergy and the Adult Allergy/Immunology Clinics. She also serves as a member of the faculty for the Division of Immunology at UIHC. Deanna shares a joint appointment as a Clinical Associate Professor with the University of Iowa College of Pharmacy

Speaker Disclosure: Deanna McDanel reports no actual or potential conflicts of interest in relation to this CPE activity. Off-label use of medications will not be discussed during this presentation.
Drug Allergy Evaluation

Deanna McDanel, PharmD, BCPS, BCACP
Ambulatory Care Clinical Pharmacist
Clinical Associate Professor
University of Iowa Healthcare and College of Pharmacy

Disclosure

• Deanna McDanel has no actual or potential conflicts of interest associated with this presentation
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Upon successful completion of this activity, participants should be able to:
1. Differentiate what defines a true IgE-mediated drug allergy in comparison to an adverse reaction.
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3. Describe the most common drug allergies seen in clinical practice.
4. Devise a plan to approach a patient with multiple drug allergies.

Outline

- Adverse Drug Reactions and Drug Allergy
- Approach to Evaluating Drug Allergies
- Common Drug Allergies in Practice
- Summary
Does This Look Familiar?

Adverse Drug Reactions (ADRs)

- Most ADRs are not severe
- Some cause hospitalizations and death
- Drug hypersensitivity reactions are a type of ADR
  - Non-allergic
  - Allergic (immune-mediated)
Drug Allergy
Pathophysiology

Immunologic response to a pharmaceutical agent and/or excipient
Previously sensitized individual is re-exposed to an allergen

Classically defined as an IgE-mediated reaction

Release of vasoactive mediators from tissue mast cells and peripheral basophils

“TRUE” Drug Allergies

**YES**
IMMEDIATE ONSET
hives/rash, pruritus, difficulty breathing, angioedema, low blood pressure, and/or anaphylaxis

30-120 MINUTES
Immediate Onset

**NO**
Drug INTOLERANCE or undesirable side effects

Diarrhea
Nausea
Vomiting
Types of Drug Allergy

Gell and Coombs System

**TYPE I: Anaphylactic (IgE-Mediated)**
- Allergen binds to IgE on basophils or mast cells, resulting in release of inflammatory mediators
- Anaphylaxis, urticaria, angioedema, wheezing
- **30 – 120 min**

**TYPE II: Cytotoxic**
- Antigen-specific antibody to IgG or IgM initiates cell destruction
- Hemolytic anemia, thrombocytopenia, interstitial nephritis
- **>72 hrs to weeks**

**TYPE III: Immune Complex**
- Antigen-antibody complexes form, deposit on blood vessel walls → activate complement system
- Serum sickness-like syndrome
- **>72 hrs to weeks**

**TYPE IV: Cell-Mediated (Delayed)**
- Antigens caused activation of T lymphocytes → release of cytokines and recruit effector cells (ex. macrophages, eosinophils)
- Contact dermatitis, Steven's Johnson Syndrome
- **>72 hrs**

### Assessing a Drug Allergy

**Clinical History:**
- A thorough history is important!
- Careful history and reviewing all available medical records is critical

**Diagnosis:**
- Clinical history, records, and physical exam
- Skin testing +/- drug challenge
- Testing for all drugs is not standardized but referral to an Allergy/Immunology Specialist may be indicated
When is Drug Allergy Suspected?

- Symptoms are compatible with immune drug reaction
- Temporal relationship between drug administration and adverse event
- The class/structure of the drug is associated with immune reactions
- The patient previously received the drug (or a cross-reacting drug)
- There is no other clear cause for the reaction
- Skin tests or laboratory findings are compatible with drug hypersensitivity

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Case

Allergic rhinitis
Chronic sinusitis
Type 2 diabetes
Rheumatoid arthritis
Anxiety
Obesity

60 yo FEMALE

Grandmother: Died of anaphylaxis to penicillin

Acetaminophen 1000 mg 3 times daily
Fexofenadine 180 mg daily
Fluticasone nasal 2 sp/d both nostrils
Folic acid 5 mg weekly
Metformin 1000 mg BID
Methotrexate oral 20 mg weekly
Montelukast 10 mg once daily
Paroxetine 20 mg daily
Case

- Her allergy list is limiting treatment options for her various conditions, including treatment of infections

- You discuss with her about a referral to the Drug Allergy Clinic, but she is very hesitant about this due to anxiety about what this means

- How would you proceed?
- What elements of her history do you consider in your decision?
- How can you evaluate her listed penicillin allergy?
Pharmacists in the Spotlight
Penicillin Skin Testing

The role of a pharmacist was demonstrated to go BEYOND:
✓ Intravenous to oral conversion
✓ Formulary restriction
✓ De-escalation interventions

DIRECT Patient Care Provider
Antimicrobial Stewardship

ICU & Inpatient Units
Emergency Departments
Pre-Surgical Evaluation
Ambulatory Care

UIHC Drug Allergy Clinic

Est. 2013
Evaluate Patients with Drug Allergies
Identifying True IgE-Mediated Reactions
Increase Use of 1st Line Surgical Prophylaxis
Mondays
Physician Appointments
Pharmacist Appointments


#RxExpo20
Managing Drug Allergies

1. Patient develops a possible ADR
2. Review of history, patient's records, physical exam, and clinical tests support ADR

Drug Allergy – Clinical Evaluation

<table>
<thead>
<tr>
<th>MEDICATION</th>
<th>CONDITION</th>
<th>REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>What caused the reaction?</td>
<td>Why were you taking it?</td>
<td>What was the reaction?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TIMEFRAME</th>
<th>ONSET</th>
<th>DURATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>How long ago did it happen?</td>
<td>Time to symptom onset?</td>
<td>Length of the reaction?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TREATMENT</th>
<th>OTHER MEDS</th>
<th>EXPOSURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>How did you treat the reaction?</td>
<td>Were your taking any other Meds/OTCs at that time?</td>
<td>Have you taken same or similar medication since?</td>
</tr>
</tbody>
</table>
Case – *Penicillin Allergy*

- She states that she developed widespread itchy hives on day 2 of taking oral penicillin in her 20’s for a sinus infection
- She stopped the medicine and it got better in 3 days
- She has not taken it or other penicillin product since

**Case**

- How do these scenarios modify your treatment plan?
  - The reaction was nausea and vomiting
  - She had hives within 24 hours of taking it about 5 years ago
  - She developed blistering and sloughing of the skin that required hospitalization
  - The patient could not remember any details, other than it happened as a kid and her parents told her she was allergic
  - She has taken amoxicillin in the past 2 years and tolerated it fine
Managing Drug Allergies

1. Patient develops a possible ADR

2. Review of history, patient's records, physical exam, and clinical tests support ADR

3. Consider other possibilities

4. Drug-induced allergic reaction suspected?

5. ADR is predictable (e.g. toxicity, side effect, drug interaction) or due to idiosyncrasy, intolerance or pseudoallergic effects

6. Future management and prevention of non-immune ADR:
   - Modify dose (for toxicity, side effect or drug interaction)
   - Alternative drug
   - Consider graded challenges
   - Consider prophylactic regimens before administration (if effective)
   - Patient education

Managing Drug Allergies

1. Patient develops a possible ADR

2. Review of history, patient's records, physical exam, and clinical tests support ADR

   Yes

3. Drug-induced allergic reaction suspected?

   Yes

4. Are appropriate confirmatory tests available?

   Yes

Drug Allergy Clinic Process

- Possible IgE-mediated reaction
- Not taking antihistamines
- No concern for T-cell mediated reaction

Skin Testing
- Prick testing
- Intradermal testing

Drug Challenge
- Full dose of drug tested (if able)
- Observation of ≥30 minutes

Patient Evaluation

GRADED Challenge
- Unable/unwilling to do testing
- Drugs without skin tests available
- 1/10th dose – 30 min → Rest of dose – 2 hr

Skin Testing Process

Step 1: Materials

Step 2: Skin Prick Test

Step 3: Process 15 min

Step 4: Measure

Step 5 if (-): Intradermal Test

Step 6 & 7: Process 20 min & Measure

Step 8 if (-): Drug Challenge
>30 min observation

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Skin Testing Caveats

Prior Literature

Non-Irritating Concentrations

Solubility/Stability

Negative and Positive Predictive Value

Information Gathered

UIHC Available Skin Tests

#RxExpo20
Case

- After a thorough evaluation and education to the patient, she agreed to proceed drug allergy testing, starting with penicillin skin testing

- Considerations
  - Evaluate one drug per clinic visit, multiple visits may be required
  - Discontinuing medications that may interfere with skin testing 3-5 days prior to visit
  - Patient buy-in to testing and priorities
  - Patient consent for drug challenges

Specific Drug Allergies

How to Approach It?
Drug Allergy in Practice

- Drug allergic reactions have been reported to most all medications
- Certain drugs are more frequently associated with specific types of reactions
- Examples:
  - Antimicrobials
  - Antidiabetic medications
  - Cancer chemotherapeutic agents
  - HIV/AIDS
  - Autoimmune medications
  - Perioperative agents
  - Opiates
  - Corticosteroids
  - Heparin, protamine
  - Local anesthetics
  - Radiocontrast media
  - Aspirin, NSAIDs
  - ACE-inhibitors
  - Biologic modifiers
  - Complimentary medicines

Beta-Lactam Drug Allergy

- Antimicrobials most commonly cause IgE-mediated reactions
  - Common for beta-lactam antibiotics (penicillins and cephalosporins)
  - Penicillin is responsible for 75% fatal anaphylactic drug reactions

1-10% GENERAL POPULATION
Self-Report Beta-Lactam Allergy

10% SELF-REPORTED
Have a TRUE Allergy

0.1-1% GENERAL POPULATION
ACTUALLY HAVE A TRUE ALLERGY!
Commonly Used Beta-Lactams

<table>
<thead>
<tr>
<th>Drug Class</th>
<th>Common Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Penicillins</td>
<td>Penicillin G or VK, Amoxicillin + Clavulanic Acid, Ampicillin + Sulbactam, Dicloxacillin, Nafcillin, Oxacillin, Piperacillin/Tazobactam</td>
</tr>
<tr>
<td>Cephalosporins</td>
<td>Cefazolin, Cephalexin, Cefoxitin, Ceftriaxone, Ceftazidime, Cefpodoxime, Cefepime, Ceftaroline</td>
</tr>
<tr>
<td>Carbapenems</td>
<td>Ertapenem, Imipenem, Meropenem</td>
</tr>
<tr>
<td>Monobactam</td>
<td>Aztreonam</td>
</tr>
</tbody>
</table>

Penicillin Drug Allergy

- Penicillin is immunologically inert
- Spontaneously degraded to reactive intermediates
  - Major determinant
  - Minor determinants
  - Side chains
  - Unique metabolite
- These act as haptens, binding to tissue and proteins → IgE forms
- Cross reactivity is high between penicillins
Penicillin Drug Allergy

Amnesia

Loss of Sensitivity

- \~10% Per Year
- Penicillin-Specific IgE Decreases

50% 5 YEARS
80% 10 YEARS

Penicillin Skin Testing

- Evaluating IgE-mediated penicillin allergy
  - Testing for PCN-specific IgE antibodies on skin mast cells
- 97-99% negative predictive value

Controls:
- Histamine (+)
- Saline (-)

Positive Reaction
- Wheat Compared to Negative Control
- Pre-Pen®: ≥5 mm
- Pen G: ≥3 mm

Pre-Pen® (package insert). Plainville, CT: AllerQuest LLC; 2009.
Case - Cephalexin

- She developed a diffuse itchy rash 1 week into the course of cephalexin for cellulitis 20 years ago
- She did take some diphenhydramine to help the itching
Cephalosporin Drug Allergy

Cross-Reactivity
Penicillin & Cephalosporins

- Share beta-lactam ring
- Cephalosporin rates 10x lower as directed at side chains
- May occur due to propensity to develop drug allergy
- Before 1980, cross-reactivity was 10-20% as 1st generation cephalosporins were contaminated with PCN

FACTS
- 1st & 2nd generation most common
- Infrequent clinical significance

Cross-Reactivity

Sensitization to R1 side chain (MOST COMMON)

- Amoxicillin
- Cefadroxil
- Cefprozil
- Ceftriaxone
- Cefaclor
- Cephalaxin
- Cephradine
- Cephaloglycin
- Loracarbef

Sensitization to R2 side chain

- Ceftriaxone
- Cefotaxime
- Cefpodoxime
- Cefditoren
- Cefotaxime
- Cefmenoxime

Sensitization to beta-lactam ring or metabolites

- Cefoxitin
- Cephaloridine
- Cephalothin
- Cefamandole
- Cefonicid
- Aztreonam
- Cefazidime

Notice: Cefazolin is not listed as structurally unique cephalosporin
Beta-Lactam Clinical Pearls

**KEY POINTS**

- Beta-lactam allergies are the most common drug allergies
- Cross-reactivity is clinically insignificant but MAY occur
- Accurate history of allergy should guide clinical decision-making
- Testing for cephalosporins is not standardized, some cannot be tested
- Data on carbapenem cross-reactivity similar to cephalosporins

_Allergy evaluation may help determine a **true** penicillin allergy_

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**Case - Sulfa**

- She took a course of Bactrim (sulfamethoxazole/trimethoprim) in her 40’s for a UTI
- She developed a rash on her abdomen, that later developed into blistering and skin peeling within 3-5 days
- She also noted mouth ulcers around the same time
Sulfa Drug Allergy

**SULFONAMIDES**
- Compounds that have a SO$_2$NH$_2$ moiety
- Reactions are primarily a maculopapular rash + fever

3-6 PERCENT
Patients Have Reported Allergic Reactions to Sulfa Antibiotics

Classes of Sulfa Drugs
1. Sulfonylarylamines (includes sulfa antibiotics)
2. Non-sulfonylarylamines
3. Sulfonamide moiety containing agents

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Sulfonamide Drugs

<table>
<thead>
<tr>
<th>Sulfonylarylamines</th>
<th>Non-Sulfonylarylamines</th>
<th>Sulfonamide Moiety</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Antibiotics</strong></td>
<td><strong>Carbonic Anhydrase Inhibitors</strong></td>
<td><strong>5-HT Antagonists</strong></td>
</tr>
<tr>
<td>Sulfacetamide</td>
<td>Acetazolamide</td>
<td>Naratriptan</td>
</tr>
<tr>
<td>Sulfadiazine</td>
<td>Brinzolamide</td>
<td>Sumatriptan</td>
</tr>
<tr>
<td>Sulfamethoxazole</td>
<td>Dorzolamide</td>
<td>Zolmitriptan</td>
</tr>
<tr>
<td>Sulfanilamide</td>
<td>Methazolamide</td>
<td></td>
</tr>
<tr>
<td>Sulfasalazine</td>
<td></td>
<td>Other Agents</td>
</tr>
<tr>
<td>Sulfisoxazole</td>
<td></td>
<td>Probenecid</td>
</tr>
<tr>
<td><strong>Antivirals</strong></td>
<td></td>
<td>Tamsulosin</td>
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<tr>
<td>Amprenavir</td>
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<td>Indapamide</td>
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<tr>
<td>Darunavir</td>
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<td>Metolazone</td>
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<tr>
<td>Fosamprenavir</td>
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<td>Sotalol</td>
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<tr>
<td>Tipranavir</td>
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<td>Topiramate</td>
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<tr>
<td><strong>Cox-2 Inhibitors</strong></td>
<td></td>
<td></td>
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<tr>
<td>Celecoxib</td>
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<tr>
<td><strong>Loop Diuretics</strong></td>
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<tr>
<td>Bumetanide</td>
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<tr>
<td>Furosemide</td>
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<tr>
<td>Torsemide</td>
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<tr>
<td><strong>Thiazide Diuretics</strong></td>
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<td></td>
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<tr>
<td>Chlorthalidone</td>
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<td></td>
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<tr>
<td>Hydrochlorothiazide</td>
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</tbody>
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#RxExpo20
Sulfa Clinical Pearls

**KEY POINTS**

- Structural differences between sulfonamides make **cross-reactivity unlikely**
- Sulfates, sulfur and sulfites do not cross-react with sulfonamides
- Accurate history of allergy should guide clinical decision-making
- Testing for sulfa allergies difficult → referral may be indicated

**Routine avoidance of ALL sulfa drugs following prior allergic reaction to a sulfonamide antibiotic is unnecessary and may compromise optimal care.**

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**Case - Sulfa**

- What if this was her allergy history instead?
  - Her Rheumatologist would like to switch her to sulfasalazine due to some intolerable side effects to the methotrexate
  - Her A1c comes back at 8.5% and you want to add glipizide
  - She is diagnosed with hypertension and you want to start hydrochlorothiazide
  - She wants to start glucosamine/chondroitin sulfate for joint pain
10. Management and prevention of drug allergic reactions

- Anaphylactic reactions require prompt emergency treatment
- Avoid drug if possible
- Consider induction of tolerance procedure or graded challenge before administration
- Consider prophylactic regimen before administration (if shown to be effective)
- Future prudent use of drugs
- Future use of drug causing non-anaphylactic, life threatening reaction (e.g. Stevens-Johnson, Churg-Strauss)

CONTRAINDICATED

- Patient education

7. Are appropriate confirmatory tests available?

No

13. Patient may be allergic (despite negative drug-specific or nonspecific confirmatory tests)


Case

Penicillin
- Negative penicillin skin testing
- No greater risk than general population of having an allergy
- Remove allergy
- Educate patient and providers

Cephalexin
- Unable to skin test
- Delayed rash 1 week into course
- Likely not IgE-mediated
- 20 years ago
- Perform graded oral challenge at future visit

Sulfa
- Blistering, skin peeling and mouth ulcers
- Concern for Type IV T-cell mediated reaction (i.e. Steven’s Johnson Syndrome)
- AVOID
Drug Allergy Documentation

*Inaccuracy Has Consequences*

- Insufficient documentation of drug allergy/intolerance may result in:
  - Administration of Drugs that **SHOULD NOT** be Prescribed
  - Unnecessary Fear of ADRs → Not Prescribing Valuable Medications that **SHOULD BE** Used

**COMPLETE Documentation of Drug Allergies and Intolerances** → **CORRECT Prescribing of Medications**

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**Drug Allergy Documentation**

- **Accurate** reaction symptoms listed
- **Time since reaction +/- severity**
- **Remove medications that are NOT valid**
- **Update with comments to qualify allergy**
- **Allergy vs intolerance**

**Accurate Allergy List**
EMR - Clean Allergy List

<table>
<thead>
<tr>
<th>Allergy</th>
<th>Reaction</th>
<th>Severity</th>
<th>Reaction Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aspirin</td>
<td>Respiratory Distress, Rhinitis</td>
<td>High</td>
<td>Patient Reported</td>
</tr>
<tr>
<td>Aspirin</td>
<td>Respiratory Distress</td>
<td>High</td>
<td>Patient Reported</td>
</tr>
<tr>
<td>Sulfas (sulfonamide Antimicrobics)</td>
<td>Dizziness, Eczema, Rash</td>
<td>High</td>
<td>Patient Reported</td>
</tr>
</tbody>
</table>

**HIGH**
- Severe allergic reactions or ADRs
- Future use contraindicated +/- evaluation

**MEDIUM**
- Benefit may outweigh risk of use in select patients
- Future evaluation may be warranted
- Avoid unless necessary

**LOW**
- Side effects but patient wants left on list
- Benefit >>> risk if necessary exposure
- Other as applicable

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Case – Cleaned Up EHR

<table>
<thead>
<tr>
<th>Allergens</th>
<th>Reaction</th>
<th>Severity</th>
<th>Reaction Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Penicillin</td>
<td>Urticaria (Hives)</td>
<td>Medium</td>
<td>Patient Reported</td>
</tr>
<tr>
<td>Penicillin</td>
<td>Urticaria</td>
<td>Medium</td>
<td>Patient Reported</td>
</tr>
<tr>
<td>Exposure</td>
<td>Patient related allergy</td>
<td>Site effect only</td>
<td></td>
</tr>
<tr>
<td>Contact</td>
<td>Patient related allergy</td>
<td>Site effect only</td>
<td></td>
</tr>
<tr>
<td>Contact</td>
<td>Patient related allergy</td>
<td>Site effect only</td>
<td></td>
</tr>
<tr>
<td>Contact</td>
<td>Patient related allergy</td>
<td>Site effect only</td>
<td></td>
</tr>
<tr>
<td>Lemon</td>
<td>Patient related allergy</td>
<td>Site effect only</td>
<td></td>
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<tr>
<td>Milk</td>
<td>Patient related allergy</td>
<td>Site effect only</td>
<td></td>
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<tr>
<td>Patient</td>
<td>Patient related allergy</td>
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#RxExpo20
Managing Drug Allergies

1. Patient develops a possible ADR

2. Review of history, patient’s records, physical exam, and clinical tests support ADR

   - Yes

   4. Drug-induced allergic reaction suspected?

     - Yes

     7. Are appropriate confirmatory tests available?

     - No

     3. Consider other possibilities

     - Yes

     5. ADR is predictable (e.g., toxicity, side effect, drug interaction) or due to idiosyncrasy, intolerance or pseudoallergic effects

     6. Future management and prevention of non-immune ADR:

        - Modify dose (for toxicity, side effect or drug interaction)
        - Alternative drug
        - Consider graded challenges
        - Consider prophylactic regimens before administration (if effective)
        - Patient education

   - No

3. Consider other possibilities

7. Are appropriate confirmatory tests available?

   - Yes

   8. Are tests positive?

     - No

     11. Does test have high negative predictive value?

     - Yes

     13. Patient may be allergic (despite negative drug-specific or nonspecific confirmatory tests)

     - No

   - Cephalexin & Sufa

   - Penicillin

12. Patient not allergic to this drug

10. Management and prevention of drug allergic reactions

   - Anaphylactic reactions require prompt emergency treatment
   - Avoid drug if possible
   - Consider induction of tolerance procedure or graded challenge before administration
   - Consider prophylactic regimen before administration (if shown to be effective)
   - Future prudent use of drugs
   - Future use of drug causing non-anaphylactic, life threatening reaction (e.g., Stevens-Johnson, Churg-Strauss)
   - CONTRAINDICATED
   - Patient education

Impact of the Pharmacist
*In Drug Allergy Assessment*

**Impaired Patient Care**
- Optimized Medication Therapy
- Antimicrobial Stewardship
- Decreased Inpatient Days
- Reduced Drug Cost
- Decreased ADRs

**Take Home Points**
- ADR vs Drug Allergy
- Low Prevalence of True IgE-Mediated Allergy
- 80% Outgrow in 10 Years
- Beta-Lactams Most Common Drug Allergies
- Clean-up Medical Record

Referral to Allergy/Immunologist May be Needed
Post Assessment #1

• An IgE-mediated allergic reaction to a medication would present with an immediate reaction within 30 minutes to 2 hours and may include hives, angioedema and/or anaphylaxis?
  A. True
  B. False

Post Assessment #2

• Which of the following are questions you need to ask a patient about when you are getting an allergy history?
  A. Medication that caused the allergy
  B. Reaction history of what symptoms the patient had
  C. How long after taking the medication the reaction happened
  D. All of the above
Post Assessment #3

• Which of the following statements is correct about penicillin allergy?
  A. Penicillin allergy rarely causes an anaphylactic reaction
  B. About 80% of patients with a history of an IgE-mediated allergy to penicillin will lose their sensitivity over 10 years
  C. About 50% of patients that report an allergy to penicillin have a true IgE-mediated allergy
  D. Skin testing to Pre-pen® and penicillin G has a 50% negative predicative value

Post Assessment #4

• Cephalosporins carry a high risk of 20% cross-reactivity in a patient allergic penicillins?
  A. True
  B. False
Post Assessment #5

Which of the following medications is likely to cause a cross-reaction in a patient allergic to sulfamethoxazole/trimethoprim?

A. Glipizide  
B. Glucosamine/chondroitin sulfate  
C. Sulfasalazine  
D. Hydrochlorothiazide

Questions?