

Drug Allergies: An Epidemic of Over-diagnosis

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Learning objectives

- Classification of drug induced adverse reactions vs hypersensitivity reactions
- Patient reports of drug induced reactions grossly overstate the true prevalence
- The 2 most commonly recorded drug “allergies”: NSAIDs and Penicillin
- Accurate diagnoses of drug allergies
- Consequences of falsely identifying a drug as causing allergic reactions

Classification of Drug Associated Events

- Type A: Events occur in most normal humans, given sufficient dose and duration of therapy (85-90%)
 - Overdose Barbiturates, morphine, cocaine, Tylenol
 - Side effects ASA in high enough doses induces tinnitus
 - Indirect effects Alteration of microbiota (antibiotics)
 - Drug interactions Increased blood levels digoxin (Erythromycin)
- Type B: Drug reactions are restricted to a small subset of the general population (10-15%) where patients respond abnormally to pharmacologic doses of the drug
 - Intolerance: Gastritis sometimes bleeding from NSAIDs
 - Hypersensitivity: Non-immune mediated (NSAIDs, RCM)
 - Hypersensitivity: Immune mediated (NSAIDs, Penicillins)

Immunopathologic (Allergic) reactions to drugs (antigens): Sensitization followed by re-exposure to same drug antigen triggering reaction

Type I	Immediate Hypersensitivity
	IgE Mediated Skin testing followed by oral challenges
	Anaphylaxis, urticaria, angioedema, some exanthems
Type II	Cytotoxic reactions Associations and complement levels
	IgG and IgM mediated-complement dependent
	Cytopenias, some Vasculitis
Type III	Immune Complex reactions Associations and complex levels
	IgG or IgM + complement circulating
	Serum sickness, certain vasculitis syndromes, drug fever
Type IV	Lymphocyte –mediated reactions Associations: patch testing
	Contact dermatitis , Hepatitis, Nephritis, Meningitis, Pneumonitis Morbilliform eruptions macular papular (late onset)
	Systemic and cutaneous (SJS/TEN, DRESS)

Reported prevalence of adverse drug events

Patients admitted to ER for adverse drug events

– 201/1035 (19.4%) 2008-2009 Nantes, France

Roulet L et al Int J Clin Pharm 2012;34:902-10

– 131/1591 (8.2%) Univ. Hospital, Vancouver, Canada

Hohl CM et al Acad Emerg Med 2012;19:640-9

- Adverse drug events cause hospital admissions

- 439/3904 (11.2%) 2 Hospitals, Manchester, UK

- Kongkaew C et al Pharmacotherapy 2013;33:827-37

- 66/789 (8.37%) Teaching hospital Toulouse, France

- Olivier P et al Drugs Aging 2009;26:475-82

Reported prevalence of adverse drug reactions in children

- meta-analysis 102 published studies
 - Admitted to hospital with reaction (42 studies)
 - 0.4 - 4% Vaccines, Cytotoxics, anticonvulsants
 - Reactions reported in hospital (18 studies)
 - 0.6 -16.8% antibiotics, cytotoxics, NSAIDS
 - Reactions reported in the community during outpatient visits (16 studies)
 - 1-10% vaccines, antibiotics, NSAIDs, anticonvulsants

Associations and drugs

- A patient observes an “event” which is bad. A drug is taken coincidentally. Drug may be the cause or may be in the wrong place at the wrong time
- Patient, nurse, MD may assume that a “drug reaction” occurred and the “culprit” drug is identified. A drug might be guilty or an innocent bystander. (“suspect” only)
- Drug is then entered in the E- record allergy list with a life sentence. “Lock them up so they don’t harm anyone”. A “suspect drug” may be eligible for early appeal
- Appeals process: Judge retrial or Allergy appeals court
 - Re-trial with 1 or 2 courses of a “suspect” or “convicted” drug.
Use for some adverse reactions and T cell mediated benign rashes
 - Further investigation, skin testing and oral challenges: Allergy

Genesis of Drug allergy listings in Allscripts



- Patient Associations
 - Recorded by Nurses or MDs after: “What medication allergies do you have?”
Patient makes the diagnosis and nurse (prosecutor) or MD (judge) records reaction
- Physician Diagnosis
 - Association with a drug.
This is usually a guess which is sometimes correct.
Categories in Allscripts are:
 - Adverse reaction
 - Allergy
 - Other (enter in box)
 - Suspect

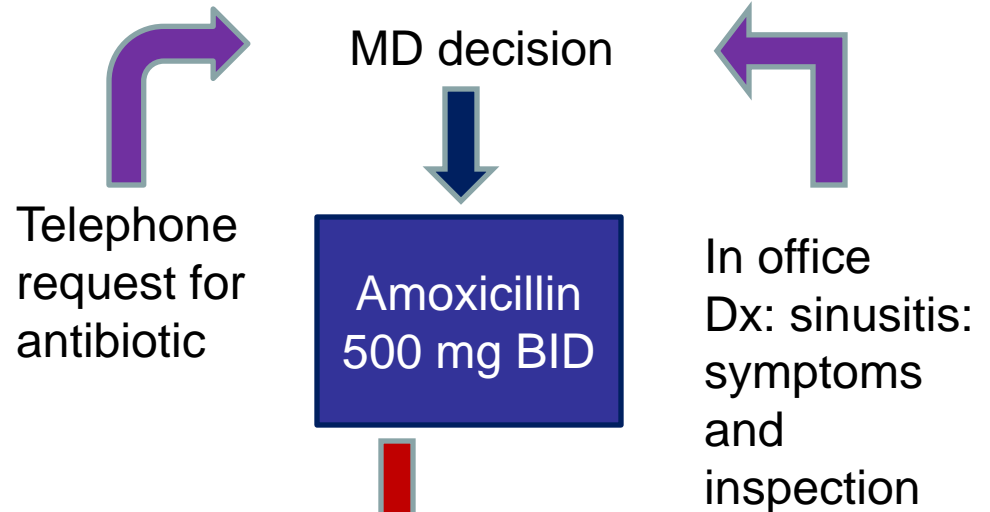
Aerobid-M
Aldactone
Bentyl
Capoten
Codeine Sulfate
Cozar
Dextromethorphan
Diltiazem
Doxazosin
Flomax
Flunisolide
HyoMax
Hyzaar
Keflex
Lexapro
Minoxidil
Niacin
Plavix
Procardia
Scopolamine
Singulair
Sulfa Drugs
Triamterene
Vicodin
Zetia
Zithromax-Z pack
Zocar

- One Scripps patient's drug allergy listings is an all time record
 - 27 drugs sent to the list for life
 - Patient vigorously resisting appeals for any drug on the list
- ## Patient's diagnoses
- Patient believes he has asthma but does not
 - Non-allergic rhinitis
 - Obsessive compulsive personality disorder
 - Belief in “drug allergies”
 - Coronary artery disease
 - Hypertension
 - Lipid disorder

One misjudgment leads to a second



Viral URI called "sinusitis"



URI clears and hives appear

Diagnosis:
Penicillin induced urticaria

List: Amoxicillin .
Allergy. Urticaria
"suspect" category
could lead to rapid
appeal

Reliability of a patient history or MD observation reporting a prior drug association event

- 2006-2012, 114 adult patients underwent 123 oral placebo controlled drug challenges
 - 2/3 of suspect drugs were antibiotics
 - History of prior cutaneous reactions
 - Excluded patients with a history of severe reactions (SJS/TEN, anaphylaxis, AERD)
- Results:
 - 20/123 (16%) subjective symptoms during the placebo day of the oral drug challenges
 - 1/123 (0.8%) pruritic rash to cefuroxime

Specific drug challenges in children

- 278 children with history of adverse reactions to drugs
 - Antimicrobial (51.7%) NSAIDs (22.7%) all others (25.6 %)
 - 126 different drugs. Anaphylaxis history in 6 patients (no challenges)
 - There were no historical cases suggesting SJS/TEN or DRESS
 - 22/669 (3%) oral drug specific challenges were positive
 - Buonomo A et al (12) Int J Immunopathol Pharmacol 2010;23:881-90
- Study: 38 children, mean age 8.9 yrs (4 mon-17 yrs)
 - Single drug reactions to NSAIDs: 38 children
 - 3 patients with historical reaction suggesting anaphylaxis (NC)
 - Progressive specific NSAID challenges in 35 of 38 children
 - 4/35 (11%) Positive oral challenges, When adding
 - 3 suspect anaphylaxis 7/38 (18%)
 - 31/38 (82%) were avoiding NSAIDs which were not guilty and therefore available for treatment in these children

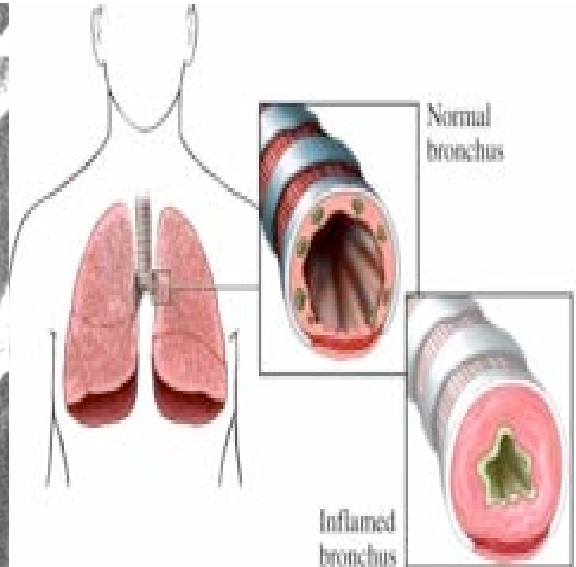
- The more severe the “reaction” the more difficult it is to prove a drug induced hypersensitivity reaction occurred:
 - Immune testing available for some patients but inaccurate for others
 - A drug challenge or re-start would be diagnostically accurate
 - No reaction to a drug would be helpful-
 - essential drug would now become available for treatment
 - Problem: reaction to the guilty drug could kill the patient
 - Standard of care: avoid any drug taken at the time of following historical events.
 - Anaphylaxis (0.01%)
 - Steven Johnson Syndrome/Toxic Epidermal Necrolysis (SJS/TEN) (1/million prescribed courses)
 - Drug reaction with eosinophilia and systemic symptoms (DRESS) (case reports)
 - Hypersensitivity Pneumonitis (Aseptic pneumonia) (case reports)
 - Drug associated Pancreatitis (Case reports. Statins)
 - Aspirin exacerbated respiratory disease (AERD): 9% of asthmatics
 - Innocent bystander drugs are routinely convicted along with the guilty
- Polypharmacy is a special problem because of the number of “suspects” Which one is guilty?
 - Aspirin is frequently listed as one of the ”suspects”
 - **Aspirin has never been proven to induce any of the above reactions, except AERD (Dr Drew White in Allergy Div can desensitize 100% of patients with AERD and treat with daily aspirin)**

Adverse reactions to NSAIDs through multiple mechanisms

- Immune hypersensitivity reactions: to specific NSAIDs
 - IgE antibody directed at a single NSAID
 - Reactions are mostly urticaria/angioedema and exanthems
 - Anaphylaxis rare to: acetaminophen, celecoxib and ibuprofen, etc
 - Anaphylaxis has never been definitively assigned to aspirin (exception AERD)
 - All type II,III and IV reactions
 - Rare and to a specific NSAID (never aspirin)
- COX-1 inhibition in mast cells with depletion of PGE₂
 - Occur with introduction of any NSAID that inhibits COX-1
 - Does not occur with ingestion of COX-2 inhibitors
 - Respiratory track: Rhinitis and asthma attacks
 - Cutaneous: urticaria angioedema
- COX-1 inhibition by NSAIDs in gastric mucosal cells
 - Depletion of both PGE₂ and PGI₂
 - Decreased gastric microcirculation and delayed replacement of mucosal cells
 - HCL acid induced epigastric pain

Aspirin exacerbated respiratory disease (AERD) occurs in 9% of a general population of asthmatics

- AERD is a clinical tetrad of:
 - Nasal polyps
 - Chronic rhinosinusitis (CRS)
 - Asthma
 - Cross reacting NSAID induced respiratory reactions



Aspirin and hives

- Chronic idiopathic urticaria: any COX-1 inhibiting NSAID
 - 1.8% of the general population have CIU
 - 20-30% will have positive ASA challenges with 650 mg ASA
 - Aspirin 81 mg and antihistamines with Allergy consult
- Cross reacting urticaria in otherwise healthy adults
 - 1.5% of the “healthy” US population will notice hives while taking any NSAID that inhibits COX-1 (no reaction to COX-2 inhibitors)
 - ASA challenges negative or desensitization and daily ASA 81 mg
- Single NSAID inducing urticaria/angioedema
 - 2-3% USA population list as associations (over diagnosis)
 - Scripps Allergy Div: patients presenting with history of prior hives while taking aspirin (aspirin usually innocent bystander).
 - For ASA: only 2/17(12%) positive oral ASA challenges
 - 88% negative challenges despite prior association history
 - 2 positive challenges desensitized to aspirin
 - continue 81 mg aspirin qd

- 2006 -2010 Scripps 9,565 patients CAD
- 142/9565 (1.4%) recorded “aspirin allergy”
 - 33/142 (23.2%) GI bleeding
 - 38/142 (26.8%) GI intolerance
 - 6/142 (5%) Miscellaneous (gout, tinnitus, etc)
 - 32/142 (22.5) ASA association (poor chart data)
 - 33/142 (23%) hypersensitivity histories
 - Cutaneous 26 (18.3%)
 - Respiratory 3 (2.1%)
 - Respiratory and cutaneous 1 (0.07%)
 - Anaphylaxis 3 (2.1%) * Did not meet criteria for anaphylaxis
History compatible with AERD



Total = 71 (50%)

142 patients with ASA “allergy”

- 34 (24%) daily ASA Rx
 - 4 cutaneous reactors referred to Allergy
 - 1 negative challenge
 - 3 pos challenge/desen
 - Not referred: 27
 - AERD 3
 - Respiratory 2/3
 - Cutaneous 22/26
 - 30 Rx qd aspirin while chart listed ASA “allergy” : **no reactions**
 - 8/22 (30%) cutaneous
 - 6/33 (15%) GI bleeding
 - 12/38 (31%) Gastritis
 - 1/3 (33%) Respiratory
 - 3/32 (9%) Unknown Dx
 - ASA not started
 - Miscellaneous 6
 - 108 (76%) ASA withheld from daily prophylaxis because aspirin was listed in the drug allergy section
 - Aspirin stuck in jail for life
 - Consequences of withholding
 - 44 (31%) documented myocardial infarctions and 9 (20%) received clopidogrel
 - 11 (10%) coronary stents and received clopidogrel
 - 5 underwent CABGs received clopidogrel
 - 48 patients with CAD did not receive aspirin prophylaxis
- Cost of clopidogrel:**
- US \$26 US/month
 - Canada \$9 CD /month

Feng CH, White AA, Stevenson DD.

Ann Allergy Asthma Immunol. 2013;110:92-5.

Percent of USA population who have CAD and % of ASA induced adverse reactions: **Consequences of withholding daily ASA because of “ASA allergy”**

Aspirin events		CAD USA 18M 2010	CABG USA 450,000/yr
Aspirin exacerbated respiratory disease	0.06%	108,000	2,700
Chronic idiopathic urticaria associations	1.8%	324,000	8,000
Single drug induced urticaria associations	2.0%	360,000	9,000
Other side effects: bleeding, dizziness, tinnitus, etc	3.0%	540,000	13,500
Gastritis with epigastric pain as intolerance	10.0%	1,800,000	45,000
	Total 16.86%	3,132,000	78,200

Use of Allergy section in Allscripts

- Entry of a drug reaction by RNs and MDs
 - click “new” button and type in name of suspect drug
 - Right click on the drug. Find edit and left click
 - **This gives a menu**
 - Status: Active, Denied, Entered in error, Inactive
 - Category: Adverse reaction, Allergy, Other (Type in “fever”), **Suspect**
 - Reaction Date: Last appointment (On, Before, After)
 - Pre or post op (On, Before, After)
 - Three general (Never, Childhood, Unknown, Adolescence)
 - Type in date if known or approximate (> 10 years important)
 - Action taken: what happened and what was done
 - Type of reaction: find from list and click: **Rash, unknown, abdominal pain**
- Example; **naproxen: adverse reaction: abdominal pain**
- Double click L and the following information is now available
 - Status: active Category: Adverse reaction
 - Reaction date: before last appointment on Aug1,2013
 - Action taken: Onset epigastric pain 24 hours after starting naproxen 440 mg BID. Omeprazole 20 mg stopped abdominal pain. DC naproxen and switch to Meloxicam 7.5 mg
 - Type of reaction: abdominal pain

Use of Drug allergy section in Allscripts continued

- Next MD knows what to do with this same patient with respect to CAD
 - adding ASA 81 mg has a high probability of not causing any epigastric pain.
(This is a classic dose dependent adverse reaction)
Omeprazole or Carafate can be added if needed
- In the next patient. MD is faced with a dilemma: **naproxen (NSAIDs)**
 - Patient with coronary artery disease
 - Key point: ASA does not cause severe, rare reactions, including anaphylaxis, SJS/TEN, DRESS, hypersensitivity Pneumonitis. (Other NSAIDs can cause)
 - Key history to establish: Naproxen caused abdominal pain (50% of pts)
 - Key histories to rule in or out:
 - Asthmatic who cannot smell = 40% chance of AERD: Refer to Allergy
 - Any NSAID associated with a flare of urticaria: Refer to Allergy
 - Worst histories: “ I don’t remember, doc”
 - “I have been cared for at Scripps and I think it is in the record” (No one bothered!)
 - “I don’t remember the reaction. But this might help. They told me in the ER to stay away from all NSAID drugs, including aspirin, and only take Tylenol” (not helpful. Patient programmed to be afraid to take any NSAIDs)

Approach to ASA prophylaxis in patients with CAD with a history of prior ASA “allergy” (reactions)

GI: gastritis or bleeding

- 33 (23%) GI bleeding
- 38 (27%) GI intolerance
- Rx all with ASA 81 mg qd and a gastric protection program
 - PPI: omeprazole 20 mg qd
 - Carafate 1 gram OTC
 - Follow up for epigastric pain and stools for occult blood. GI consult

Cutaneous or respiratory

- 26 (18%) cutaneous
- 4 (2%) respiratory
- Refer all to Allergy* for ASA challenge
 - Negative(88%) for cutaneous
 - Positive. Proceed to aspirin desensitization
 - Daily aspirin 81 mg maintains desensitization
- * Note: all ASA challenges are performed at our Carmel Valley challenge center

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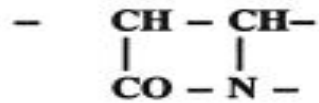
ASA innocent bystander

- 7(5%) Conditions and diseases not caused by aspirin but sometimes patient belief strong and entrenched
- Refer to Allergy:
 - Psychological patient management
 - Double blind placebo controlled oral challenges
 - 100 % will be negative with rational patients eventually Rx ASA 81 mg qd

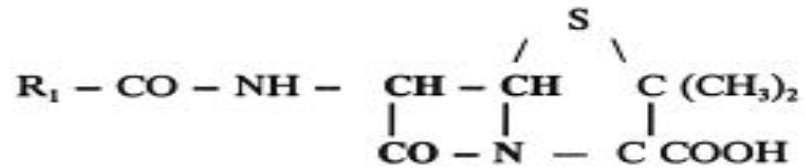
ASA reaction recorded but poor or no description

- 32 (23%) no history or poor history taking by MD
- Refer to Allergy
 - Additional history taking or testing may uncover the real history or patient cannot remember
 - Sinus X-ray
 - Spirometry
 - Oral challenge tests

BETA LACTAM CHEMICAL STRUCTURES

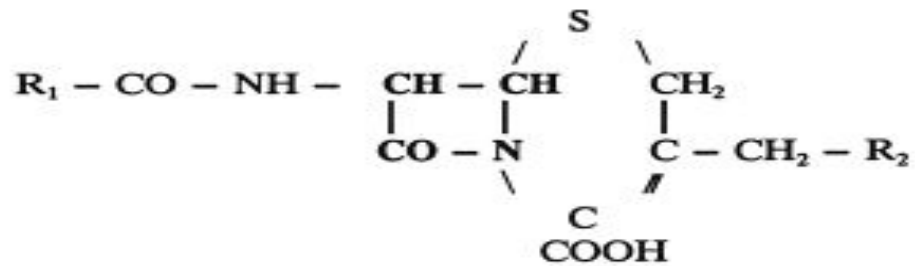


Beta Lactam Ring

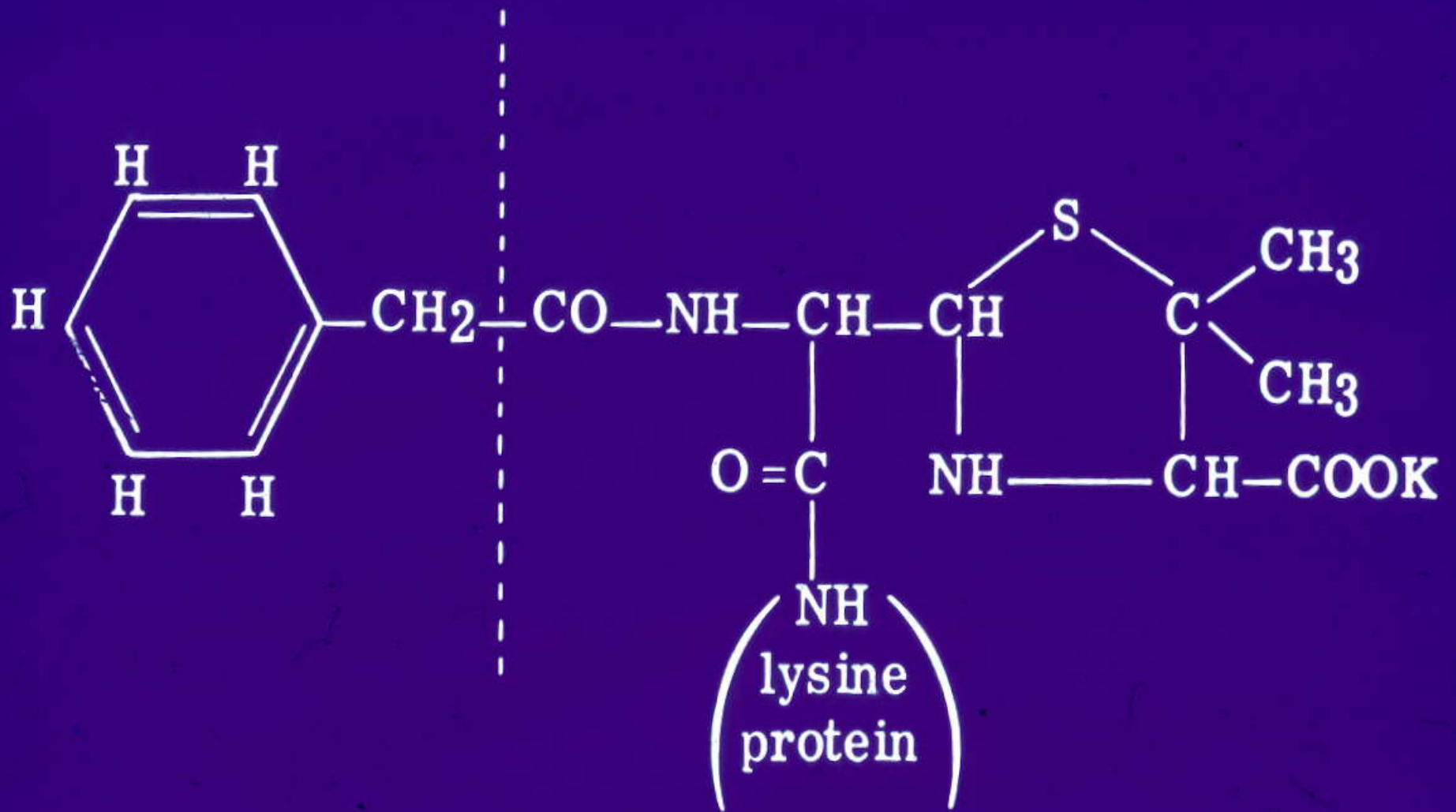


Basic Penicillin

Beta-lactam ring and thiazolidine ring

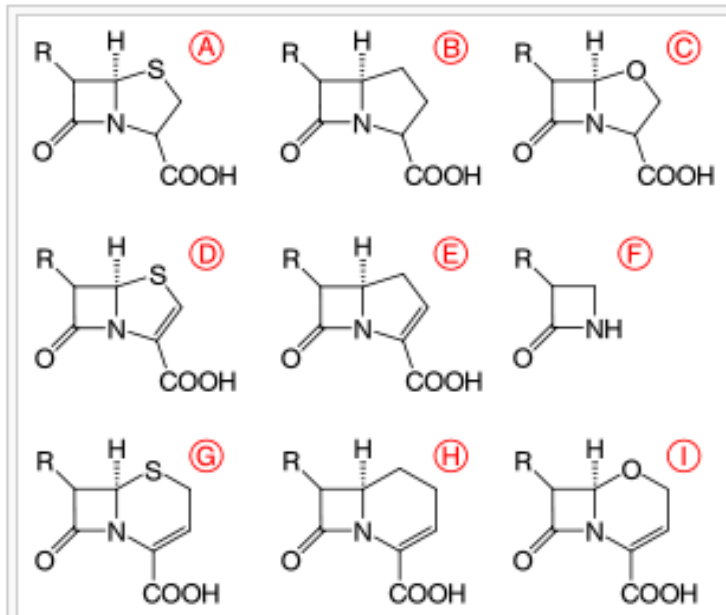


Basic Cephalosporin



Benzylpenicilloyl (BPO), the major antigenic determinant of benzylpenicillin.

Standard of care: If you are “allergic” to one beta-lactam antibiotic, you are allergic to all



The β -lactam core structures. (A) A penam. (B) A carbapenam. (C) An oxapenam. (D) A penem. (E) A carbapenem. (F) A monobactam. (G) A cephem. (H) A carbacephem. (I) An oxacephem.

- **Penams:** benzyl penicillin, amoxicillin, methicillin, ampicillin, dicloxacillin,
- **Cephems:**
 - **First:** Cephalexin, Cefazolin
 - **Second:** Cefaclor, Cefuroxime, Cefoxitin
 - **Third:** Cefixime, Cefixime, Cefprozil
 - **Fourth:** Cefepime, Cefpirome
 - **Fifth:** Ceftobiprole
- **Carbapenems:** Meropenem, Doripenem
- **Monobactams:** Aztreonam, Nocardicin A
- **Beta-lactamase inhibitors:** Clavulanic acid, Tazobactam, Sulbactam

Beta-lactam antibiotics are the most widely used anti-bacterial treatment in the world

- Beta-lactam antibiotic
- List of β -lactam antibiotics

A

- Aminopenicillin
- Amoxicillin
- Amoxicillin/clavulanic acid
- Ampicillin
- Ampicillin/flucloxacillin
- Ampicillin/sulbactam
- Antistaphylococcal penicillins
- Azidocillin
- Azlocillin

B

- Bacampicillin
- Benzathine benzylpenicillin
- Benzathine phenoxymethylpenicillin
- Benzylpenicillin
- Benzylpenicilloyl polylysine
- Beta-lactamase

C

- Carbenicillin
- Carboxypenicillin
- Carfecillin

C cont.

- Carindacillin
- Carumonam
- Cephem
- Ciclacillin
- Clometocillin
- Cloxacillin

D

- Dicloxacillin

E

- Epicillin

F

- Flucloxacillin

H

- Hetacillin
- History of penicillin

M

- Mecillinam
- New Delhi metallo-beta-lactamase 1
- Metampicillin
- Meticillin
- Mezlocillin
- Monobactam

N

- Nafcillin
- Nitrocefin
- Nocardicin A

Currently available:
58 beta lactam antibiotics

O

- Oxacillin

P

- Penamecillin
- Penicillin
- Penimepicycline
- Pheneticillin
- Phenoxymethylpenicillin
- Piperacillin
- Pivampicillin
- Pivmecillinam
- Procaine benzylpenicillin
- Propicillin

S

- Sulbenicillin
- Sultamicillin

T

- Talampicillin
- Temocillin
- Ticarcillin
- Tigemonam

U

- Ureidopenicillin

Alternative antibiotics: Aminoglycosides (Gentamicin), Tetracycline, Macrolides (Erythromycin,) Fluroquinolones (Cirprofloxin, Norfloxin,) Vancomycin, Bactrim, etc

Practical Testing for Penicillin allergy

- Electronic medical record since 2007
 - June 2010-March 2012 tested 500 patients
 - Females 63% and males 37%
 - White (65%), Hispanic (20%), Black (3.6%), Asia (6.4%)
- Patient or prior MD gave a history of Penicillin “allergy”
 - Referred to Allergy for testing
 - Anaphylaxis, hives, respiratory symptoms, angioedema, rashes, gastrointestinal symptoms, unknown
 - Excluded: SJS/TEN, hemolytic anemia, hepatitis, nephritis

Practical Testing for Penicillin allergy (cont 2)

- Index penicillin associated adverse reactions
 - Non-hive rash 204 (40.8%)
 - Hives/angioedema 169 (33.8%)
 - Unknown 72 (14.4%)
 - Other adverse reactions 41 (8.2%)
 - Anaphylaxis 14 (2.8%)
- Results of penicillin skin testing
 - 500/500 prick tests were negative
 - ID positive in 4 patients
 - Pre-pen ID 20/30, Pre-pen ID 20/30,
 - Pre-pen ID 15/20 Penicillin ID 8/12

Practical Testing for Penicillin allergy (cont 3)

- Results of Oral challenges with Amoxicillin 250 mg;
 - 4 skin test positive patients excluded: **Diagnosis of allergy to beta lactam antibiotics secure**
 - Of the remaining 496 skin test negative patients **4 reacted to oral challenge with amoxicillin 250 mg**
 - Age Sex Index reaction oral challenge time (min)
 - 53 F anaphylaxis hives 50
 - 37 F hives hives 20
 - 6 M rash hives 60
 - 5 F hives hives 50
- **8/500 (1.6%)** avoid beta lactam antibiotics
492 (98.4%) converted from “allergic” to
non-allergic.

Practical Testing for Penicillin allergy (cont 4)

- 100 day follow up of 492 patients
 - 2 patients “delayed reactions” (not T-cell induced reactions)
 - (1) Nausea at 12 hours (2) Migraine headache at 12 hrs
 - 8 patients PCN allergy notation remained in e-record
 - 69/492 were exposed to 88 courses of Rx PCN
 - In 6 patients:
 - 4/69 (5.8%) new PCN associated immediate onset rashes
 - 2/69 (2.8%) new penicillin delayed rashes

Estimated 20 M/314 M (6.3%) US citizens have PCN allergy on their record and only 1.6% (320,000) are allergic to beta-lactam antibiotics

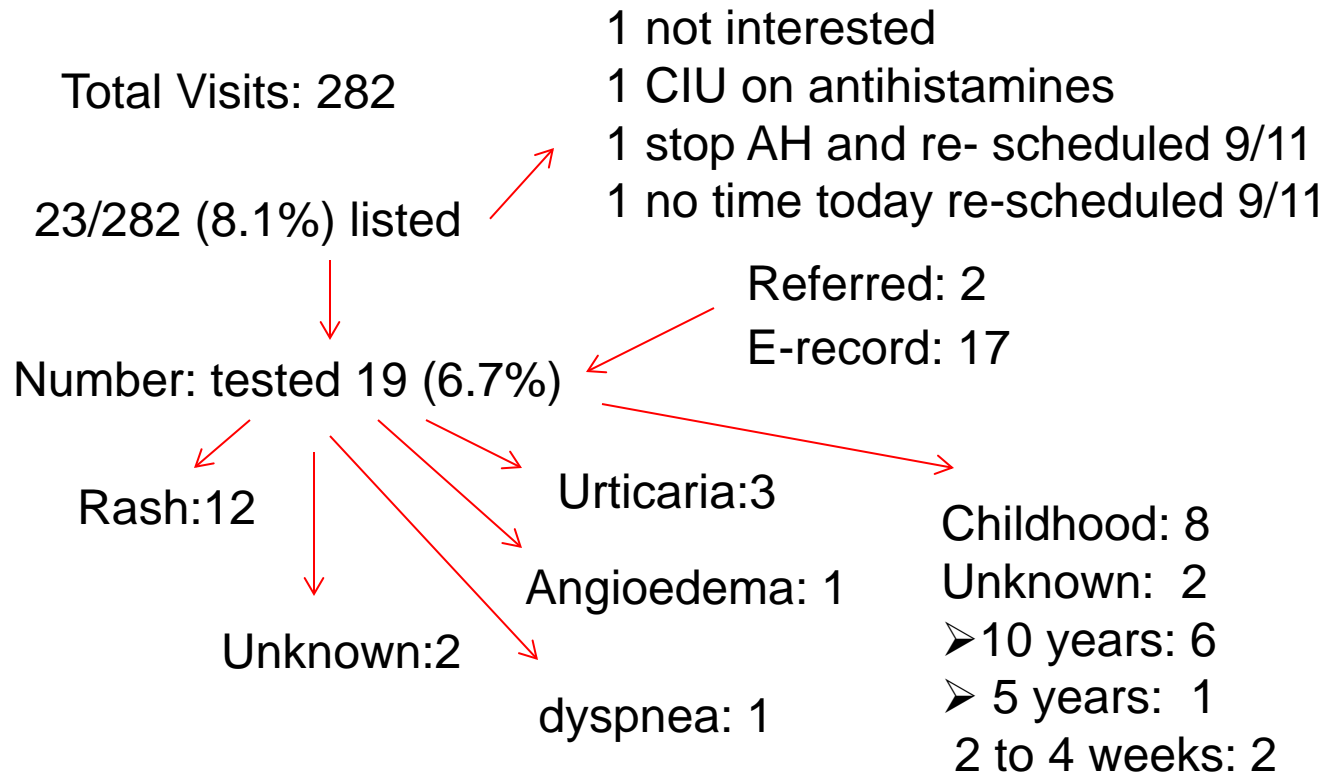
Prevalence of Penicillin “allergy” at Scripps Clinic: a survey

- Search Criteria:
 - All visits of one part time Scripps Allergists (DS) 6/11-8/30/13
 - In 23 Allscripts allergy sections: penicillin or amoxicillin listed
 - In 2/23 information about historical “reaction” available
 - In remaining 21 patients DS obtained supporting historical data directly from the patients

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1 not interested
1 CIU on antihistamines
1 stop AH and scheduled 9/11
1 no time today reschedule 9/11

Total Visits: 282

23/282 (8.1%) listed

Referred: 2

E-record: 17

Number: tested 19 (6.7%)

Penicillin skin tests
negative: 19

Oral PCN challenges
negative: 19

Penicillin removed
from allergy list: 19

Note dictated and
patient counseling: 19

Rash:12

Urticaria:3

Childhood: 8

Unknown: 2

➤ 10 years: 6

➤ 5 years: 1

2 to 4 weeks:2

Angioedema: 1

Unknown:2

dyspnea: 1

Explanations for the mismatch between history of penicillin allergy and the accuracy of this diagnosis

- Beta-lactam antibiotics = innocent bystanders
 - Viral infections caused urticaria and rashes.
 - Other perceived events (dizziness, fever, nausea, headache) blamed on penicillin
- True IgE mediated reactions to penicillin in the distant past occurred.
 - > 10 years: loss of memory immunocytes programmed to synthesize IgE antibodies
- Original immune mediated reaction (Type II, III, IV)
 - Skin tests for specific IgE antibodies to PCN negative
 - Oral Pen-VK challenge of one hour does not exclude

Making an accurate diagnosis of PCN allergy

- Allergy consults available at all 6 allergy sites.
 - Standard of care is PCN skin testing and if negative oral challenge with Pen VK or amoxicillin 250 mg
- Which patients to refer to Allergy for PCN testing?
 - Outpatient, off antihistamines.
 - “Suspect” patients to the Allergy appeals court
 - Multiple suspected reactions to other antibiotics
 - Recurrent infections requiring antibiotics
 - Elderly: historical “reaction” usually distant past
 - Scheduled operations
 - Peri-operative cephalosporins are routinely used
 - Cefazolin (Ancef) decreases hip infections from 3.3% to 0.9%
 - Refer to Allergy as part of the pre-operative protocol if penicillin, cephalosporin or amoxicillin listed

Consequences of leaving “penicillin allergy” on drug list

- Standard of care forces use of second line antibiotics
 - May be less effective
 - May have side effects and their own immune reactions
 - Usually more expensive than generic beta-lactam antibiotics
 - Less than optimal patient care
- Standard of care does not allow: prescribing a beta lactam antibiotic when penicillin allergy is listed in the E-record
 - Severity of the infection and lack of other antibiotic choices may push you toward a beta lactam antibiotic anyway
 - Routine peri-operative orders: cephalosporin IV
 - If no reaction, no problem (dictate note, patient education and deletion of penicillin from Allscripts):
 - Orthopedic procedure number, 2 or >
 - If reaction, violation of the standard of care
 - Injury + failure to protect patient by prescribing a beta-lactam antibiotic when penicillin is listed in the drug allergy section

Consequences of removing penicillin from drug list

- If oral challenge is negative and a
 - Dictated note
 - Penicillin deleted from the allergy drug list
 - Patient educated
- Irrefutable evidence that “penicillin allergy” is not present on that date.
 - 58 beta-lactam antibiotics can be used as indicated
 - High level of physician and patient satisfaction
 - Any subsequent adverse event associated with penicillin will be
 - < 3 % with any event during additional courses of beta-lactam antibiotics
 - a new adverse reaction,
 - a new hypersensitivity reaction
 - coincidence and innocent bystander
 - Such a new event **cannot be a prescribing error**

Summary

- Drug allergies are rare
- This lecture concentrated on NSAIDs and Penicillin, the two most commonly prescribed and convicted drugs
- But most other drugs are also innocent bystanders and there is extensive literature supporting this statement
- Most drugs are convicted and locked up for life
- Over diagnosis of drug allergy leads to withholding drugs that otherwise would be available for treating patients or drugs are prescribed anyway outside the standard of care
- The appeals courts for suspects or wrongly assigned drug allergy are: re-trial treatment courses or skin testing plus oral drug challenges in the Allergy appeals court