Allergy and Anaphylaxis

Keith Conover, M.D., FACEP,
Allegheny Mountain Rescue Group

References in
Survival and Wilderness Travel Chapter in
http://www.conovers.org/ftp/AppSAR-Drafts

1/11/23

1

Why?

- Allergies are common and debilitating
- Beesting and food allergies are common and can be life threatening
- Need to destroy some myths about how to manage different allergies

2

Delayed vs Immediate Hypersensitivity

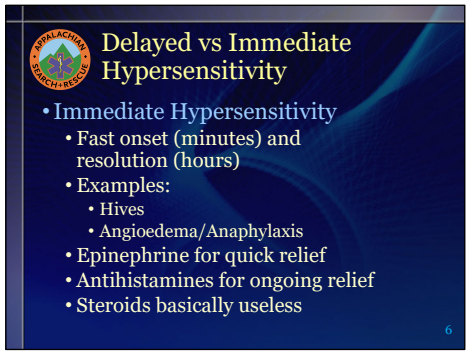
- Delayed Hypersensitivity
  - Slow onset (hours/days)
  - Slow resolution (6 wks)
  - Examples:
    - Nasal allergy (hay fever/allergic rhinitis)
    - Eye allergy (allergic conjunctivitis)
    - Poison ivy rash
  - Antihistamines for quick relief
  - Steroids to shorten course or prevent

3

There are two types of allergy with which we are concerned: Delayed and Immediate Hypersensitivity. (We don't care about the other three types.) Delayed hypersensitivity is the most common.
Conjunctiva are the clear coverings of the inside of your eyelids and the white parts of your eye.

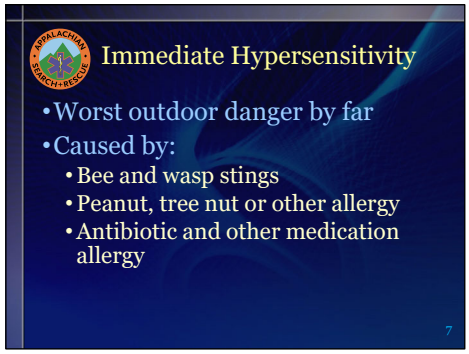
What is this? Hives, AKA urticaria, remember, doctors get paid by the syllable, with extra credit for Latin or Greek roots.
Licensed under the Creative Commons Attribution-Share Alike 3.0 Unported license via Wikimedia Commons, courtesy Enochlau.

What is this? Angioedema of the tongue.
Licensed under the Creative Commons Attribution-Share Alike 3.0 Unported license via Wikimedia Commons, courtesy James Heilman, MD

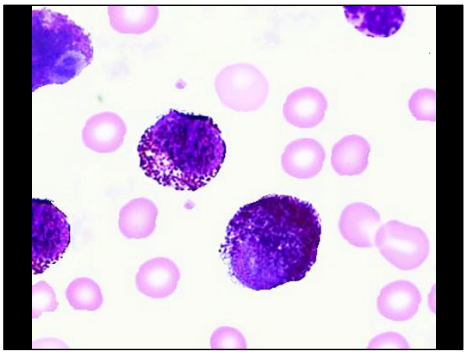


My wife Betty is allergic to cold. She has a condition such that her skin mast cells degranulate when they get cold. She gets hives.
Usually, she takes some Pepcid – famotidine – before she goes out in the cold for a walk or a hike, or to shovel snow. This prevents her from getting hives.
Once, she forget to take it and all of her skin was swollen and bright red. She was miserable. She said, "I just took a Pepcid Complete but I know it takes about half an hour to work. I am totally miserable. Is there anything that will work faster?" "Yes, an intramuscular injection of adrenaline – epinephrine." "GIVE IT TO ME!" I did and it

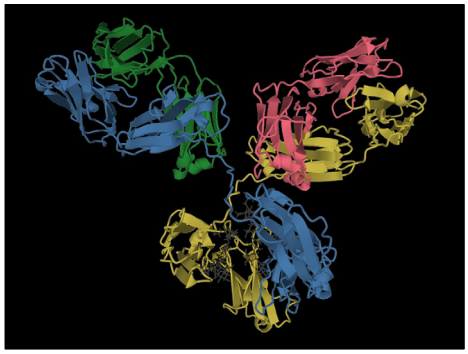
worked in just a few minutes.



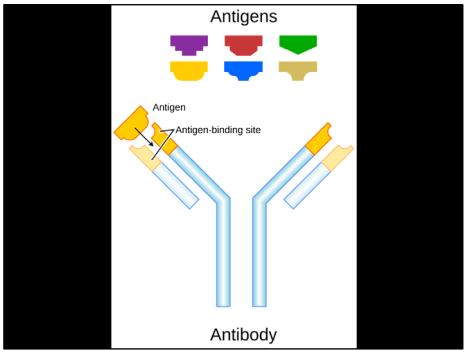
Don't worry about lions, tigers and bears, or even rattlesnakes, worry about beestings, they're more likely to kill you and your teammates.



Mast cells. The dark purple granules are full of histamine, bradykinin, and various cytokines: chemical messengers that trigger inflammation. Although these are free in the blood due to a mast cell leukemia, most are in the skin and mucous membranes that line the airways, lungs and gastrointestinal tract. You can't see them as they are so small, but these mast cells are covered with antibodies. Public domain via Wikimedia Commons, courtesy Ayman Qasrawi.

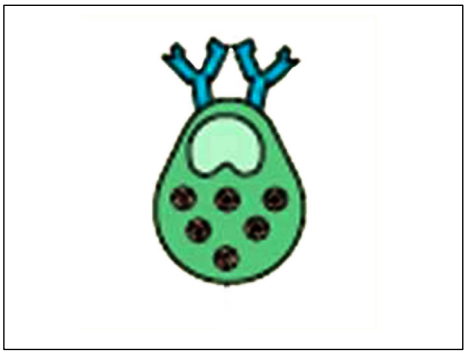


This is part of your immune system: an antibody, in a diagram showing the details of how the proteins in it are folded up. You need to memorize what this looks like. Just kidding.
Licensed under the Creative Commons Attribution-Share Alike 4.0 International license via Wikimedia Commons, courtesy Tokenzero.

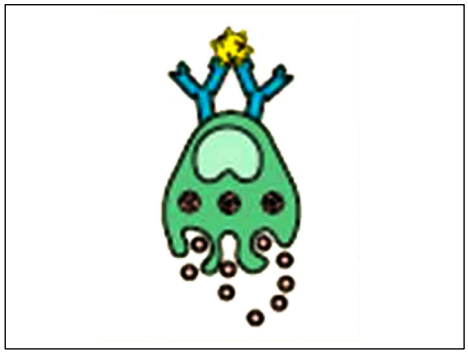


This is a more useful abstraction. This you ***DO*** need to understand. In this diagram, the light-blue rods are the constant region, and the yellow bits at the end are the variable regions That variable region is crafted by your immune system to bind and recognize specific ***antigens:*** parts of enemy bacteria, viruses – and in the case of allergies and anaphylaxis, parts of pollen, mold spores and beesting venom. Note that only the yellow antigen will bind and activate this antibody. These antibodies can be free-floating in your blood and extracellular fluid, for example in your skin, or attached to cells of your immune system. When the correct antigen binds to the variable

region, the bottom of the constant region will activate the immune system cell to which it attaches. That's how your immune system recognizes antigens from bad things like certain bacteria or viruses. It's also how your immune system gets confused and reacts to relatively benign things like pollen, mold spores or beesting venom, and causes an allergic reaction. We call those relatively benign things like pollen, mold spores and beesting venom ***allergens***: antigens that cause allergy.
Public domain via Wikimedia Commons, courtesy user Fvasconcellos.

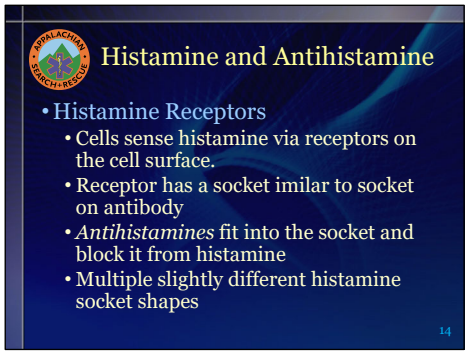


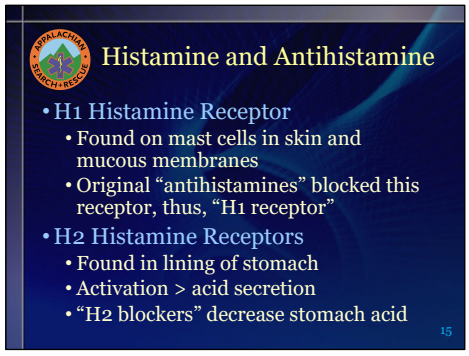
Here is a mast cell with two antibodies attached to it. The antibodies are attached to the cells via the bottom of the Y, the constant region.
Public domain via Wikimedia Commons, courtesy US National Institutes of Health.



When a ragweed pollen bit attaches to the antibodies, they send a message to the cell to degranulate: to dump its load of histamine, bradykinin and cytokines into the extracellular fluid. We are not going to talk further about bradykinin or cytokines as (a) it's too complicated, (b)) for our purposes they aren't as important as histamine and (c) we really don't know squat about them. Double negative used intentionally to emphasize how little we know about them, following Shakespeare's use of double negatives. This signals other mast cells to degranulate as well sin a feedback situation like when the speaker with the microphone gets too close to the speaker. These

chemicals also directly cause itching and swelling.
Public domain via Wikimedia Commons, courtesy US National Institutes of Health.





Mucous membranes are the "skin" of the airways. And so now the term "antihistamines" now refers to H1 antihistamines, and "H2 blockers" refers to those to decrease stomach acid.

Now there are zillions of products using the "Benadryl" label, but when medical people say "Benadryl" they mean diphenhydramine.

First-Generation H1 Anthistamines

- Why ban first-generation antihistamines?
  - Unwanted side effects
  - Kill people by vehicular homicide
  - Better alternatives available
  - Better alternatives also cheap generics
- Don't put them in your kits.

18

Second-Generation H1 Anthistamines

- Don't cross blood-brain barrier like first-generation antihistamines
- Supposedly no sedating effects
- Longer-lasting anti-allergy effects (12-24 hours)
- Cheap generics available

19

Second-Generation H1 Anthistamines

- Specific brands:
  - cetirizine (e.g., *Zyrtec*) and almost-the-same levocetirizine (e.g., *Xyzal*): make many people groggy/sleepy
  - loratadine (e.g., *Claritin*, *Alavert*) and almost-the-same desloratadine (e.g., *Clarinex*) make some sleepy
  - **fexofenadine** (e.g., Allegra) doesn't make essentially anyone sleepy

20

"Essentially" in there just because people are different and maybe one in a million will get sleepy with fexofenadine.

Second-Generation H1 Anthistamines

- Fexofenadine (e.g., Allegra):
  - Cheap
  - Available in chewable kid's size
  - Almost never any side effects
  - Add some 180 mg tablets to your personal wilderness first aid/medical kit *instead* of Benadryl

21

This is the H1 antihistamine you want in your personal wilderness first aid/medical kit.
Photo by Keith Conover

-D Versions and Decongestants Don't Work

- "-D" versions of antihistamines also have a decongestant
- Oral decongestants don't work and have bad side effects
- Oral decongestants also available separately, names on next slide

Like "Allegra-D"

Oral Decongestants

- pseudoephedrine
  - Silfedrine
  - Sudafed
  - Suphedrin
- phenylephrine
  - Sudafed PE
  - Suphedrin PE

Like "Allegra-D"

H2 Antihistamines (H2 Blockers)

- Marketed for acid indigestion but work for hives and anaphylaxis (but not much for nasal or eye allergies)
- Brand names:
  - famotidine (e.g., Pepcid AC)
  - cimetidine (e.g., Tagamet HB)
  - nizatidine (e.g., Axid AR)
- famotidine has least drug interactions > best

Best H2 Blocker: famotidine

- Pepcid Complete chewable (
  - famotidine plus antacid
  - Brand name tastes better, dissolves in mouth quicker than generics
  - Can take without water
  - Kids can take
  - Can chew and hold in mouth > maybe some absorption from veins under tongue > faster than swallowing pills
  - For hives or anaphylaxis: **FOUR** 10 mg tablets at once

26

No dose-related toxicity, 40 mg may be overkill but I have treated many cases of hives and anaphylaxis with this dose without any problems, though in the ER I usually give it IV to work faster.

Photo by Keith Conover

Proton-Pump Inhibitors (PPIs)

- Like H2 blocker antihistamines, marketed for acid indigestion
- Unlike H2 blockers, do ***nothing*** for hives/anaphylaxis
  - omeprazole (e.g., Prilosec OTC)
  - lansoprazole (e.g., Prevacid 24HR)
  - esomeprazole (e.g., Nexium 24HR)
  - omeprazole and sodium bicarbonate (e.g., Zegerid OTC)

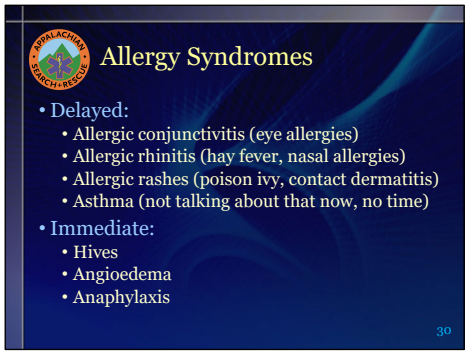
28

Steroids

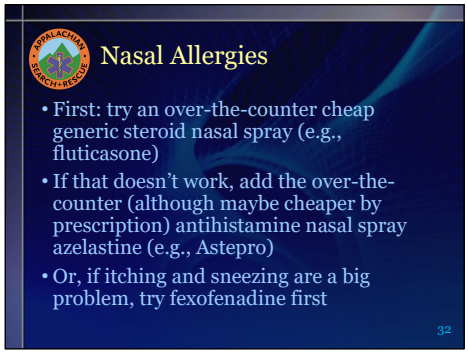
- Corticosteroids = "steroids" in medicalese
  - For delayed hypersensitivity reactions, do *nothing* for immediate hypersensitivity reactions.
  - Work slowly (hours to days) unlike antihistamines (minutes to hours).
  - Available in over-the-counter nasal sprays for allergic rhinitis
  - Available in over-the-counter 1% hydrocortisone cream for mild poison ivy
  - Available in prescription pills and high-potency creams for more severe poison ivy

29

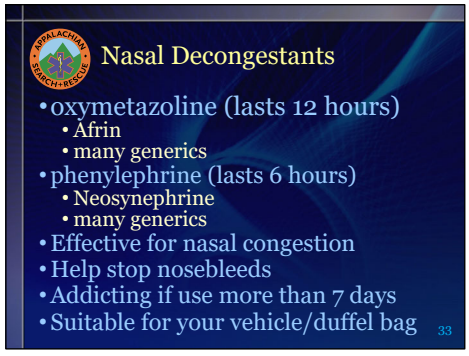
Anabolic Steroids are used for boosting athletic performance and landing you in jail as they are quite illegal.



From least serious to most serious.
Asthma needs a whole separate lecture.



My wife says the Costco generic fluticasone is best as it smells like honeysuckle.



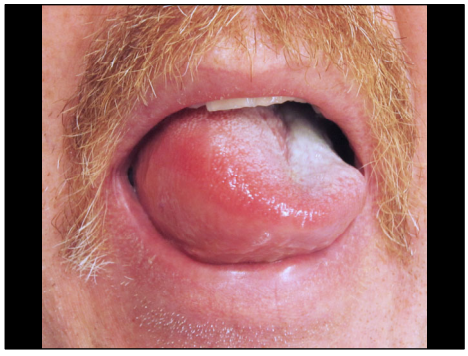
Since we're talking about nasal sprays…
"Addicting" in this case means something called "rhinitis medicamentosa": you have to use more and more Afrin to be able to breathe through your nose. The bottle says no more than 3 days, the more recent research says 10 days which is why I recommend 7 days. Helps sinus infections and ear infections, in the case of ear infections behind the eardrum ("otitis media") as much if not more than an antibiotic.

Poison Ivy

- Recognition, decontamination beyond the scope of this lecture
- Itch control:
  - fexofenadine 180 mg ***twice*** a day (recommended by dermatologists)
  - Over-the-counter anti-itch cream with *pramoxine* and *menthol* (e.g., CVS version)
  - No creams with *benzocaine* or *lidocaine*: tend to cause allergic reactions
- Mild : over-the-counter 1% hydrocortisone steroid cream makes it better faster
- Worse cases: need prescription steroid

34

Hives again.



Angioedema of the tongue again.

Beestings

- If stung, and stinger still in you, try to flip it off with a fingernail.
- You only have two second to flip it off, so forget about using a credit card or knife.
- Sting-eeze (potent combination of local anesthetics) very helpful for pain relief
- Can result in either a local delayed hypersensitivity rash (treat like poison ivy) or hives, angioedema or anaphylaxis. Even if you're never been stung before.

37

Hives and Angioedema

- Wilderness first aid/medical care for mild hives or angioedema:
  - Pepcid Compete or equivalent, 4 tablets chewed, held in mouth, and then swallowed.
  - fexofenadine 180 mg, one tablet swallowed.
- For more severe angioedema, or angioedema not responding to above ("is your voice hoarse?")
  - Epinephrine 1:100 0.3-0.5 mg IM
  - Epi-Pen works
  - Vials of epi and syringe and needle works
  - May need to repeat in 15 minutes, several times

38

Both NOLS and Outward Bound train their trip leaders to use vials of epi rather than Epi-Pens and their programs have been successful as published in the medical literature. In AMRG we are in the process of setting this up right now, with training and credentialing for anyone, even at the wilderness first aid level, who wants to carry vials of epinephrine in their personal wilderness first aid/medical kits. Hoarseness is the first sign of swelling deep in the airways and always an indication for an epinephrine injection.

ACEis and ARBs

- ACE (angiotensin converting enzyme) inhibitors, known as ACEi, commonly used effectively and safely for high blood pressure and some other problems.
- ARBs, (angiontensin receptor blockers) are used similarly.
- All of the above, even if used safely for years, predispose to sudden onset of angioedema.
- Treat like any other angioedema.
- **Never take an ACEi or ARB again**, and call your doctor tomorrow to discuss alternative medications.

39

Anaphylaxis

- A sudden bad allergic reaction
- Not just a vagal reaction to pain that makes you lightheaded and have to lie down
- Definition depends on which journal you read:
  - **Hives**
  - **Angioedema**, with or without airway swelling
  - **Shock**, either from loss of fluid from angioedema or other causes; treat for shock if needed
  - Slow or fast **heart rate**
  - Asthma-like **wheezing**: treat for asthma if needed

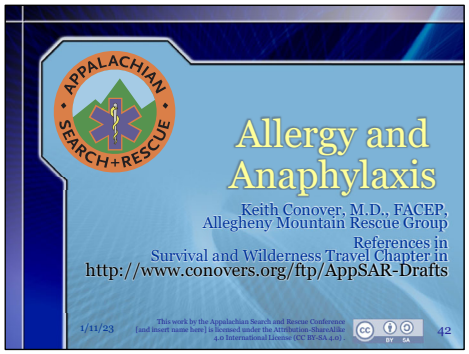
40

Treating for shock and asthma beyond the scope of this talk.

Biphasic Anaphylaxis

- Sometimes people get over anaphylaxis and then it comes back.
  - Average time to recur: 10 hours. Longest time: 78 hours.
  - Always milder than initial attack.
  - Anyone who recovered from anaphylaxis should stay close to epinephrine for the next day (near street EMS or near someone in the field/backcountry with epi)

41



Reminder that references and more information and links to even MORE information available in the current draft of the *Appalachian Search and Rescue* textbook's Chapter 1, *Survival and Wilderness Travel*, at the link on the screen.