

Allergies

At times, we all sneeze and get runny noses. Does that mean we all have **allergies**? No. Most of us don't react to things like plant pollen, dust mites, bee stings, animals with fur or feathers, or foods like peanut butter. For others, these can trigger **allergic reactions**, sometimes with serious consequences. Besides the **symptoms** that Keesha and other students have, kids with allergies might also get an upset stomach, cough a lot, or have difficulty breathing.

Let's think about how to reduce exposure to **allergens** (things that trigger allergic reactions).

- Keesha wants a pet. A fish might be a good choice—no fur or feathers here.
- Andrew wants to play outside. Before he goes out, he checks the weather report. Andrew will feel better if the pollen count isn't too high.
- Juan is hungry for a snack. He reads food labels to look for any trace of "peanuts."
- Jen is congested. Dust mites might be the cause. She finds out that air filters and floors without carpeting will reduce the number of dust mites in her house.

Sometimes these steps are not enough. A doctor might suggest medicines like **antihistamines** and **decongestants** or even allergy shots.

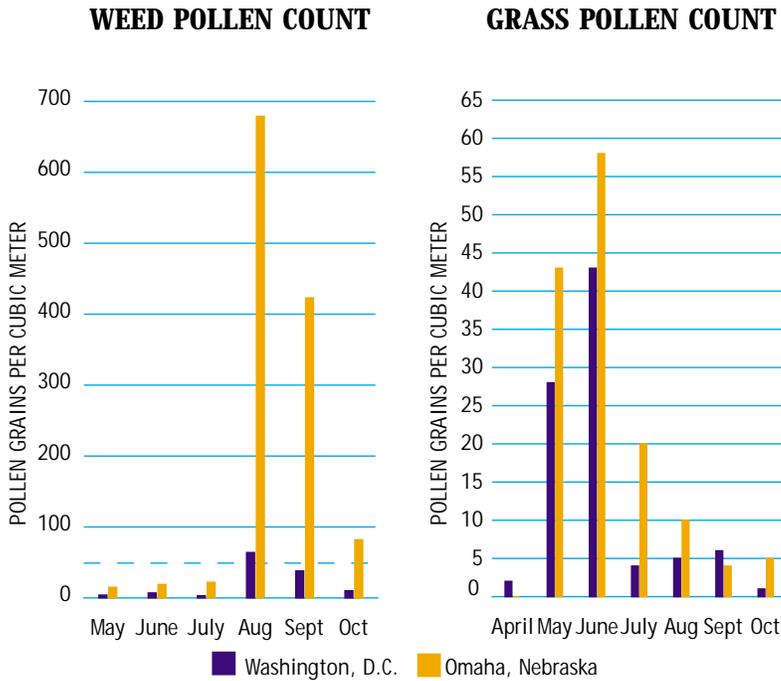
Why is it that only some people have allergies? Kids are more likely to have allergies if their parents have allergies. Just as a son or daughter might have the same blue eyes and brown hair as a parent, a child can inherit an **immune system** that is more **sensitive** to allergens.

But that's not the whole story. You have to be exposed to the troublesome allergen. If you are never around dogs and never eat shrimp, you are not likely to become allergic to these things. Even if you are sensitive, your first exposure will not cause much to happen. But your immune system will remember this allergen. It's "primed" and ready to react at another time. When the dripping, sneezing, and itching starts, you'll know that your immune system recognizes the allergen! Both your family and your **environment** are important pieces of the allergy puzzle.



Check It Out

Have you ever seen a powdery yellow dust in the air? That's **pollen**. If you start to sneeze in certain months every year, you may have a **seasonal pollen allergy**.



1. When **weed pollen** levels are greater than or equal to (\geq) 50 grains, most people with sensitivity to weed pollen will have symptoms. In which months will most people be bothered in each city?
2. When **grass pollen** levels are \geq 20 grains, most people with any sensitivity to grass pollen will have symptoms. In which months will most people show symptoms?
3. When **grass pollen** levels are \geq 5 grains, extremely sensitive people will be bothered. Which months are these?
4. Are grass pollen **seasons** different for most people? How about for people who are extremely sensitive?
5. There are no grass or weed pollen readings for these cities for about 6 months of the year. Why not?

Individual sensitivity and the environment can determine what type of treatment is best.

Untangle the WEB

Pollen and Spore Counts

Go to: www.aaaai.org
Find out when allergy season hits other cities around the country. Click on the "Pollen and Spore Count" box, then "Go." Untangle the web and find:

- The mold spore count for a city in the Southern Region. Ask for a graph of the past year. When is it highest?
- The types of trees producing pollen in April vs. September in Los Angeles.

Choose another place you want to learn more about.

Food Allergies

Should peanut butter be banned in school cafeterias? Find out more.

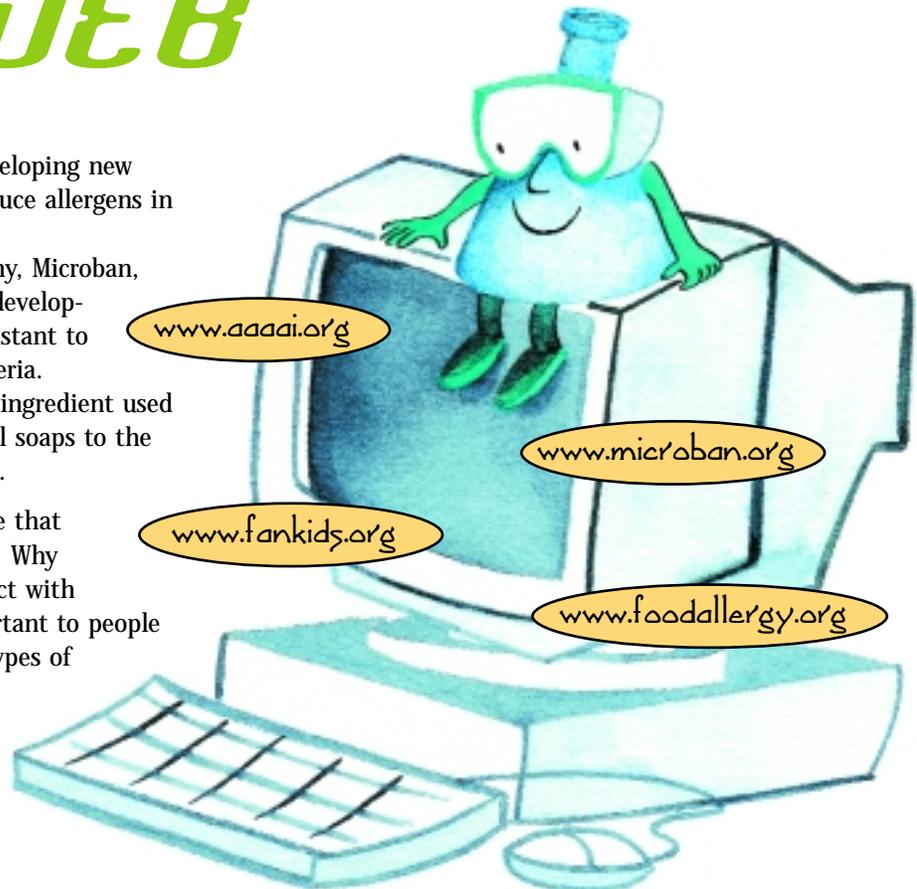
Go to: www.foodallergy.org
www.fankids.org

After conducting research, organize a class debate in teams.

New technologies

Scientists are developing new products that reduce allergens in the environment.

- At one company, Microban, scientists are developing fabrics resistant to mold and bacteria. They bind the ingredient used in antibacterial soaps to the fibers of fabric.
- Find a web site that explains HEPA. Why would a product with HEPA be important to people with certain types of allergies?



Get REAL

Have you ever seen mildew in a shower or fuzzy stuff on old fruit? These are examples of mold growth. Molds make more molds by spreading their **spores** in the air. Spores are another **allergen** that can trigger drippy noses and coughing. Molds can grow indoors and outdoors, so they are a cause of **perennial allergies** (all year long). Let's find out what conditions affect mold growth.



Hypothesis:

Find a partner. Together, choose an environmental condition for scientific testing (warm or cold temperature, darkness or light, dampness or dryness).

Write a hypothesis stating what you predict will happen.

Materials:

bread	zipper-lock sandwich bags
marking pen	journal
pencil	spray bottle of water
ruler	magnifying glass
microscope and slides (<i>optional</i>)	cotton swab (<i>optional</i>)

Procedure:

Step 1: Decide where to expose the bread to a potential source of mold (for example, air inside, soil outside, plants). Determine the length of time for exposure. In your journal, record your plans (for example, classroom vs. refrigerated temperatures).

Step 2: Expose bread to a potential source of mold. Cut the bread in half. Place each half into separate bags. Label the bags.

Step 3: Close the bags completely and place in the conditions for testing.

[Caution: Do not open bags after closing them.]

Step 4: Check your bags for mold growth every other day for a two-week period. Draw and describe your observations.

Step 5: Write down results. Share your findings with the class.

Conclusions:

Do the results support your original hypothesis?

Did they match results from other groups?

What additional hypotheses could be tested?

What's an Allergy?

An allergy is a misdirected immune system reaction to things that are harmless for most people.

Flaska's Facts

1 out of 5 students has allergies.

15 out of every 100 people are allergic to pets. They are allergic to the protein in saliva, urine, or flakes of skin, not the actual fur or feathers.

1 out of every 100 people is allergic to peanuts or other nuts.

1 ragweed plant can produce millions of grains of pollen in a single day.

1 gram of dust contains 500 dust mites.

Hay fever has nothing to do with hay. It's another name for **seasonal plant allergies**.

(Note that the figures represent data for the U.S.)



Inside Story

Who needs Super Heroes? You've got your own personal defender, your **immune system**. It attacks germs and other harmful things. These foreign invaders try to enter your body through the nose, mouth or skin.

White blood cells are a key part of your immune system. Some white blood cells hang out in the **lymph nodes** and other immune system organs, waiting for action. Other white blood cells travel throughout the body via the lymph and blood vessels looking for suspicious invaders.

White blood cells can attack these invaders in two main ways. Some white

blood cells make **antibodies**. Others just gobble up the invaders. Sometimes, the immune system makes mistakes. It might think pollen and other allergens are harmful and then overreact.

Let's look at what happens inside a person with a pollen allergy. First, pollen enters the nose. Cells lining the nose are ready with their secret weapon, a type of antibody called IgE. If the pollen attaches to at least two of these Y-shaped IgE molecules, a **chain reaction** starts. Cells make loads of **inflammatory** histamines and other chemicals. The overloaded cells respond and blow up, releasing these chemicals. More white blood cells rush to the site. The result is a person with the itchy, drippy, swelling symptoms of a pollen allergy.

Imagine you've invented an amazing new floor cleaner with a secret chemical ingredient no one has used before. Laws require safety testing before you can sell this product. We know certain chemicals in plants like poison ivy and metals like nickel can cause **skin contact allergies** for some people. When they come in contact with the skin of allergic people, itchy, red, bumpy skin results. How can we test this new ingredient?

Our immune system is complex. We cannot imitate all of its reactions in a test tube. To protect humans from unsafe products, animal testing is required first. Scientists Ian Kimber, David Basketter, and Frank Gerberick are working to improve safety testing. What makes a better test? Most importantly, it's more accurate. It should also use fewer animals, get results more quickly, and be less expensive.

The test developed by these scientists is called the **local lymph node assay (LLNA)**. It works like this:

- An unknown chemical is painted on mouse ears. If it is an allergen, the chemical will cause the immune system to respond. Then, the lymph nodes near the ear swell up. That's because white blood cells increase in number to fight a chemical allergen.

Before the LLNA was developed, the only approved contact allergy test looked for skin changes on guinea pigs. After applying a chemical, several scientists might look at the same guinea pig and not agree if there was enough swelling or redness to indicate an allergic reaction. The guinea pig test often had to be repeated to confirm an allergy.

Why is the LLNA more accurate? The results are clearly an immune system response, not just a skin irritation. A scientist removes the swollen lymph node and counts the number of white blood cells. Three times the normal number indicates a true allergic reaction. Dr. Gerberick worked with four laboratories in the U.S. and Europe to produce the same results on the LLNA.

The LLNA uses about one-half the number of animals as the guinea pig test. Good scientific practice **refines** test methods to **reduce** the number of animals used. The goal is to produce reliable results that protect people and animals. Dr. Gerberick and his colleagues continue their research to develop non-animal approaches for skin allergy testing.

Research RAP



Helping Humans, Helping Animals

What's wrong here? In May 1996 a little Jack Russell Terrier named Fergie developed terribly itchy skin. This cleared up after a few weeks. In August, the dog was miserable again. Grass pollen peaks in May where Fergie lives. Ragweed pollen season is in August. Could there be a connection?

The dog was given allergy skin tests, just like those given to humans. Tiny amounts of grass and ragweed pollen extract were scratched onto Fergie's skin. Within 15 minutes, her skin puffed up in those spots. This proved she

was allergic to grass and ragweed.

Why was it important to know what caused Fergie's problems? Then the veterinarian could suggest the appropriate treatment. Fergie got an **anti-histamine** and other allergy medications. This stopped the skin from releasing the chemicals that cause itching. If Fergie had been scratching because she had fleas, she would have needed different medicine or treatment.

What do you suppose happened the following spring and summer? The allergies returned. In fact, Fergie felt

worse than ever. Her constant biting and scratching led to a skin infection. Medications from the previous year no longer controlled the allergies without **complications**. Some allergy medications can cause drowsiness or over-activity. Next, the vet tried allergy shots. These shots help the body's immune system to make its own medicine, or **antibodies**, that block the release of histamine.

In 1998 and 1999, Fergie remained allergy free with no



Dr. Patterson and his dog Fergie

additional medications or shots. She enjoyed being outdoors again. Thanks to allergy research with animals, Fergie got the right treatment.



DELVING DEEPER

Just because you hate the taste of something like broccoli doesn't mean you are allergic to it. With a food allergy, your mouth might tingle, your tongue and throat swell up, you have trouble breathing, or your stomach might cramp. You might even become unconscious. Did you know that teenagers are more at risk for serious food allergy reactions than others? If you have an allergy, don't be embarrassed to ask what's in the food served at a friend's house or at a restaurant. Be a careful label reader.

Go on a scavenger hunt. Track down 10 products with known food allergens. Here's your list: peanuts, milk, wheat, fish, eggs, tomatoes, or soy. HINT: Look for gluten, lactose, casein, modified food starch.



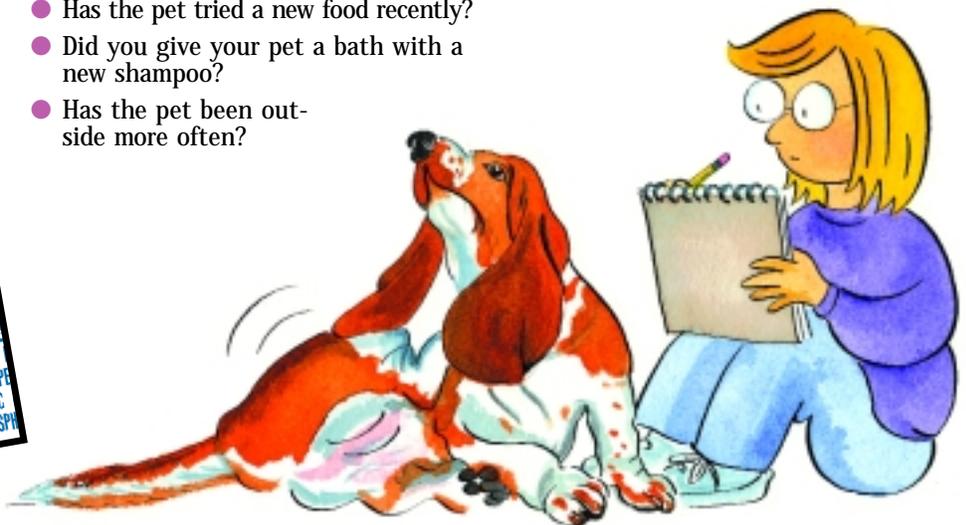
Express Yourself

Let's pretend that you have a pet. Your pet is chewing its feet and scratching its ears more than usual. It's your job to collect data.

- When did the symptoms start?
- What season of the year is it?
- When does the pet chew and scratch? For how long?
- Has the pet tried a new food recently?
- Did you give your pet a bath with a new shampoo?
- Has the pet been outside more often?

- Where does the dog sleep?
- Does the fur or skin look different? Describe the change.
- Does the pet have a fever?
- Could the pet have gotten a bee sting or insect bite?
- Do any of your pet's relatives have allergies?

Write down your answers to develop a **history** of your pet's problem. If necessary, you could report this information to a vet.



Cool Careers

Are you a future allergy detective? Allergy and Asthma Associates, a medical team in Virginia, uses patient clues to search for the cause of allergies. Here's what they do.

First, Jean Evers, a registered nurse (RN), meets with patients to take a **history**. She asks lots of questions (see Express Yourself). Then the patient sees Dr. Richard Loria, an allergist with several years of specialized training. After reviewing the history, the doctor examines the patient for more clues. Dr. Loria looks for mucus or swelling in the nose and any skin rashes. He also

listens to the lungs for unusual sounds.

If the patient appears to have allergies, the team collects evidence to determine what kind of allergy so they can plan the appropriate treatment. Skin tests can prove what triggers the allergy. Nurse Evers scratches tiny drops of pollen, mold, and food **extracts** into the patient's skin. She tests for allergies that are common in this region. She checks for others that may be a problem, based on the patient history. After 20 minutes, Dr. Loria inspects the skin swelling under each drop. After that, he might recommend allergy medications, a new diet, or allergy shots.

Remember that you can't use pollen directly from a tree and scratch it into the skin. That's where a laboratory technician like Mary Durm becomes important. She prepares the extracts used in skin tests and allergy shots.

What's the reward for the allergy team? Each specialist knows that they help make many people feel better.



Mary Durm prepares extracts for skin tests and allergy shots.

Is one of these careers for you?

Do you like to analyze problems and take responsibility for the solution? Doctors put together all of the information from the history, physical exam, and skin tests to plan patient treatment.

Are you good at communicating with others? Nurses and doctors must be good communicators. They plan the best treatment to fit the patient's symptoms and lifestyle. They have to be persuasive because they might have to ask patients to give up a favorite food.

Can you remain calm in an emergency? Doctors and nurses must react quickly if an allergy patient develops an allergic reaction that can be life-threatening (a person can go into shock). Also, an extremely sensitive person may have such a severe reaction during skin tests or allergy shots.

Can you follow directions and be very precise? A laboratory technician has less contact with patients. Preparing the extracts requires careful measurement. A technician must follow germ-free techniques to avoid contaminating the extracts.

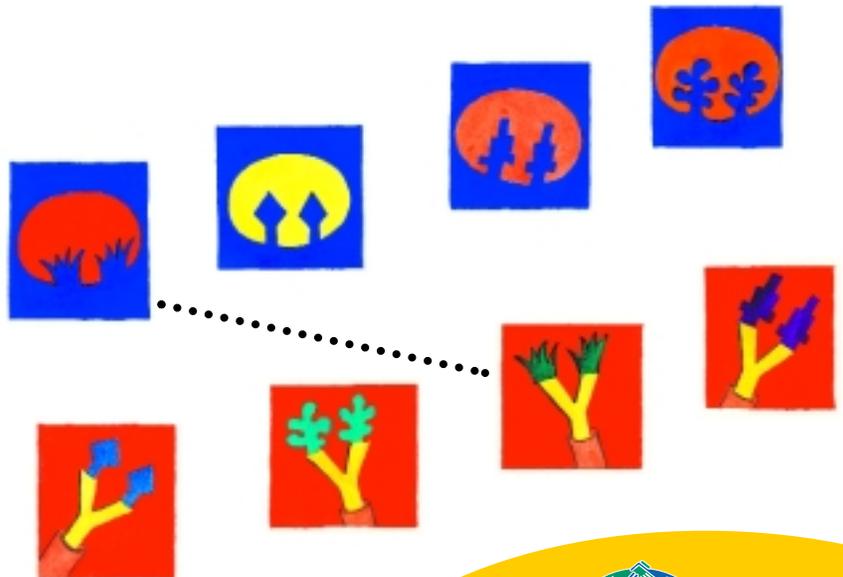
★ BENDER

MIND

Ah, springtime

What happens when people who are sensitive to oak tree pollen first breathe it in? Their immune system learns the pattern for making an antibody that matches the oak pollen. Not much else happens at that time. No drippy nose or itchy eyes. But guess what? The immune system will probably go into action the next time, making plenty of antibody. Here's the bad news: with lots of antibody and lots of pollen matched up, major dripping and sneezing begins.

Each antibody matches only one type of allergen. Match the pairs that go together in this puzzle.



www.joinhand.org