



Can hydrogels help the environment?

Water is everywhere – in the sky, in the ground, and in our homes. However, caring for this vital resource is often a challenge for each of us. Conservation means using water wisely. Protecting our groundwater is important because it is a source for drinking and irrigation. Consequently, scientists and engineers have developed amazing, superabsorbent polymers, called **hydrogels**, that can help.

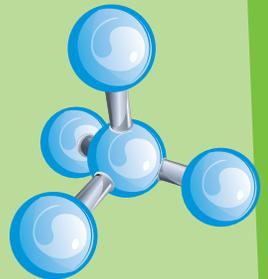
In this investigation, you will look at a particular hydrogel that is secretly at work in millions of households across the country...

Materials:

- Disposable diaper
- Measuring cup and measuring spoons
- Water
- Zipper-lock bag; 1 gallon size
- Newspaper
- 9 oz. plastic cup
- Scissors

Time Requirement: 20 minutes.

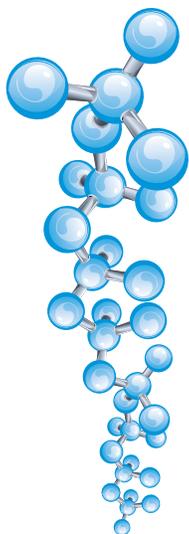
A **polymer** is a long chain of molecules. Polymers are all around us, and they make up materials like bicycle helmets, CDs, tires, plastic water bottles, rubber bands, and glue. This experiment focuses on special kinds of polymers that are superabsorbent: hydrogel polymers. Hydrogel polymers are long molecule chains that grab onto water molecules. Some can soak up as much as 500 times their weight in water! This superabsorbent characteristic makes hydrogel polymers useful in water conservation and in solving other environmental issues.





Collect a sample of hydrogel from the cotton and plastic lining of a disposable diaper.

1. Place a new diaper on the piece of newspaper. Carefully cut through the inside lining and remove all the cotton-like material. Put all the stuffing material and plastic lining into a clean, 1 gallon zipper-lock bag.
2. Scoop up any of the powdery material that may have spilled onto the paper and pour it into the bag with the stuffing. Blow a little air into the bag to make it puff up like a pillow, then seal the bag.
3. Shake the bag for a few minutes to remove the powdery hydrogel polymer from the stuffing. Notice how much powder falls to the bottom of the bag.
4. Carefully remove the stuffing and the plastic lining from the bag, and check out the powdery polymer left in the bag. Repeat steps 1-4 with another diaper, if needed, to get 1 teaspoon of the hydrogel powder. *(For larger groups, you can purchase the powder at www.4-H.org)*
5. Now it's time to mix the powder with water to see what happens. Pour 1 teaspoon of hydrogel powder into a 9 oz. plastic cup. Measure $\frac{1}{2}$ cup of water, and pour it into the cup along with the powder.
6. After about 30 seconds, observe that the water has changed — it's no longer a liquid... it's a gooey solid!



Take a closer look at the gel by scooping up some of the gel with your fingers. You can poke holes in it and even tear it into smaller pieces. This hydrogel is safe and non-toxic, so you can touch it, but remember: even safe chemicals never go into your mouth, ears, eyes, or nose! *(For full safety precautions, visit www.4-H.org and download the experiment safety guide.)*

Things to think about...

- How does this water-slurping powder work? Does it only absorb water?
- How much water will the average diaper absorb?
- What would happen if you let the gel dry out? Is this powder reusable?
- Besides diapers, how else could this powder be used?
- How does the absorbency of the hydrogel compare with other materials that are absorbent: cotton balls, paper towels, sponges?
- How could adding other ingredients (like salt) affect a hydrogel's water-absorbing properties?

So what's next?

Hydrogel technology, of which there are many different types, lends itself well to an unlimited number of agricultural and domestic applications. For example, certain growers have learned that by adding hydrogels to the soil in the right proportions, crops easily survive on sixty to eighty percent less water. Today, hydrogels are widely used in such applications as forestry, gardening, and landscaping as a means of conserving water.

Go to www.4-H.org to share your thoughts, find more information, try the expanded student version of the National Science Experiment, and join a discussion on the potential impact of hydrogels as well as environmental issues relating to water conservation and groundwater contamination. 4-H, part of the Cooperative Extension System of the United States Department of Agriculture and the 106 Land Grant Universities across the country, has been educating youth on agriculture and the sciences for over 100 years—and we have lots of ways for youth to explore, engage, and get inspired by science!

