



Eye Injury Simulations

I. EGG EYES: CHEMICAL Injury Simulation

Pre-experiment preparation: requires overnight prep (soak)

Make “eyes” out of eggs!

You will need:

Eggs

White (plain distilled) Vinegar

One large bowl, two small bowls

Splash Goggles

Vinyl Gloves (avoid Latex due to allergies)

Chlorine Bleach

Toilet Bowl Cleaner with rust remover (with hydrochloric acid)

Soak your eggs overnight in the vinegar. This works best if you replace the vinegar after the first few hours. The acidic vinegar will dissolve the egg shells, leaving the egg membranes in-tact. Rinse off your “eyeballs” the next day. **Beautiful!** (These will keep a long time if covered with water and refrigerated, so they can be made well in advance.)

Since this model has a real, permeable membrane, it can absorb things.



- 1. Put on your EYE PROTECTION (Splash Goggles) to protect your real eyes.**
2. Carefully place a couple of ounces of the caustic substances (household bleach for the alkali, and toilet bowl cleaner for the acid) into different containers, so that half the egg will be exposed.
3. Very carefully lower an “egg eye” into each one.



Alkali...



Acid...

4. Wait several minutes (if you are short on time, this is a good time to prep the “flubber” eyes for the impact simulation that you will do later in the presentation)
5. What happens to the “eye” with each exposure?
6. What first aid measures do you think you should take in case of chemical injury? Why would this help?

Alkalis penetrate the membrane:



Acids bind (coagulate) tissues:



II. EGG EYES: IMPACT Injury Simulation

Pre-experiment preparation: requires overnight prep (soak)

You will need:

Egg Eyes (from above)

Safety Specs or Splash Goggles

Can or Bucket

Hollow Tube (like the inside of a wrapping paper roll, or PVC pipe section)

Metal Compass (the kind for drawing a circle, not for finding directions...alternately a letter opener or scissors that could fit through the tube should also work)

Chair

Zipper-type Sandwich Bags

Now for the injuries....

1. Put on your Safety Specs or Splash Goggles to protect your real eyes.

2. Penetration Impact Injury: Place an “egg eye” in your can or bucket, and drop the metal compass (or alternative) through the tube onto the “eye.”

Ready...



Aim...



...Fire! (Let the compass slide down the tube to hit the egg.)

3. Blunt Impact Injury: Place an “egg eye” in a plastic sandwich bag. Remove excess air and zip up the bag! Drop eggs from several heights (2 feet, 4 feet, 6 feet 8 feet) into your can or bucket to simulate increasing impact.

4. What happened to your “eyes?”

5. Your ocular bones (eye socket) offers some protection against flying objects. How much protection does the front of your eye really have?

6. What kind of protection is best for impact-resistance? (See the link on the “Play Sports?” slide that follows Impact Injury First Aid if you’re not sure.)

III. FLUBBER EYES: 5 minute preparation, IMPACT Injury Simulation

Make an “eye” out of flubber and tissue paper.

You will need:

Glue (preferably Elmer’s Glue-All®-- for some reason off-brands don’t seem to work as well)

Water

Borax (sodium tetraborate)

2 Cups per “eye”

Spoons

Three 12” squares of Tissue Paper (gift wrap) per “eye” 3 colors (white, red, and green or blue)

Rubber Bands or Twist Ties

Safety Specs

Can or Bucket

Hollow Tube (like the inside of a wrapping paper roll, or PVC pipe section)

Metal Compass (the kind for drawing a circle, not for finding directions...alternately a letter opener or scissors that could fit through the tube should also work)

Chair

In one cup, mix approximately 2 ounces of glue with 2 ounces of water.



In another cup, mix about 1 Tablespoon of Borax with ½ cup (4 ounces) of warm water.



Pour about 2 ounces of the Borax mixture into the glue-water mixture. Stir until most or all of the water is absorbed into a gelatinous mass.



Pick it up and form it into a ball. (Add a little more borax-water mixture if needed.)



Lay your three pieces of tissue in a pile to represent the 3 outer layers of the eye (retina, choroid, sclera). Suggestion: use white for the sclera (outermost) blue or green for the choroid (middle) and red for the retina (inner most) layer.

Place your ball of gelatinous mass in the middle. Wrap the layers of tissue paper around it.



Secure the ends (like a ponytail) with a rubber band or twist tie to represent the optic nerve hanging off the back of your eyeball. **Viola!**

Now to injure your “simulated eyes” ...

1. Put on your Safety Specs to protect your real eyes.

2. Penetration Impact Injury: Place a “flubber eye” in your can or bucket, and drop the metal compass (or alternative) through the tube onto the “eye.”

Ready...



Aim...



...Fire! (Let the compass slide down the tube to hit the “eye.”)

3. Blunt Impact Injury: Drop a “flubber eye” from several heights (2 feet, 4 feet, 6 feet 8 feet) into your can or bucket to simulate impact.

4. Was your eye split open or did the layers protect it?

5. What first aid measures might you take to protect an eye injured by impact? Why would that help?



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