In a Plastic World

Facilitator Instructions contributed by Meghan McNamara

Reflection

I taught this lesson to my adult literacy class, which is a pre-GED level class. We had done some science previously, cell biology and health and medicine. This was our first time looking at a technical document.

Students were very excited generating the list of plastics we use in our daily life and had creative answers (hard hats, the watch I was wearing). Before we were finished they made observations like, "We live in a plastic world!" One student had heard of BPA and knew it was something you should look out for. ("Look for labels that say BPA-free.")

Students connected with The Change Agent article. Their reactions to the piece were "scared" and "I didn't know—what are we doing to ourselves?" The fact about BPA leaching in heated plastics stood out to many of them.

I was very impressed with students' perseverance with the technical document. All students were able to come up with at least one question or observation. Many came up with a handful.

The most comments/ questions were on the posters for "Health Risks" and "Action Steps." (See photos below). We talked about how we could find definitions for the words we didn't know, and also how to look up answers to the other questions we had. Their comments/ questions around action steps generated rich discussion about government and corporate responsibility and monetary motivation. Students wanted to know how come more people didn't know about BPA and how people who were illiterate were supposed to be able to find out about it. (Hire translators to talk to people in non-technical language, was one suggestion).

Students began the writing assignment in class, but many finished it for homework. It gave them a chance to try to share what they learned in class, putting it into their own words. Another writing prompt could have been to write a letter to an elected official with suggestions for educating people about BPA in plastic. See below for excerpts from student writing.

Activity Overview

1. **Brainstorm (20 min)**
   - Start with a brainstorm of all the plastics that we use in our daily life.
     - > Students brainstorm on their own, then share with full group
   - How do we interact with these plastics?
     - > Ex, drink from them, eat from them, etc.
   - Plastic can be useful, but we have to be careful… Ask who has heard of BPA, and give definition:
     - > BPA is a chemical used in making plastic typically used in…
       - Some clear plastics, like reusable water bottles and infant bottles—although this has been outlawed recently;
       - The coating on food cans and bottle tops
       - Bring in examples of some objects to show the class

Skill:

Objectives:

Practice approaches for reading and understanding technical documents

Think critically about plastics used in our day-to-day life

Time:

Materials

Copies for each student of "I Can Protect My Baby" from the Change Agent: Staying Safe in a Toxic World (http://sfa.terc.edu/materials/pdfs/CA_32_Final.pdf p. 3)

Three sections and 1 figure from the CERHR's report on BPA (http://cerhr.niehs.nih.gov/evals/bisphenol/bisphenol.pdf) (see attached), on separate pages and enough copies of each page for members of a small group

6 sheets of poster-sized paper & tape

Post-its (4-5 per student)

Writing Prompt handout (see attached)

Preparation

Review SfA's "A First Look at Technical Documents" (http://sfa.terc.edu/materials/pdfs/a_first_look_at_technical_documents.pdf)

2. Putting It In Context (25 min)

- Read as full group "I Can Protect My Baby"

  > Discuss: What stands out to you from this article? Why do you think that piece stands out to you?

3. Understanding Technical Documents (60 min)

- How would you write an article that looks at BPA in your own life? What information would you need? You'd probably have to read a scientific report…
- Use "A First Look at Technical Docs" to look at four selections, including one figure, from "NTP-CERHR Monograph on The Potential Human Reproductive and Developmental Effects of Bisphenol A" (http://cerhr.niehs.nih.gov/evals/bisphenol/bisphenol.pdf)

  > Instructions on board: Look at this page carefully. What do you notice? What seems clear? What does not make sense? What questions do you have? Write down your observations and questions, one per sticky note.

- Give an example of an observation and question--have to be understandable when read alone

  > Break into small groups, each group looks at a different section (It's okay if more than one group is looking at each section)

  > Students read over the section once or twice on their own, writing down questions and observations they have

  > In their small group, students share questions and observations

  > When group has all post-its done, they put each one into one of the categories on the posters

  > Students read the post-its on all posters

  > Categories of questions/observations:

  - Definitions & chemical properties
  - Health risks
  - Predictions
  - Action needed
  - Other Questions and Observations

- Share what we know
- Discuss what we don't know

  > How could we find answers to these questions (for each category)?

4. Wrap up- In Writing (15 min)

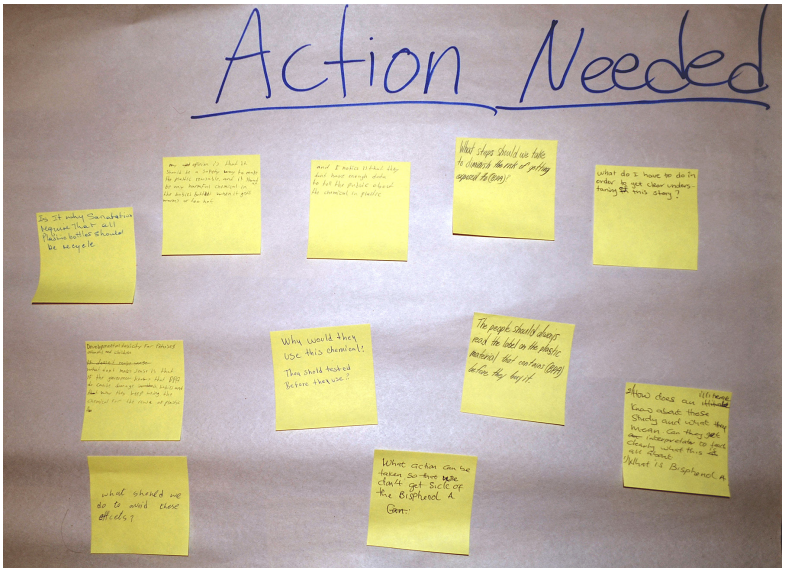
- Students respond in writing to the prompt:

  > A friend or family member is going to have a baby soon. How would you tell the mom-to-be about the possible dangers of BPA in plastic?

Helpful Definitions

Bisphenol A — a chemical used in the making of some plastics

Questions/comments on this poster included "Since they found out that BPA is bad for your health, why use BPA to make plastic", "The thing that I notice people can get exposure to Bisphenol A is through your diet." "How can it be in breast milk?" "Did you know Bisphenol A can migrate into food," "Can you die from it?"



Questions/comments on this poster included "The people should always read the label on the plastic material that contains BPA before they buy it." "Why would they use this chemical? They should tested before they use?" "What action can be taken so that we don't get sick off the Bisphenol A." "Is it why sanitation requires that all plastic bottles be recycled", "I notice that they don't have enough data to tell the public about the chemical in plastic."

Student Work Samples

Below are excerpts of students writing from the last portion of the lesson, "Wrap up- In Writing."

"A family member is having a baby, I will try as much as possible to tell her to be very careful whenever she is buying plastic supplies, especially baby bottles and the kind of food she is going to get for the baby.

"I will explain the little research I have done about BPA (Bisphenol A), how we have been exposed to this chemical…"

"Since we all have been already exposed to this Bisphenol A, I will tell her it's in her breast milk, but not to be scared but to let her know it's in our systems by being exposed. Also advise her not to buy plastic which the label doesn't say BPA free, not to put any plastic into microwaves or boiling baby bottles, which as any African mothers we are fond of doing that. Also not to buy baby formula in the can."

"I would tell an expecting mother to be about preventing BPA by asking if she has heard about it, once she says no and asks what is it? I will tell her it is a chemical that is in plastic bottles like water bottles and certain baby bottles and liquid formula. The best thing that we can start doing is reading instructions when shopping for baby items. Check for BPA free bottles, eating healthy instead of canned foods or using microwave, eat fruits, cook. Don't microwave your baby's milk, and if you're pumping your breast milk out in a bottle best thing to do is breast feed the baby so that the mom's breast milk won't be exposed to BPA. If not breastfeeding, instead of the liquid formula get the powder formula. Also can change the plastic bottles to glass bottles."

"By protecting your baby from this toxins, it will be the safest way for you to avoid exposure to your infant. If you purchase any plastic make sure that it state BPA free. BPA free products are more expensive than regular plastic but it's worth paying a little more for your infant's safety. The reason why I'm sharing this with you because not a lot of people are knowledgeable about this Bisphenol A and how harmful it is to humans."

Worth Noting

N/A

Smart Moves

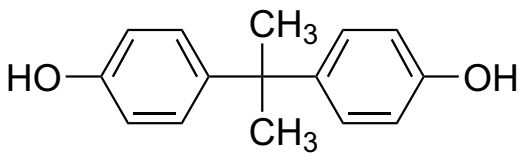
Slow down.
√ Talk it out.
Use your senses.
√ Connect ideas to whar people already know.
Play with different ways to show it and say it.
Show numerical relationships in more than one way.
√ Encourage verification.

NTP Brief on Bisphenol A

What is Bisphenol A?

Bisphenol A (BPA) is a chemical produced in large quantities for use primarily in the production of polycarbonate plastics and epoxy resins (Figure 1).

Figure 1.
Chemical structure of Bisphenol A
($C_{15}H_{16}O_2$; molecular weight 228.29)



It exists at room temperature as a white solid and has a mild "phenolic" or hospital odor. Polycarbonate plastics have many applications including use in certain food and drink packaging, e.g., water and infant bottles, compact discs, impact-resistant safety equipment, and medical devices. Polycarbonate plastics are typically clear and hard and marked with the recycle symbol "7" or may contain the letters "PC" near the recycle symbol. Polycarbonate plastic can also be blended with other materials to create molded parts for use in mobile phone housings, household items, and automobiles. Epoxy resins are used as lacquers to coat metal products such as food cans, bottle tops, and water supply pipes. Some polymers used in dental sealants or composites contain bisphenol A-derived materials. In 2004, the estimated production of bisphenol A in the United States was approximately 2.3 billion pounds, most of which was used in polycarbonate plastics and resins.

CERHR selected bisphenol A for evaluation because it has received considerable attention in recent years due to widespread human exposures and concern for reproductive and developmental effects reported in laboratory animal studies. Bisphenol A is most commonly described as being "weakly" estrogenic; however, an emerging body of molecular and cellular studies indicate the potential for a number of additional biological activities. These range from interactions with cellular receptors that have unknown biological function to demonstrated effects on receptor signaling systems known to be involved in development.

Are People Exposed to Bisphenol A?[4]

Yes. Based on the available data the primary source of exposure to bisphenol A for most people is through the diet. While air, dust, and water (including skin contact during bathing and swimming) are other possible sources of exposure, bisphenol A in food and beverages accounts for the majority of daily human exposure [*(1)*; reviewed in *(2, 3)*]. Bisphenol A can migrate into food from food and beverage con tainers with internal epoxy resin coatings and from consumer products made of polycarbonate plastic such as baby bottles, tableware, food containers, and water bottles. The degree to which bisphenol A migrates from polycarbonate containers into liquid appears to depend more on the temperature of the liquid than the age of the container, i.e., more migration with higher temperatures *(4)*. Bisphenol A can also be found in breast milk *(5)*. Short – term exposure can occur following application of certain dental sealants or composites made with bisphenol A-derived material such as bisphenol A dimethacrylate (bis-DMA). In addition, bisphenol A is used in the processing of polyvinyl chloride plastic and in the recycling of thermal paper, the type of paper used in some purchase receipts, self-adhesive labels, and fax paper *(6, 7)*. Bisphenol A can also be found as a residue in paper and cardboard food packaging materials *(7)*. Workers may be exposed by inhalation or skin contact during the manufacture of bisphenol A and bisphenol A-containing products, e.g., polycarbonate and polyvinyl plastics, thermal paper, epoxy or epoxy-based paints and lacquers and tetrabrominated flame retardants *(6)*.

[4]Answers
to this and subsequent questions may be: Yes, Probably, Possibly, Probably Not, No or Unknown

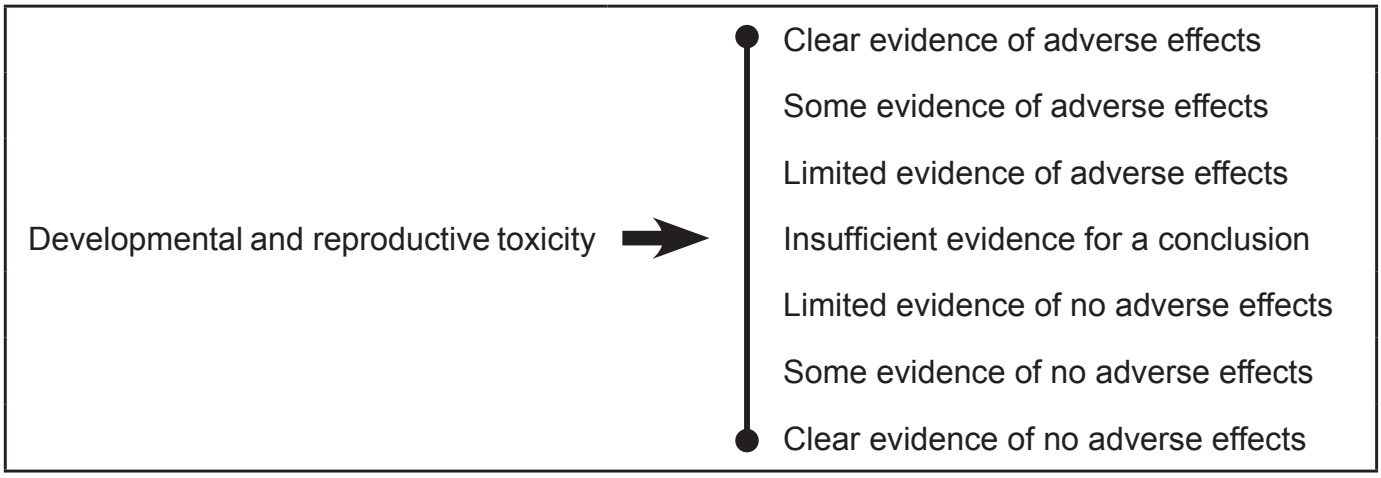
Can Bisphenol A Affect Human Development or Reproduction?

Possibly. Although there is no direct evidence that exposure of people to bisphenol A adversely affects reproduction or development, studies with laboratory rodents show that exposure to high dose levels of bisphenol A during pregnancy and/or lactation can reduce survival, birth weight, and growth of offspring early in life, and delay the onset of puberty in males and females. These effects were seen at the same dose levels that also produced some weight loss in pregnant animals ("dams"). These "high" dose effects of bisphenol A are not considered scientifically controversial and provide clear evidence of adverse effects on development in laboratory animals. However, the administered dose levels associated with delayed puberty (≥ 50 mg/kg bw/day), growth reductions (≥ 300 mg/kg bw/day), or survival (≥ 500 mg/kg bw/day) are far in excess of the highest estimated daily intake of bisphenol A in children (< 0.0147 mg/kg bw/day), adults (< 0.0015 mg/kg bw/day), or workers (0.100 mg/kg bw/day) (Table 1).

In addition to effects on survival and growth seen at high dose levels of bisphenol A, a variety of effects related to neural and behavior alterations, potentially precancerous lesions in the prostate and mammary glands, altered prostate gland and urinary tract development, and early onset of puberty in females have been reported in laboratory rodents exposed during development to much lower doses of bisphenol A (≥ 0.0024 mg/kg bw/day) that are more similar to human exposures. In contrast to the "high" dose developmental effects of bisphenol A, there is scientific controversy over the interpretation of the "low" dose findings. When considered together, the results of "low" dose studies of bisphenol A provide limited evidence for adverse effects on development in laboratory animals (see Figures 2a & 2b).

Recognizing the lack of data on the effects of bisphenol A in humans and despite the limitations in the evidence for "low" dose effects in laboratory animals discussed in more detail below, the possibility that bisphenol A may alter human development cannot be dismissed (see Figure 3).

Figure 2a. *The weight of evidence that bisphenol A causes adverse developmental or reproductive effects in humans*



Excerpted from National Toxicology Program Center For The Evaluation of Risks To Human Reproduction (NTP-CERHR) *NTP Brief on Bisphenol A*. September 2008. NIH Publication No. 08 – 5994

Full report available at http://cerhr.niehs.nih.gov/evals/bisphenol/bisphenol.pdf

Writing What You Know: BPA In Plastic

A friend or family member is going to have a baby soon.How would you tell the mom-to-be about the possible dangers of BPA in plastic?