ACS Green Chemistry Student Chapters Activity

"Formulate your own hand soap using the Safer Choice Criteria"

Introduction:

Cleaning products are everywhere and are used multiple times a day. Whether it's washing your hands, cleaning dishes, washing clothes, or disinfecting surfaces, we interact with them on a daily basis. But what are the ingredients that make cleaning possible? Have you ever taken the time to look at the label on the back of the container? Chances are you haven't. If you have, do you understand everything that is written and know the function of every chemical ingredient that makes up the composition of liquid hand soap?

As future chemists, possibly in the personal care industry, you will be responsible for understanding the functions and uses of chemical ingredients. These chemical ingredients will be the building blocks for the products you will help to formulate. So, wouldn't you want to know if there any chemicals you should avoid using?

Green Chemistry is important in the design of future innovations and technologies because its principles offer a way to create new products (i.e. household soap/cleaners) that minimize risk while still offering superior performance and lower costs. More specifically, one can use Green Chemistry thinking to reduce the risk of adverse human and environmental health effects in next generation household cleaners by purposely reducing the hazards associated with products and processes. Green Chemistry offers a competitive advantage by facilitating the development of less hazardous products at the design phase!

Table from: http://ehs.ucsf.edu/hazard-communication-standard

After participating in the Safer Choice Webinar, you now are aware that some of the ingredients found in the cleaning products you use might have potential adverse effects to human and environmental health. YIKES! However, through the efforts of EPA Safer Choice Program, there are methods and resources to identify better alternatives that eliminate the possibility of future adverse effects. For this student chapter activity, you will be putting your Green Chemists hats on to investigate and research better alternatives for cleaning products!

Activity #1: Formulate a Safer Choice Consumer Product

As a student chapter, you will apply the information you learned in the Safer Choice webinar and creatively attempt to formulate your own liquid hand soap based upon the Safer Choice Ingredient List. Utilize the list to develop a formulation that would meet the Safer Choice Standard.

At a basic level, liquid hand soap formulations can be narrowed down to the following ingredients:

1. Water
2. Surfactants & Emulsifiers
3. Colorants/dyes
4. Fragrances
5. Skin Conditioning Agents
6. Antimicrobial additives

Using this as a mere guideline, use all available resources at EPA Safer Choice and develop a formulation label for a hand soap with the type of ingredients that **SHOULD** be in cleaning products. All Safer Choice certified products facilitate a more transparent labelling system by providing the 1) Ingredient names 2) CAS # 3) Functions of each ingredient (ex. Surfactant). Go to your local grocery store and take pictures of product labels for certified Safer Choice cleaners. Then as a student chapter, create an effective and elaborate formulation label for **YOUR** proposed liquid hand soap. Remember, the more creative the better!

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However, this wouldn't be a Green Chemistry activity if we didn't try to better understand the hazards associated with specific ingredients found in hand soaps. So…each student chapter will perform a comparison study of your proposed Safer Choice hand soap vs. a non-certified Safer Choice hand soap (*Hint: When searching for Safer Choice labels at the grocery store, find a non-certified Safer Choice product and use it for this comparison study*) . Look at all ingredients listed in each formulation and retrieve all obtainable SDS. From the SDS, identify all the corresponding GHS hazards and record them. A description of GHS pictograms and hazards can be found at the end of the document. Once all GHS hazards have been identified and listed, compare the results and conclude why **YOUR** Safer Choice formulation is better. Below is an example of a template to perform and analyze your results.

"Name of Product"				
Ingredient Name	CAS	Function	Hazards	Category (physical, human, or, environmental)

Activity #2: Be an Advocate for Safer Choice!

With new information on what type of products **SHOULD** be in your hand soaps, take the initiative to research what type of ingredients are used in the hand soaps at your university, laboratories, and department restrooms. Then create flyers that discuss the added benefits of Safer Choice products and advertise potential safer choices around your chemistry department (with permission from chemistry department head).

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Submitting your Work

ACS Student Chapters: For this event to qualify as one of your green chemistry activities at least six people must view the webinar and participate in this activity. Please submit Activities 1 & 2 along with your attendee list in your Chemistry Student Chapter Report at the end of the year!

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Supplemental Information: GHS Pictograms and Hazards

Health Hazard  • Carcinogen • Mutagenicity • Reproductive Toxicity • Respiratory Sensitizer • Target Organ Toxicity • Aspiration Toxicity	**Flame**  • Flammables • Pyrophorics • Self-Heating • Emits Flammable Gas • Self-Reactives • Organic Peroxides	**Exclamation Mark**  • Irritant (skin and eye) • Skin Sensitizer • Acute Toxicity (harmful) • Narcotic Effects • Respiratory Tract Irritant • Hazardous to Ozone Layer (Non-Mandatory)
Gas Cylinder  • Gases Under Pressure	**Corrosion**  • Skin Corrosion/ Burns • Eye Damage • Corrosive to Metals	**Exploding Bomb**  • Explosives • Self-Reactives • Organic Peroxides
Flame Over Circle  • Oxidizers	**Environment** (Non-Mandatory)  • Aquatic Toxicity	**Skull and Crossbones**  • Acute Toxicity (fatal or toxic)

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