



Carry Out Science:

Pesto



Description: Make a classic old-world sauce and learn about emulsification!



Grades: 7 and up
Ability Level: Medium
Time: 20-30 minutes
Servings: Several

Tools:

- Blender
- Knife
- Rolling Pin (Heavy Mug)
- Zip lock bag

Ingredients:

- 4 cups fresh basil
- 3 garlic clove
- ½ Cup extra virgin olive oil
- ¼ cup of pine nuts, walnuts, or pecans
 - Can be removed or replaced with spinach
- ¼ cup of parmesan cheese
- ¼ teaspoon salt
- 1/8 teaspoon black pepper

Old World Instructions:

- 1.) Separate the stems and leaves of the basil.
- 2.) Chop finely.
- 3.) De-shell garlic clove and chop finely.
- 4.) Chop nuts finely.
- 5.) Grate and add parmesan cheese.
- 6.) Once all ingredients are chopped, add remainder to a zip lock bag and add olive oil. Press all air out of bag.
- 7.) Use a rolling pin or heavy weight (such as a mug) back and forth over the bag.



Modern Instructions:

- 1.) Separate the stems and leaves of the basil and add leaves to blender.
- 2.) De-shell garlic and add to blender.
- 3.) Add nuts to blender.
- 4.) Grate and add cheese.
- 5.) Add oil and blend until it is a paste.

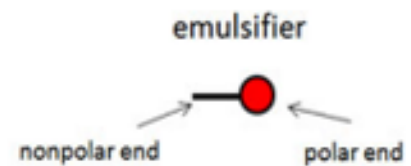
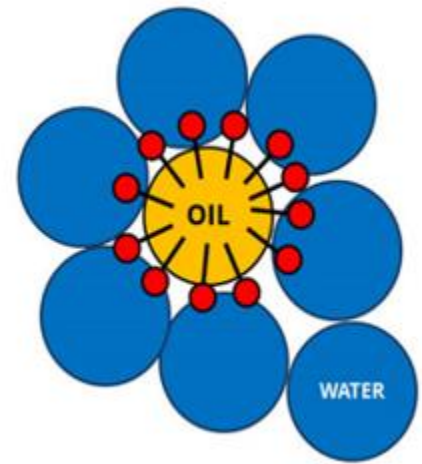


Enjoy your pesto over pizza, pasta, bread, tossed in veggies, or as a garnish for soup!

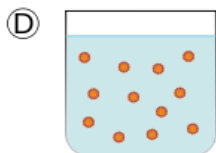
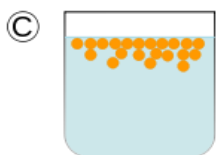
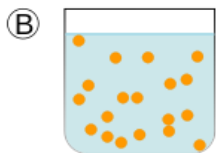
Saucy Science!

Emulsification is the process of combining two liquids that do not normally mix. The most common example of emulsification is when water and oil are mixed, which is exactly what happens when you make pesto! Basil contains water within its cells and as you add olive oil to the mixture these two liquids repel each other. They repel each other because the charges of the water and oil are opposite. However, protein within the parmesan cheese – called *casein* – allows the water (from the basil) and oil to mix evenly. In other words, casein acts as an **emulsifier**. The non-polar end of the emulsifier attaches to the oil and the polar end attaches to the water, which allows the oil to evenly disperse in water.

As you mix the two liquids together to make pesto, you spread the oil out which creates a paste-like consistency. The consistency of this paste depends on the method of mixing, which is different for the old world and modern styles of pesto. Try making these two pesto styles and compare – even though they both use the same ingredients, one will be smoother than the other because of greater emulsification.



Tasty Questions



What questions do you have? Can you develop one for each of the categories below?

Noticing: _____?

Example: What did you notice about the smell of the two styles of pesto (the old world style and the modern style)?

Comparing: _____?

Example: Compare the consistencies of the two types of pesto. Which do you prefer and why?

Predicting: What would happen if you did not add cheese to the recipe?

_____?

Experimenting: How could you make the old world style smoother? How could you make the modern style coarser?



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