**Vitamin C in SASKATOON berries**

Vitamin C (or ascorbic acid) is an important nutrient found in many foods. Berries and other fruit are a good source of vitamin C. As we know, nutrients are important for keeping our bodies healthy. Vitamin C can aid in helping combat against cancer causing agents called free radicals.

Our bodies cannot produce vitamins like vitamin C and so we must get it from the food that we eat. Most of us get the bulk of our food from grocery stores. However, First Nations peoples traditionally got all of their food from collecting it from the natural environment. Can you think of any foods that cannot be collected in the winter? Some foods like fruits and vegetables are only available seasonally meaning that they would not be available for First Nations peoples to collect in the winter.

What happens to food if you leave it out too long or if it sits in your fridge for a long time? Fresh food spoils if it is left out too long and then it is no longer suitable for consumption. Food preservation helps prevent food from spoiling. Can you think of any way in which food can be preserved? Food can be dried, frozen, canned, fermented, pickled, smoked, etc. Since First Nations peoples collected their food from the natural world and could not go to the grocery store to get food it was necessary to preserve foods are not available during winter months so that they can be eaten throughout the year. Preserving foods allows it to be eaten over a longer period of time than if it were to be kept fresh.

Drying food was an important preservation method for First Nations peoples. Both meat and berries would be collected and dried (and smoked in the case of meat) in order to provide food all year round. Traditionally, berries and meat would be dried in the sun. These dried foods would then be stored in order to eat later.

One way in which the dried meat and berries would be used is in making Pemmican.

Pemmican is a traditional dense food that is made from dried meat which would be pounded into a coarse powder. The meat would then be mixed with an equal part of melted fat. Dried berries would sometimes also be added for additional nutrition. Different berries that would be used include cranberries and Saskatoon berries. Other berries would only be used for special pemmican for ceremonies and weddings. These include cherries, currants, chokecherries and blueberries.

As mentioned, drying out food is one method of food preservation. Drying berries preserves vitamins and minerals which help ensure that there aren’t nutrients missing from the diet during the winter months when fresh fruits and vegetables are not available. Some food preservation methods work better than others when preserving nutrients. For example, vitamin C is an example of a nutrient which is better preserved through drying than boiling. This is because boiling fruit, like when making jams and jellies, breaks down the vitamin C because vitamin C is heat sensitive.

It is possible to determine the relative amount of vitamin C in fresh and dried berries in order to determine if any vitamin C is actually preserved through the drying process. Similarly, a comparison can be made between berries that were dried and berries that were boiled. We can do this using a technique called a titration.

Titrations work by adding compounds that help detect what we are looking for, in this case vitamin C. In order to detect vitamin C we have to first add cornstarch and then add something called iodine. Has anyone heard of cornstarch or iodine before? We can get cornstarch at the grocery store because it is used in cooking and iodine is available at pharmacies because it is used to help protect wounds from getting infected. When we combine iodine and cornstarch it makes a nice dark blue solution. However, when we add iodine to a solution that has vitamin C in it, the vitamin C changes the iodine so that it does not make a dark solution with cornstarch. Once we add enough iodine so that all of the vitamin C has been “used up” when we add more iodine it will pair with the starch to make a blue solution.

Therefore, when we know how many drops it takes to make the solution blue-ish in colour we know how much vitamin C there is. We can compare the number of drops necessary to make a blue solution using different types of berries (fresh, dried, frozen) to determine which has the most vitamin C.

**RESOURCES:**

http://www.foodbycountry.com/knowledge/Pemmican.html

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OBJECTIVES:
- Understand the importance of food preservation to First Nations peoples traditional diets
- Understand the importance of vitamin C in our diets
- Be introduced to titrations

MATERIALS: (one per student unless indicated)
- Berries (cranberries, blueberries, Saskatoon berries…)
- tincture of iodine
- cornstarch
- cups (2/student)
- forks (1/student)
- eye droppers (2/student or 1/student and 1 for a master starch solution)
- Small clear cups (1 oz or so is good) or test tubes
- stir stick (1/student)

RELATED MEDIA: See Vitamin C Titration PowerPoint

Activity: Vitamin C Titration (15 minutes)

Preparation: (before class)
1. Dilute the tincture of iodine. The proper iodine concentration will depend on the concentration of vitamin C in your berry of choice, ut the following dilution should work fine.
40 drops [2mL] of tincture of iodine per 50mL of water.
If the colour change is not observed within 5-25 drops, then increase the concentration of the iodine solution [60 drops/50mL] and try again.
This solution will be distributed to each of the students. It will go in one of the two cups they are given. The second cup is for mashing the berries.
2. Prepare the starch solution. To make a 1% solution weight starch/volume water you need to dissolve 1g of cornstarch for every 100mL of water (or multiples/fractions of this). Each student will need 10 drops [~0.5 mL].
Dissolve the cornstarch in a small amount of water (similar to when making gravy). Once thoroughly mixed you can add the rest of the water. Slowly heat the solution to aid in dissolving the starch. Allow solution to cool and then when the students come to get their 10 drops starch solution/0.5 teaspoons berry juice be sure to give the solution a stir.

Directions:
1. Hand out supplies to each student. Indicate where the starch solution is if just using one bulk solution for the class.
2. Instruct students how to do the titration. Use the Vitamin C Titration PowerPoint for “how to” pictures.

‘How to’ Steps:
1. Collect supplies from teacher.
2. Add 1 tbsp. (or amount reasonable for cup size) of berries to one of the cups. Mash the berries up with a fork.
3. Add 1 tbsp. (or equal amount to berries added) of water to the mashed berries. Continue to mash the berries and when the berries seem to be entirely mashed remove the chunks of skin and berry flesh with the fork.
4. Separate the berry mush/ juice into two containers.
5. Add ten drops of the starch solution to ONE of your sample containers. Stir.
7. Continue to add iodine one drop at a time until the solution changes to a purple colour.
8. Repeat steps 2-7 with a different type of berries (dried, frozen etc.)

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