

GUIDED PRACTICE

Class: Introduction of Food Science

Date assigned: Aug 16th, 2019

Date due: Aug 15th, 2019

Time estimate to complete this assignment: 30 min

Overview/Introduction

What is this lesson about? Why do we care?

Vitamins are organic compounds usually of low molecular weight, which are essential nutrients. Vitamins must be supplied in the diet in minute amounts to sustain growth in the young and maintain health in the adult. The name vitamin come from “vital amine”, meaning a vital nutrient containing an amine group. However, not all vitamins contain an amine group. A deficiency of a single vitamin results in a specific syndrome, or defect, in metabolism or physiology. Modern methods of food processing and manufacturing along with vitamin fortification have eliminated any risk of chronic vitamin deficiency in developed countries.

Minerals in foods first serve as nutrients. The purpose of food is to provide nutrients and energy, and minerals help to catalyze energy-yielding reactions. Minerals serve biological and minor structural functions in unprocessed foods. Minerals accomplish a variety of functional properties in the preparation of processed foods. Minerals help achieve an acceptable final product.

Learning Objectives

Basic objectives

List 3-5 learning objectives that you expect students to be able to master on their own before class.

LO 1: List the fat-soluble and water-soluble vitamins and identify examples of how solubility affects the application in processed food.

LO 2: Describe the function and food sources of vitamins and minerals.

LO 3: Compare the stability of vitamin and minerals under food processing conditions (e.g: thermal processing, high-pressure, irradiation, etc.).

Advanced objectives

List 3-4 learning objectives that you expect students to need help mastering.

LO 1: Describe the role of common vitamins and minerals in normal physiology and disease.☐

LO 2: Review the beneficial effects of vitamin and mineral supplements in processed food and evaluate the stability of vitamins and minerals during processing (e.g: thermal processing, high-pressure, irradiation, etc.).

LO 3: Identify the potential toxic effects of vitamin and mineral supplements.

Preparatory Activities and Resources:

1. Give detailed, action-oriented instructions for completing the Guided Practice assignment. Keep in mind that the activities should be minimal, simple, engaging, productive, and failure tolerant (see Talbert, 2017, pg. 135)

Read the Chapter 10 Vitamin and Chapter 11 Minerals in *Fennema's Food Chemistry (5th Edition)*. As you are reading, keep track of food source, bioactivity, and stability during food processing of each vitamin and mineral, and complete the attached fill-in-blank questions (*Appendix 1*).

2. Give a "playlist" of resources such as readings, videos, audio, or other content delivery methods that provide students the content to work with.

Here is some useful YouTube link can help you understand the contents in the textbook:

Link 1: Natural vs. Synthetic vitamins: https://www.youtube.com/watch?v=Shep_FligfY

Link 2: How supplements are made? <https://www.youtube.com/watch?v=i83oNd6ze94&t=9s>

Link 3: Foods high in vitamin A: <https://www.youtube.com/watch?v=-Y-G557fm5o>

Link 4: How vitamin D works? <https://www.youtube.com/watch?v=MtUgi9wZGXU>

Link 5: Vitamin E rich foods: https://www.youtube.com/watch?v=AHa_qZ0HRew

Link 6: Top 25 vegetables high in vitamin C: https://www.youtube.com/watch?v=t6fp_x3olyM&t=78s

Link 7: A brief introduction to minerals: <https://www.youtube.com/watch?v=8a7p1NFn64s>

Exercises: Please complete by Aug 15th, 2019.

- Give a method for students to submit their work online BEFORE the face to face class meeting. Google forms, SurveyMonkey, and tools in your LMS will all work. Alternatively, give them instruction on what completed work to bring to class as an entry ticket.
- The submitted work should demonstrate students' mastery of the basic learning objectives.

Please submit your assignment to Canvas by the end of Aug 15th, 2019. This assignment is 5 pts. No late submission will be accepted unless an advance notice.

Questions?

Give a way for students to get help.

If you have any questions, please email me at xi.feng@sjsu.edu, visit me during office hours, or schedule an appointment to meet with me. I usually respond to email within 24 hours.

Appendix 1

Vitamin A:

Sources: Fish liver oils, _____, _____, _____.

Biological functions: _____, Reproductive functions, _____.

Stability:

1) Stable to heat in _____.

2) Highly susceptible to _____.

- _____ sensitive

- Susceptible to conditions favoring _____

- Sensitive to _____

3) Unstable in _____

4) Stable in _____

Vitamin D:

Sources: Yeast, _____, _____, _____, _____, _____.

Biological roles:

Stimulate absorption of _____.

Immunity system

Deficiency disease - _____.

Stable to: _____, _____, _____, _____.

Vitamin E:

Sources: _____, _____, _____.

Biological functions: Antioxidant activity

Stability: _____ losses in processing and storage

Vitamin C:

Sources: fruit, _____, _____, _____, _____, _____, _____.

Biological roles:

- 1) Role in _____.
- 2) Deficiency – _____.

Stability (Factors affecting Vitamin C Stability):

1) Oxidation

- Exposure to _____.
- Least stable at _____ and _____.
- Exposure to _____.
- Prolonged _____.
- Exposure to _____.

2) Enzymes:

- Direct reaction: _____.
- Indirect reaction: _____, _____, _____.

Minerals:

Nutritional functions:

Electrolytes, _____, _____, _____, Components of enzymes, _____, _____, _____.

Predominant form in foods:

- Monovalent ions: _____.
- Polyvalent ions: Equilibrium between _____, dissolved, _____ and colloidal species, chelates.

Stability:

- Physical removal: Leaching, _____, _____.
- Formation of chelates

ADVANCED PRACTICE

This is given for students to complete after the class meeting in which they work together.

Class: Introduction of Food Science

Date assigned: Aug 16th, 2019

Date due: Aug 20th, 2019

Time estimate to complete this assignment: 1h

(Note that this is advanced practice, so is expected to take longer than a preparatory assignment – but not TOO long! Keep it reasonable.)

Learning Objectives

Advanced objectives

List 3-4 learning objectives that you expect students to need help mastering in class and after class.

LO 1: Describe the role of common vitamins and minerals in normal physiology and disease.☐

LO 2: Review the beneficial effects of vitamin and mineral supplements in processed food and evaluate the stability of vitamins and minerals during processing (e.g: thermal processing, high-pressure, irradiation, etc.).

LO 3: Identify the potential toxic effects of vitamin and mineral supplements.

Activities & deliverables

- Give detailed, action-oriented instructions for completing the assignment. Make sure to also include a reflective component.
- Describe what students should turn in, by when.

Vitamin C, ascorbic acid, is not stable when it exposures to air, heat, light or free radicals. Pulsed electric field, and high-pressure processing are the two common food processing units. Pulsed electric field (PEF) processing is an efficient non-thermal food processing technique using short, high voltage pulses. These pulses induce poration of plant, animal and microbial cells, leading to cell disintegration, microbial inactivation and extend the food shelf-life. High Pressure Processing (HPP) is a cold pasteurization technique by which products, already sealed in its final package, are introduced into a vessel and subjected to a high level of isostatic pressure (300–600MPa/43,500-87,000psi) transmitted by water.

The assignment is attached as Appendix 1 in this word file, please complete the questions and submit it by the end of Aug 20th, 2019. No late submission will be accepted unless a earlier notice.

Resources:

- Give a “playlist” of resources to help students complete the assignment.

Here is some helpful links in YouTube can assist you to answer the questions in the assignment:

Application of High-Pressure Processing (HPP) in seafood:

<https://www.youtube.com/watch?v=GZL6jQjWu-M>

Advantage of using Pulsed Electric Field (PEF) in food processing:

https://www.youtube.com/watch?v=2z0uLS8oQ_I

Questions?

Give a way for students to get help.

If you have any questions, please email me at xi.feng@sjsu.edu, visit me during office hours, or schedule an appointment to meet with me. I usually respond to email within 24 hours.

Appendix 1

NuFS 101A – Lecture Discussion

Aug 16th, 2019

1. The effect of non-thermal processing methods (PEF-pulsed electric field, and HP-high pressure processing) on the stability of ascorbic acid in blueberry juice was determined. The control treatment did not receive any additional processing. The juices were stored for up to 56 days at 4 °C. (Barba et al. 2012. Innov. Food Sci. Emerg. Technol. 14: 18-24).

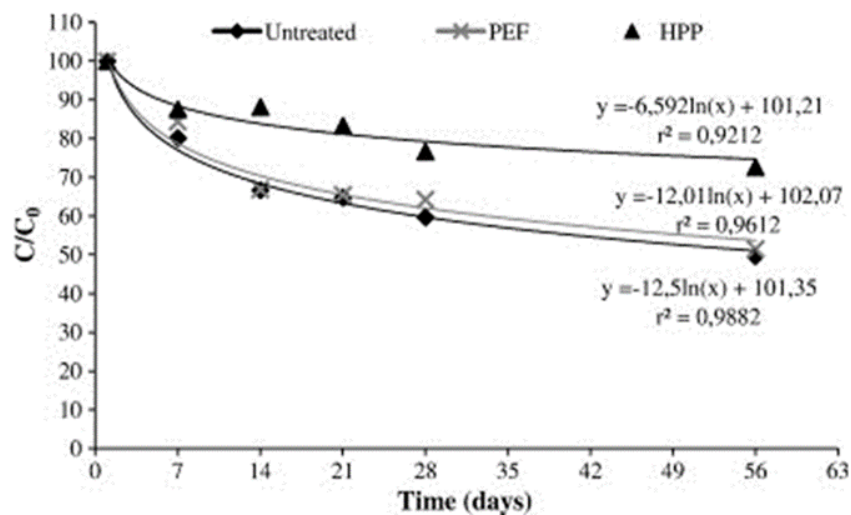


Fig. 1 Ascorbic acid remaining concentration in untreated, HP and PEF treated samples stored in refrigeration at 4 °C.

- A. Discuss the effects of storage and the treatments on the stability of ascorbic acid in the juices. Propose a possible mechanism to explain the effect of the treatments on the stability of ascorbic acid.
- B. If blueberry juice was thermally processed, predict how the retention of ascorbic acid would compare to the treatments in this study (greater retention or less retention). Discuss why.

Flipped IN-CLASS Lesson Plan

Topic or concept:

Vitamins and Minerals

Basic objectives for preparatory work:

LO 1: List the fat-soluble and water-soluble vitamins and identify examples of how solubility affects the application in processed food.

LO 2: Describe the function and food sources of vitamins and minerals.

LO 3: Compare the stability of vitamin and minerals under food processing conditions (e.g: thermal processing, high-pressure, irradiation, etc.).

Advanced objectives for classwork & after class work:

LO 1: Describe the role of common vitamins and minerals in normal physiology and disease.

LO 2: Review the beneficial effects of vitamin and mineral supplements in processed food and evaluate the stability of vitamins and minerals during processing (e.g: thermal processing, high-pressure, irradiation, etc.).

LO 3: Identify the potential toxic effects of vitamin and mineral supplements.

	Time planned	Activity and rationale	Resources needed
Beginning of class period	5 mins	Recap the important concept of preparatory activity assignment. After completing this activity, I can make sure each student is in the same page, so we can move forward to the next stage and have some deep discussion based on pre-class learning.	<ul style="list-style-type: none"> - Course Textbook (Fennena's Food Chemistry, 5th Ed) - Students' assignment from their reading. - Materials to write with (e.g., pen/pencil, paper, laptop)
Middle of period	20 mins	Instructor leads explain the most confusing concept in fat-soluble vitamins. Identify the role of fat-soluble vitamins, review the beneficial effects of vitamins in processed food and evaluate the stability during processing (e.g: thermal processing, high-pressure,	<ul style="list-style-type: none"> - Materials to write with (e.g.: pen/ pencil, paper, laptop)

		irradiation, etc.), and identify the potential toxic effects of vitamin supplements.	
Middle of period	20 mins	Instructor leads explain the most confusing concept in water-soluble vitamins. Identify the role of fat-soluble vitamins, review the beneficial effects of vitamins in processed food and evaluate the stability during processing (e.g: thermal processing, high-pressure, irradiation, etc.), and identify the potential toxic effects of vitamin supplements.	- Materials to write with (e.g.: pen/ pencil, paper, laptop)
Middle of period	10 mins	Individual quiz by iclickers. Students will use clicker or mobile devices to answer multiple-choice questions in order to describe the food source, bioactivity and stability of vitamins.	- Clickers or mobile devices with iclicker app. - Course Textbook (Fennena's Food Chemistry, 5th Ed) - Students' notes.
middle of period	10 mins	Instructor leads explain the most confusing concept in minerals. Identify the role of minerals, review the beneficial effects of minerals in processed food and evaluate the stability during processing (e.g: thermal processing, high-pressure, irradiation, etc.), and identify the potential toxic effects of mineral supplements.	- Materials to write with (e.g.: pen/ pencil, paper, laptop)
End of period	10 mins	Summarize the most confusing concepts in this chapter. Students solidify understanding in preparation for doing advanced work at home.	- Materials to write with (e.g.: pen/ pencil, paper, laptop)

Flipped BEFORE CLASS Work Plan Template

Basic learning objectives	Activity and rationale	Instructions to students
<p>LO 1: List the fat-soluble and water-soluble vitamins and identify examples of how solubility affects the application in processed food.</p> <p>LO 2: Describe the function and food sources of vitamins and minerals.</p> <p>LO 3: Compare the stability of vitamin and minerals under food processing conditions (e.g: thermal processing, high-pressure, irradiation, etc.).</p>	<p>Students will keep track of food source, bioactivity, and stability of vitamins and minerals during processing. After reading, they have to complete the fill-in blank assignment. This assignment could give the first impression what we will learn in this chapters and leave room for me to go deep of some complex concepts (e.g.: bioactivity of vitamin D)</p>	<p>Read the Chapter 10 Vitamin and Chapter 11 Minerals in Fennena’s Food Chemistry (5th Edition). As you are reading, keep track of food source, bioactivity, and stability during food processing of each vitamin and mineral.</p>

Flipped AFTER CLASS Work Plan Template

Advanced learning objective	Activity and rationale	Instructions to students
<p>LO 1: Describe the role of common vitamins and minerals in normal physiology and disease.☒</p> <p>LO 2: Review the beneficial effects of vitamin and mineral supplements in processed food and evaluate the stability of vitamins and minerals during processing (e.g: thermal processing, high-pressure, irradiation, etc.).</p> <p>LO 3: Identify the potential toxic effects of vitamin and mineral supplements.</p>	<p>Students have identified and practiced applying various concepts in a real food system. Now they will compare the two different processing technologies, PEF and HPP, in order to understand the mechanisms of ascorbic acid degradation under different processing conditions. This will include comparing PEF and HPP based on their principles. Once students understand the principles of two processing technologies, they will propose a possible mechanism to explain the effect of the treatments on the stability of ascorbic acid. Further, students will predict what the retention of ascorbic acid is under thermal-processing (greater retention or less retention?)</p>	<p>Vitamin C, ascorbic acid, is not stable when it exposures to air, heat, light or free radicals. Pulsed electric field, and high-pressure processing are the two common food processing units. Pulsed electric field (PEF) processing is an efficient non-thermal food processing technique using short, high voltage pulses. These pulses induce poration of plant, animal and microbial cells, leading to cell disintegration, microbial inactivation and extend the food shelf-life. High Pressure Processing (HPP) is a cold pasteurization technique by which products, already sealed in its final package, are introduced into a vessel and subjected to a high level of isostatic pressure (300–600MPa/43,500-87,000psi) transmitted by water.</p>

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