**Lesson plan**

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| **Lesson Title**  | Complementary proteins |
| **Instructor** | Stange |
| **Suggested grade level/course** | Culinary Arts II (2nd year culinary course) High School |
| **Time suggested** | 40 minute class period |
| **National Standards addressed:*** State the entire standard, not just the number

**Objectives:*** State the informational and the instructional objective.
* What will students know and be able to do at the end of the lesson?
 | Demonstrate ability to acquire, handle, and use foods to meet nutrition and wellness needs of individuals and families across the life span.Apply various dietary guidelines in planning to meet nutrition and wellness needs. Design strategies that meet the health and nutrition requirements of individuals and families.The student will define amino acids.The student will differentiate between complete and incomplete proteins.The student will give examples of legumes and whole grains.The student will identify and describe complementary proteins.The student will revise and prepare daily menu plans to include plant sources that provide complete protein combinations. |
| **Strategy and Rationale for the lesson:*** Why are you choosing this activity/strategies?
* How will this strategy help your students be successful with your objectives?
 | Prior to this lesson, students will have been introduced to the types of vegetarians and the reasons people become vegetarians. Today’s lesson will deal with the essential nutrients that vegetarians need to be aware of when planning their diet. In particular -- protein is essential to life. Most people eat more protein than they need without harmful effects. Because some vegetarians avoid eating all (or most) animal foods, they must rely on plant-based sources of protein to meet their protein needs. Proteins are made from building blocks called amino acids. The human body can synthesize all of the amino acids necessary to build proteins except for the nine or ten called the "essential amino acids.” Children and pregnant mom’s need an additional 2 – 3. An adequate diet must contain these essential amino acids. Typically, they are supplied by meat and dairy products, but if those are not consumed, some care must be applied to ensuring an adequate supply. They can be supplied by a combination of cereal grains (wheat, corn, rice, etc.) and legumes (beans,peanuts, etc.). With some planning, a vegetarian diet can easily meet the recommended protein needs of adults and children.Teenagers are the fastest growing segment of our population trying vegetarian dietary patterns. Although there are many different types of vegetarians, it is important not to assume all vegetarian eating patterns support health. Professionals should be aware of is the use of vegetarian eating patterns as a method to restrict food consumption. There is no evidence to show that vegetarianism leads to disordered eating but it is possible that teens with eating disorders or *disordered eating* may be using vegetarianism to disguise their eating patterns. |
| **Concepts/ideas covered*** List/outline the major concepts/ideas of the lesson. What are the BIG IDEAS?
* Be sure to include CTE, academic, and 21st century knowledge and skills
 | **Proteins --** a substance found in foods (such as meat, milk, eggs, and beans) that is an important part of the human diet. The name protein name comes from the Greek word *protos,* which means “first.” Your body uses proteins in your diet to build new cells, maintain tissues, and synthesize new proteins that make it possible for you to perform basic bodily functions.**Amino Acids**-- When proteins are digested or broken down, amino acids are left. The human body needs a number of amino acids to:* Break down food
* Grow
* Repair body tissue
* Perform many other body functions

**Essential amino acids** cannot be made by the body. As a result, they must come from food.**Complete protein** is a source of [protein](http://en.wikipedia.org/wiki/Protein) that contains an adequate proportion of all nine (this number is often in dispute in scientific circles, depending on the individual you are speaking about—adults are different than children in their need for these [essential amino acids](http://en.wikipedia.org/wiki/Essential_amino_acid)). All animal products contain complete proteins. Some incomplete protein sources may contain all essential amino acids, but a complete protein contains them in correct proportions for supporting biological functions in the human body.**Incomplete proteins-** Plant foods are considered **incomplete proteins** because they are low or lacking in one or more of the amino acids we need to build cells**Complementary proteins-** By combining foods from two or more incomplete proteins, a complete protein can be created. The amino acids that may be missing from one type of food can be compensated by adding a protein that contains that missing amino acid. The typical combination of legumes and whole grains will provide this combination.**Legumes--** herbs, shrubs, and trees having fruits that bear nodules on the roots that contain nitrogen-fixing bacteria (such as peas, beans, or clovers) Typically these plant seeds grown in long cases (called pods)**Grains—**seeds, with or without their hulls and fruits**Whole grains** 100% of the original kernel – all of the bran, germ, and endosperm – must be present to qualify as a whole grain (it can be processed, but the product must contain all of the grain parts)**The attached handout link covers the other essential nutrients that vegetarians need to be aware of as they plan their presentations and menu plan later in the unit.****Communication, collaboration, problem solving** |
| **Assessment:*** How will you know students can do the above?
 | Ticket out the door (formative assessment)- Students give an example of combinations of these items that make a complete protein for their ticket out the door and what they are called (complementary proteins).Summative assessment – (future) Students will plan a daily menu for a vegan that will provide complete protein in the menu plan. They will then prepare a meal from that daily plan after researching the other nutrients that need special attention in the diet. |
| Materials needed: | Individual white boards (one per group) or iPad Handout -- <http://www.cdph.ca.gov/HealthInfo/healthyliving/childfamily/Documents/MO-NUPA-10VegetarianTeen.pdf>Blank paper folded into 10 sections, one for each studentScissors, for cutting apart sections (optional)White board and markers or projector for instructor to post symbols and for mind map reviewEdamame, soy milk, small glasses for tastingChocolate chips cookies made from tofu – premade for tasting (see attached recipe) |
| **Procedure/activities:**1. **The instructor will start the day a review of the types of vegetarians as students eat cookies that have been prepared using tofu (students won’t know until later in the lesson what they contained.) Students will share on the board by adding to a mind map that has VEGETARIANS in the middle.**

**To include: types – what they eat; reasons** 1. **Think/pair/share - What nutrients do we get from food? (use white boards or ipad apps)**
2. **Table groups - Write sources of these nutrients on their lists.**
3. **Whole class: Share out a couple of groups and ask if there are any of these nutrients that one or more of the vegetarian groups may have trouble getting and why. (Students should come up with protein if they identified the source as animal products and vegans would have the problem.)**
4. **Whole group: Ask what a protein is ---- combination of amino acids**
5. **See attached powerpoint----Mini lecture on essential amino acids, complete and incomplete proteins and sources**
6. **ACTIVITY: put 10 symbols on the board and have students divide a plain sheet of paper into 10 even sections. Instruct them to put one symbol in each section. They can put any of the 10 symbols on the paper in any order. The only rule is that they cannot use all ten. They can use only 1 if they want (or 2 or 5 or 8—their choice) but all sections must have a symbol in it. Once they have their symbols drawn, they are to cut the sections apart.**

**Students must now go around the class and trade symbols so that they have a full set of all 10 symbols. They cannot erase or ‘steal’ the symbols or create new ones, but must use the sections that the class has completed.** **Give them time to make as many “complete” sets as possible. After a period of time, have them sit back in their seats with their new “sets.” Ask how many are full sets. Ask how difficult it was to have a complete set of symbols. Ask students to share with their partners how this might relate to our discussion of complete and incomplete proteins. (the symbols were representing the essential amino acids, no one had “eaten” a complete protein, and the class ‘ate’ randomly without thinking about getting all they needed, so in the class we were “hit or miss” whether we each got a complete protein for this meal. Why is it important for teens, especially to get the required amount of protein daily? How can a non-vegan vegetarian get this complete protein?****These “foods” that when combined, provide all the essential amino acids are called COMPLEMENTARY PROTEINS – they “complement” each other by providing what the other is missing in specific amino acids. Whole grains and legume combinations are best as doing this. (What amino acids whole grains are missing, legumes have.) Then ask for some “common” combinations that do this. (think “ethnic” -- rice and beans, hummus and whole grain pitas --- yes, a peanut butter sandwich, if it is on whole grain bread!)****Share the chart (across the top are four essential amino acids) on the board:**06_15**From:** [**http://www.google.com/url?sa=t&rct=j&q=&esrc=s&frm=1&source=web&cd=8&ved=0CFEQFjAH&url=http%3A%2F%2Fwww.faculty.umassd.edu%2Fxtras%2Fcatls%2Fresources%2Fbinarydoc%2F3299.ppt&ei=lUZdUpmwO\_DyyAHO\_4CwDw&usg=AFQjCNEjSYyFJlo4yg3QZgM4wGUUYW9iJw**](http://www.google.com/url?sa=t&rct=j&q=&esrc=s&frm=1&source=web&cd=8&ved=0CFEQFjAH&url=http%3A%2F%2Fwww.faculty.umassd.edu%2Fxtras%2Fcatls%2Fresources%2Fbinarydoc%2F3299.ppt&ei=lUZdUpmwO_DyyAHO_4CwDw&usg=AFQjCNEjSYyFJlo4yg3QZgM4wGUUYW9iJw)**Ask if students know what a legume is. Is soy a legume?** **TASTE TEST: How do we eat soybeans? (tofu, soymilk, edamame) ---have samples of soymilk and edamame for students to try. Show them a refrigerated box of tofu, opened. As how they might eat this product and then share that the cookies they ate when they came in were made with tofu in place of the fat. Share that it is a tasteless product that needs some spices added for flavor and that they will be making some items later in the unit with it.****Ask groups to come up with a statement regarding how a vegan can be sure to get a complete set of amino acids. Share out. (They need to think about what they are eating in order to get all they need – just eating salads and fruits won’t get them what they need. Recent studies have shown that the combinations don’t necessarily need to be in the same meal, as our combinations suggest, but they do need to be in the same day to get the benefits.)****Vegetarians need to be aware of the foods they eliminate and the nutrients they provide in order to have adequate quantities of these nutrients for optimal health. Tomorrow, each group will study a specific nutritional concern for vegetarian teens and develop a presentation for the class. Assignment is to read the specific section of the handout found at** [**http://www.cdph.ca.gov/HealthInfo/healthyliving/childfamily/Documents/MO-NUPA-10VegetarianTeen.pdf**](http://www.cdph.ca.gov/HealthInfo/healthyliving/childfamily/Documents/MO-NUPA-10VegetarianTeen.pdf)**That is assigned to their group. (Calcium, Iron, Zinc, vitamin B12, vitamin C and D)** **Have students to give an example of combinations of these items that make a complete protein for their ticket out the door and what they are called (complementary proteins).**  |
| References and resources | <http://www.dummies.com/how-to/content/why-you-need-protein-in-your-diet.html>Difference between whole wheat and whole grains: <http://wholegrainscouncil.org/whole-grains-101/definition-of-whole-grains> |

Include attachments of any handouts, assessments, and/or powerpoints, etc.

### Tofu chocolate chip cookies

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| 1 1/2 cups all- purpose flour (or sub ¾ whole wheat flour)1/2 teaspoon baking soda1/2 teaspoon ground cinnamon1/2 teaspoon salt8 tablespoons (1 stick) margarine, cut into chunks2/3 cup packed dark brown sugar1/3 cup granulated sugar6.15 ounces silken firm Tofu(i. e., half a 12.3 ounce package), cut into chunks2 teaspoons vanilla extract12 ounces semisweet chocolate chips |
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| Directions: | 1. Position the rack in the middle of the oven; preheat the oven to 375°F. Whisk the flour, baking soda, cinnamon, and salt in a medium bowl; set aside.2. Place the margarine chunks and both kinds of sugar in a large bowl and beat with an electric mixer at medium speed until fluffy and light, about 3 min. Scrape down the sides of the bowl with a rubber spatula, then beat in the tofu and vanilla until smooth, about 1 min.3. Remove the beaters, scrape any excess batter back into the dough, and stir in the flour mixture with a wooden spoon, just until moistened. Stir in the choc. chips. Drop the batter by 1 T increments onto a large baking sheet, spacing the mounds about 1 in apart.4. Bake for 7 min, then flatten the puffed cookies with the back of a wooden spoon or a metal spatula, just until they crack slightly at the sides. Continue baking until the cookies are browned at the edges and firm to the touch, about 7 more min. Cool the cookies on the baking sheet for 2 min, then transfer to a wire rack to continue cooling. Cool the baking sheet at room temperature for 5 min before making another batch, or use a second sheet that hasn’t been in the oven. To store, cool the cookies completely, about 2 hrs, then seal in plastic bags or a lidded container at room temperature for up to 4 days, or in the freezer for up to 3 months. Serves 20 (2 cookies each) |
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| Personal Notes: From: Bruce Weinstein & Mark Scarbrough |

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