

Question 1:

Examine the ingredient list for [Yves Jumbo Veggie Dogs](#). Vegetable protein and a vegetable gum are included to help give the product its structure. Identify these ingredients and discuss their functionality with respect to product structure. (8 marks)

Every product needs a combination of starches, flours and gums to aid in holding a product together. In non-veggie hot dogs, meats contain proteins that are activated as a result to grinding the meat, this is called exudate, which holds the meat together. However these proteins are not present when constructing a vegetarian hot dog. To combat this, vegetable gums are added to vegetable based meat substitutes, not to act as a fat replacer, but to thicken the ingredients by being able to combine with water and create gel(K. Montgomery). These gums then bind to the vegetable proteins that are present in meat substitute products such as veggie dogs. Vegetable proteins are defatted flour products, typically made from wheat or soy, which is often times used as a meat substitute. Soy protein is a a protein that comes from soybeans and is often used to replace animal proteins in an individual's diet (K. Montgomery). Another common protein substitute in meat free products is wheat gluten, which is that main protein component present in wheat. The function of these two proteins is to be used as a meat substitute, and to provide structure in meat free products such as veggie dogs. Two common gums used in vegetarian foods is carrageenan gum, and wheat starch. Both of these gums main functions is to hold vegetable proteins together in meat free products in order to give products their structure. An example of these two products working together is veggie dogs, as without the protein, the

veggie dog would be mushy, and without the gums holding the proteins, the veggie dogs would have a texture of being chunky and lumpy.

Montgomery, K. 2003. "Soy Protein" retrieved on February, 9 2018. From:

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1595159/>

Question 2:

Regular product:

sugar, enriched wheat flour, palm oil, cocoa, high fructose corn syrup, baking soda, cornstarch, salt, soy lecithin (emulsifier), artificial flavour, chocolate

Reduced calorie product:

maltitol, enriched wheat flour, palm oil, polydextrose, cocoa, cornstarch, glycerin, milk protein concentrate, inulin, whey protein concentrate, soy lecithin (emulsifier), baking soda, salt, dextrose, artificial flavour, cellulose gum, chocolate, cream, acesulfame-K, sucralose

The lower calorie version has a modified formulation which attempts to mimic flavour characteristics and creamy mouthfeel associated with the regular formulation. Identify 2 ingredients responsible for imparting flavour and 2 ingredients responsible for imparting mouthfeel in the reduced calorie product. Discuss their roles in the reduced calorie formulation in comparison with ingredients performing the same function in the regular formulation. (12 marks)

In these two versions of the creme in between two cocoa wafers, the low calorie version of the filling contains a sugar substitute called maltitol. Maltitol is a sugar alcohol and is a common

substitute, however, it imparts the flavour of the creme, as it only contains 90% of the sweetness contained by sugar, however, this lack of sweetness causes appeal to this substitute, as it only contains approximately half of the calories that sugar has. Another sugar substitute that is used to stimulate sweetness is acesulfame-K. Acesulfame-K is used to reduce calorie count in a product while simultaneously increasing the sweetness of the product. This is responsible for imparting the flavour as it is trying to make up for the absence of sugar in the creme by increasing the sweetness, as well as being calorie-free. An ingredient in the reduced calorie version of the creme filling that affects mouthfeel is polydextrose. Polydextrose is also a sugar substitute, much in the same way that maltitol and acesulfame-K is used as a substitute, however, along with sweetening the creme, Polydextrose is able to help maintain the same mouthfeel that is often times lost with lower calorie versions of food. Polydextrose is able to maintain the same mouthfeel because it is identified as a soluble fiber, therefore it gives the foods it is used in a texture similar to that of which sugar would give (M. Anthony). Polydextrose is used in the reduced-calorie version of the creme because it also has lower calories than the sugar used in the regular version of the creme. A final ingredient in the reduced calorie product that imparts mouthfeel is cellulose gum. The cellulose gum is used to help keep the creme held together. This imparts the mouthfeel compared to the regular version of the product because, the cellulose gum replaces the binding corn syrup with a lower calorie binding agent.

Anthony, M. 2012. "Understanding Polydextrose and How It Works" Retrieved on February 9, 2018. From: <https://www.foodprocessing.com/articles/2012/understanding-polydextrose/>

Int'l Food Information Council Foundation. 1998 "Everything You Need To Know About Acesulfame Potassium" Retrieved on February 9, 2018. From

<https://www.nutritionexpress.com/article+index/vitamins+supplements+a-z/showarticle.aspx?id=>

[120](#)

Simpson, J. 2017. “Negative Side Effects of Maltitol” Retrieved on February 9, 2018. From

<https://www.livestrong.com/article/250589-negative-side-effects-of-maltitol/>

Question 3:

Kefir is a milk product touted to have health benefits. Explain why kefir may be slightly alcoholic, carbonated, and have a sour flavour. What microorganisms are used to produce kefir?

(5 marks).

Kefir has been gaining traction in the health community recently due to supposed health benefits, however, Kefir has also been seen to be considered alcoholic, carbonated, and have a sour flavour. Kefir is a milk product that is traditionally fermented with the use of “kefir grains”.

The grains are curds that start a culture in each batch of kefir. The reason that this drink is considered alcoholic, carbonated, and be sour, is because of the fermentation of the sugar lactose that is present in milk. This alcoholic feature is similar to the way that fermentation happens in the production of beer, yeast metabolizes the sugars in the milk, which then produces alcohol.

The carbonation also comes from the yeast as it incorporates carbon dioxide into the drink, and the sour taste comes from the milk being stored at room temperature, without refrigeration, and becomes slightly “spoiled”. The microorganisms that are used in Kefir are *Bifidobacterium bifidum*, *Lactobacillus delbrueckii* subsp. *Bulgaricus*, *Lactobacillus acidophilus*, *Lactobacillus helveticus*, *Lactobacillus kefirianofaciens*, *Lactococcus lactis*, *Streptococcus thermophilus* and *Leuconostoc* species (Prado *et al.* 2015). These microorganisms all culture and assist in the production of kefir.

Prado, M. R., Blandon, L. M., Vandenberghe. L. P. S., Rodrigues. C., Castro, G. R., Thomaz-Soccol, V., Soccol, C. R., 2015. "Milk kefir: composition, microbial cultures, biological activities, and related products" |Retrieved on February 9. 2018, From: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4626640/>

Question 4:

According to regulations, maple syrup must have a sugar content of 66% by weight (66 degrees Brix). Calculate the mass of maple sap required to make 500 kg of syrup. How much water must be removed by evaporation to make 500 kg of syrup? Assume that the sugar content of the sap is 3%. (5 marks)

500 kg of the syrup has 330 kg of sugar (0.66 x 500)

$0.03 \times X = 330 \text{ kg}$

$X = 330/0.03 = 11000\text{kg}$, total weight of the sap.

Therefore, from this 11000 kg, 97% of it is water, this means that 10670 KG of water has been removed.

Question 5:

A bowl of potato salad was left on the picnic table for 3 hours on a hot summer day. The microbial load was 300 CFU/g when the salad was put on the table. Would the salad be spoiled after the 3 hour period? (Base your assessment on 1,000,000,000 CFU/g as the threshold for spoilage.) Assume a generation time of 20 minutes under ideal growing conditions, with no deaths, immigration or emigration. (5 marks)

$$x = 300(2^{(180\text{min}/20\text{min})}) \text{ CFU/g}$$

$$x = 300(2^9) \text{ CFU/g}$$

$$x = 153600 \text{ CFU/g} < 1,000,000,000 \text{ CFU/g}$$

These results indicate that that potato salad does not spoil when it was left out on the table for 3 hours.

Question 6:

Strawberries are quick frozen at a rate of 6500 kg/h. The fruit enters the freezer at a temperature of 15°C and is frozen to a final temperature of -20°C. Calculate the rate of heat removal per hour. (5 marks).

$$35 \text{ }^\circ\text{C} \times 3.98 \text{ KJ/kg }^\circ\text{C} = 139.3 \text{ KJ/kg}$$

$$139.3 \text{ KJ/kg} \times 6500 \text{ kg/h} = 9.05 \times 10^5 \text{ KJ/h}$$

Therefore, the rate of heat removal per hour of the strawberries is 9.05×10^6 KJ/h