



LEVEL 4

SEMESTER 2

MODULE CODE: SHSS4068

MODULE TITLE: THE SCIENCE OF NUTRITION

ASSESSMENT TYPE: ESSAY

ASSESSMENT/COMPONENT: 1

COMPONENT WEIGHTING: 100 %

WORD COUNT: 3000

MODULE TUTOR: David Gardner

SUBMISSION DETAILS: by 3.00 pm through turnitin

- Complete all 3 essays to be submitted through Turnitin UK via moodle.
- Each essay to be no more than 1000 words, excluding figures, tables and references.

By 28th February 2020

Describe the hormonal and enzyme regulation of the digestion process.

or

Describe the digestive process with particular reference to gut flora and bioavailability.

By 27th March 2020

Describe the mechanisms of cell signalling.

or

Describe the processes of gene expression.

By 1st May 2020

Describe the roles and importance of vitamins or minerals during energy catabolism.

or

With reference to a specific vitamin or mineral discuss the implications of deficiency and toxicity.

Assessment Criteria

Details relating to the specific requirements levels grading for the essays are provided in the generic level descriptor provided on moodle.

Specific details and an example session will be provided during lectures.

School of Sport, Health & Outdoor Education

Assessment Feedback Sheet

Student No./Name: Brandon Evans 1903511

Module Code: SHSS4068

Module: The Science of Nutrition

Personal Evaluation – to support your academic progress please complete the section below BEFORE submitting your work.									
What do you consider to be the best aspects of this work?	Gathering of varied information to conclude								
Which aspects do you consider could have been improved in this piece of work?	Amount of research								
What have you found most satisfying whilst undertaking this submission?	Learning about the impacts of health on digestion								
ASSESSMENT CRITERIA	Learning	GRADE							
		Poor 0-25%	Unsatisfactory 26-39%	Satisfactory 40 – 49%	Good 50 – 59%	Very Good 60 – 69%	Excellent 70 – 85%	Exceptional 86– 100%	%
Theoretical explanation	1								70%
Use and appropriateness of references	2								20%
Structure and flow of answer	1								10%
It is expected that students will present work that is proof read, correctly referenced and adheres to the Assessment Checklist . Therefore a range of 0 – 10 marks will be deducted for non-completion of any of the points on the checklist below .									
TUTOR COMMENTS:									
Submission date: via Turnitin		Return date: (at least within 4 weeks)		Tutor:			Mark:		

A study on the effects of digestion on the bioavailability of nutrients

This essay will investigate the impact that the digestive process has on the bioavailability of nutrients from food. Bioavailability, which the commonly accepted definition for is known as the proportion of the nutrient that is digested, absorbed and metabolized through normal pathways has been a well-researched topic and still continues to have new evidence brought forward. Simply put it is said that the nutritional value of food is not necessarily the values that we absorb into our body for functional use, due to this it is simply not enough to know the nutrient content of food but also there is a need to know how internal and external factors affect this.

Before even looking at how digestion affects the bioavailability of food it should be known that the external and genetical factors affect bioavailability before consumption has even taken place, this includes age, sex, life stage (pregnancy) and process of heating food.

Macronutrients have a high bioavailability of about 90% whereas micronutrients i.e minerals and vitamins have a wide variability to the extent in which they are absorbed after ingestion. Due to this there is currently a lot of research looking into the affects of these variables due to the fact the health of a person is greatly affected by vitamin and mineral intake and thus explains why the RDA (recommended daily allowance) of these varies from country to country due to the fact that habitual diet and host related factors greatly affect the outcomes when looking at research.

There are several phases of the digestive process in which the bioavailability of nutrients can change, they are as follows:

- release of the nutrient from the physicochemical dietary matrix - The **food matrix** is described as an assembly where complex physical and **chemical** interaction of nutrients and non-nutrients take place.
- effects of digestive enzymes in the intestine – proteins that help to breakdown larger food molecules
- binding and uptake by the intestinal mucosa –“ Intestinal mucosa contains a mixture of glycosidases (also disaccharidases) and in many cases a substrate is hydrolysed by several enzymes”(Thomas 2008)

- transfer across the gut wall (passing through the cells, in-between them or both) to the blood or lymphatic circulation
- systemic distribution
- systemic deposition, stores
- metabolic and functional use
- excretion via urine or faeces

Through these processes it can be expected that quite a lot of nutritional value could potentially be lost, though potentially measurable there is quite a wide array of inaccuracies that could occur during tests so it is not a factual statement to make within this essay, though it is safe to assume that the nutritional values on food labelling would not be the values absorbed and used by the body. There is however research on the factors that affect the effectiveness of absorption during the digestive process and also factors that affect digestion itself as this will also impact nutrient breakdown and therefore bioavailability of nutrients, one of which being how chewing actually increases absorption due to its part in breaking down molecules stating that “We found that approximately 40% of the AUC achieved by loratadine chewing gum was due to loratadine absorbed via the oral mucosa.” (NOEHR-JENSEN, L et al, 2006.) which meant that when compared to other oral administrations that the process of chewing was vital in ensuring more of the medication was absorbed. Another factor that will affect digestibility is also the processing of food, one such study by Opstvedt (1974) has reported that oxidation during storage of unstabilized fish meat can reduce its digestible energy value by up to 20%, where as another study looking at the breakdown of certain food types, mainly cereals, such as Fritz (1935) who had found that grinding maize increased the digestibility of the organic matter and another study by Jones (1940) suggested that the mechanical rupture of starch granules is a method of increasing the nutrient values of cereal. Another factor that could potentially have the biggest impact on digestion and thereby bioavailability is gut flora or bacterium, it is found that an unbalanced environment within the gut of unhealthy bacteria due to things including but not limited to overuse of antibiotics, unhealthy diet, bad hygiene or method of birth, which can potentially have a very bad impact on health such as Crohn's disease and various other bowel and digestive related diseases. This therefore would lead to the assumption that maintaining a healthy gut environment is potentially a very effective way of

maintaining as much nutritional value from the food we consume, one of which ways this can be done is shown in research on probiotics in which one study states “increased levels of probiotics may induce a ‘barrier’ influence against common pathogens.”(L fooks,2002)

By taking a overall look at all the research into the external and intrinsic factors that could potentially affect the bioavailability of nutrients the biggest take away that can be applied would be to maintain health, this is because it is so clear that if the body is not in a healthy state that it can become detrimental to the absorption of nutrients, regardless of values of food or the quantity consumed, if the body is unable to breakdown and process the vital parts that are needed from food then it can become an endless cycle of declining health and therefore a declining ability to maintain the bioavailability of nutrients and minerals.

Whether it be from using better methods of cooking ,using probiotics to improve healthy gut flora or even using higher quality food, it would seem that every aspect involved in digestion and therefore maintaining overall health, plays a vital part in maintaining bioavailability of nutrients.

Word count :947

Reference list

- Fardet, A. (2014). Food Health Potential is Primarily Due to Its Matrix Structure, then Nutrient Composition: A New Paradigm for Food Classification according to Technological Processes Applied. *Journal of Nutritional Health & Food Engineering*, 1(5).
- Fritz, J. C. (1935). *Poult. Sci.* 14 267.
- Jones, C. R. (1940). *Cereal Chem.* 17, 133
- Fooks, L. and Gibson, G. (2002). Probiotics as modulators of the gut flora. *British Journal of Nutrition*, 88(S1), pp.s39-s49.
- mcnab, j. (2020). *Factors affecting the digestibility of nutrients*. [online] Cambridge.org. Available at: <https://www.cambridge.org/core/services/aop-cambridge-core/content/view/S0029665175000067> [Accessed 27 Feb. 2020].
- NOEHR-JENSEN, L., DAMKIER, P., BIDSTRUP, T.B., PEDERSEN, R.S., NIELSEN, F. and BROSEN, K., 2006. The relative bioavailability of loratadine administered as a chewing gum formulation in healthy volunteers. *European journal of clinical pharmacology*, **62**(6), pp. 437-45.
- Turgeon, S. and Rioux, L. (2011). Food matrix impact on macronutrients nutritional properties. *Food Hydrocolloids*, 25(8), pp.1915-1924.