

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: 1352214/ Amir uddin

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?	The research I had done								
Which aspects do you consider could have been improved in this piece of work?	They way I had explained my research								
What have you found most satisfying whilst undertaking this submission?	The information that I had learned								
ASSESSMENT CRITERIA	Learning Outcome	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:	

Assignment Checklist

- ☐ Please complete the **Personal Evaluation** section of the Assessment Feedback sheet, add your name and details, and paste the whole of this assignment document into the front of your assignment
- ☐ Submission is a **single .pdf file, clearly labelled** with your name and module code
- ☐ Font style - Times New Roman, size -12 for text and 14 for headings
- ☐ Ink colour – black only
- ☐ Line spacing – 1.5 line spacing and 2cm- 2.5cm page margins
- ☐ Quotations more than three lines to be indented 1 line spacing
- ☐ One line space between paragraphs, paragraphs must be left aligned
- ☐ Pagination (your assignment should have **page numbers**)
- ☐ All tables and figures are internally referenced and have a title
- ☐ **Word count** checked and written at end of text (before references and any appendix)
- ☐ Assignment is within 10% of the word limit (excluding references and any appendices)
- ☐ **All** references in the text are included in the reference list
- ☐ **Correct referencing as described in UWTSD Harvard Referencing Handbook on the Library website** <https://www.uwtsd.ac.uk/media/uwtsd-website/content-assets/documents/library-and-learning-resources/infoskills/harvard-eng.PDF>
- ☐ Correct spelling and punctuation, using **UK English**
- ☐ Grammar and syntax correct- double check anything that has a green line under it
- ☐ I have read my assignment out loud to myself and it makes sense and is easy to read
- ☐ Somebody else has read my work and it makes sense to him or her!
- ☐ **I have checked and I have not plagiarised**

**Failure to follow these guidelines will
cost you marks!**

The hormonal and enzymatic regulation of protein digestion

The main role of the digestive system is to break down food eaten through 2 processes mechanical and chemical. These processes involve numerous enzymes and hormones which regulate how efficiently food is broken down. While eating is a part of life and an everyday activity there are functions which take place to breakdown different types of foods consumed. In this essay the main focus is to analyse how hormones and enzymes aid in the digestion of protein. The essay will include the digestive process of protein in order and which hormones and enzymes start to activate while the digestion of protein is taking place.

Food oral processing is the very beginning of food digestion Wang and Chen (2017). Food is broken down by the teeth and tongue, plus the enzymatic actions of saliva, food is broken down into smaller pieces and then transported through the oesophagus into the stomach for further digestion according to Wang and Chen (2017). When the chewed down food reaches the stomach, the hormone gastrin is secreted. Gastrin is a gastrointestinal peptide hormone which plays a central role in regulation of gastric acid secretion stated by Misund et al. (2013). Tucker, (2015, p. 226) explains that gastric acid contains hydrochloric acid and pepsin. Pepsin is formed from the precursor pepsinogen, when pepsinogen reacts with hydrochloric acid, active pepsin is formed Bowen, (2020). Tucker, (2015, p. 226) states that pepsin then hydrolysis protein peptide bonds turning them into polypeptides, now they are partially digested until they are passed into the duodenum of the small intestine as you can see on figure 1. Hormone, (2018) states that somatostatin is a hormone that inhibits gastric secretion and emission of gastrointestinal hormones such as gastrin, this is to balance out hormone levels in the body to stop over production of certain hormones this is done through negative feedback.

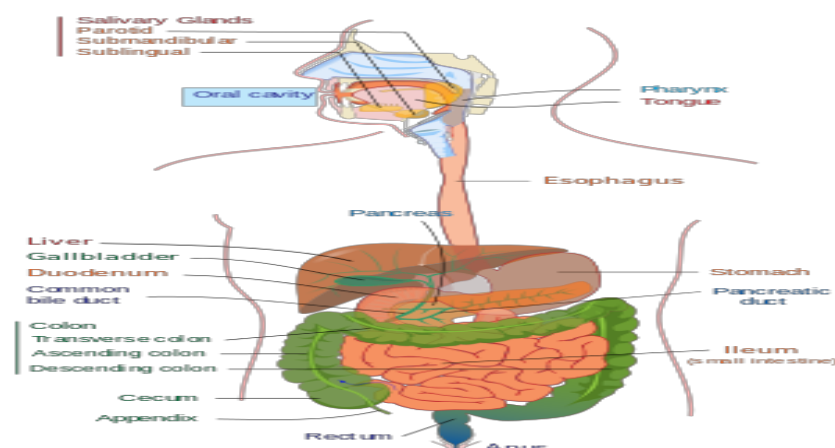


Figure 1

In the duodenum the main function is to digest the polypeptides further, the duodenum also produces a range of digestive enzymes supported by the pancreas Nigam and Knight, (2017). The hormone Secretin is released in the duodenum when the acidic protein (chyme) arrives from the stomach. Afroze et al, (2013) states the role of secretin is to neutralise the acidic level of the chyme, it does this by signalling to the pancreas to release alkaline bicarbonate solution to the duodenum, solution then neutralises the chyme ready for digestion. The hormone cholecystokinin controls the release of the enzymes from the pancreas e.g. the pancreatic enzymes, this was stated by Rehfeld, (2004). There are 3 enzymes that are released:

- Trypsinogen
- Chymotrypsinogen
- Procarboxypeptidase

Reseland et al, (1996) states that these 3 enzymes are released in the pancreatic juice to aid in the digestion of the protein polypeptides. These 3 enzymes are inactive, firstly trypsin is activated by an enzyme in the small intestine called enterokinase, this enzyme converts trypsinogen into its active form trypsin which then starts to hydrolyse the peptide bonds present further breaking them down into smaller chains stated by Mann and Mann, (1994). That's not where trypsin's job ends it has other functions as well as breaking down polypeptide bonds. Firstly, when trypsin formed it can autocatalytically activate more trypsinogen to trypsin stated by Sigma Aldrich, (2020). Trypsin also activates chymotrypsinogen into the active form chymotrypsin, this is done by the cleavage of the N terminal strand on chymotrypsinogen stated by Pritchard et al, (2003, p.96). Chemistry LibreTexts, (2019) states that the enzyme chymotrypsin then starts to hydrolyse the polypeptide bonds thus breaking it down into shorter chains. Trypsin also starts to activate the inactive enzyme procarboxypeptidase, it does this by cleaving at the c terminal of the enzyme creating the active form carboxypeptidase stated by Burgos et al, (1991) all though this article is very dated the activation of the enzyme still remains accurate till this day. The active enzyme carboxypeptidase then starts to hydrolyse the carboxyl end of the polypeptide or peptide chains breaking them down further into shorter chains stated by Rsc.org, (2020). These enzymes then work to break down the polypeptide chains into

smaller polypeptide chains like dipeptide and tripeptide chains. There is then little work left to do in the digestion process. The next step the brush border enzymes come into play, they are situated on the lining of the intestinal wall these enzymes are aminopeptidase and dipeptidase stated by Hooton et al, (2015). The role of these 2 enzymes are to break down the remaining small chain peptides into absorbable single molecule amino acids. This is the last stage in the digestion process before the absorption process starts. The role of dipeptidase is to hydrolyse dipeptides to component amino acids this was proposed by Hooton, (2018, p.56). The role of aminopeptidase is to hydrolyse the release of any n terminal amino acid from di, tri, and oligopeptides stated by Hooton, (2018, p.67). This is the end of the digestion process though there are still remaining peptide chains that haven't been broken down by the enzymes, but are absorbed as they are Hooton, (2018, p.57). The digestion of protein takes place in a normal functioning body, but there are certain limitations that occur because of disorders when enzymes that can't break down certain amino acids. For example, lysinuric protein intolerance this is when the body's inability to digest and use certain amino acids like lysine and arginine, this is because the body cannot effectively break down these amino acids which are found in the many protein rich foods this was stated by Reference, (2020).

Hormones and enzymes play a crucial role in the functioning of the digestive system so we really have to understand how it all works. From the basic understanding that we first chew our food and it reaches our stomach for digestion, then in the duodenum it starts to take vigorous digestion so that it can finally be absorbed for our bodies to make use of this macronutrient. While it's in our mouth we have to understand it goes through a process of digestion, then it reaches our stomach and hormones and enzymes start to take action in digesting the food down. Then it can finally pass into the duodenum and be broken down further by hormones signalling more enzymes to come and break down the nutrients that have entered till finally the digestion process has ended.

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