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AN

INAUGURAL DISSERTATION,

ON

*Assimilative Digestion*

SUBMITTED TO THE

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OF THE

University of Nashville,

FOR THE DEGREE OF

DOCTOR OF MEDICINE.

BY

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Gentlemen of the Faculty

As it is a duty rendered obligatory upon all those who may present themselves as candidates for graduation, in the institution of which you compose the faculty, to offer their views upon some one of the branches pertaining to the science of medicine, I have among the many subjects before me choosed that of Assimilative Digestion.

I am aware of the task which I have taken upon myself in the choice of the above subject, and therefore fear that I will not be able to discuss it fully, as it is no doubt a subject upon which many have written, and many of the most preeminent men

of the profession have delighted to revel.  
And no doubt theory after theory has  
been presented to the world upon this  
subject which has stood for ages as  
the landmarks of the profession, but  
which at the terminus has been suc-  
ceeded by others equally as fanciful  
and unstable in their character. If  
this has been the fate of those who  
have preceded me in the discussion  
of this subject, men distinguished for  
their intellect, what can be expected  
of one who is young in years, and  
possessing but a limited knowledge  
of the subject. In this discussion  
I do not expect to throw a ray of  
additional light upon a subject of  
so much brilliancy to the Physiologist of

the present day. My highest aim is to present the theory of digestion as advanced by them, and to show its perfect adaptation to the laws of the animal economy. Digestion in a degree, has been considered of less importance than either respiration, or circulation, but as the human frame cannot long subsist, without a supply of nourishment and new materials; I can but conceive that digestion is as essential as any function of the animal system, for it is by <sup>this</sup> means that the food is made to undergo certain changes, so as to assimilate itself to the action of the absorbents, so as to be taken up and carried into the circulation, by which process the

whole system is nourished and maintained, while the other portion pass off as effete.

The course which I propose to pursue in the discussion of my subject, will be as follows: in the first place to inquire into the whole process which the food undergoes while passing the alimentary canal. Thus commencing with Mastication deglutition, movements of the stomach, changes the food undergoes while in the stomach, and the fluids which assist in digestion while the food is in the stomach.

The changes the food undergoes while in the duodenum while in the small intestines, and the condition after reaching the colon. Second, giving a brief Anatomical description of each division

of the alimentary canal which extends from the mouth to the anus. The mouth is an irregular cavity containing the tongue the organ of taste. The mouth is bounded in front by the teeth and lips, behind by the soft palate, above by the hard palate, below by the tongue, and on the sides by the buccal muscles. The food being received into this cavity, is masticated by the teeth, lower jaw and masseter muscles, together with the assistance of the tongue, which places the food in such a manner as to be triturated by the teeth. During this process there is a considerable flow of saliva, which softens the substances taken in the mouth and assist in breaking down their texture while

others are entirely dissolved by the saliva, while remaining in the mouth. During mastication the food is mixed with the saliva, and thus being mixed it passes on through the pharynx, into the oesophagus a muscular canal leading to the stomach, a receptaculum pabuli. The pharynx is that portion of the alimentary canal which extends from the basilla process to about the fifth cervical vertebra, the oesophagus extends from the pharynx to the stomach. The food after reaching the pharynx is forced into the stomach by the contraction of the constrictor muscles of the oesophagus. The food before passing into the stomach should be well triturated as it is

so essential to health, and the utmost facility of digestion in the stomach depends in a great degree, upon the mastication of the food in the mouth, especially so if the stomach is in a state of debility. The stomach the organ of so much importance, is a membranous bag placed in the left hypochondriac, and epigastric region; is composed of three coats and has two orifices, the superior called the cardiac, the terminus of the oesophagus, the inferior called the pyloric, the commencement of the duodenum. The stomach secretes the gastric fluid, which is said to ooze from the glands and inner surface of the stomach. Few portions



of the system is better endowed with blood vessels, than the stomach, which is so essential in the performance of so great a function as digestion. The stomach is also numerously supplied with glands, whose office it is to secrete the gastric juice. The fluid secreted by these vessels is considered by some to be analogous to saliva but rather more antiseptic in its nature than the saliva.

The principle character of this fluid is its antiseptic, and solvent power. In consequence of its antiseptic properties many substances may be eaten with perfect impunity, which otherwise would be detrimental to the system.

As for instance in cases where bone is taken into the stomach. Were it

not for the solvent properties of this fluid would not this substance be injurious to the system. According to the writings of Dr. Oliver there are cases reported, where knives have been accidentally swallowed, and their handles were acted upon so as to become entirely dissolved, while the blades have been seen to be acted upon by the gastric juice. In this instance it seems to act by corroding as well as by dissolving bodies taken into the stomach and in the meantime converting them into new substances, which go to supply the system or depress it according to the nature of the substance taken into the stomach. Digestion in its most extensive sense is

nothing more than the changing of the food in the stomach, so as to adapt it for the purpose of nutrition. In the stomach the first change is performed by the combined agency of all the secretions, and muscular movements of the stomach, which fits the nutritious matter for being received into the circulation, and there for assimilation with the blood and becomes a component part of the animal. The masticated food being here subjected to the influence of the gastric juice, and other secretions of the stomach, is converted into a pulstaceous mass called chyme, which then passes into the duodenum, through the pylorus, and

there being subjected to the influence of the bile, and pancreatic fluid, is converted into an other mass called chyle, and other liquid secretions. Digestion is assisted by various other means such as the vermicular motion of the stomach, which motion being constant agitates the pultaceous mass, and forces the dissolved portions downwards; whilst those parts which are unacted upon are repelled from the pyloric orifice, by the antiperistaltic motion. The vermicular motion consist in the alternate contraction, and relaxation of the muscular fibres. This motion is certainly intended to turn over, and mix the alimentary mass

together, and subject each part to the influence of the gastric juice, and in order to be nutritious, it must be easy of digestion, capable of being absorbed into the circulation, there assimilating with the blood. By the combined agency of the above process the masticated food, is as I have afore said, converted into chyme, which passes into the duodenum, and there being mixed with the secretions of the pancreas, and liver is there converted into chyle. The food having now undergone the full action of the stomach, is converted into chyme a thick semifluid substance. The chyme after suffering the full action of the

Stomach is sent into the duodenum, through the pylorus. We now see that digestion is principally performed, by the action of the gastric juice, a fluid which is so antiseptic as to preserve it from all changes, such as rancidity, and putridity. Preserving it from these changes it will answer other purposes preparatory to chylification, in the small intestines. Digestion is supposed to be fully completed in the stomach, but this certainly cannot be so or is an erroneous idea; nevertheless I must admit that the stomach is the main link in the great chain. In the stomach the food is only broken down into the putraceous

mass, which then passes into the duodenum where it is converted into chyle, before it can be adapted to the circulation. The stomach when in a healthy state, will not transmit the food before it is converted into a pulp, while a weak and debilitated stomach will often allow the food to pass undigested, and hence it is important that persons of a weak digestion should confine themselves to light and easily digested food, and to trituate thoroughly, each morsel.

When food is taken into the stomach as is frequently the case this organ becomes greatly distended, producing an uneasy sensation as is often felt immediately after a hearty

meal, it is under these circumstances that the stomach by the combined agency of the abdominal muscles makes an effort to expel its contents, by eructations, for in this case it is impossible for the stomach to turn over its contents and subject them to the influence of the gastric juice. The time required for perfect digestion will vary according to the ingesta, and the time used in masticating the food, or the manner in which it is masticated. It is generally admitted by Physiologists that the chyme passes the pyloric orifice from three to four hours after a meal.

The food is said to be of a different nature in the center of the stomach



to that of the surface, this is readily accounted for by the fact, that the food at the surface is in contact with the organ, which is all the time pouring out the gastric fluid.

When a part of the mass becomes converted into chyme; it passes off into the duodenum, without waiting until the whole is converted into a homogenous mass. The glands being more numerous about the cardiac orifice is the reason why the food is more readily acted ~~acted~~ on at that portion of the stomach, and so soon as it is acted on it then passes along the great curvature of the stomach to the pyloric orifice where the process is completed. This process is

accomplished with a sudden impulse which forces the chyme into the duodenum, and there being subjected to the influence of the bile, pancreatic juice and other liquid secretions, is converted into chyle, which is then taken up by the absorbents, carried to the thoracic duct, thence to the right subclavian vein and then to the right auricle, of the heart where it is carried to the lungs, and giving out its carbon, and receiving its oxygen assumes new properties, which goes to supply the waste, and deficiency of other parts of the system; while the unnutritious part passes off as effete matter, through, ~~through~~ the large intestines. We have now seen

that all substances taken into the stomach are first converted into chyme, before it passes through the pylorus into the duodenum. After passing into the duodenum it there becomes mixed with the bile and other secretions all of which tend to the perfection of chylification.

The duodenum is somewhat larger than the other small intestines and takes its name from the supposition that it is equal in length to the breadth of twelve fingers.

The duodenum is situated between the stomach and jejunum, and has terminating into it the ductus choleductus, and pancreatic duct, the secretions of which assist in

chilification. While considering this function, may I not with propriety notice to some degree the influence of the nervous system in the performance of so great a function as digestion. Digestion in some degree, depends upon the influence of the nervous function or at least upon the indirect agency of the nerves.

In the duodenum we can notice to some extent the influence which the nervous system exerts over digestion. If the par vagum, or pneumogastric nerve, be divided in the neck, we will see that the formation of chyle will be very imperfect or quite suspended. According to anatomists the nerves have the power of

stimulating an organ to action, for in cases where the nervous influence is destroyed, the part becomes in an atrophied condition, as in cases of paralysis. The food after reaching the small intestines and there being blended with the secretions, is then taken up by the lacteals, and carried into the circulation, the undigested part being ejected as effete. The food in the small intestines is converted into chyle a creamlike substance. The food passing on through the intestines is still subjected to the action of the secretions of the small and large intestines, the nutritious part being taken up by the absorbents as it

passes along the canal. The small intestines consist of the duodenum jejunum and ileum. The intestines like the stomach have three coats, serous, muscular and mucous. The intestines are numerously supplied with glands, such as the glands of Brunner, Peyer and Lieberkuhn.

The office of the glands of the large intestines must be to soften the feces, as nothing definite has yet been discovered respecting them. The effete matter after having undergone the action of the small intestines passes into the large antestines through the ileocecal valve. In the meantime that the fecal matter is passing through the intestines there

are excretions into them which also tend to soften the feces. The fecal matter having passed the ileo-cecal valve has reached the large intestines, which consist of the caecum, colon, and rectum, where the last change takes place in the passage of the fecal matter through the intestines. The contents of the small intestines is said to be alkaline, until they reach the caecum where they are again acid, from the action of the fluids that is secreted by the glands and intestines acting on the portions of fecal matter that passes undigested through the intestines. After thus being acted on by the secre-

cretions it is taken up by the lacteals and veins, the other part being effete passes off as feces through the anus. The feces during the passage along the large intestines being nearly all excrementitious is still continued to be acted on until it gradually assumes the consistence and other characters of the feces expelled from the intestines by the agency of the abdominal muscles and muscular coats of the rectum.