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Health & Nutrition
The Gastrointestinal System

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Seven Steps of Nutrition

When most people think of nutrition, they think only of the food they eat. However, the true definition of nutrition is to nourish the cells of the body - cellular nutrition. To accomplish cellular nutrition, nature designed several steps to get the nutrients from the food to the cells of the body. These processes can be simplified into the "seven steps of nutrition":

1. **Ingestion**
2. **Digestion**
3. **Absorption**
4. **Circulation**
5. **Assimilation**
6. **Metabolism**
7. **Detoxification**

None of these seven requirements function without WATER

The function of each of these steps depends on the effectiveness of the other steps. The first step, ingestion, involves human choice. Healthy food choices supply the nutrients required for the optimum functioning of each subsequent step. Poor choices, however, result in poor function of these steps and ultimately poor metabolism.

Once you have made your choices for ingestion, the next two steps are key to cellular nutrition. First, digestion, "the process of converting food into molecules that can be absorbed through the intestine into the blood"[1], must occur optimally. Improper or incomplete digestion will result in incomplete or improper absorption. It is important not only to understand how digestion and absorption occur, but also to understand the importance of having a healthy intestine and healthy accessory digestive organs.

The Digestive System

The gastrointestinal tract is a complex organ system whose primary functions are to carry out digestion and absorption of ingested nutrients: and simultaneously, to protect the body from ingested microorganisms and noxious substances[2]. Digestion and absorption of nutrients is what people commonly think of when discussing the functions of the gastrointestinal system, so that is what will be addressed first.

Part One
Digestion & Absorption

Digestion & Enzymes

One of the most important factors in digestion is enzymes. Enzymes are complex proteins, which regulate all aspects of body function, and are found in the cells of every living creature. Enzymes can be divided into three categories: digestive enzymes, metabolic enzymes, and food enzymes[3].

Digestive enzymes are the driving force in the digestive process. Without those enzymes the nutritional value of food wold be lost. The salivary glands, the pancreas, and the mucosal cells that line the intestine[2] all produce enzymes that are designed to break down the specific components in food. For example, protease enzymes break down protein into peptides, and peptidase then breaks the peptides into usable amino acids that can be absorbed by the mucosal cells of the intestine[2].

Let him that would move the world first move himself.

~ Socrates

Food Enzymes in Digestion

In addition to the digestive enzymes produced by the body, food enzymes can aid in the breakdown of food. Food enzymes are the enzymes found naturally in food. The enzyme composition of a food matches with its nutrient composition. In other words, foods high in carbohydrate contain high amounts of amylase and foods high in protein contain protease. Food enzymes naturally assist the body in digestion and relieve some of the burden of digestion.

The Gastrointestinal System - *Continued*

Relieving the burden of digestion from the body is important for health and longevity. Dr. Edward Howell and other enzyme researchers[3] point out that each one of us is given a limited supply of bodily enzyme energy at birth. This supply, like the energy supply in a new battery, has to last a lifetime. The faster you use up your enzyme supply, the shorter your life. By supplying food enzymes, you use up less of your body's enzyme reserves. Unfortunately, cooking and processing methods destroy the enzymes in food leaving the entire burden of digestion on the body, which uses up your enzyme supply. In essence, eating processed foods "robs" the body of the energy it needs for growth, maintenance and repair of its tissues and organ systems. Only raw foods contain enzymes vital to health and longevity.

Supplemental Enzymes

The busy lifestyle lead by the majority of people makes it difficult to eat enough raw foods to supply adequate amounts of enzymes, but there are other alternatives. To overcome the effects of processing and cooking, supplemental enzymes can be used to assist the body with digestion. Supplemental enzymes should meet the following guidelines:

- **Be specifically** created for oral consumption.
- **Include all** the necessary co-factors (vitamins & minerals), for maximum enzyme activity.
- **Be active** in a wide pH range.
- **Be supplied** as plant-based food enzymes.

Plant-based enzymes are more effective than animal enzymes for several reasons. First, plant enzymes have a broader pH activity range, which means they can help digest foods and remain active throughout the intestinal tract, which varies in pH. Second, they do not interfere with the natural functioning of the body and therefore have no side effects[3].

Absorption

The role of absorption in the seven steps of nutrition is to transfer beneficial substances from the intestinal lumen into the circulation for transport to the liver and the cells of the body. The nutrients must be transported across the cell membrane into the mucosal cell and then out of the mucosal cell and into the circulation[2]. This step requires one of several membrane transport mechanisms. These mechanisms can be divided into four categories: passive diffusion, facilitated diffusion, active transport, and pinocytosis[2].

Each nutrient can use one or more of these mechanisms to be transported across the cell membrane. The effectiveness of the transport of nutrients depends on healthy mucosal cells, the activity of digestive enzymes, nutrient interactions within the digestive tract and many other factors.

Carrier-mediated transport (facilitated diffusion and active transport) is distinguished by the interaction of the permeating substance with one of the protein components of the membrane. The carrier-mediated interactions have all the characteristics of the interactions between enzymes and substrates. The reaction is saturable, shows competition between structurally similar substrates, has specificity to stereoisomers of substrates, and is inhibited by metabolic poisons. Thus the "carrier" protein that shuttles the substrate from one side of the membrane to another may be considered a specialized membrane enzyme[2]. These specialized membrane enzymes are specific in which nutrients they transport, and some require co-factors to function optimally.

The CA^{e}DS® Difference

The Infinity^2 Product Formulation Team is aware of the role of enzymes and their co-factors in the absorption process and has created a unique delivery system CA^{e}DS® (Chelate Activated Enzyme Delivery System) to enhance and assist in the digestion and absorption of nutrients.

CA^{e}DS utilizes an exclusive process that combines enzymes and chelated minerals to ensure the nutrients in each of Infinity^2's products are delivered to the cells of the body. The enzymes in CA^{e}DS are precisely coordinated with the ingredients in each supplement and the patented Albion amino acid chelated minerals fully activate the enzymes. This unique combination of enzymes and patented chelated minerals results in optimum delivery of the nutrients.

Without a delivery system, enzymes and nutrients work less efficiently, and when taken in high dosages or over a long period of time, may "leach" minerals from the body's stores. Why? Every time you put a nutrient into the body, it requires other nutritional co-factors in order to work effectively. If those necessary co-factors are not provided with the supplement itself, the supplement "leaches" the co-factors from your body, depriving you of nutrient factors you already had in storage.

To ensure that cellular nutrition is achieved, each one of Infinity^2's products contains a different CA^{e}DS formulation specifically matched with the quality whole food ingredients of the formula. Providing a specific CA^{e}DS formulation for each product ensures that the necessary nutritional co-factors are matched to the exact balance found in nature.

Part Two
Immunity

Intestinal Immune System: The forgotten function of the GI tract.

In addition to digestion and absorption, a primary function of the gastrointestinal system is to protect the body from toxic substances that enter the body. It not only keeps foreign substances out, but is a key component of the body's immune system[4]. Elements of the intestinal immune system include: lymphocytes scattered between the cells of the gastrointestinal epithelium; lymphocytes and macrophages spread diffusely in the lamina propria of the stomach and intestine; differentiated lymphoid structures located along the course of the gastrointestinal tract; and intestinal flora[4]. These systems help to prevent foreign substances from entering the circulation and destroy pathogens before they can affect body systems.

The intestinal microflora of humans represents a rich ecosystem composed of metabolically active microorganisms in close proximity to the absorptive mucosal surface[4]. Human health depends on the presence of some bacteria, such as *Lactobacillus acidophilus*, in the digestive tract and the vaginal mucous membranes. There are at least 400 kinds of microorganisms found in the gastrointestinal tract, and a healthy balance of the bacteria is essential to the proper functioning of all systems of the body, especially the immune system[4]. "Friendly flora" act as part of the immune system first, by preventing infectious organisms from gaining a foothold in the GI tract, and secondly by enhancing the function of immune cells.

The microflora of the intestine are destroyed by common factors such as carbonated drinks, laxatives, birth control pills, coffee, alcohol, aging, stress and antibiotics. Maintaining and promoting the growth of helpful bacteria while destroying the harmful strains is vital to health. If harmful bacteria grow in too great a proportion, serious consequences can arise. A number of diseases such as rheumatoid arthritis, colitis, diabetes, meningitis, thyroid disease and bowel cancer are thought to be related to significantly altered bowel flora.

Probiotics

The composition of microflora in the human intestine greatly influences health and well-being, and scientists are now looking at ways to modulate the composition of the gut flora[9]. This can be achieved through the targeted use of dietary supplementation with probiotics. Probiotics are live microbial food supplements that beneficially affect the host by improving its intestinal balance[10,11]. An effective probiotic should[9]:

1. **Exert** a beneficial effect on the host
2. **Be nonpathogenic** and nontoxic
3. **Contain** a large number of viable cells
4. **Be capable** of surviving and metabolizing in the gut
5. **Remain** viable during storage and use
6. **Have good** sensory properties
7. **Be isolated** from the same species as its intended host.

Postulated health advantages associated with probiotic intake are the alleviation of symptoms of lactose malabsorption, increase in natural resistance to infectious diseases of the intestinal tract, suppression of cancer, reduction in serum cholesterol concentration, improved digestion, and stimulation of gastrointestinal immunity[10-15].

Recently, the nutritional and medical sciences have begun to investigate the benefits of supplementing with "friendly flora". A recent article in the American Journal of Clinical Nutrition[5] reported the benefits of specific strains of bacteria. These strains of bacteria can enhance nonspecific, anti-infective mechanisms of defense without causing severe systemic responses. Schiffrin et al[5] have provided direct evidence that oral administration of lactic acid bacteria (LAB) in humans alters the function of blood phagocytes. LAB and their products can induce in vitro cytokine production by human lymphocytes[6] and peritoneal macrophages[7], as well as inducing endogenous cytokine production[8]. The increased production of these cytokines indicates that intestinal flora can play a significant role in mounting immune responses against invading organisms and toxins.

Our very lives depend upon friendly bacteria. The level of health and well-being we enjoy is affected by how well we maintain a wholesome environment in which these microorganisms can live and flourish. The regular inclusion of supplemental flora ensures that healthy growth of needed bacteria is maintained.

Part Three

Enhancing the Health of the Digestive Tract

Infinity² Essentials For Life 2: Enzyme Flora Combo

The Infinity² Product Formulation Team is well aware of the research on enzymes and probiotics. Infinity² is known for having the best enzyme supplements and probiotics available on the market, and is excited to announce that the Product Formulation Team has combined the benefits of enzyme supplementation and probiotics into one formula. This formula is a part of the Infinity² Essentials For Life System.

Infinity² Essentials for Life 2 provides intestinal health factors (enzymes and flora) that are vital to the utilization of nutrients in the body. It supplies a full complement of enzymes with all the necessary co-factors. Supplying the complete enzyme complexes ensures that all foods are broken down to their most usable form to be delivered to the cells of the body. The formula has extra lipase to assist in the digestion and utilization of dietary fats, and provides patented chelated chromium to assist in the utilization and metabolism of fats and sugars.

In addition to enzymes, this formula also provides friendly bacteria strains that can suppress harmful bacteria; aid in digestion and elimination; improve absorption of minerals; reduce toxins in the bloodstream; and effectively address the problems caused by dietary fats and refined sugars.

To ensure that cellular nutrition is achieved, each one of Infinity²'s products contains a different CA^{e}DS formulation. Infinity² Essentials For Life System is no exception. The CA^{e}DS formula found in Infinity² Essentials For Life System is specifically matched with its quality whole food ingredients to ensure that the necessary nutritional co-factors are matched to the exact balance found in nature. This formula will help to improve the nutritional state of the body by maximizing nutrient delivery through its own unique CA^{e}DS delivery system. It provides the necessary enzymes and probiotics required to optimize the health of the gastrointestinal system. No other company has gone to these lengths to ensure that supplementation provides you with every constituent component your body needs.

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