The Raw FOODS DIET:

Enzyme Tolerance to Cooking and Digestive Processes

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Abstract

The Raw Food Diet, composed mainly of uncooked, plant-based foods, was created in order to preserve certain food's health benefits, specifically enzymes, which are specialized proteins that aid in the digestive process. By researching enzyme tolerance to different cooking processes and their function in the digestive process, I determine whether a diet composed of raw foods is truly beneficial in terms of enzymes. I examine nutrition texts, scientific literature, raw food diet critiques, and raw food literature to gain an understanding of enzyme function and its significance to the raw food dogma. While "Raw Foodists" are working hard to preserve enzyme activity in their foods, many other conscious consumers are cooking their food with the intention of destroying enzymes and the catalytic reactions that potentially come with them. I summarize arguments for the questions: Can this diet work as a healthful way of life? If so, why is it that this practice isn't exercised more globally? And finally, do the benefits of the Raw Food Diet truly outweigh the limitations? The Raw Food Diet is so limited in comparison to a standard diet that, based on my review, it seems very impractical as a sufficiently nourishing diet.

Introduction

The Raw Food Diet is a diet and lifestyle based on observations of nature. It is so called because it consists fundamentally of raw, whole foods, which are most often plant-based. The diet was created from the idea that cooking is a process of destruction, which depletes foods of their natural benefits and renders them toxic, as it mutates the food from its original chemical state. Followers of The Raw Food Diet work to preserve the health benefits of foods by keeping foods in their raw, natural state, and preparing these foods only with methods that alter structural, and not chemical states (Fry, 1).

The focus of Raw Food Diet preservation is the enzymes of certain foods. Enzymes are specialized proteins which speed the burning and building reactions that take place in the body during the digestive process. They turn the foods we eat into energy which can be used by the body. There are several different types of enzymes, some which the human body can produce, and some of which can only be assimilated in the foods that we consume. Followers of the Raw Food Diet, or "raw foodists," as they are called, consider the effect of cooking processes on enzymes, which are often destroyed by temperatures as low as 105° F. By avoiding these temperatures in their food preparation, raw foodists create a diet of raw, enzyme-rich foods, which, they claim, the body is able to metabolize better than a diet consisting of cooked foods without such enzyme activity.

I hypothesize that with thorough research, I can gather enough understanding of the significance of enzymes in a healthful diet and the chemical changes related to enzymes that occur to certain foods during cooking processes to make an educated judgment on whether or not the Raw Food Diet is as beneficial as its dogma claims. By comparing the enzyme activity of raw and cooked foods, I expect to also conclude whether the Raw Food Diet is more beneficial than the standard, cooked foods diet.

Results

Although moderate temperatures do not destroy many components essential to a healthful diet, increasing temperatures *DO* deactivate enzymes and destroy some water-soluble vitamins. Carbohydrates, fatty acids, fat-soluble vitamins, minerals and micronutrients are all able to survive cooking processes of moderate temperatures. Still, the enzymes required to process these nutrients are deactivated during these processes.

Through research, biological anthropologists have determined that people have been cooking foods since early human existence. Although it depletes certain benefits of foods, cooking foods eases digestion, and therefore allows for a greater variety in our diet."People with strong digestion and abundant energy better assimilate salads and raw fruit. On the other hand, people suffering from low energy, congestion, allergies, or weak digestion better assimilate cooked foods" (Wood, 1999). Although we continue to learn when we question our modern science, it is important for us to also recognize the benefit of our technologies- especially those which date back as far as the cooking process.

Types of Digestive Enzymes

Enzymes can be classified into three categories (EnzymEssentials):

- METABOLIC ENZYMES
- DIGESTIVE ENZYMES
- FOOD ENZYMES

Metabolic enzymes are responsible for running the body. There are unique enzymes with specific functions for each organ in the body.

Although their work aids the entire body, both Digestive enzymes and Food enzymes function only in the digestive system. Digestive enzymes are produced by the salivary glands, stomach, pancreas, the small intestine, and certain foods. Because they are also found in foods, these enzymes can be supplemented with an enzyme-rich diet. Food enzymes can be found only in the foods which we consume. (Therefore, to benefit from Food enzymes, we must first consume them.)

Proteins, Carbohydrates, and Fats are the three caloric components of any diet. For each of these three elements there exists a digestive enzyme meant to break down their specific structure. These enzymes are Protease, Amylase, and Lipase, respectively. Because these enzymes are so specific to digest our diet, they will be the enzymes focused on this project.

Figure 1: Protein Digestion

Protease digests proteins. When proteins enter our digestive systems in the form of polypeptides (long chains of amino acids), **protease** separates them into smaller chains, or single amino acids. These single amino acids can then be used by the body to rebuild and renew itself.

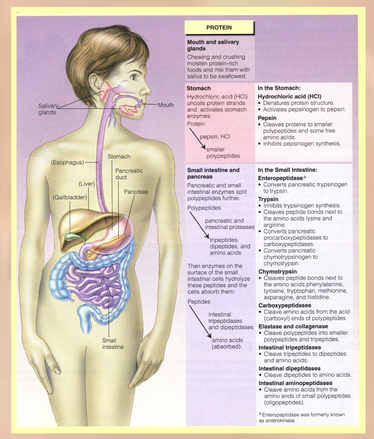

Figure 2: Carbohydrate Digestion

Carbohydrates, which consist of starches and fiber, are digested by **Amylase.** This enzyme is most concentrated in our saliva. When we consume food, **Amylase** starts to hydrolyze (chemically break down) starches into smaller polysaccharides and maltose. Moving into the small intestine, this then gets further broken down into glucose, and is used by the body as an essential source of energy, which fuels all bodily functions.

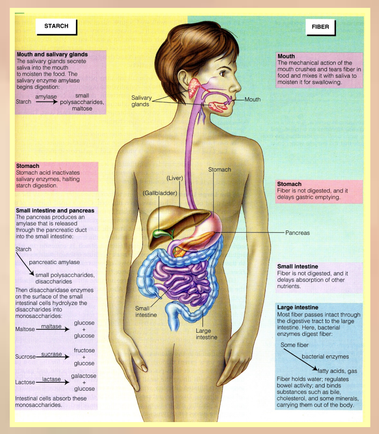

Figure 3: Fat Digestion

The fat-digesting enzyme, **Lipase,** has many forms. The first type of **Lipase,** produced by the salivary glands, begins to break down fats as soon as food is in the mouth. The next and most significant **Lipase** is produced by the pancreas. This **Pancreatic Lipase** breaks down the fats into monoglycerides. These then move to the small intestine, where they get further broken down into glycerol and fatty acids. **Glycerol and fatty acids** can be converted by liver and other cells to an energy for fueling cellular metabolism. Certain **fatty acids**, like the omega-3s, especially DHA, are essential for regulating a variety of bodily functions, including immune responsiveness and brain function.

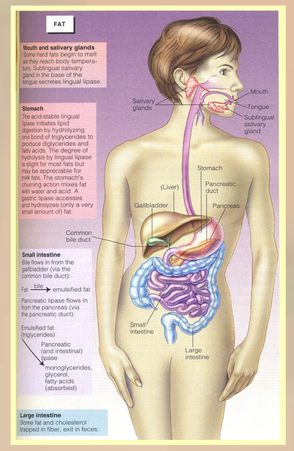

Table 1: Enzyme Tolerance to Heat

Digestive Enzyme	Temperature (°C)	Temperature (°F)
Protease	95°	203°
Amylase	60°-80°	140°-186°
Lipase	40°	104°

Table 2: Temperatures of Common Cooking Processes

Cooking Process	Temperature (°C)	Temperature (°F)
Steaming	100° +	37.7
Pan Frying	121.1°-190°	350°-375°
Deep Frying	83.8°-129.4°	183°- 265°
Baking (Standard Electric Range)	65.5°-232.2°	150°-450°
Grilling	148.8°-204.4°	300°- 400°

Figure 4: Model: How an Enzyme Works

Discussion

The tables above show how cooking will denature many enzymes. However, these digestive enzymes are synthesized in our bodies, and are not obtained solely from food. In terms of enzyme preservation, The Raw Food diet makes a lot of sense. Otherwise, many of the components essential to a healthful diet, such as vitamins and minerals, survive moderate temperature cooking. In addition, slowing enzyme reactions by heat inactivation allows for food preservation. Many of the enzymes lost in cooked foods can be supplemented with a good portion of the right raw foods.

Cooking and other food processing methods are a significant part of cultures throughout the world. Food culture has defined us throughout history, and the practice of cooking has brought people more than just delicious food to the table. Cooking and food preparation is a wonderful way to be creative and inventive, so it is important that this activity is easily accessible for people. The Raw Food Diet is a beautiful idea, but it seems very impractical for the way people live today. With that said, I believe that, in the end, a diet composed of a variety of both raw and cooked nutritious, whole foods is healthful, satisfactory, practical, and fun!

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Model: http://ghs.gresham.k12.or.us/science/ps/sci/ibbio/chem/notes/chpts/enzyme.gif