Immuno-Enzymatic Therapy: A review of the Literature

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By Roger Scott Cathey

An overview on digestive enzymes

All enzymes accelerate reactions, or even permit reactions that otherwise would not happen, while the enzymes themselves end up unchanged. Enzymes therefore are catalysts and can act over and over again doing the same thing. Inorganic catalysts, such as platinum, are not specific, while most enzymes are highly specific. A common saying in biochemistry is: one enzyme, one reaction. Thus proteases are specifically directed to proteins, glucosidases attack sugars, lipases attack fats, etc. While in some cases a single enzyme may attack only a single bond in a single molecule or chain of molecules amongst a variety of substances of the same type, others may attack several different linkages or the same type bond in a category. An example is a sulferase, which only attacks sulfur bonds, while a protease may attack several different amino acids in a protein.

In most cases enzymes have names that end in -ase. There are a number of exceptions: pepsin, trypsin, chymotrypsin, emulsin (beta-glucosidase), etc. These are archaic terms now well entrenched in the nomenclature, but the standard today is that all enzymes end in -ase.

Each digestive enzyme acts upon one substance at a time. The substance acted on is termed a substrate. Thus an enzyme first encounters a substrate to form an enzyme-substrate conjugation. After reaction, the enzyme is left intact and there is now an altered substrate. In the case of the enzymes we are going to discuss, reactions result in two parts of substrate per enzyme-substrate reaction. Thus they may be termed "cleaving" enzymes.

These enzymes can be very efficient. Consider this: although acting on only one substrate at a time, the enzyme carbonic anhydrase releases about 600,000 molecules of CO2 per second, thus 36 million per minute. Catalase can in one minute decompose 2,600,000 molecules of hydrogen peroxide per minute at 32 degrees Farenheit (0 degrees Celsius). This turnover number equates to about 430,000 reactions per second. These are, of course, far greater reaction rates than most other enzymes possess, but all the enzymes we will be discussing can process hundreds to thousands of reactions per second. Trypsin for example has a turnover number of 138 peptide bonds hydrolyzed per second. Amylase: 18,000 hydrolyzed carbohydrate bonds per second. The slowest enzyme known is lysozyme with two reactions per second.

Of the six broad classes of enzymes that exist, we are going to discuss here only HYDROLASES: enzymes that divide a substance by the addition of water. This of course requires the splitting of water into two parts and represents one of the reasons abundant water consumption in enzymatic therapy is so important.

The way substrates are digested by enzymes is beautifully simple: some part of a length of protein (or carbohydrate or fat) fits into a specific site or pocket on the enzyme. Within this

conformable pocket is a niche called the active site where the actual reaction or cleavage takes place. This mutual fit between enzyme and substrate is often compared to a key in a lock. We might say it is more like a baseball in a mitt, wherein the mitt can move or shape itself to hold the ball, for we know now that enzymes are flexible and plastic during their functioning, and for an enzyme to function properly, it must be flexible. Thus an enzyme attaches, undergoes flexure thus straining the substrate, and a bond is broken in the substrate.

While a portion of the substrate is in the enzyme "pocket", the enzyme typically binds with some atom on the substrate, and at the same time surrenders an atom to the substrate. The part of the substrate bound to the enzyme is then surrendered and thus the enzyme is released at the same time the substrate pieces are. This process means the enzyme must re-acquire the atom it surrendered to the substrate, which means absorbing some free radical like a proton (+H)ydrogen or a hydroxyl (-OH) from water.

Many enzymes require helper molecules to aid in changing their shapes to facilitate either grabbing onto the substrate or releasing it after having hydrolysed it. Such factors can be vitamins, minerals or simple molecules. Such molecules may attach only after the enzyme-substrate molecule is formed. Other co-factors or co-enzymes must be present to facilitate attachment to the substrate.

This is why some vitamins are also called co-enzymes, specifically the B vitamins. These adjunctive, facilitating and helper factors must all be considered or supplied in successful immuno-enzyme therapy.

All enzymes with few exceptions are proteins. A proven exception is RNA, a nucleic acid responsible for creating proteins from DNA. Some research seems to indicate that DNA also has enzymatic properties, and perhaps more surprising, a single amino acid, proline, also seems to behave like an enzyme (Internet, 1).

Otherwise we refer to enzymes as part of the total protein product of active cells. DNA is nothing but a record of proteins. Proteins are the only output of nucleic acids (aside from more DNA or RNA). A special RNA is sent forth from the nucleus to bind to amino acids which are constructed into proteins. It is suspected that most of the proteins encoded on DNA are enzymes.

A conservative estimate of the protein content averaged over all cells in the human body, excluding structural proteins, is 10 per cent of mass. If .01 per cent of this were enzymes, each cell may contain 1000 enzymes (Sumner and Somers, 1943,p. 4). Each cell produces enzymes according to need. For example, if a cell is cultured in the absence of galactose, it may only contain 5 galactosidase enzymes. If a galactoside sugar is introduced in high quantity, a new assay may reveal that the cell now contains up to 4,000 copies of this enzyme. This feedback mechanism of protein expression is called *induction* or it could be termed adaptative expression (internet, 20).

Proteins are made up of individual amino acids. Humans use about 20 amino acids for protein synthesis. Nine of these are essential, and must be in the diet. The other eleven can be synthesized from the essential amino acids. A general consensus defines a protein as having 30

or 40 amino acids linked together. Two amino acids would be a di-peptide. Three a tri-peptide (like glutathione). Short chained peptides are sometimes referred to as oligo-peptides (3 to 10 amino acids). Longer chains are polypeptides.

The term amino refers to the presence of nitrogen. The general formula for an amino acid is HNCHRCO2. The R (radical) refers to the distinguishing groups of atoms attached to the amino group.

An amino acid is characterized as a central carbon (alpha carbon) bearing an amino group (nitrogen bound to two hydrogens), a hydrogen, an acid group (carboxyl COOH) and a side chain (R). It is the R-groups or side chains that distinguish one amino acid from another. Amino acids are bonded between the carboxyl or acid group of one to the nitrogen (amine) group of another. The distinguishing characteristic of proteins from sugars is the nitrogen atom and the side chains attached to amino groups can contain such molecules as sulphur which play a role in protein folding.

Free Amino Acids and Chromium GTF (Glucose Tolerance Factor)

In enzyme therapy, especially in late stage cancers, it is vital that free ***essential*** amino acids be provided to allow the synthesis of new enzymes. Part and parcel to such synthesis is the necessity for the health of the whole pancreas. The pancreas has two major functions: production of insulin (endocrine pancreas) and the production of the digestive enzymes (exocrine pancreas). A very important role of insulin is the attachment to free amino acids for delivery to the pancreas and other systems in the body. The specific mineral that allows insulin to bind to these amino acids is chromium 3+, or glucose tolerance factor (GTF). The body preferentially utilizes chromium nicotinate for this function, not picolinates. This is a very important distinction in chromium supplementation. All of our enzyme preparations contain GTF, or chromium nicotinate. Other minerals proved to be important for endocrine pancreas health are magnesium, vanadium, zinc and manganese.

> High-quality brewer's yeast powder or flakes contain as much as 60 mcg of chromium per tablespoon (15 grams). When doctors recommend brewer's yeast, they will often suggest 1–2 tablespoons (15–30 grams) of this high-potency bulk product per day. Remember, if it is not bitter, it is not likely to be real brewer's yeast and therefore will not contain biologically active chromium. In addition, "primary grown" yeast (i.e., that grown specifically for harvest, as opposed to that recovered in the brewing process) may not contain GTF.
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> It is extraordinarily rich in nucleic acid, which is a basic element in cell development and is believed to retard the aging process. It is the best nutritional source of chromium, which occurs in brewer's yeast in an organic compound known as GTF (glucose tolerance factor). This vital factor is essential for the production of functionally effective insulin, without which the body cannot handle glucose—its major fuel. Hypoglycemia results when the blood sugar level rapidly shoots upward, followed by a rapid release of insulin, which in turn overshoots the mark and drives the blood sugar too low. The role of GTF is to moderate insulin activity. First, by potentiating and circulating insulin and then by reducing the amount required to be released. This moderating effect of GTF is important, not only for diabetics and hypoglycemics, but also many of those who have increased hunger or craving for sweets. Brewer's yeast has at least ten times more GTF activity than any other natural food.

Polypeptides and proteins spontaneously fold into complex three-dimensional configurations, forming internal cross-linkages or bonds. While the particular amino acid sequences in a protein are important, most of any protein's active properties comes of this folded shape. When functional proteins, like enzymes, lose this folding they are said to be denatured, and will not perform their function.

Most enzymes are made up of more than 100 amino acids, but some may consist of thousands of amino acids.

Pancreatic Enzymes

The primary digestive enzymes are classed into four main groups:

Carbohydrases
Proteinases or proteases
Lipidases or lipases
Nucleases

Carobhydrases

Amylase

The first acting enzyme of the body in digestion is amylase, a carbolytic hydrolase, secreted primarily by the salivary glands and pancreas. In the mouth it begins working on carbohydrates, releasing maltose and a little glucose and dextrins.

Carbohydrates are characterized chemically as consisting of polysaccharides, or many sugar units. The most basic formula for sugars is a polymer of Carbon, Hydrogen and Oxygen molecules (CnHnOn). The most basic sugar molecule is glucose ($C_6H_{12}O_6$). Two sugar molecules are termed a di-saccharide, three a tri-saccharide, then oligo-saccharides (3-10) and polysaccharides. Complex or Branching polysaccharides such as glycogen are typical storage forms of sugar in the human body. Amylase does digest glycogen somewhat, but the principle enzyme that attacks glycogen is phosphorylase, a liver enzyme that breaks down glycogen in the presence of phosphate to form glucose-1-phosphate or Cori Ester.

Salivary amylase is known to continue acting in the upper part of the stomach before the pH drops drastically. At low pH, (acid) the enzyme is denatured, or unfolded as noted above, unless protected by special coatings (enterically coated) or involved in food boluses that protect the enzyme from denaturation and digestion by pepsin.

This suggests another possible benefit of high fiber in our dietary. The human body does not digest fiber, not possessing the enzyme cellulase. Fiber conglomerations could conceivably absorb these enzymes along with water, later releasing them again in the intestines or colon where they may play a role in colon health. For this reason, our formulations do not contain cellulase, the enzyme that digests fiber.

Enteric coatings are such as to prevent dissolution of the tablet in the low pH of the stomach, but such coatings are dissolved by the alkaline environs of the small intestines.

Recent studies have shown that this unfolding or denaturation of ingested proteins by low pH is reversible when the pH is raised again, as it is when the food passes into the small intestines. This presumes that the protein chain comprising the enzyme is not cleaved by pepsin. In other words, that the enzyme itself is not attacked by the pepsin enzyme in the stomach.

Because of the presence of foods to act as interference in the dance of these proteins with each other, amylase may survive digestion in the stomach, and whole denatured amylase may renature in the small intestine. Presumably, amylase taken on an empty stomach will simply be digested at the various amino acid-linkages susceptible to pepsin action. Therefore, for people using non-enteric coated enzymes, it might be wise to also use an antacid like magnesium oxide. This will raise the pH, deactivate pepsin, and allow the amylase to pass unaltered into the small intestines. Ant-acids with aluminum should be avoided. In 1925 Sherman, Caldwell and Naylor showed that amino acids had a protective effect on amylase. One could take them with amino acids, antacids and soluble fiber when lacking enteric coated forms. For this reason, none of our preparations contain the enzyme cellulase, which breaks down fiber. Many formulations do contain this enzyme because they derive their enzymes from micro-organisms or molds. Dr. Nicholas Gonzalez, who is an expert on immuno-enzyme therapy in cancer, has found that the animal derived enzymes are the most effective enzymes in cancer therapy. The human body only produces amylase in the alpha form. Plant amylases can be found in both alpha and beta forms (they attack both alpha and beta linkages in carbohydrates). However, the proteolytic enzymes derived from papaya (papain) and pineapple (bromelain) have shown good supportive function in immuno-enzyme therapy, and we use these enzymes as well.

The optimum pH range of pancreatic amylase is between 6.78 to 7.2, but continues to act in higher pH.

Calcium ions are necessary for activation of amylase (Dixon, Webb, 1979). Electrolytes, chlorides and iodides increase amylase activity, while fluorides decrease it (Sumner and Somers, 1943). On this basis alone, one should avoid using fluoridated toothpastes. Such toothpastes or fluoride drops or teflon coated pans or other sources of fluoride should be avoided during enzyme therapy (more on this under enzyme inhibitors to avoid).

Amylase is regularly found in the active state in plasma of the blood. The origin of all blood plasma amylase has not been fully delineated. Some say amylase in the blood stream is from an internal deposition from the pancreas directly to the blood, some say it is from the salivary glands. Some is known to be pancreatic enzymes reabsorbed from the small intestines (entero-pancreatic circulation), and it is also known that oral supplemented amylase is also absorbed from the intestines (Seifert, 1986). Studies indicate that re-absorption of pancreatic amylase is preferred over plant amylases (Santillo, 1993). Most of plasma amylase is from the pancreas. Probably all these means contribute to the plasma total amylase pool. Physiologists have not understood its purpose in the blood, but from the perspective of enzyme therapy in cancer, it is seen to serve partly as an anti-cancer surveillance factor, which we will discuss in detail below. It is likely that such exportation of amylase via the parenteric pathway is partly involved in

deriving energy from glycogen stores. Amylase is used by various white blood cells in digesting pathogens and cellular debris.

Other carbohydrases are produced in the body of significance in immuno-enzyme therapy include: beta-glucosidase (saliva, lysosomes, gut, food sources) lysozyme (tears, nasal fluid, lysosomes), beta-glucuronidase (liver, spleen), beta-galactosidase or lactase.

The Proteinases or Proteases

The chief pancreatic proteinases are trypsin, chymotrypsin, the carboxypeptidases and elastase.

Trypsin digests amino acid complexes only at specific linkages involving arginine and lysine. Trypsin is a chromium 3+ (trivalent chromium) containing enzyme. So important is Chromium to trypsin function, that its absence reduces trypsin to merely 5 per cent of its normal catalytic potency (Saner, 1980). It should be pointed out again that chromium supplements should be taken in the form of nicotinates or niacin bound form. An ideal food source is brewer's yeast, which carries the form dinicotinic acid glutathione chromium. Picolinates have been shown to induce damage to the genes (Tufts University, 1996; USDA, 1996; George Washington U, 1995), and other forms of chromium, chelates or citrates have to be converted to nicotinates to function ideally.

Chymotrypsin attacks linkages involving tyrosine, phenylalanine, and tryptophan. These same bonds are attacked by pepsin. But pepsin is only active in the highly acid environment in the stomach, and becomes inactive in the small intestine.

Carboxypeptidases. These are zinc containing enzymes. There are two different carboxypeptidases secreted by the pancreas: Carboxypeptidase A and B. The A type cleaves hydrophobic (water shunning) amino acids on the carboxy-side; the B type cleaves basic amino acids (Lysine and Arginine) at the carboxy-side of a polypeptide or protein. Together carboxypeptidases cleave amino acids one by one from any chain beginning at the carboxy terminal end of the chain. They are perhaps the most important of the proteinases for this thorough property.

Mast cells make homologues of trypsin (tryptase) and chymotrypsin (chymase), and one makes a carboxypeptidase. (Internet, 3)

Elastase hydrolyses peptide bonds on the carboxyl side of uncharged amino acids such as those of alanine, serine and glycine.

Trypsin, chymotrypsin, and elastase are also called endopeptidases because they cleave peptide bonds within the protein length. Carboxypeptidases are called exopeptidases because they cleave peptide bonds from one end of the protein length (the carboxyl termini).

Fat Digesting Enzyme or Lipolytic enzymes

Lipids are characterized by long chains of carbon appended with hydrogens, and an acid terminus (COOH). These chains are called fatty acids. The hydrogen saturated terminus is called the methyl or omega end, and the acid end is called the carboxyl group. Fatty acids are usually bonded in threes to glycerol to form a tri-glyceride. When a phosphate is attached to glycerol, a phospho-lipid is formed, and thus possesses only two fatty acids. Such phospholipids are constituents in cell membranes and the phosphate may be bonded to other functional groups.

Lipase hydrolyzes the fatty acids off the 1 and 3 positions of food triglycerides to produce 2 free fatty acids and a monoglyceride. The monoglycerides are directly absorbed. Co-lipase is also secreted and prevents bile salts from inhibiting lipolysis of triglycerides. It binds with lipase in a 1:1 ratio, and brings lipase to the surface of lipid drops covered by bile acids. Bile salts solubilize the lipids, while bile acids permit the water soluble enzymes to act on the lipids at water-oil interfaces of the tiny globules. Thus bile is a form of detergent and the globulization is called emulsification that greatly increases the surface area of the lipids for thorough digestion.

Phospholipase A hydrolyzes the fatty acid off the 2 position of lecithin and phosphatidyl ethanolamine.

Cholesterol esterase breaks down cholesterol.

Nucleases.

Ribonuclease and **deoxyribonuclease** hydrolyze liberated nucleic acids (RNA and DNA) into their component nucleotides.

As noted above, all these enzymes are hydrolases, meaning they insert water or terminate divided chains with a hydrogen on one side and a hydroxyl or -OH on the other.

The Enzymes in Cancer Therapy

From these observations and those which are to follow, it will become evident that the gamut of pancreatic enzymes are important in cancer therapy, as cancer cells and their products consist of all the designated substrates of these enzymes. Naturally one may wonder how intestinal or ingested enzymes could apply to cancers other than those in the stomach or intestinal tract.

Systemic Enzymes and Intestinal Enzyme Absorption

Pancreatic and food enzymes are absorbed into the blood and lymphatic circulatory systems from the intestines. Many studies have been conducted showing that pancreatic and food derived or supplemental oral enzymes are absorbed from 12 to 20 per cent (Seifert, 1990); other specialized formulations have been reported as having up to 40 per cent absorption (Lopez et al. 1994). That this re-abosorbtion is not contested, that they may be re-absorbed by the pancreas itself is contested. We do not believe that the pancreas re-absorbs its own enzymes, rather, the systemic circulation of these enzymes is what is important and a proven fact. It is in this systemic circulation we see an immunologic role for the pancreas.

Consequently, these enzymes become systemic or circulating enzymes, and any digestive action by them in the system is referred to as "parenteral" digestion, to distinguish it from enteric digestion or digestion in the alimentary canal or digestive tract.

In the system, these enzymes are weakly inhibited by circulating macroglobulins (except amylase). These macroglobulins (especially alpha-2-macroglobulin) are transport and regulatory molecules derived from the monocytes and macrophages of the immune system. They deliver and regulate cell messengers (cytokines). In the presence of a suitable substrate, the enzymes can separate from these delivery molecules and digest the substrates (Gebauer et al., 1993). This is proven by the fact that the circulating substrates are degraded and their products are observable in the urine and by blood analyses.

The Pancreas a component of the Immune system

From the data collected from numerous clinical and laboratory studies on the systemic or parenteral role of the pancreatic enzymes or their homologues (enzymes similar to pancreatic enzymes but from other sources), we can say that the pancreas and its enzymes are a true component of the immune system. For this reason, this form of treatment is sometimes called ***immuno-enzyme therapy.***

The Cause of Birth and its relation to Cancer Control and Remission

Early in this century the embryologist John Beard reasoned that the same mechanisms the body uses to reject the placenta, thus causing birth, must also apply in cancer therapy (Beard, 1911). His reasons for thinking this began with his observation of the striking similarities of behavior and appearance between placental cells and cancer cells. One is normal to the life cycle, the other an aberration. The placental cells are called ***TROPHOBLAST*** cells.

The placental or trophoblast cells in pregnancy are characterized as being rich in one or both subunits of a hormone called human chorionic gonadotropin or **hCG.** This hormone is the basis of the standard pregnancy test.

Trophoblast cells are the first differentiated cells after creation of the zygote in reproduction. Once these cells make contact with the uterus, they express special adhesion molecules (oncofetal fibronectin), begin digestion and erosion of tissues, rapid expansion, fusion with normal cells, inhibition of certain body hormones and enzymes, expression of new ones: hormones to develop new vascularization (Vascular Endothelial Growth Factor or VEGF); enzymes to digest body cells and connective tissue, and they form metastases. Trophoblast or placental cells are commonly found in the mother's lungs, liver and even the brain. But after birth, all these metastasized cells are either already dead or quickly consumed.

Beard observed that after the 56th day or so of pregnancy, the cellular trophoblasts stop growing. In fact they begin to regress and differentiate to more benign forms. At this time in pregnancy the onset of morning sickness also occurs. Beard saw that this coincided with the activation period of the fetal pancreas. Beard reasoned that the combined digestive action of the fetal pancreatic enzymes and the maternal systemic pancreatic enzymes marks the onset of the

degradation of the placental or trophoblast cells. Even so, it will require 7 and a half more months for this digestion to progress to the point that the mother's body lets go, and the baby is born. By that time the placental trophoblasts are practically all benign.

The Unitarian Basis of all Cancers

Like the placental or trophoblast cells, the cancer cell is also characterized by being rich in human chorionic gonadotropin beta (hCG-Beta) (Acevedo et al. 1995). This hormone, a glyco-protein, is built into the cancer cell surface, and is also secreted into the system to varying degrees in different cancers. Its ostensible purpose structurally is presumably to protect the cancer cells from attack by the immune system and systemic proteases, just as pregnancy trophoblasts use hCG to preserve themselves and to preserve the swollen uterine tissues from digestion by body proteases. (HOW? Negative charge?)

Cancer utilizes all the same mechanisms for survival that a developing placenta uses in pregnancy: expression of oncofetal fibronectin, digestion and erosion of tissues, rapid expansion, fusion with normal cells; inhibition of certain body hormones and enzymes, expression of new ones, hormones to develop new vascularization (Vascular Endothelial Growth Factor or VEGF), enzymes that degrade body tissues, and the formation of metastases.

All the factors needed to accomplish these ends by the cancer cell are subject to digestion under appropriate circumstances by the systemic pancreatic enzymes and their homologues, including digestion of the entire cancer cell itself. This unity between trophoblasts and cancer is what Beard perceived way back in 1900. The susceptibility of cancerous tissues to these enzymes that are so important in pregnancy was Beard's test for cancer: if a living tissue reacts to these enzymes or are digested by them, it must be cancer. Normal live somatic tissues are not digested by these enzymes. Beard's thesis became the basis of what is known today as the Unitarian basis of all cancers.

The Definitive Cancer biomarker: hCG

hCG beta is unique to only one natural component of the life cycle: placental cells or trophoblasts. Outside of pregnancy, hCG is a cancer biomarker. Trophoblasts appearing outside pregnancy are cancer. Because all cancers display hCG, all cancers are defined as trophoblastic, and this single datum proven by the strictest principles and methods of science, transformed Beard's original thesis to the unitarian fact of cancer.

However, hCG is not the only defining factor. There are dozens of other properties shared between normal pregnancy trophoblasts and cancer cells of all types but not by normal cells. This broad spectrum of "onco-" traits between pregnancy trophoblasts and cancers is defining when it comes to therapy. For whatever is at work in causing birth (or abortion) by action on trophoblasts will most likely also work on cancer.

hCG: cancer's defensive hormone

As the term "glyco-protein" suggests, hCG is part protein, part carbohydrate. hCG is found in all cancers, in part or as an entire molecule. Two major components make up hCG, both of which are glyco-proteins: Alpha hCG and Beta hCG. When combined, it is called hCG-holo (whole). These parts are termed "moieties".

Because trophoblast cells normally only arise from the zygote which is the primary truly totipotent cell (cells that can produce all tissues: body tissues and placental tissues), it follows that if cancer appears in the body, it suggests the presence of totipotent cells in the body, or stem cells. There is an abundance of research over the past 50 years that confirm the presence of totipotent cells (stem cells), most recently studies at the University of Michigan (Al-Hajj M, et al., 2003, and internet,17 and 18). We now have a means of identifying such totipotent cells by isolation of a specific gene responsible for unlocking these potentials (Tir non Og set or nonog cluster) (Internet,).

As a secretion, hCG has been recognized as a potent enzyme inhibitor (Milwidsky et al. 1993). Because hCG affects the serine enzymes such as trypsin, chymotrypsin, urease, etc., hCG is called a SERPIN (serine protease inhibitor). However, it doesn't just inhibit proteases, for it is well known as an inhibitor of the enzyme rhodanese, the enzyme responsible for detoxifying cyanide. The importance of this fact will be realized further on when we discuss in detail the process of reactivating inhibited enzymes.

In pregnancy, besides acting as a hormone inhibitor (for preserving the uterine lining) hCG probably protects the uterine tissues by inhibiting the body enzymes which digest those uterine tissues and which digestion causes the expression of blood in the period.

A Two step Defensive Attack against hCG

Amylase is accentuated in our formulations because of its role in cleaving the carbohydrates from hCG, deactivating it as a hormone on one hand; while also helping towards unraveling of the cancer cell itself. We also believe it plays a role in re-activating the hCG-inhibited serine enzymes trypsin, chymotrypsin and carboxypeptidase.

It is believed that hCG sugars probably act on the enzyme away from the active site as a noncompetitive inhibitor. Amylase can cleave the carbohydrate moiety from the protein part of the hCG, perhaps permitting the protein product to leave the enzyme or at least permit the enzyme to regain some flexibility. It is possible that the large carbohydrate portion blocks the enzyme from a co-enzyme or helper molecule. By cleaving the carbohydrate portions, thereby their masking properties and reducing the size of the entire hCG molecule, the hCG-inhibited enzyme may be re-activated. Certainly in the circulating form of hCG, amylase can prevent inhibition of trypsin and the other protease enzymes by cleaving the carbohydrates away from the protein before trypsin or another protease would act on the hCG protein.

This inhibitor action of this hormone is also suggested by the finding that hCG samples have been found to bind other enzymes including lysozyme, ribonuclease A and ribonuclease U. (Lee-Huang et al. 1999) Since a large part of the hormone is sugars, it is reasonable to assume

that this is what is mostly responsible for inhibition. Also, the sugars would not enter the active site of a protease.

Research proves that amylase can deactivate hCG, by cleaving the carbohydrate part away from the protein part (Krebs, Bartlett, 1949).

hCG prevents immune reaction

The carbohydrate moiety of hCG has a large electro-negative charge conferred upon it by the presence of sugars called sialic or neuraminic acid. hCG-beta protein is bound by six carbohydrate units with two side chains of sialic acid each. This large negative charge on the sugars repulses the white blood cells which also are negatively charged. This prevents contact by the white blood cells with the trophoblast proteins, as well as protecting the cancer cell from any proteases. The result is that this sialomucinous coating confers upon cancer cells, as it does placental cells, "immunologic privilege".

Some of the white blood cells play a role in digesting and clearing the cancer cell debris after cellular digestion. These white blood cells also secrete amylase and other hydrolases. However their output is limited in comparison with that of the pancreas or by means of supplemental enzymes.

The carbohydrate moiety of hCG is also susceptible to digestion by beta-glucosidase, beta-galactosidase and even lysozyme. Many of these sugar digesting enzymes are products of the granular cells of the white blood cell complement, and are found in the cellular lysosomes, all of which accentuates the importance of the efficient delivery of amino acids to every cell, and consequently the importance of free amino acid and chromium nicotinate supplementation for cancer patients.

After amylase clears the carbhohydrate coating, the protein digesting enzymes can come in and digest the protein back-bone of the cell membrane, just as it does the circulating hormone. Naturally, lipase and phospholipase and cholesterase are also very important systemic enzymes in this therapy, since the cell membrane consists of such. Afterwards the RNase and DNase can come in and degrade the genetic material of these destroyed cells.

Importance of Amylase Accentuation found early

The importance of amylase in enzyme therapy was discovered experimentally early in the 20th century. Physicians experimenting with Beard's enzyme treatment of cancer utilized only proteinases, primarily trypsin. They noted the cancer patients experiencing symptoms of high arterial pressure, fainting, low back pain, malaise, nausea and altogether symptoms similar to morning sickness in pregnancy. Beard reasoned these symptoms might be due to the lack of amylase, since the fetus does not produce amylase during gestation, but it does produce proteinases.

We know now that proteinases can only partially digest this hormone hCG that is bound with a large carbohydrate moiety. The permanent binding of the hormone to the enzyme also represents

a detritus the body doesn't know what to do with. Higher protein content in the blood burdens the kidneys (low back pain), and results in higher osmotic pressure which in turn causes extravasation, constrictions, edema and other bad effects.

Without understanding the finer points of the biochemistry of these secretions of the cancer cell (which he called anti-enzymes) and their interactions with the enzymes, Beard realized that the lack of fetal amylase might be the cause of "cancer eclampsia", since the cancer patient's symptoms so resembled morning sickness. He instructed the clinicians he worked with to begin using amylase along with trypsin, and the symptoms disappeared. Indeed, from that point on, he suggested that the ideal use of these enzymes in cancer treatment was to apply double the weight of amylase over that of trypsin (Internet, 4)

Amylase levels in the blood are definitely controlled by the adrenal cortex (Logsdon et al. 1985; Cope et al. 1939). Such functional connectivity in the body is never found without a purpose. Ultimately, natural selection does not preserve inefficient processes or deleterious ones. Amongst the gluco-corticoids secreted by the adrenal cortex which increase amylase levels, dexamethasone (DXM) seems to have the greatest effect, both cellularly and in the acinar cells of the pancreas. The fact that hCG is antithetical to DXM (Soliman, Walker, 1977) suggests that amylase is antithetical to hCG. In this datum we see further why accentuation of supplementary amylse is essential in modern immuno-enzyme therapy.

Amylase safety

Plasma amylase is not active against pituitary hormones similar to hCG (Abromowitz and Hisaw, 1939), indicating its safety. Even in disease conditions that cause a striking rise in the system of amylase, as in pancreatitis or multiple myeloma, the enzyme itself does not produce toxic effects.

Pancreatic protease safety

With regard to absorbed enzyme safety, the same pertains to the proteases. For example, while it has long been known that pancreatic carboxypeptidase does not digest pituitary gonadotropin, it does digest the protein portions of mare hCG, deactivating it. (Chow, Greep & Van Dyke, 1939; Evans and Hauschildt, 1943). While this is not a direct confirmation using human hormone, the fact that normally functional human pituitary hormone constantly intermixes with systemic pancreatic enzymes bears out its safety as well as its specificity against hCG. Dr. Nicholas Gonzalez and other enzyme therapists have been using these enzymes over many years, and have never noted any toxic reaction to them. Some patients may receive several ounces of enzymes each day, with no untoward effects. Nevertheless, this does require an adjustment period, as the tumor begins to break down, if the mass is large, to accommodate the excretory system and immune clearance. Part and parcel to this clearance after the accommodation period is more enzymes, for these can aid in destroying the toxic immune-complexes that form with exposure of anti-genic proteins into the system by enzymatic therapy. Sometimes these antigens are bound by antibodies and they are not cleared by macrophages. This may be due to insufficient numbers of macrophages, monocytes, etc. Or possibly due to the inefficiency of these immune cells due to a deficiency in their own imported or synthesized enzymes or helper molecules like magnesium and other elements. If such anti-body-antigen complexes accumulate in various areas they may

lead to blockage, as well as to inflammation. High enzyme follow-up keeps this from occurring, and provides a good method of unburdening the excretory and immune systems.

Nevertheless, when immuno-enzyme therapy begins, patients do report feeling worse for a period of time. Very often this may be due to a larger output of free-radicals from the white blood cells when they finally recognize the de-shielded cancer cells. We do not advocate super high levels of free-radical scavengers (FRSs), because free radicals are actually helping kill cancer cells. Most cells have natural buffers against these. A rational use of free-radical scavengers is to derive them from foods: citrus fruits, blueberries (highest natural content of FRSs) and other natural sources. Super high doses of vitamin C is not recommended.

Studies over a period of 50 years by immuno-enzymologists, in which millions of doses of enzymes have been used, have shown most side-effects of enzymes are of the nuisance type: slight rash, itching or burning sensations (using enemas of enzymes or injections), altered odor in stools, gas. Most reactions related to itching and burning or mild allergic reactions to these preparations come of plant or fungal derived enzymes. Of the millions of reports on enzyme therapy, only three have reported anaphylactic reactions (Lopez, et al., p.136), and these only occurred when used in conjunction with local anesthetics (ibid.). Since we do not sell injectible enzyme mixtures, we will not delve further into this subject.

Enzyme Inhibitors

For any enzyme, any substrate can be an inhibitor. While the substrate is attached to the enzyme, the enzyme is not able to act on other substrates. For this reason, when there is a large ratio of substrate versus enzyme, the enzymatic transformation is limited. The best way to overcome this is to increase the amount of enzymes. At the peak of enzymatic therapy, a patient may be consuming up to 180 tablets a day.

Also, some substrates can have parts that attach to other parts of the enzyme slowing release of the product by altering the flexure of the enzyme. This is called non-competitive inhibition. Various substances can act to help the turnover of substrate from the enzyme and release of the inhibitors.

The cancer cell secretes a number of substances that reversibly inhibit the proteases of the body, usually glyco-proteins. Pancreatic enzymes must work over time to overcome this inhibition. Usually this is too much of a burden for the pancreas without risking enlargement, inflammation and dysfunction. The only alternative is to supplement the enzymes involved along with enzyme reactivators.

Amylase always circulates in its active state in the body. In other words, is not weakly inhibited as are the serine enzymes, although there are amylase inhibitors in wheat and anionic detergents can deactivate amylase, as do heavy metals.

It is important to avoid toxic heavy metals. The heavy metals mercury, silver, copper and lead ions are able to deactivate these enzymes. For trypsin and other proteases, phosphate esters

(constituents in detergents), organo-phosphates (constituents in insecticides) can also do this. Below we discuss briefly methods of reversing such poisoning.

Cofactors and Accessory factors that act as adjuncts to enzyme therapy.

It was observed by researchers in the early 20th century that hydrocyanic acid (HCN) had a "remarkably favorable effect" on proteolytic activity. (Vines,1903; Mendel and Blood, 1910).

In early researches on papain, the chief protease of papaya, a means of keeping substrate samples sterile was required. Sodium fluoride was tried for a time, but it was found to inhibit the enzymes. Chloroform, salicylic acid, thymol, toluene and formalin all had this inhibitory effect and were deemed unsatisfactory antiseptics. However, HCN did not have this effect, and in fact was seen to accelerate proteolysis by papain; while others found the same for trypsin (Chittenden and Cummins, 1884-1885). This effect was so strong, that papain was seen as inactive in various concentrations unless HCN was added, leading them to regard it as behaving like a vitamin:

"..nothing remains but to compare the behaviour of HCN with that of the so-called co-enzymes." (Mendel and Blood, 1910. p212).

HCN had this accelerating effect even in the presence of inhibitors. Thus it not only acts as an accelerator, but reactivates inhibited enzymes.

HCN has the ability to reverse the inactivation of some enzymes by heavy metals like lead (Sumner and Somers, 1943, p.28), evidently by preferential displacement of the poisons from the enzyme by HCN.

As noted above, Mendell and Blood found HCN to have a favorable effect on proteolysis or digestion of proteins. The only comparable molecule to HCN they studied was hydrogen sulfide. Hydrogen sulfide is too toxic to use in therapy except in minute amounts. Other sulfur bearing compounds are known for their protective or reactivating effects on enzymes, as for example cysteine, glutathione or magnesium sulfate.

HCN is detoxified in the body by the enzyme rhodanese (thiosulfate transulferase), converting HCN to thiocyanate (SCN). Thiocyanate is also capable of accelerating proteolysis, though to a lesser degree than HCN. Glutathione also is known to provide a protective effect on amylase (Sumner and Somers, 1943, p.84).

While it is common for people to regard HCN as highly poisonous, it is a required compound in metabolism, as for example as forming part of the structure of vitamin B12.

Besides the enzyme rhodanese for detoxifying HCN to thiocyanate, the red blood cells contain an enzyme called thiocyanate oxidase which releases HCN again from thiocyanate (Goldstein and Rieders, 1953, quoted by Oke, 1969 p. 175). Such mechanisms prove the metabolic necessity for free HCN in the body. This is further supported by the fact that the vitamin B12 cycle of the body requires free CN- to convert hydroxocobalamin (pro-B12 or B12a or B12b) to cyanocobalamin (B-12).

Thiocyanate oxidase and rhodanese represent together the functional necessity and utility of HCN metabolically. The cyanide is tightly bound to cobalt in B12, nevertheless, the body possesses mechanisms for liberating the CN- from B12. Other functions for CN- include acting as a carbon donor for the synthesis of choline and other compounds and for the conversion of homocysteine to methionine (Oke, 1969, pp190-191)

With this in mind, it is then logical to regard this molecule HCN and its principle dietary sources as an important adjunct to enzyme therapy along with all the other vitamins and minerals necessary for normal health. The safest way to derive HCN is from the dietary nitrilosides, or cyanophoric glucosides. These substances are abundant in nature in natural food stuffs, with the richest sources found in the seeds of apricots, peaches, cherries, plums and the bitter almond. Other foods that are rich in nitrilosides include lima beans, lentils, chick-peas (garbonzo beans), vicia fava, mung beans, wheat grass and cassava (Krebs, 1964). Nitriloside rich foods make up the majority in the dietary of many cultures (Oke, 1968, 1969).

Thus HCN is an essential cofactor if not a co-enzyme, and should not be labeled as a poison any more than we would label B12 a poison, or vitamin A, which can be highly toxic taken out of the context and quantities required for normal metabolism.

Purified amygdalin is used in many clinics as an alternative therapy in cancer. However, it is popularly regarded in those settings as a selective cytotoxin, and the enzyme protocols may be regarded and treated by these clinics as biochemically unconnected to the HCN fraction as cofactor or co-enzyme. In some of these clinics, they may introduce thousands of milligrams of amygdalin without a concomitant large load of enzymes. Mendell and Blood found that a mere .15 per cent concentration was sufficient to accomplish remarkable results on the enzyme turnover numbers (1.7 per cent HCN per 70 cc water with 2 per cent papain in 700 cc water acting on 135 grams protein).

This is what we would expect of a true vitamin or cofactor. However, with very high loads of amygdalin, the liver will have to work overtime to process the whole molecule for physiological function or in making it excretable. This in turn can have deleterious effects by dissipating detox molecules needed in the tumor arena. Seen as a co-enzyme, HCN probably binds 1:1 (one to one) with each enzyme molecule. It would be pointless to have a thousand molecules of HCN to only one hundred enzyme units, assuming the HCN acts immobilly on each enzyme. Much less would be needed if it acts dissociably.

It should also be noted that HCN probably does act as a cellular *cyto-static*, meaning it drives the cancer cell towards a state in which it will not divide. Cancer cells require oxygen during mitosis. Since the cancer cell is rich in hCG, which inhibits the enzyme rhodanese (thiosulfate transulferase) which detoxifies HCN, the cancer cell will be susceptible during their aerobic phase (oxygen metabolism) to inhibitory effects of HCN. HCN deactivates the mitochondrial enzyme cytochrome oxidase.

While HCN will inactivate cytochrome oxidase in cancer cells, in normal cells rhodanese is present in active form to detoxify it before it reaches the mitochondria.

However the cancer cell is facultatively anaerobic. This term means the cancer cell can and does use oxygen, but when aerobic metabolism is threatened by HCN or other means, it will merely undergo transformation to anaerobic or fermentative metabolism. Thus this potency of HCN would be more like the Pasteur effect, such as the effect oxygen has on anaerobic organisms, inhibiting their growth. Probably the benzaldehyde molecule of amygdalin is a true *cyto-toxin*, since this molecule has been shown to have a very powerful and selective anti-cancer potency (internet, 5, 6) by its inhibiting action on mitochondrial ATPase (Racker, 1972; Erwin et al. 1975). Together HCN, thiocyanate and benzaldehyde would cover all the bases of a cancer cell's energy production: aerobic and anaerobic.

Thus, seen as a cytotoxin, HCN would only be useful in killing or more probably slowing cancer cells for part of their life cycle. On the other hand, as adjunctive to enzyme digestion of cancer cells, HCN will always be useful, no matter what phase the cancer cell is in, assuming sufficient free active enzyme is available. The rational use of nitrilosides is therefore never as a mono-therapy, but in conjunction with pancreatic enzymes.

Interestingly, thiocyanate has been shown to successfully prevent the crisis of sickle-cell anemia (Houston, 1973), as has cyanate (OCN-) (Ceramin and Peterson, 1975) .

Vegetarian versus Meat diets in Therapy

The safe use of nitrilosides in diet and therapy presupposes the availability of sulfur in the metabolic pool. Vegan diets and certain forms of vegetarianism can put a strain on this sulfur pool and alter the metabolism unfavorably especially with regard to enzyme synthesis wherein sulfur amino acids are essential. Certainly a vegan or vegetarian diet can be safely maintained with sulfur rich food sources and nitrilosides (for B12 synthesis), but the cancer patient must conserve these resources and a vegetarian regimen may be too much. Eating meat will not "dissipate" the enzymes we are using. Indeed, systemic amylase levels are actually higher in meat eaters than in vegetarians, while protease levels in the blood are higher in vegetarians.

Because low amylase levels can result in poor reactions to enzymatic therapy, we want amylase levels to be higher. Most of the poor responses in patients to enzyme therapy in terms of how they feel, or discomfort levels, is due to too high an intake of proteinases versus amylase.

HCN/Amylase interractions

In some enzyme texts, HCN is noted as an inhibitor of amylase. In order to test this, I subjected starch to salivary amylase digestion in the presence of soda (to pH 7) and normal saline with and without amygdalin. Amygdalin is a glucoside, specifically a nitriloside known as laevo-mandelonitrile-beta-glucoside. It is known that saliva also carries the glucoside digesting enzyme beta-glucosidase. Beta-glucosidase does digest amygdalin releasing the sugar from the mandelonitrile moiety and allowing the spontaneous generation of HCN and benzaldehyde (possibly suggesting the presence of a nitrilase). Using standard determination techniques, salivary amylase digestion of starch was accelerated in the starch-amylase-amygdalin samples, and not inhibited. The samples without amygdalin did not show positive reactions for maltose at

the same time, though equivalent parallel samples did show positive reactions later. Naturally, further studies by other researchers must be performed to confirm this datum.

The Efficacy of Immuno-Enzyme Therapy in Cancer

Lab studies

Amongst an abundance of literature that show that circulating pancreatic and homologous enzymes act against cancer cells, we will only refer to three lab studies.

In one, dealing with leukemia, a study by researchers in Israel showed that proteolytic enzymes of the serine type (trypsin, chymotrypsin and carboxypeptidase for example) caused human myeloid leukemic cells to undergo differentiation to benign and functionally normal leukocyte cells (Fibach et al., 1985). This study suggests that leukemia represents a deficiency of pancreatic enzymes leading to a state of arrested development in leukocytes. The body uses a system of feedback to tell itself that something is lacking or at appropriate levels. Possibly when active appropriate enzymes are lacking, mature and active leukacytes are lacking. On one hand this is analogous to how digestive enzymes are changed from a zymogen or pro-enzyme to active enzyme by cleavage of a small peptide chain from one end of the zymogen by interokinases or active trypsin. This allows the enzyme to unfold to its active state. We might say that pro-leukocytes are waiting for proteolytic digestion for activation or to become mature leukocytes. Lacking mature leukocytes, to compensate, the body continues producing more pro-leukocytes, as is found in leukemia. When sufficient active leukocytes are present, production is cut off. Therefore supplying supplemental enzymes of the type used in this study (pancreatic enzymes) is a safer way of ameliorating this condition than using exotic therapies like chemo and radiation.

Trophboblasts and tumor cells are characterized by certain adhesion molecules. For example, oncofetal fibronectin which is found only in trophoblasts and cancer cells (Siemianowicz, Gminski, et al., 2001 p.1291; Feinberg et al., 1991;Matsuura and Hakomori 1985; internet 25; internet 26). Another adhesion molecule expressed by trophoblast and cancer cells is CD44. CD44 is associated with and is used as a predictor for metastatic phenotypes in cancers of many types. CD44 is absent in first trimester trophoblasts, but is present in pre-implantation trophoblasts, which have highly invasive characteristics required in normal pregnancy for establishing the associated fetal cells (at this stage, undetermined diploid totipotent cells or primitive individual cells or stem cells, one of which will become the fetus) in the endometrial luminal epithelium. German scientists found that the number of CD44 molecules (epitotopes) on cancer cells from cultures of various types (leukemic, melanoma, mammary carcinoma, histiocytic lymphoma) were reduced after exposure to pancreatin, chymotrypsin, papain and bromelain (Gebauer et al., 1997). All CDs, of which trophoblasts and cancers express several, are subject to digestion by the pancreatic enzymes and other enzymes used in immuno-enzyme therapy. Thus we see IET can not only digest cancer cells on site, but can prevent them from moving beyond the local site of action by affecting their adhesion motifs.

The first rational cure of cancer was developed by John Beard, as applied by Dr. Lambelle. This case is reported in Beard's book, The Enzyme Treatment of Cancer.(Beard, 1911; Lambelle, 1910). This was the first reported cure of sarcoma by enzyme therapy.

However, we would not expect such an old case to provide evidence in today's standards. Therefore, we can turn to modern studies, such as those provided by Dr. Nicholas Gonzalez.

Other adjunctive factors to Enzyme therapy

Although the systemic enzymes all function optimally in basic or non-acid environs, they can be activated by acids; and though the body temperature is usually 98.6 F, these same enzymes actually improve in catalytic properties at higher temperatures to the limits of fever temperatures. This suggests the usefulness of hyperthermia therapy. (internet, 15)

As noted above, hCG confers upon a tumor cell **a high electronegative charge** that repulses the white blood cells. It also aids in protecting the cell membrane from digestion by proteinases like trypsin, chymotrypsin and carboxypeptidase as well as the lipidases and phospholipidases. The negative charge is on the carbohydrate molecule of hCG. The carbohydrate of hCG is capped by many side chains of a sugar called sialic acid (neuraminic acid). The human body does not produce the enzyme sialidase (neuarminidase), the enzyme that breaks down these sugars, which enzymes are only expressed by virus and some pathogens. However, studies have shown that **vitamin A, retinoic acid, seems to have the ability to strip this sugar from the carbohydrate part of hCG** (Hogan-Ryan and Fennelly,1978).

Similarly, studies done with the chelator **EDTA** (ethylenediaminetetraacetic acid), show it has the ability along with **trypsin** to strip the cell coat of cancers making them **susceptible to both protease attack and immune approach.**(Anghileri and Dermietzel, 1976).

Inhibitors to be avoided in enzyme therapy

Dr. Nicholas Gonzalez has been treating patients successfully with enzymes for over 20 years. In his experience, he has found it necessary to **restrict his patients from using soy products.** This is because soy contains a natural form of trypsin inhibitor. Most legumes have such inhibitors. Unless these foods are cooked or sprouted (to one and three-quarter inches), they convey these inhibitors into the blood stream or affect the enzymes in the digestive tract.

Similarly, many organo-phosphates or pesticides have been shown to inhibit or destroy these enzymes, as well as do various detergents. **Dish detergents are highly negatively charged molecules that are not easily stripped from dishes even with much rinsing.**

Denaturents

In our state of civilization it is almost impossible to avoid heavy metals. They perfuse the atmosphere and are incorporated into the plants and animals we use as food. Heavy metals are especially destructive to enzymes, with the most potent enzyme destroyers being mercury, lead, silver, copper and cadmium ions. Ionic gold will also destroy enzymes. When these heavy

metals are encountered by the body, it will usually attempt to excrete them immediately or sequester them if that fails. Thus these heavy metals will show up in the nails, hair, and fatty tissues of the body. As an adjunctive therapy, chelation can be used to ameliorate the deleterious effects of these heavy metals. Effective chelators are EDTA, malic acid, N-acetyl Cysteine (NAC), **BAL** (British Anti-Lewisite or penicillamine) and even the garnish cilantro has been shown to possess chelating properties.

Naturally if a patient undergoes full scale chelation therapy, mineral supplementation must be instituted to refortify the body with essential minerals. By far the most effective means of getting these minerals is in the form of foods wherein they are bound to proteins or other natural compounds or naturally chelated. Not all therapists agree with this conclusion, preferring to use solutions with free ions of these elements, such as Clark's Mineral formula orally or as enema.

A very important adjunctive therapy for any patient (except those in danger of renal failure) is **magnesium chloride therapy**. Dr. Raul Vergini has used this therapy in his practice for many years with no untoward effects, but many benefits for normal health and in cancer (internet 12, 14). It is no exaggeration to say that magnesium is the quintessential mineral for homeostasis and normalization of metabolism. It is hard to think of any metabolic process that does not involve magnesium. In fact many experts contend that because of its importance in over-all health and especially heart health and the high incidence of heart disease, that magnesium deficiency in our country is catastrophic (internet, 13, 21).

Toxic loading

Shutz law says that to double the digestion rate, the enzyme quantity must be quadrupled. This naturally results in greater product loading of the excretory mechanisms of the body. In therapy, it is suggested that a regular increase be applied over a period of time, to accommodate the necessarily limited ability the body has to eliminate the detritus or break-down products.

It is essential that liver and kidney function not be compromised by over-digesting the tumor. At no time would enzyme supplements be removed, but there is a logical patient-response/enzyme-quantity curve that must be gradually steepened to maintain progress towards remission. If the increase is too sharp, it can lead to a toxic overload. It would be pointless to completely destroy a tumor only to kill the patient by kidney failure.

To help stimulate toxic flushing, some therapies utilize colonic flushes and coffee enemas. The coffee enema has been used in professional medicine for over 100 years, and is not just a folk remedy (internet 10,11). Rather, it properly falls under the category of empirical medicine, which constitutes the origin or basis of 90 per cent of all medicine even today. Modern science works to convert such methods to rational grounds. That does not alter their origins. In traumatic head injury at the turn of the century, to ameliorate shock, "black coffee per rectum" was used along with hypodermic whiskey injections, saline enemas, ice cap to head and heating of extremities (Cathey, 1918) with very good effect.

Coffee enemas stimulate the release of glutathione-S-transferase, which aids the detoxification of free-radicals.(internet, 10) They also have the subjective effect of inducing a sense of well-being. (internet, 11).

Enemas of enzymes can also be of great help in the absorption of same. For prostate cancer, colon cancer, and urinary-genital cancers, enzyme enemas are required. For prostate cancer, see internet references 5 and 6: **fig slurries** will deliver benzaldehyde which has powerful anti-cancer effects and is readily absorbed by the colon.

> Note: Another factor is benzaldehyde's close link to amygdalin (a.k.a. laetrile), the bete noire of the cancer establishment. Amygdalin, found in apricot kernels, etc. breaks down into benzaldehyde, glucose, and hydrogen cyanide in the body. Gluconated benzaldehyde (BG) is essentially laetrile without the hydrogen cyanide.... Readers seeking treatment for cancer should seek out competent medical help, including doctors open to alternative treatments. Scientific references on benzaldehyde research, as well as other treatment options, are to be found in Ralph W. Moss's book, *Cancer Therapy*, published by Equinox Press.

You can get benzaldehyde by eating figs, apple seeds, peach or apricot kernels. It is also found in almond extract. Almond extract is available in most supermarkets. One teaspoon of almond extract usually contains approximately 90 mg of benzaldehyde.

Benzaldehyde is remarkably cheap about $8 an ounce at chemical supply houses. (Such companies do sell it, but may require a pledge that it is not to be used for medicine - only for laboratory research.) Since the average person needs less than a gram per day [see below], the cost per year, astonishingly, would be about $2.00, or less than a penny a day.

In conclusion, it must be accentuated that enzymatic therapy is very complex, and should be administered by a competent professional. Many other adjunctive therapies have been proven to be useful towards remissions and regressions: hyperthermic therapy (in which papain is very much advocated because of its stability in high temperature along with HCN); Coley's toxins to induce fever and augmentation of immune reaction; hydrazine sulfate therapy, etc. All of these therapies can be rationalized within the context of the immuno-enzyme therapy discussed herein. Nevertheless, all these other adjunctive therapies used WITHOUT consideration of immuno-enzyme therapy are destined to be categorized as merely hit-or-miss attempts at remission.

It goes without saying that this review of important molecules, enzymes, and vitamins as well as other nutritional factors cannot be complete. Cancer falls within the scope of diseases termed chronic and metabolic disease. In the history of medicine, no chronic or metabolic disease has ever been resolved by factors other than those normal to the animal economy: namely, factors of nutrition including air, water, proteins(including enzymes), fats, carbohydrates, vitamins and minerals. This automatically excludes such exotic factors as surgery, radiation and chemotherapy, unless we amend chemotherapy to include such factors normal to the animal economy.

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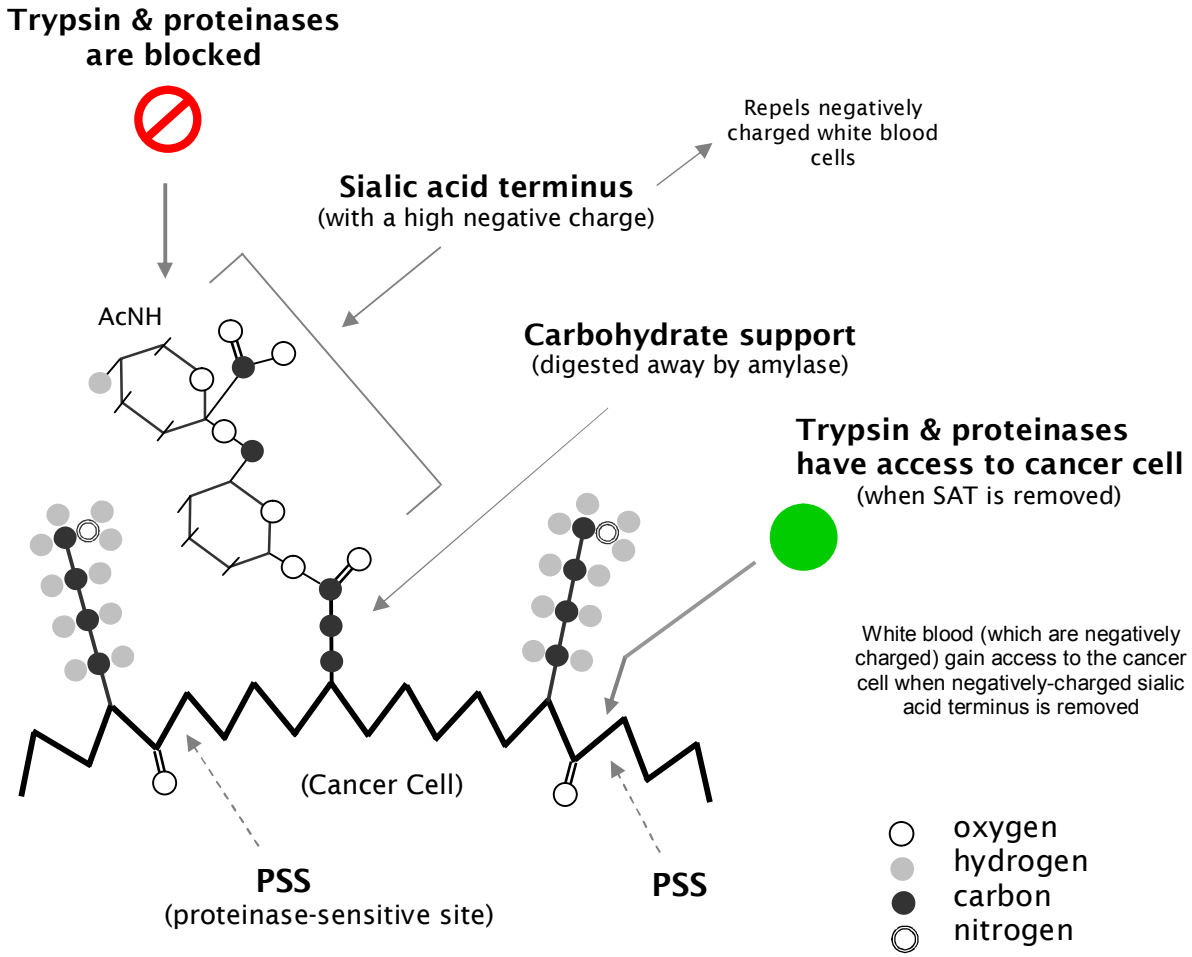
Appendix:

Amylase attacks hCG; and the importance of amylase as precursive enzyme activity before proteinase

The outer coating of a cancer cell has human Chorionic gonadotropin as the suitable substrate for the attack of amylase, then protease. The carbohydrate portion is sialylated, but the sugar portion is susceptible to attack. But the proteases, like carboxypeptidase, trypsin and chymotrypsin are unable to reach the protein until amylase does its work. This is the rationale for using amylase in abundance alone or in combination. In some cases, due to symptoms of pain in the back, high arterial pressure, drowsiness, etc., proteases/proteinases should be discontinued and amylase alone used. For a more extensive overview on enzymes go to: www.navi.net/~rsc/iet_txt.html

Enzymes destroy the net which connects tumor cells with each other and with endothelium, realize a proteolysis of tumor cell membranes. Consequently, tumor size is reduced, tumor necrosis occurs, and tumor is more easily attainable for chemo- and hormone-preparations. Results of experimental and clinical studies (Zeneca and Pur, 1964) have shown that proteinases increase tissue permeability. Moreover, enzymes slow down formation of immune complexes and show an indirect immunoregulatory effect (Kunze, 1993, 1995).

Action of Amylase:



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