

Rationale For Equine Diet™ and Supplements

The horse is one of the most intriguing of all animals. It is perhaps unequaled among all creatures in its sheer elegance and beauty. It has that “something” which no one can quite describe or even understand, yet it is there, and it adds to the excitement and pleasure of having a horse.

Most horse owners regard caretaking seriously and believe they do best by following conventional advice. But as mysterious as the horse itself is, beliefs about horse care are even more so. Lore, myth, commercial propaganda and pseudoscience abound. This is particularly true regarding the most important aspect of stewardship – health.

EQUINE DIET™

W Y S O N G

WYSONG EQUINE DIET™

An easily digested, high energy, high quality protein, grain-based feed containing a spectrum of vitamins, minerals, enzymes, probiotics and essential fatty acids, designed to be fed with high quality legume hay/pasture.

WYSONG E.F.A.™

An essential fatty acid supplement containing naturally stabilized, cold processed omega-3, -6, and -9 fatty acids.

WYSONG BIOGEL™

A probiotic containing a concentrated source of viable (live) naturally occurring microorganisms. Use Biogel routinely during weaning, diet change, travel, worming, sickness, and before and after antibiotic therapy to help prevent adverse effects.

E-BIOTIC™

A concentrated, natural food source of active enzymes, probiotic cultures, amino acids, vitamins, minerals, fatty acids, and various other micronutrients particularly beneficial to horses primarily on the standard “hay and oats” diet, and to those under stress.

EQUINE CHELAMIN™

A natural 74+ trace mineral supplement derived from a unique ancient geological formation of composted sea vegetation, plankton and sea mineral salts.

EQUINE TREATS™

A delicious snack that is boosted with a wide array of important natural nutrients including vitamins, chelated minerals, antioxidants, essential fatty acids, probiotics, proteoglycans and phytonutrients.



A critical element influencing health, over which owners have control, is nutrition. However, there are many hidden factors that influence food quality which are not properly addressed in common practice or by following convention. For example, modern high intensity farming exhausts the land of valuable soil nutrients. Although crop yield may be high through clever genetic manipulation, nutrient value declines. Furthermore, once a crop is harvested it immediately begins to degrade, resulting in even less nourishment available.

The accepted solution to this depletion is to supplement vitamins and minerals. Which ones to use, and in what quantity, are decisions usually dictated by opinion, sometimes fanatical, whether or not there is credible basis. Additionally, commercial vitamins are synthesized and purified, while the minerals are inorganic. Such manufactured forms may not be balanced or as easily absorbed and metabolized as their natural food-borne counterparts.

Formulated foods often contain inferior grain fractions and milling by-products, usually stripped of much of their nutrient value. Processing can further harm nutrients with up to 90% of their value being destroyed on the way to the “table.”

If the goal is to optimize health, foods must be selected which are truly wholesome, have not been harmed excessively by processing, and which can be efficiently utilized. To make choices, the horse owner must be informed – armed with a rational, scientific understanding of how nutrition can enhance health.

A paradigm, a logical framework, a philosophy not easily tossed by the ever-changing wind of horse care fable, is the starting point. Using this as a filter, truth can be sorted from fiction, myths exposed and choices made with confidence.

Philosophy

The following is based upon evidence from the study of a wide range of animals, including humans, and can be reasonably extrapolated to the horse because of basic biochemical similarities among all creatures.

First, let's see if current health approaches truly achieve health. Modern medicine is primarily focused on the treatment of disease rather than its prevention. The tremendous resources of modern medical technology are by and large attempts to extend the length of time an animal or person can be kept alive in a hospital. Much is spent on dying, little for living.

To begin this journey toward a more rational philosophy of health, let's first dispel the belief that all is well, and that modern nutrition and medicine are bettering or extending life. It is commonly believed, for example, that modern medicine and technology are responsible for lengthening the life span of humans and the animals within their care. For example, the life expectancy for people born in 1900 was 47 years whereas the life expectancy of a person born today is approximately 73. The obvious conclusion, therefore, seems to be that medicine and modern nutrition are lengthening the span of life. However, these numbers are an average resulting from decreased infant mortality (due to improved food distribution and public utilities, not medical measures) combined with death at mature ages. Thus, if there were only two people on the earth, one an infant and the other an adult, and the child died

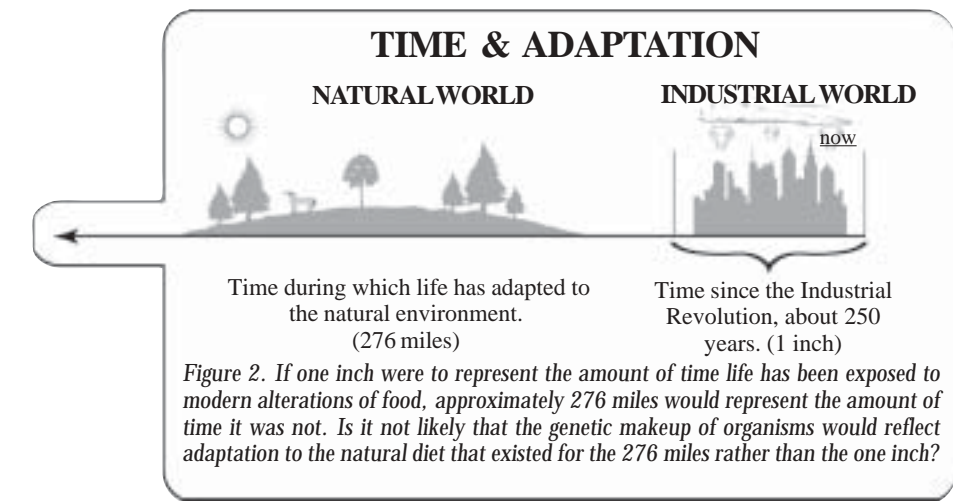


Figure 2. If one inch were to represent the amount of time life has been exposed to modern alterations of food, approximately 276 miles would represent the amount of time it was not. Is it not likely that the genetic makeup of organisms would reflect adaptation to the natural diet that existed for the 276 miles rather than the one inch?

at two years and the adult died at 80, the average life expectancy would be midway between 2 and 80, or 39 years. Lengthen the life of the child to 70, and suddenly average life expectancy rockets to 75 years.

Life span, on the other hand, is the length of time an organism can expect to live. The life span of humans is 120 years, of a dog 20, a mouse 2, an elephant 70, and a horse 35. Interestingly, these figures have not changed since life span has been tracked. In fact, it is believed that for domestic animals and humans in mid-life, the ability to live beyond this average life span is not significantly different than it was since actuarial data was first tallied.

The ability to change maximum life span is stalled. However, the opportunity to reach that optimal life span is

within our grasp, and can be achieved through careful attention to preventive nutritional and lifestyle practices.

If one were to plot the average course of health from birth until death, the graph would assume the shape of a mild sloping backward "S." (see Figure 1.) On the other hand, the ideal shape of that graph would be more rectangular, with high health and vitality being maintained until the genetic end of life, at which time life ends quickly, much like a leaf falls from a tree at the end of its life.

Extending the healthy, vital part of life and compressing morbidity into a short period of time at the end of life is the worthy goal. It is adding life to years, not just years to life.

Nutrition is a rapidly unfolding field. It is exceptionally complex since it requires a grasp of a variety of sciences. How does one sort through the morass of data to determine how to best optimize health through nutrition?

It is confusing to rely on the latest scientific discovery for health information. This week nutrient X is believed to be promising but next week nutrient A is more promising, and the next week X may be found to interfere with A, and so on. This is not to say that scientific information is not important. It just needs to be sorted, filtered if you will, through the correct philosophical sieve.

Duplicating the archetypal diet of the horse provides the best chance for

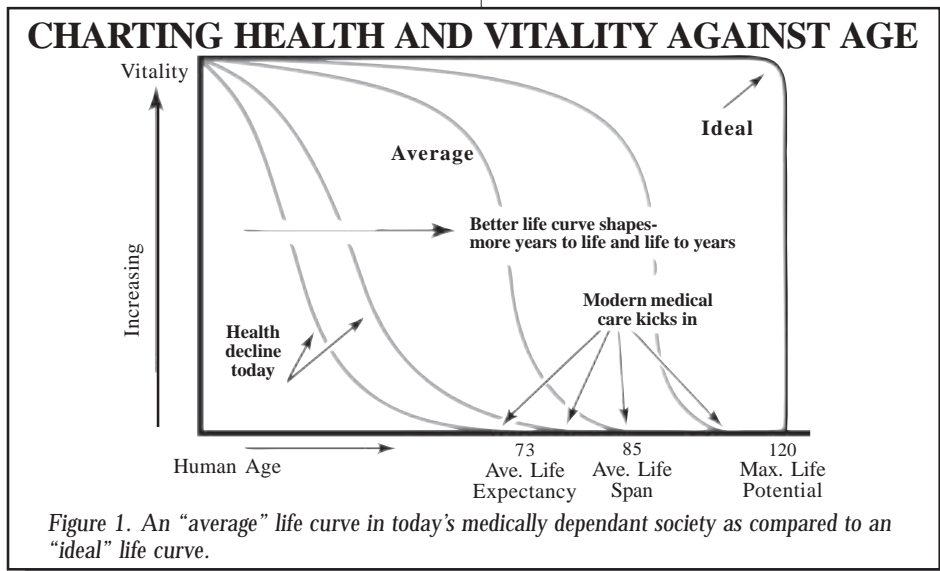


Figure 1. An "average" life curve in today's medically dependant society as compared to an "ideal" life curve.

increasing healthy life. The original, natural, genetically-expected context is the philosophic key for which we are looking.

Here's why. If one were to represent the time since foods have been altered by modern agriculture and food processing as one inch on a line, the remainder of the line would extend off the page 276 miles to represent the amount of time that life subsisted on natural foods consumed in their raw, fresh, whole state (see Figure 2).

It is clear that living organisms have not had time to adapt to modern manipulations. The genetic program of organisms expects the archetypal diet represented by the 276 miles, not the new, synthetic, increasingly toxic world and diet of the 1 inch.

To demonstrate the dramatic changes that occur in tissue as a result of modern dietary alterations, a comparison of domestic to wild animal tissue characteristics is shown in Figure 3. Of particular significance is the alteration in fatty acid composition, since evidence increasingly links fatty acid nutriture to a wide range of degenerative maladies.

Fresh, whole, natural foods are the goal to reach toward. They fit the rational philosophic paradigm that dictates that creatures are designed for their natural genetic context – the 276 miles.

An environment that is increasingly polluted, a water supply contaminated, foods harvested from nutrient-depleted soils year after year, storage degradation of fragile food components, and many other risk factors introduced to the modern horse need to be addressed. But in doing so it is possible to use the overall philosophic objective we have stated above, namely, attempt to mimic the archetypal patterns of the horse so that the food consumed is the food it is genetically most capable of recognizing and utilizing.

COMPARISON OF DOMESTIC AND WILD ANIMAL MEAT

	<u>% Protein</u>	<u>% Fat</u>	<u>% Polyunsaturated Fatty Acids (as a % of fat)</u>
Domestic Tissue	16	28	7
Wild Tissue	24	4	37

Figure 3. This alteration of tissue is a direct result of diet. We are what we eat.

Food Formulations for Nutrition & Health

Given this logical and scientifically based philosophy, how does one select the best health-promoting food? Match ingredients and processing to the philosophy. That which most closely matches the horse's genetic expectation is whole, fresh, natural food. That which does not is a food-fraction based, synthetically "fortified," additive-laden, lifeless food artifact.

A food can be no better than the sum and quality of its ingredients. Knowledge of essential nutrients and intake requirements is still evolving. While there are over 50 known nutrients, dietary levels have been set for less than half of them. It is therefore quite unlikely that we can get full nourishment from foods designed merely to meet minimums of only a fraction of known nutrients. Furthermore, it is also difficult to expect sound nourishment from ingredients such as grain fractions and milling by-products whose nutrient values are greatly depreciated as a result of the harsh conditions to which they are subjected in processing. Thus, it is not only reasonable, but essential in the idealistic nutritional sense, that a food contain whole, natural ingredients. If fractions are used, they should be the nutrient-dense parts, selected because of their specific nutritional merits, and not be low value, low cost fillers meant only to maximize profits or create aesthetic effects such as color, texture, or mouth feel.

The following specific Wysong food features help match horses to their genetic expectation and, with that, create opportunity for optimum health and healing.

Whole Grains

Fiber, protein, vitamins and minerals are compromised when grains are milled and fractionated, with certain parts separated for human consumption and the remainder used in animal feeds (see Figure 4). White flour, soy meal and brewer's rice are examples of such nutrient-stripped, fractionated products. Wysong whole grains provide a natural balance of nutrients not duplicated by fractionating – even if the end product is "fortified." These whole grains are then extruded by a special extrusion method (HTST) that inactivates

LOSS OF NUTRIENTS IN MILLED FLOUR

(Percent lost)

Vitamins

Thiamin	77.1%
Riboflavin	80.0%
Niacin	80.8%
Vitamin B ₆	71.8%
Pantothenic Acid	50.0%
Folacin	66.7%
α-Tocopherol	86.3%
Betaine	22.8%
Choline	29.5%

Minerals

Calcium	60.0%
Phosphorus	70.9%
Magnesium	84.7%
Potassium	77.0%
Sodium	78.3%
Chromium	40.0%
Manganese	85.8%
Iron	75.6%
Cobalt	88.5%
Copper	67.9%
Zinc	77.7%
Selenium	15.9%
Molybdenum	48.0%

Figure 4. Milling grains negatively impacts their nutritional value.

THE DISTRIBUTION OF ELEMENTS IN THE EARTH

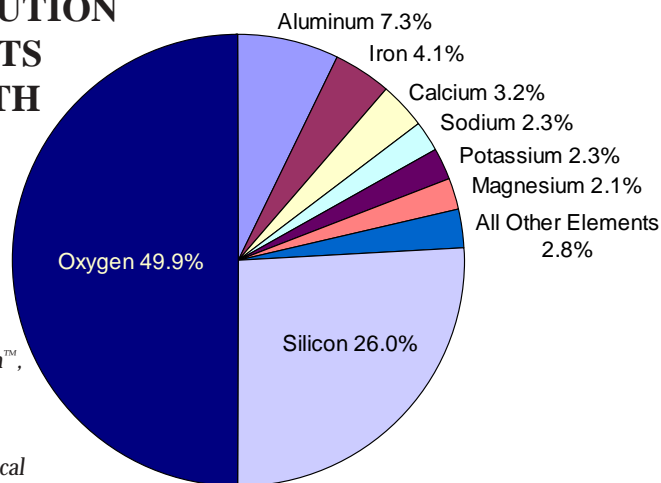


Figure 5. Wysong Chelamin™, a natural 74+ trace mineral organically complexed product, has a distribution of elements essentially identical to that found in the earth.

anti-nutritional factors and gelatinizes starches to increase digestibility and palatability.

Vitamins & Minerals

Virtually every vitamin used in supplements or as fortification in foods is in a synthetic, purified form. In contrast, natural source vitamins carry with them associated biochemicals and minerals as cofactors, as well as unknowns that are believed to enhance and broaden vitaminic activity. Natural vitamins and minerals are absorbed up to 5 times better and retained up to 6 times better than conventional USP synthetic vitamins and inorganic minerals.

Wysong products contain vitamin and mineral-rich whole grains and Chelamin™ (see Figure 5), a chelated 74-mineral ancient sea bed composite derived from ancient, pre-industrial composted mineral-rich sea vegetation. Additionally, special yeast plasmolyzate and probiotic cultures serve as additional sources of organically complexed vitamins and chelated minerals.

Probiotics

All life exists in complex and critical interrelationships with the environment. These vital associations extend to include obvious factors such as food, water, air, and less obvious influences such as sunlight, gravity, magnetism, and the unseen microbial world.

Recognizing and respecting these relationships is a key to health and well-being since it helps restore natural genetic context.

This realization has surfaced not so much from doing, but rather as a result of undoing. The pollution of air, water and soil, the fabrication of synthetic foods, and the misuse and/or overuse of various drugs and antimicrobials has disrupted important natural balances and forced us to re-evaluate our dominionistic, somewhat marauding attitude toward our world.

Since Pasteur's germ theory of disease, microorganisms, by and large, have been viewed mostly as an enemy to be vanquished. But increasing evidence indicates that the microbial world is mostly in symbiotic partnership with more complex life forms. Disease may be related more to an organism's inability to resist illness than to the actual presence of a microbe. Even tragic scourges have been shown to be ameliorated not because of antimicrobials, but rather as a result of the restoration of balances through hygiene and dietary improvements.

Our natural link to microorganisms is emphasized by evidence that basic cellular structure is a composite of once free-living microorganisms. Organelles, such as mitochondria, have been found to contain genetic material and other biochemical features. This is persuasive of

the idea that microorganisms have always been in intimate beneficial relationships with more complex life forms.

Theoretically, if beneficial organisms could be supported by, and/or introduced into the gastrointestinal tract, health could be enhanced and potential pathogens inhibited. The use of organisms for this purpose is termed probiosis, meaning "for life." This is in contrast to antibiosis (represented primarily by antibiotics) which means "against life."

The contents of the gastrointestinal tract are technically outside the body. Ingested materials are thus a part of an open ecosystem analogous to a stream with changing speeds, which can be interrupted by occasional eddies and rather stagnant pools. Each area in the gastrointestinal tract represents a unique habitat providing highly specialized niches of specific microbial populations (climax communities) consisting of both prokaryotic (cells with no nucleus) and eukaryotic (cells with a nucleus) organisms.

When it is considered that microorganisms within the digestive tract of a human can exceed 100 billion cells per gram, over 100 trillion cells total, 10-fold the total number of eukaryotic cells in the body, one can begin to understand their potential impact. Such an enormous microbiota interacts nutritionally and physiologically in profound ways only now beginning to be understood. Studies have isolated and identified a host of autochthonous microorganisms (native inhabitants) in the gut and have further shown several of these to directly or indirectly affect health.

This complex, sensitive microbial population (containing 20,000 times the organisms of the entire earth's human population) is affected by myriad allogenic and autogenic factors. Allogenic factors include diet, temperature, pH, peristalsis, villus contraction, oxygen, redox potential, bile acids, epithelial

turnover, mucous gel, antimicrobials, phagocytic cells, and antibodies. Autogenic factors include lactic acid, volatile fatty acids, hydrogen sulfide, bacteriocins, nutrition competition, and synergy. Alteration of any of these factors can create sweeping changes in microbial contents.

In herbivores, such as the horse, these microbes are more fully understood and respected. They constitute the very means by which plant stuffs (indigestible to humans) can be converted to energy and tissue building blocks.

The Role of Probiotics

Normal gastrointestinal microflora play an indispensable role in combating potential pathogenic microorganisms. Certain species of probiotic bacteria are capable of rapid multiplication, competitive inhibition of disease-producing microorganisms, lowering of the intestinal pH by the production of lactic acid, and production of bacteriocins (natural antibiotics). The probiotic hypothesis suggests that if sufficient numbers of these bacteria are introduced into the intestinal tract at a time when the balance has swung in favor of pathogens (such as at birth, during periods of stress or disease, or following antibiotic therapy), then disease can be minimized or overcome.

Although microorganisms have long been used in various fermentative industries and are essential to vast ecological cycles, their use for the explicit purpose of building health is a relatively new, but highly promising application.

In one study using young pigs as a model, *Enterococcus faecium*, a probiotic culture found in several Wysong products, was fed for ten days after weaning, and total *Escherichia coli* (a potential pathogen) counts were made of the feces (see Figure 6). Counts in control pigs (no probiotics) raised dramatically in the first five days and then came back down. The test group receiving the *Enterococcus*

faecium maintained a low fecal *E. coli* count throughout the test period of ten days. The numbers of hemolytic *E. coli*, those thought to be most pathogenic in baby pigs, were also measured, and the response was similar. Of interest in these tests is the resurgence of *E. coli* after the *Enterococcus faecium* was discontinued while there was no similar resurgence of the hemolytic bacteria. This suggests that *Enterococcus faecium* is particularly effective in controlling the pathogenic forms of *E. coli* bacteria. This same conclusion may be drawn if weaning-age foals were used as model.

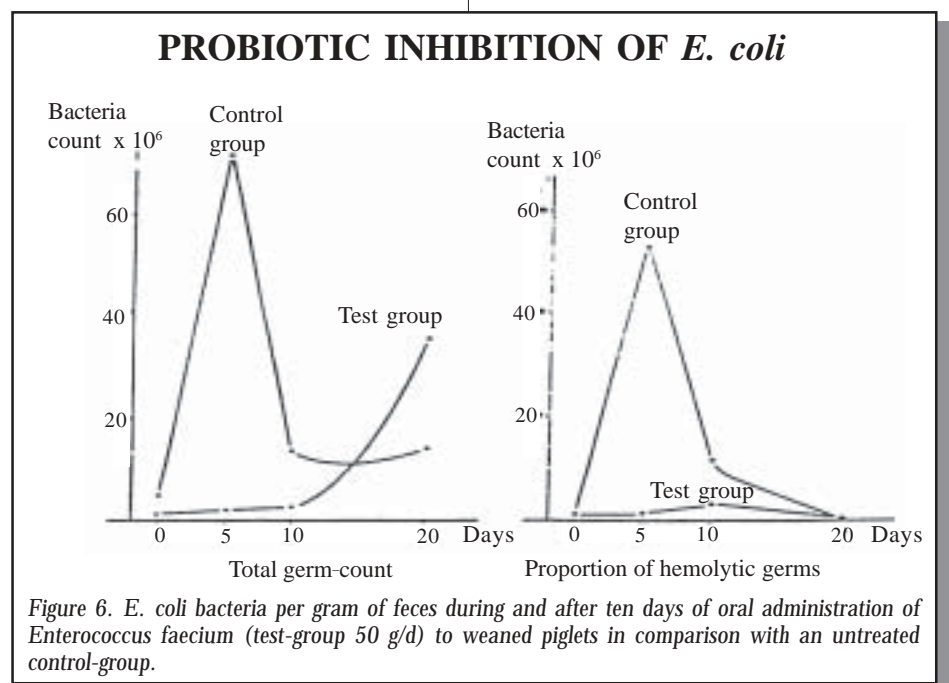
In addition to the inhibition of pathogens, probiotics are believed to exert a variety of subtle effects that can enhance overall health and disease resistance. In exchange for the nutrients and comfortable environment provided by the host (symbiosis), probiotics biosynthesize vitamins, essential amino acids, fatty acids, numerous enzymes and unidentified growth factors. Some probiotics also have the capability of inactivating the carcinogenic intestinal b-glucouronidase and nitroreductase. The pronounced microbial role in digestion encourages appetite and facilitates the thorough breakdown and

absorption of food substances which are essential to favorable growth in foals and maintenance in adult horses.

Maintaining the Probiotic Balance

An improper intestinal microbial balance, or the selective killing off of normal flora, may precipitate serious disease. Therapeutic levels of antibiotics greatly disrupt beneficial autochthonous microflora and can result in rapid reinfection when withdrawn. Food animals have become the source of antimicrobial-resistant *Salmonella* infections in humans, with a direct link to antibiotic use on the farm. It is estimated that the purposeful digestive tract colonization with probiotics of 85% of food animals could eliminate 8.5 million cases of human food-borne illness at a savings of \$850 million per year.

The constant infusion of friendly organisms in the diet, as it happens in the wild through contact with the mother's milk, and then from natural forage, helps prevent the colonization of disease-producing bacteria such as *Salmonella*, *E. coli*, *Shigella* and others. Probiotic bacteria implant themselves on the mucus-coated walls



of the intestine and crowd out and prevent colonization of pathogenic or unfriendly microbes by competitive exclusion. The lactic acid and altered redox potential produced creates an intestinal environment that is not conducive to the growth of pathogenic bacteria. Probiotic organisms compete for food and are also capable of producing natural antibiotics and hydrogen peroxide, which sharply discourage the growth of enteropathogens.

Resistance to disease in chickens is actually decreased when increasing the "hygiene" of chicks by removing them from the mothers' droppings. Resistance (to infective doses of 10^3 - 10^6 cells of *Salmonellae*, for example) can be actually increased by feeding the chicks these droppings. The droppings are the autochthonous inoculum for establishing probiotic cultures in the chicks' digestive tracts.

The results of many research studies have pointed out the possibility of improving the health and performance of cattle and other farm animals including the horse, dogs and cats, and even humans through the use of probiotics (bioregulation). Lactobacilli probiotics have been found, for example, in newborn pigs just four hours after birth. (The inclusion of *Lactobacillus acidophilus* in the diet of young piglets also decreases the number of *E. coli* in the digestive tract.) Nature has obviously recognized the importance of providing a healthy start on life by implanting helpful bacteria via colostrum and environmental contact, before harmful bacteria can overpopulate the young's initially sterile system.

Optimal health, not just the absence of disease, must be the goal every horseman strives for with each newborn foal. Sound health translates into optimum growth. Probiotics provide an excellent safe, natural, and effective means of helping to achieve these goals. Not only can probiotics fight and resist disease, but they

have the capability of bolstering overall health.

APPARENT DIGESTIBILITIES

Nutrient	Yeast Culture	
	Before	After
Dry matter	68.6	73.4*
NDF	51.7	60.7**
Hemicellulose	54.1	68.8**
ADF	51.2	58.2*
Cellulose	59.2	67.4*
Nitrogen	53.2	56.2*

*p<.05. **p<.01.

Figure 7. Utilization of protein increases when yeast cultures are added to feed rations.

Specific Wysong Probiotics

Enterococcus faecium:

Enterococcus faecium benefits are many: fermentation of carbohydrates to lactic acid thus lowering pH and discouraging pathogenic growth; increased palatability and appetite stimulation; production of antitoxins; microbial insensitivity to many antibiotics; production of hydrogen peroxide which exerts a bacteriocidal effect on pathogens; yielding of a metabolite that has specific activity against *E. coli*; production of a variety of bacteriocins which act against such pathogenic species as *Pseudomonas* and *Salmonella*; a significant increase in feed efficiency; improvement in daily weight gain; and a decline in mortality.

Lactobacillus spp.:

Lactobacillus first implants in the young's digestive tract via the mother's milk, then begins to exert a protective and beneficial role which is important throughout life. *Lactobacillus* spp. increase resistance to stress and resultant disease; increase feed efficiency and weight gain; increase food palatability and appetite; inhibit the growth of enteropathogenic

organisms; and have a direct nutritional enhancing effect. *Lactobacilli* include the following species: *acidophilus*, *lactis*, *plantarum* and *casei*. These *Lactobacillus* species inhibit such pathogens as *S. aureus*, *B. proteus*, *Salmonella*, *Pseudomonas*, and *E. coli*.

OLIGOSACCHARIDE BLOCKING OF PATHOGENS

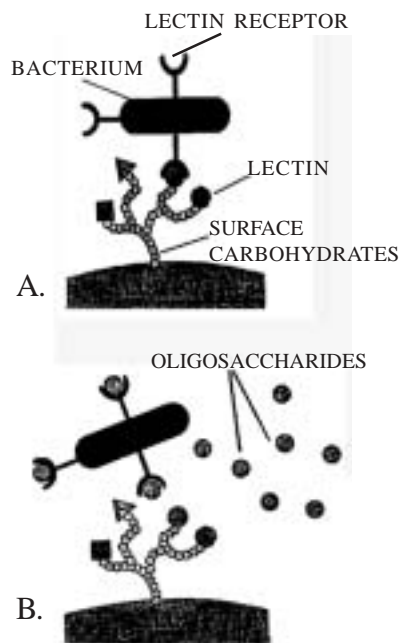


Figure 8. Lectin receptor site binding action of oligosaccharides.

A. Attachment of bacteria to the intestinal epithelium via lectins.

B. Oligosaccharides prevent the attachment by binding to the lectin receptors.

Saccharomyces cerevisiae:

Saccharomyces cerevisiae is a live yeast culture (not at all related to pathogenic yeasts). It is microencapsulated with a water soluble b-glucan to enable its survival through processing. The net effect of yeast culture is increased palatability and appetite; weight gain; improved feed efficiency and immune response; and decreased mortality. Studies show that the addition of *Saccharomyces cerevisiae* yeast culture to the equine ration will improve the efficiency of feed protein utilization by specific manipulations of the equine urea cycle (see Figure 7).

Prebiotic oligosaccharides:

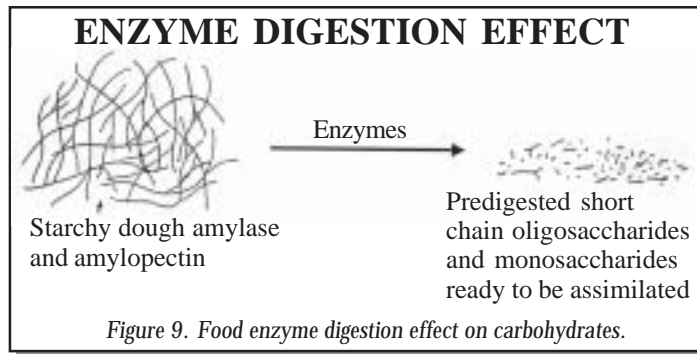
Short-chain carbohydrates are components of yeast cultures, artichoke, garlic and other plants, and are beneficial to the horse in several aspects. Fructooligosaccharides (FOS) are utilized by Bifidobacteria, a probiotic strain of bacteria. Multiplication of these bacteria contributes to the competitive exclusion action of probiotics. Mannan oligosaccharides (MOS) are actual pathogen inhibitors in the gut which act by binding lectin receptor sites on the pathogenic bacteria, thereby blocking implantation on cell membranes (see Figure 8). Digestive function is enhanced by increased digestibility of soluble fiber and fiber-like activity of non-digestible oligosaccharides. Stimulation of specific and non-specific immune responses, including cancer preventing activity, are also benefits. Studies in pigs and turkeys have shown that systemic IgG (immunoglobulin G) and IgA concentrations increase significantly after consuming oligosaccharides, indicating enhanced immune response.

Enzymes

Enzymes are delicate compounds important in nearly every chemical reaction that occurs in the body. Digestion and all metabolic pathways rely on enzymes to function. Enzymes participate in at least 80,000 processes and are considered the biochemical essence of life itself.

Enzymes are found in all living cells, both vegetable and animal, and therefore in natural foodstuffs. However, they are inactivated by heat slightly above body temperature, such as occurs in processing.

It is commonly believed that enzymes in food are broken down by digestion and are therefore of no more importance than any other consumed



protein. However, research shows that enzymes within food can survive in the digestive system. By doing so they spare the body's own digestive enzyme reserve.

It was previously believed that because enzymes are produced by the body, that there could never be a deficiency. However, enzymes can become deficient, as can other nutrients such as amino acids and vitamins. The amount of enzymes the body can produce in a lifetime is limited. Adding enzymes through raw foods and supplementation can relieve undue stress on the digestive organs, particularly the pancreas.

The enzyme content of food is essentially ignored by nutritionists and processors. Modern processed foods are by and large devoid of enzymes. Likewise, forage that has aged also loses its enzyme activity.

The solution is to provide fresh forage and only processed foods that have had enzymes enrobed on the products post-processing.

When ingested from live foods, enzymes combine with food and water to aid in the breakdown of proteins, fats and carbohydrates (see Figure 9). Supplemental enzymes are produced by probiotic microorganisms such as *Aspergillus* and *Bacillus*. These organisms are cultured on various food substrates to produce the enzyme desired.

By supplying enzymes to the diet, enhanced enzymatic digestion results in increased absorption of nutrients

with less undigested product passing in the stool. Beneficial effects of enzyme supplementation include:

1. Better weight maintenance
2. Increased resistance to stress
3. Improved recovery from a variety of debilitating disease conditions
4. Better health and performance during gestation and lactation
5. Larger foals
6. Improved skin condition
7. Decreased food sensitivities and allergies.

Specific Wysong Enzyme Supplements

Aspergillus oryzae:

Aspergillus oryzae fermentation product secretes a wide variety of enzymes, including amylase, protease, lipase, pectinase, maltase, rennet, catalase, tannase, lactase, diastase, and cellulase.

Bacillus subtilis:

Bacillus subtilis fermentation products, which have been used for 50 years or more in animal feeding, generate protease and amylase enzymes which promote digestion of proteins and carbohydrates over a broad pH range. Due to the variety of non-enzyme metabolites produced in addition to amylase and protease enzymes, inhibitory effects upon other microbial populations in close regional proximity can occur due to competitive inhibition (see "Rationale for

Probiotic Supplementation”). *Bacillus subtilis* also produces b-glucanase, an enzyme which breaks the b-1, 3-glucose polymer in complex carbohydrate grains: soy, barley, milo, and others. *Bacillus subtilis* remains active when excreted with manure, resulting in less odor, faster decomposition, and improved reduction of solids in the manure.

Phytase:

An enzyme that releases phosphorus for use in bone tissue from plant phytin.

Essential Fatty Acids

Essential fatty acids are those fats (lipids) that an organism is incapable of synthesizing in sufficient quantities to meet metabolic demands. In contrast with fat, which is used for fuel, cushioning of organs, and as a vehicle for absorption of fat-soluble nutrients, essential fatty acids play critical roles in cell and organelle membrane structure and a wide array of physiological processes through eicosanoid modulation. (For a more detailed discussion of this important class of nutrients see: [Lipid Nutrition: Understanding Fats and Oils in Health and Disease](#). R. L. Wysong, 1990.)

Cell and organelle membranes consist of a lipid bilayer. This lipid bilayer is comprised primarily of phospho-lipids, which in turn are made of an assortment of fatty acids reflecting dietary fat intake (see Figure 10).

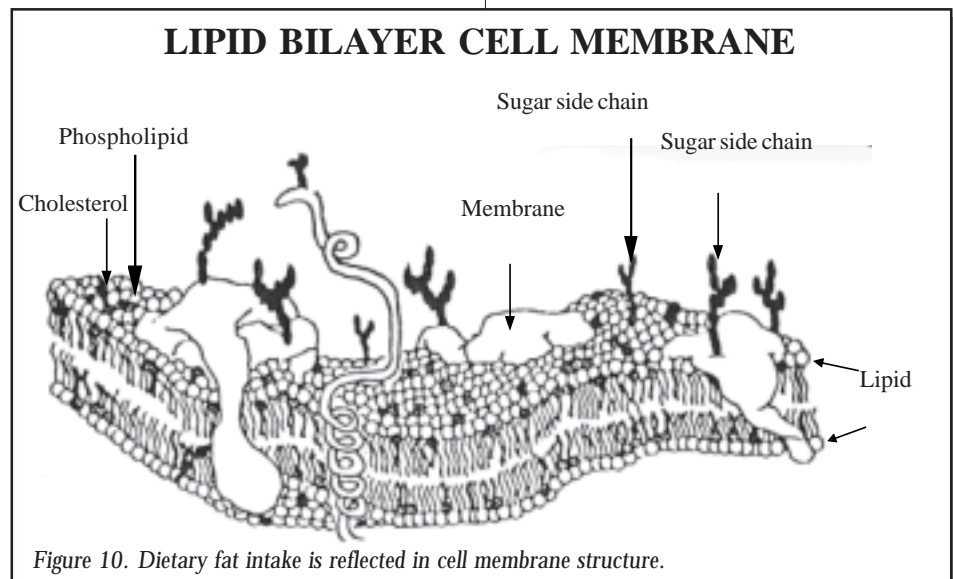
Essential fatty acids, such as linoleic and linolenic, are unsaturated fatty acids. They are very fluid by nature and thus contribute to transmembrane dynamics more effectively than saturated fatty acids or the trans-fatty acids that can occur in processed oils. Within membranes there are also protein molecules that contribute to forming electron passageways for the flow of oxygen and energy into and out of cells and organelles. (Unsaturated essential

fatty acids accomplish this by forming pi electron clouds with the sulfur groups of membrane proteins).

Disease is the consequence of long-term fatty acid malnutrition. If membrane structures are not sufficiently supplied with proper fatty acids, they are unable to perform with maximum efficiency. The very gatekeepers of life (cell membranes) cannot be impaired without consequences. Essential fatty acids in fresh, quality food and properly designed fatty acid supplements can help swing the balance of fatty acid membrane structure to a more healthful state. Essential fatty acids are transformed into a variety of more complex and more unsaturated fatty acids known as eicosanoids. These play extremely important roles in the moment-by-moment regulation of metabolic activities at the cellular and tissue levels. Eicosanoids are midway between enzymes (biochemical level) and hormones (organ level). Compounds such as thromboxanes, prostaglandins, leuko-trienes, and lipoxins comprise some of the members of this important family derived from essential fatty acids. Eicosanoids turn on and off processes which activate certain metabolic events, as well as moderate these metabolic events. Some of the functions of eicosanoids are shown in Figure 11.

Natural foodstuffs of horses contain essential fatty acids properly protected against oxidation and in appropriate ratios for optimal nutrition. However, once food products are harvested they immediately begin to degrade in nutrient value. Vitamins can be lost, minerals can leach, proteins and carbohydrates can degrade and isomerize, and fatty acids can oxidize and lose their nutritional value. Fatty acids are particularly susceptible to such degradation because they are highly reactive, easily oxidized compounds which are vulnerable to heat, light and certain mineral catalysts.

Within natural plants, fatty acids are protected from such degradation due to inherent antioxidant systems. These antioxidants include vitamins E and C, carotenoids, enzyme systems, and mineral chelators. There is also the physical protection provided by the ensconcing natural shell of the plant itself. But once stripped from the protective factors by processing, they become highly labile, can quickly lose their nutritional value, and can even form toxic compounds, such as free radicals. Couple this with the fact that modern monoculture farming practices do not build nutrient value into crops (but rather focus simply on crop yield) and the extreme vitiating effects of modern food processing – from milling, to solvent extraction of oils,



FUNCTIONS OF EICOSANOIDS

Organ system	Effects	Species involved ^a	Organ system	Effects	Species involved ^a
Prostanoids			Leukotrienes		
Blood vessels	Vasodilation	$\text{PGI}_2 > \text{PGI}_3 > \text{PGE}_1$	Bronchioles	Constriction	$\text{LTC}_4, \text{LTD}_4$
Platelets	Vasoconstriction	TXA_2	Ileum	Constriction	$\text{LTC}_4, \text{LTD}_4$
	Adhesion	TXA_2	Vascular	Constriction	$\text{LTC}_4, \text{LTD}_4$
	Aggregation			Permeability	$\text{LTC}_4, \text{LTD}_4$
Lung	Antiaggregatory	$\text{PGI}_2 > \text{PGI}_3 > \text{PGE}_1$	Pancreas	Insulin secretion	$\text{LTB}_4, \text{HETE}$
	Bronchiole constriction	$\text{PGE}_2, \text{TXA}_2, \text{PGD}_2$	Neutrophils	Adhesion	LTB_4
	Bronchiole dilation	$\text{PGE}_2, \text{PGI}_2$		Chemotaxis	$\text{LTB}_4, \text{HETE}$
Kidney	Glomerular filtration rate	$\text{PGE}_2, \text{PGI}_2, \text{TXA}_2$		Chemokinesis	
	Renin secretion	$\text{PGE}_2, \text{PGF}_2$		Lysozyme secretion	$\text{LTB}_4, \text{HETE}$
	Naturesis	$\text{PGE}_2, \text{PGI}_2$	Monocytes	Chemotaxis	$\text{LTB}_4, \text{HETE}$
	Diuresis	PGE_2		Chemokinesis	
Stomach	Acid secretion	$\text{PGE}_2, \text{PGE}_1$	Basophils	Histamine secretion	$\text{LTB}_4, \text{HETE}$
Small intestine	Peristalsis	$\text{PGE}_2, \text{PGF}_2$			
Pancreas	Amylase secretion	$\text{PGE}_2, \text{PGI}_2$			
	Insulin secretion	PGE_2			
Hypophysis	Secretion and growth	PGE_2			
	Hormone				
	adrenocorticotrophic				
Tissue	Pain	PGE_2			
	Cytoprotection	$\text{PGI}_2, \text{dimethyl PGE}$			

Figure 11. Functions of eicosanoids on metabolic processes.

^aPG = prostaglandin; PGI_2 = prostacyclin; TXA = thromboxane; LT = leukotriene;

For example, the eicosanoid thromboxane, from the omega-6 fatty acids, has the ability to cause platelet aggregation and clot formation, whereas the eicosanoids produced by the omega-3 fatty acids tend to reverse these effects by increasing clotting time and decreasing coagulation factors, including blood viscosity. Thus, if the omega-6 fatty acids predominate in the diet, the chances for vascular damage and circulatory difficulties increase. This is the basis for the supplementation of some oils and seeds such as flax, rape, and soy, which are rich in omega-3 fatty acids. Omega-3 fatty acids compete for the same enzyme system that converts omega-6 fatty acids into eicosanoids and thus can shift the balance to more healthy eicosanoids (see Figure 12).

A variety of inflammatory and allergic disorders are also related to fatty acid nutriture. Oxidized fats, as well as an imbalance of omega-6 to omega-3 fatty acids, result in the overproduction of eicosanoids which are inflammatory, and the underproduction of eicosanoids which are anti-inflammatory. Prostanoids, leukotrienes and lipoxins that are proinflammatory are increased or decreased depending upon the types of fatty acids consumed.

The common clinical findings of dry coat and skin, and poor hoof condition with essential fatty acid deficiency and imbalance are explained by similar mechanisms. Eczema, pruritis, atopy, and hyperkeratosis can be controlled by fatty acid intake. Trans-epidermal water loss is affected by the makeup of a particular sphingolipid that exists between the granular and horny layer of the skin. If essential fatty acids are not associated with this lipid barrier in sufficient amounts, increased water loss will occur, resulting in dryness, cracking, and breaking of the integument including skin, hair and hooves (see Figure 13).

In summary, whole food sources, careful processing, natural stabilization, and an increase in the omega-3 to

to pelleting, puffing, dehydrating, freezing, and so forth – it is not surprising that nutrition can be greatly compromised.

Thus, it is important that foods containing essential fatty acids be minimally processed and properly protected from oxidation until they are consumed. One step in this direction is to use whole grain products since the nutrients that protect fat while it is “on the vine” can also serve to protect fatty acids in a finished food product. Additionally, supplemental natural antioxidants can be used for preservation. A combination of specific vitamins, oleoresins from certain herbs, and organic acids has been proven to be exceptionally capable of stabilizing fatty acids against oxidative degradation (see Wysong Oxherphol™ monograph).

Essential fatty acid deficiency manifestations include:

1. Loss of ability to maintain body temperature
2. Dry coat and skin, and poor hoof condition

3. Impaired energy metabolism
4. Eczema
5. Gallstones
6. Vascular pathology
7. Immune dysfunction
8. Allergy
9. Susceptibility to a broad range of degenerative conditions including arthritis, cancer and cardiovascular disease.

Another consideration in essential fatty acid nutriture is the shift that has occurred in the balance of essential fatty acids since the Industrial Age (see Figure 2). With the scaling up to mass feeding and the use of easily cultivated southern latitude high-yield grains, linoleic acid (LA), an omega-6 fatty acid, has become predominant in the diet. In contrast, the consumption of linolenic acid (LNA), an omega-3 fatty acid, has been proportionately reduced.

Eicosanoids generated from omega-3 fatty acids exert a variety of beneficial effects to cancel and balance potential pathological effects of excess omega-6 fatty acids.

omega-6 ratio provide an exciting opportunity to enhance equine health and promote healing. Why? Because this approach fits our philosophic paradigm of matching the equine to its proper food genetic context.

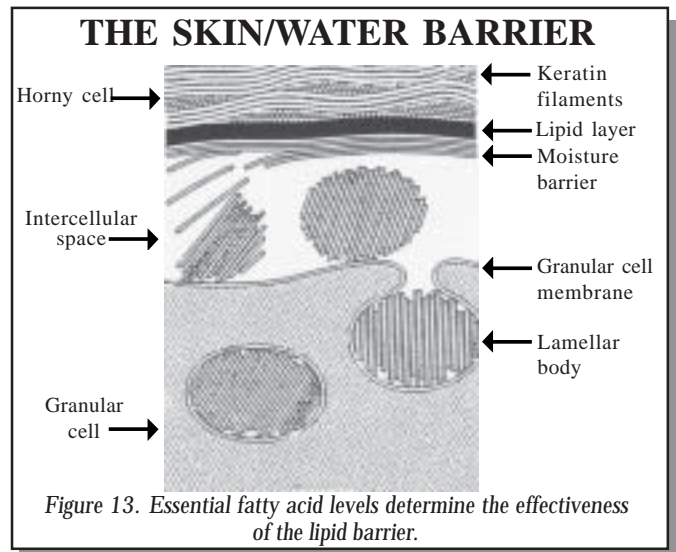
Extrusion

Agricultural products can only be harvested during certain seasons. They must then be stored, packaged, distributed and made into forms that are palatable as well as nutritious. These inherent problems are the legitimate reasons for modern feed processing methods. However, the fractionation of ingredients and their adulteration with a variety of synthetic materials, simply to enhance aesthetic qualities with the intent of attracting buyers, detracts from a feed's original purpose – to provide nutrition.

Another legitimate reason for processing is to convert essentially inedible ingredients into usable foods. Raw grains, have high nutrient value but contain anti-nutritional factors. Glycinin, b-conglycinin, urease, phyto-hemagglutinins, tannins, phenolics, phytic acid, and trypsin inhibitors are all examples

of factors in grains which can cause problems if fed in the raw state. Heating grains causes the destruction of anti-nutritional properties, but also results in the loss of nutrient value. Thus, we have the dilemma of potential toxicity of raw grains, but if the toxins are neutralized by heat, many nutrients are lost.

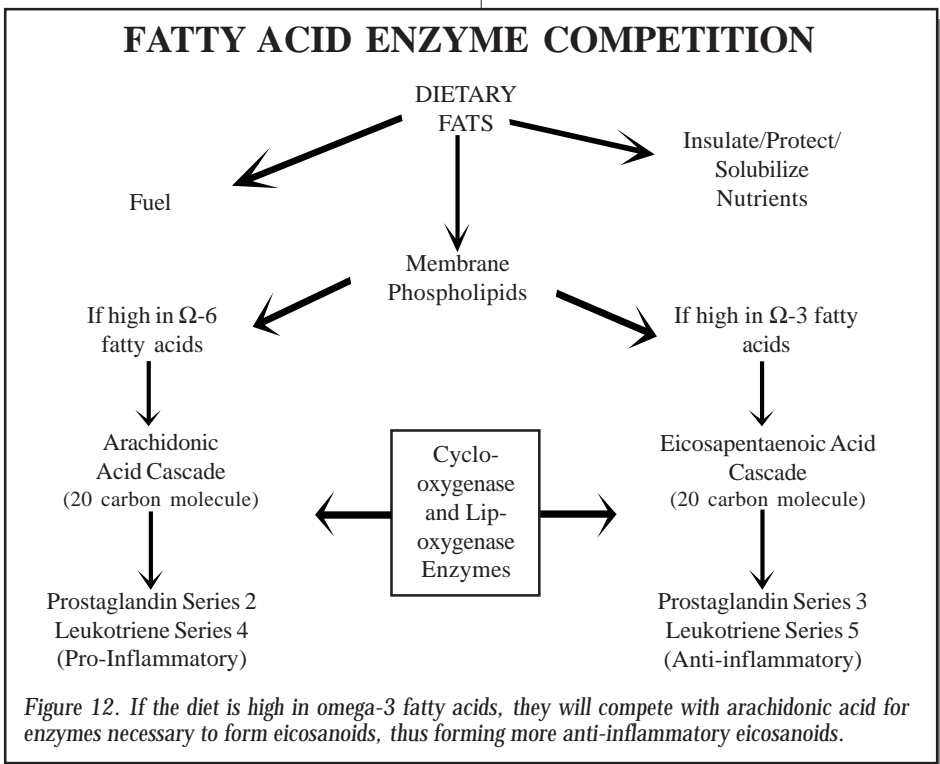
Extrusion is a process by which grains are forced through a barrel of narrowing diameter with a screw. With new processing technology, HTST (High Temperature, Short Time), it is possible to produce enough heat during the extrusion process to inhibit anti-nutritional factors without resorting to the use of additional heat. This decreased exposure to heat saves much of the original nutrient value of the grains (see Figure 14). Feeds processed in this manner also have a low moisture content, so they are inherently more



shelf-stable, and resistant to bacterial and mold growth.

An equally important function of extrusion is its ability to gelatinize starches. Gelatinization opens the carbohydrate chains so that enzymatic digestion can occur more readily. During this special processing, soy oil cells are ruptured to release a variety of fatty acids including omega-3, -6, and -9, vitamin E and other tocopherols, and lecithin. These fat-soluble elements increase the health of hair, skin, and hooves, naturally preserve the product, and enhance the health of the immune system. This unique processing improves the availability of immune-enhancing, sulfur-containing amino acids, minerals, and B-vitamins; also calcium and phosphorus which, with other major and trace minerals, promote strong teeth, bones and improve mineral-dependent physiological processes. Blood nutrients such as copper, vitamin B₁₂, folic acid, cobalt, and essential fatty acids build performance levels, stamina and recuperative powers.

The benefits of this technology are numerous. The increased surface area created by extrusion results in superior digestibility, allowing the horse to extract more nutrients and energy from less feed. Thus, the horse is getting greater benefit from its food and the owner is getting greater value for the



HIGH TEMPERATURE SHORT TIME EXTRUSION PROCESS

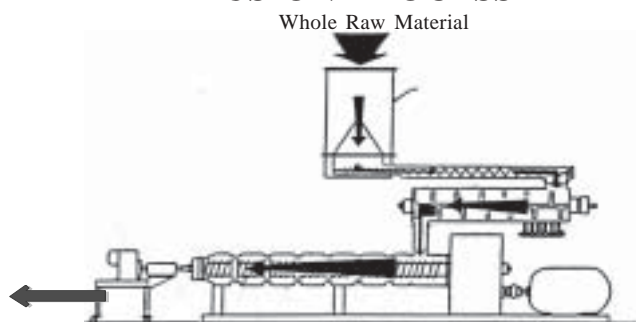


Figure 14. Extrusion produces a nutritious feed with minimal processing.

dollar. The higher volume and lower density of extruded feed takes the horse longer to eat, helping to satisfy its grazing instinct and possibly reducing the incidence of chewing on fences and stalls from boredom, also an economic benefit to the owner and health benefit to the horse. Extruded feeds are low in dust and fines (good for horses with respiratory problems) containing finely ground Vitamin E Tocopherol Epimers, Fat-Soluble Vitamin C, Organic Chelators, and Natural Botanical Oleoresins. Grains processed with the HTST

extrusion method are then supplemented, after a cooling period with enzymes, probiotics, vitamins, minerals and essential fatty acids. This significantly nutritious extruded whole grain food, when fed in combination with a quality forage and intelligent supplementation, provides

excellent health-promoting nutrition (Figure 15).

Preservation

Although foods are commonly preserved with synthetic antioxidants, these additives are suspected of causing a variety of health problems. Documented risks include depression of growth, loss of weight, metabolic stress, alopecia, fetal anomalies, and liver damage. Some commonly used synthetic preservatives, such as BHT (butylated hydroxytoluene), are banned or restricted in

Sweden, Romania, Australia, and Great Britain – but not in the U.S.A.

It is important that food be preserved. High heat, mechanical forces, solvent extraction, distillation, oxidation, and hydrogenation in modern processing can severely degrade the nutrient value of important essential fatty acids. Processed fats can readily oxidize and become rancid. Rancidity not only destroys palatability but creates toxins. A better and safer alternative is the use of natural antioxidants. Wysong uses an effective natural preservative (antioxidant) comprised of vitamin E, oleoresin extracts, and organic acids. It has been demonstrated to protect important fats as well as fat-soluble vitamins even better than chemical synthetics of questionable safety such as BHT, BHA (butylated hydroxyanisole), propyl gallate, and ethoxyquin.

These statements have not been evaluated by the Food and Drug Administration. This product is not intended to diagnose, treat, cure, or prevent any disease.

PROCESSING APPROACHES

Process	Quality/Nutrition Approach	Quantity/Profit Approach
1. Ingredient Storage	<ul style="list-style-type: none"> - Leave whole - Natural pest control - Oxygen excluded 	<ul style="list-style-type: none"> - Pesticides used - Exposed to air
2. Grinding	<ul style="list-style-type: none"> - Low heat - Smaller batches - Immediate use 	<ul style="list-style-type: none"> - High heat and speed - Larger batches - Storage
3. Extrusion	<ul style="list-style-type: none"> - Careful control of heat, pressure and moisture 	<ul style="list-style-type: none"> - High production primary objective
4. Ingredient Addition	<ul style="list-style-type: none"> - Those not requiring cooking added after heat e.g., nutritional oils, vitamins, probiotics, enzymes 	<ul style="list-style-type: none"> - All mixed together - All cooked together
5. Storage and Transportation	<ul style="list-style-type: none"> - Fresh batching 	<ul style="list-style-type: none"> - Warehousing

Figure 15. Processing can produce either a nutritious food, or a lifeless, fractionated food fragment.

Wysong Equine Diets and Supplements

Wysong Equine Diet™

WYSONG EQUINE DIET™ is an easily digested, high energy, high quality protein, grain-based feed containing a spectrum of vitamins, minerals, enzymes, probiotics and essential fatty acids, designed to be fed with legume hay/pasture. As such, it is an excellent ration for growing foals, mares, breeding stock, and a maintenance and supplemental ration for all horses. Each of the major grains used in Wysong Equine is in its whole state with all the inherent fiber, protein, vitamins, and minerals. These grains are then HTST extruded to increase digestibility and palatability.

After extrusion and a cool-down period, Wysong Equine incorporates live probiotic cultures which help maintain a beneficial enteric flora, as described earlier.

Rather than use inexpensive, nutritionally weak ingredients, and then attempt to make up for it by simply adding synthetic additives, Wysong uses ingredients specifically for their nutrient content – not price. Wysong Equine Diet and Supplements do not just maintain horses, they enhance and optimize nutrition. The results (the ultimate measure of value) speak for themselves: improvements in the condition of coat, skin, hooves, bones, joints, teeth, vitality, growth, and temperament are often remarkable.

Wysong Equine is ideal for the older horse that is a “hard keeper” and any other horse that requires an energy-dense source of nutrients. Wysong Equine is also suited for use as a fitting feed for sales of yearlings and show horses, since its fat content will result in added body condition and improved hair coat.

The average daily maintenance feeding level of Wysong Equine is 1/4 lb. per 100 lbs. of body weight. On an intermittent basis, up to 1-1/2 lbs. per 100 lbs. of body weight may be fed during lactation, gestation, working, racing, rapid growth, and to debilitated or older horses as required to meet their metabolic needs. Feed in conjunction with Wysong Optimal Forage™.

Do not feed additional vitamins or minerals unless advised by a veterinarian. Do not overfeed. Adjust feeding levels to maintain ideal body weight.

Available in 50 lb. bags.

Ingredients: Ground Oats, Ground Corn, Ground Barley, Ground Wheat, Ground Extruded Whole Soybeans, Cane Molasses, Ground Flax Seeds, Salt, Yeast Culture, Soybean Oil, Dried Kelp, Dried *Bacillus subtilis* Fermentation Product, Dried *Aspergillus oryzae* Fermentation Product, Dicalcium Phosphate, Magnesium Proteinate, Niacin Supplement, Ferrous Carbonate, Choline Chloride, Potassium Amino Acid Complex, Calcium Pantothenate, Manganese Proteinate, Zinc Proteinate, Thiamine Mononitrate, Iron Proteinate, Copper Proteinate, Folic Acid, Pyridoxine Hydrochloride, Vitamin A Acetate, Riboflavin Supplement, Biotin, Cobalt Carbonate, D-Activated Plant Sterol, Cobalt Proteinate, Dried *Lactobacillus acidophilus* Fermentation Product, Dried *Lactobacillus casei* Fermentation Product, Dried *Lactobacillus lactis* Fermentation Product, Dried *Enterococcus faecium* Fermentation Product.

Guaranteed Analysis: Crude Protein 14.0% min., Crude Fat 6.0% min., Crude Fiber 6.0% min., Calcium 0.3% min., Calcium 0.7% min., Phosphorus 0.3% min., Copper 25 ppm min., Selenium 0.3 ppm min., Zinc 78 ppm min., Vitamin A 3500 IU/lb min., Moisture 10.0% max., Ash 5.0% max., Added Minerals 4.0% max.



Equine E.F.A.™

EQUINE E.F.A.™ is an essential fatty acid supplement containing naturally stabilized, cold processed omega-3, -6, and-9 fatty acids. Benefits of supplementation include healthy and shiny coat, healthy skin, and modulation of the immune system to help overall health and disease resistance. Essential fatty acids are extremely fragile once extracted from their natural source. Light, heat, and air are all enemies of these fragile nutrients. Thus, Wysong Equine E.F.A. is carefully prepared through gentle, cold processing methods, stabilized with Wysong Oxherphol, and then packaged in light-impervious, nitrogen-flushed (oxygen excluded) bottles with a convenient pump top.

To use, administer one Tbsp. per 1,000 lbs. of body weight daily (1 Tbsp. = 2 pumps). Mix with grain portion of ration.

Available in 32 oz. bottles. Pump dispenser top also available.

Ingredients: Cold Pressed Soybean Oil, Cold Pressed Flax Seed Oil, Pumpkin Seed Oil, High Oleic Safflower Oil, Rice Bran Oil, Black Currant Seed Oil, Wysong Oxherphol (A Natural Antioxidant Consisting of Vitamin E Tocopherol Epimers, Fat-Soluble Vitamin C, Organic Chelators, and Natural Botanical Oleoresins).

Each 1 Tablespoon Contains: Stearidonic Acid 0.017 g (Ω 3), Palmitic Acid 1.361 g (s.f.a.), Stearic Acid 0.553 g (s.f.a.), Oleic Acid 3.884 g (Ω 9), Linoleic Acid 6.308 g (Ω 6), Linolenic Acid 1.786 g (Ω 3), GLA (gamma linoleic acid) 0.075 g (Ω 6).



Wysong Equine Biogel™

EQUINE BIOGEL™ probiotic contains a concentrated source of viable (live) naturally occurring microorganisms. Use Biogel routinely during weaning, diet change, travel, worming, sickness, and before and after antibiotic therapy to help prevent adverse effects.



To use, administer orally on the back of the tongue.

Dosage: Mature horses - 10 cc; Foals - 5 cc.

Available in a 30 cc oral syringe.

Ingredients: Cold Pressed High Oleic Safflower Oil, Dried Whey Product, Silicon Dioxide, Cold Pressed Flax Seed Oil, Dried *Enterococcus faecium* Fermentation Product, Dried *Lactobacillus acidophilus* Fermentation Product, Dried *Lactobacillus casei* Fermentation Product, Dried *Lactobacillus lactis* Fermentation Product, Dried *Aspergillus oryzae* Fermentation Product, Dried *Bacillus subtilis* Fermentation Product, Vitamin E Supplement, Sage Extract, Rosemary Extract.

Enzyme activity per 10 cc dose:

6000 Amylase bacterial activity units

4000 Hemicellulase units

300 b-glucanase units

9000 Protease proteolytic casein units

Each 10 cc dose contains the following culture quantities:

Enterococcus faecium 10 billion CFU

Lactobacillus acidophilus 5 billion CFU

Lactobacillus casei 2.5 billion CFU

Lactobacillus lactis 2.5 billion CFU

Wysong E-Biotic™

E-BIOTIC™ ensures the presence of important nutrients commonly lacking in some rations. E-Biotic is a concentrated, natural food source of active enzymes, probiotic cultures, amino acids, vitamins, minerals, fatty acids, and various other micronutrients. This rich formulation is particularly beneficial to horses primarily on the standard “hay and oats” diet, and to those under stress (gestating, lactating, undergoing rapid growth or debilitated from enteric, metabolic, infectious, or nutritional disease). E-Biotic not only supplies a wide range of micronutrients, but also increases the horse’s ability to extract maximum nutrition from the normal ration.



To use, topdress daily grain ration. Average dose is 1 Tbsp. (10 shakes) per 500 lbs. body weight, divided among daily feedings. Each 1 Tbsp. = 0.25 oz. = 7 g.

Available in 20 oz. bottles or 23 lb. pails.

Enzyme activity per 14 g dose:

4800 Amylase bacterial activity units

3200 Hemicellulase units

2400 b-glucanase units

7200 Protease proteolytic casein units

Each 14 g dose contains the following culture quantities:

Enterococcus faecium 500 million CFU

Lactobacillus acidophilus

125 million CFU

Lactobacillus casei 125 million CFU

Lactobacillus plantarum

30 million CFU

Ingredients: Yeast Cultures, *Aspergillus oryzae* Fermentation Product, *Bacillus subtilis* Fermentation Product, Ground Whole Sesame Seeds, Lecithin, Dried Kelp, Dried Ground Whole Carrots, Dried Wheat Grass Powder, Dried Barley Grass Powder, Spirulina, Bee Pollen, Sage Extract, Rosemary Extract, Natural Apple Flavor, Dried *Enterococcus faecium* Fermentation Product, Dried *Lactobacillus acidophilus* Fermentation Product, Dried *Lactobacillus casei* Fermentation Product, Dried *Lactobacillus plantarum* Fermentation Product, Magnesium Proteinate, Niacin, Ferrous Carbonate, Choline Chloride, Potassium Amino Acid Complex, Calcium Pantothenate, Manganese Proteinate, Zinc Proteinate, Thiamine, Riboflavin Supplement, Iron Proteinate, Vitamin A Acetate, Vitamin D₃ Supplement, Vitamin E Supplement, Copper Proteinate, Pyridoxine Hydrochloride, Folic Acid, Biotin, Cobalt Carbonate, Vitamin B₁₂ Supplement, Cobalt Proteinate.

Wysong Equine Chelamin™

EQUINE CHELAMIN™ is a natural 74 trace mineral supplement derived from a unique ancient geological formation of composted sea vegetation, plankton and sea mineral salts.

The combination of these unique, natural ingredients makes Equine Chelamin a comprehensive source of vitally important trace minerals as they occur in nature. Its trace minerals are synergistic with each other and chelated (combined) with organic molecules. Mineral chelates occur naturally in foods, and are the form that best facilitates mineral absorption.



Over time, with deforestation and intensive farming practices, soils from which feeds are derived have been dangerously depleted of trace minerals. Nitrogen, phosphorous and potassium (NPK) fertilizers fail to restore to the land the equivalent of what is taken. Equine Chelamin permits supplementation of a naturally occurring trace mineral complex without having to resort to purified single minerals in arbitrary dosages.

To use, sprinkle over daily food. In some cases, lightly dampening the food will increase acceptance.

Adult horses: Feed 4 oz. per day for one month; 2 oz. per day for the second month; 1 Tbsp. per day from the third month forward. Highly active horses should be on a maintenance dose of 1 oz. per day.

Foals: Feed 1/2 tsp. per day; this dose should gradually increase to the adult dosage of 1 Tbsp. per day.

Cycling: In some instances, favorable results have been obtained by giving Chelamin for 5 days and desisting for 2 as a routine cycle.

Available in 6 or 30 lb. pails.

Ingredients: Dried Seaweed Meal, Algae Meal, Diatomaceous Earth.

Elements in Wysong Chelamin

(All values are parts-per-million unless noted as a percent)

Si	Silicon	25%	Sc	Scandium	3.7	As	Arsenic	.2	F	Fluoride	3.85
Al	Aluminum Silica	9.3%	Co	Cobalt	4.8	Sb	Antimony	29	Li	Lithium	1.44
K	Potassium	4.8%	Yb	Ytterbium	1.4	Se	Selenium	4.1	Hg	Mercury	.166
Mg	Magnesium	.83%	Sr	Strontium	240	Zn	Zinc	20	Pd	Palladium	.74
S	Sulfur	1.6%	Ba	Barium	390	Sn	Samarium	3.5	Po ^{4-p}	Phosphate	320
Fe	Iron	1.6%	Au	Gold	.68	Ho	Holmium	1.1	Pt	Platinum	.08
Ca	Calcium	4.1%	Eu	Eutopium	.49	Tb	Terbium	.62	Rh	Rhodium	.44
Ti	Titanium	.23%	Nd	Neodymium	20	Ir	Iridium	51	Rb	Rubidium	36.5
Na	Sodium	.138%	Ce	Cerium	40	Lu	Lutetium	.45	Ag	Silver	.3
Mn	Manganese	150	Cs	Cesium	183	Cr	Chromium	70	Te	Tellurium	.1
Ga	Gallium	25	Th	Thorium	above 100	La	Lanthanum	18	Tl	Thulium	.65
Mo	Molybdenum	61	U	Uranium	above 100	Ru	Ruthenium	7.8	Sn	Tin	.44
Ge	Germanium	25	Ni	Nickel	60	Y	Yttrium	1.2	V	Vanadium	8
I	Iodine	7	Be	Beryllium	.10	In	Indium	.38	Dy	Dysprosium	4.0
Br	Bromine	5.2	Bi	Bismuth	14.3	Pb	Lead (under)17Pr			Praseodymium	2.0
W	Tungsten	8.1	B	Boron	7	Nb	Niobium	2.89	Tl	Thallium	10.0
Hf	Hafnium	2	Cd	Cadmium	1.12	C	Carbon	.19	Re	Rhenium	1.0
Ta	Tantalum	50	Cl	Chloride	6,100						
Zr	Zirconium	10	Cu	Copper	2.2						

Wysong Equine Treats™

Wysong Equine Treats™ have been designed to provide a delicious snack that is boosted with a wide array of important natural nutrients including vitamins, chelated minerals, antioxidants, essential fatty acids, probiotics, proteoglycans and phytonutrients.

Ingredients: Ground Wheat, Ground Corn, Ground Oats, Cane Molasses, Sugar Beets, Carrots, Ground Flax Seeds, Ground Extruded Whole Soybeans, Yeast Culture, Soybean Oil, Dried Kelp, Apples, Limestone, Salt, Sea Cucumber Meal, Dicalcium Phosphate, Magnesium Oxide, Magnesium Proteinates, Manganous Oxide, Zinc Oxide, Niacin Supplement, Ferrous Carbonate, Copper Oxide, Choline Chloride, Potassium Amino Acid Complex, Calcium Pantothenate, Manganese Proteinates, Zinc Proteinates, Thiamine Mononitrate, Iron Proteinates, Copper Proteinates, Folic Acid, Pyridoxine Hydrochloride, Vitamin A Acetate, Riboflavin Supplement, Biotin, Cobalt Carbonate, Vitamin D, Supplement, Cobalt Proteinates, Dried Bacillus subtilis Fermentation Product, Dried Aspergillus oryzae Fermentation Product, Dried Lactobacillus acidophilus Fermentation Product, Dried Lactobacillus casei Fermentation Product, Dried Lactobacillus lactis Fermentation Product, Dried Enterococcus faecium Fermentation Product.

Gauranteed Analysis: Crude Protein, 11.0% min.; Crude Fat, 4.5% min.; Crude Fiber, 5.0%; Calcium, 0.4% min., 0.7% max.; Phosphorus 0.2% min.; Copper 25 PPM min.; Selenium 0.3% PPM min.; Zinc 60.0 PPM min.; Vitamin A 2200 IU/lb. Min.; Moisture 12.0% max.; Ash 4.0% max.; Added Minerals, 4.0% max.

Available in 1^{1/2}# pails.



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WYSONG EQUINE DIET™ COMPARISON CHART

	Wysong Equine Diet™	Purina Omolene 100™	Purina Omolene 200™	Purina Omolene 300™	Purina C.O.B.™	Purina Equine Sr.™	Purina Equine Jr.™	Purina Equine Adult™	Purina Strategy™	Compare Your Feed
*FIRST FIVE INGREDIENTS AS LISTED ON INGREDIENT TAG:	Ground Oats	Grain Products ¹	Grain Products ¹	Grain Products ¹	Grain Products ¹	Processed Grain By-Products ⁴	Processed Grain By-Products ⁴	Roughage Products ⁶	Processed Grain By-Products ⁴	
	Ground Corn	Molasses Products ²	Plant Protein Products ³	Plant Protein Products ³	Molasses Products ²	Forage Products ⁵	Forage Products ⁵	Processed Grain By-Products ⁴	Grain Products ¹	
	Ground Barley	Plant Protein Products ³	Processed Grain By-Products ⁴	Molasses Products ²	Soybean Oil	Molasses Products ²	Molasses Products ²	Forage Products ⁵	Forage Products ⁵	
	Ground Wheat	Dicalcium Phosphate	Molasses Products ²	Processed Grain By-Products ⁴		Roughage Products ⁶	Plant Protein Products ³	Molasses Products ²	Molasses Products ²	
	Ground Extruded Whole Soybeans	Calcium Phosphate	Soybean Oil	Dicalcium Phosphate		Plant Protein Products ³	Roughage Products ⁶	Plant Protein Products ³	Soybean Oil	
OTHER INGREDIENTS:	Cane Molasses Soybean Oil Flax Seeds Kelp Chelamin™ (74-trace mineral chelated salt) Prebiotics Probiotics	Soybean Oil		Soybean Oil		Soybean Oil	Soybean Oil	Soybean Oil		

“A Product Can Be No Better Than the Sum and Quality of Its Ingredients”

*As taken from tags of product in Tijeras, NM.



WYSONG EQUINE DIET™ COMPARISON CHART

(continued)

DEFINITIONS:

1. Grain Products – “May include one or more of the following which are whole, ground, cracked, screen cracked, flaked, kibbled, toasted, or heat processed: barley, corn, wheat, rice, ground brown rice, ground paddy, ground rough, broken grain sorghum, chipped grain sorghum, mixed feed oats, brewer’s rice, oats, rye, triticale.”**
2. Molasses Products – “May include one or more of the following: beet molasses dried product, beet pulp dried molasses, cane molasses, citrus molasses, molasses yeast condensed solubles, condensed molasses fermentation solubles, starch molasses, molasses distiller’s condensed solubles, molasses distiller’s dried solubles.”**
3. Plant Protein Products – “May include one or more of the following: algae meal, soy protein concentrate, dried beans, canola meal, coconut meal, cottonseed flakes, cottonseed cake, cottonseed meal, low gossypol cottonseed meal, whole pressed cottonseed, guar meal, linseed meal, peanut meal, peas, rapeseed meal, safflower meal, soybean meal, soybean feed, ground soybeans, soybean meal, kibbled soybean meal, soybeans heat processed, soy flour, soy grits, sunflower meal, dehulled sunflower meal, active dry yeast, brewer’s yeast, yeast culture, dried yeast, primary dried yeast, torula dried yeast.”**
4. Processed Grain By-Products – “May include one or more of the following: aspirated grain fractions, brewer’s dried grains, buckwheat middlings, condensed distiller’s solubles, condensed fermented corn extractives with germ meal bran, corn bran, corn flour, corn germ meal, corn gluten feed, corn gluten meal, corn grits, distiller’s dried grains, distiller’s dried grains/solubles, distiller’s dried solubles, flour, grain sorghum germ cake, grain sorghum germ meal, grain sorghum grits, grain sorghum mill feed, hominy feed, malt sprouts, oat groats, feeding oat meal, pearl barley by-products, peanut skins, rice bran, rice polishings, rye middlings, partially aspirated gelatinized sorghum grain flour, gelatinized sorghum grain flour, wheat bran, wheat flour, wheat shorts, wheat germ meal, defatted wheat germ meal, wheat middlings, wheat mill run, wheat red dog.”**
5. Forage Products – “May include one or more of the following: dehydrated alfalfa meal, ground alfalfa hay, suncured alfalfa meal, coastal bermuda grass hay, dehydrated corn plant, dehydrated silage, flax plant product, ground grass, lespedeza meal, lespedeza stem meal, ground soybean hay.”**
6. Roughage Products – “May include one or more of the following: ground almond hulls, dried apple pectin pulp, dried apple pomace, bagasse, barley hulls, barley mill by-product, dried beet pulp, buckwheat hulls, dried citrus meal, dried citrus pulp, citrus seed meal, corn cob fractions, cottonseed hulls, flax straw by-products, husks, malt hulls, clipped oat mill by-products, oat hulls, oat mill by-products, peanut hulls, rice hulls, rice mill by-products, rye mill run, soybean hulls, soybean mill feed, soybean mill run, sunflower hulls, ground straw, dried tomato pomace.”**

Wysong Equine™ includes only natural whole grains, probiotics, enzymes, chelated minerals, vitamins, essential fatty acids, and special phytonutrients that enhance nutrient absorption. All Wysong products are designed using nature, not the laboratory, as the guide. Wysong products help create lasting health, a strong immune system, and excellent development, endurance and performance.

**as defined by the labeling regulations of the Association of American Feed Control Officials (AAFCO)



EQUINE BIOGEL™ PRODUCT COMPARISON CHART

PRODUCT*	PROBIOTIC CULTURES	CFU** PER TUBE	DOSES PER TUBE	CFU PER DOSE	ENZYMES				NATURAL ANTIOXIDANT	COLD PRESSED NUTRITIONAL OILS	SYNTHETIC ADDITIVES	PRICE PER TUBE	PRICE PER DOSE
					Amylase	Hemicellulase	Beta-glucanase	Protease					
WYSONG EQUINE BIOGEL™	<i>E. faecium</i> <i>L. acidophilus</i> <i>L. casei</i> <i>L. plantarum</i> <i>A. oryzae</i> <i>B. subtilis</i>	60 bil.	3	20 bil.	Yes	Yes	Yes	Yes	Yes	No	\$17.99	\$6.00	
FASTRACK® EQUINE GEL	<i>E. faecium</i> <i>L. lactis</i> <i>L. cerevisiae</i>	1.5 bil.	5	0.3 bil.	No	No	No	No	No	No	\$14.79	\$2.95	
PROBIOS® EQUINE ONE ORAL GEL	<i>E. faecium</i> <i>L. acidophilus</i> <i>L. casei</i> <i>L. plantarum</i>	300 mil.	2	150 mil.	No	No	No	No	No	Yes	\$4.39	\$2.20	
SELECT THE BEST® DIGEST-PRO	<i>A. oryzae</i> <i>B. longum</i> <i>L. acidophilus</i> <i>B. thermophilum</i> <i>S. faecium</i>	2 mil.	1	2 mil.	Yes	No	No	Yes	No	Yes	\$9.95	\$9.95	

*Product information as listed on commercial websites

** CFU =colony forming units



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