Article: Breakthrough in Neglected Essential Nutrition

THE VALUE OF DNA/RNA NUCLEOTIDE SUPPLEMENTATION
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Dr. Ovokaitis was educated at Northwestern University where he was 1st in his class of 1800 with a 4.0 GPA. From Northwestern, he was accepted into a combined, accelerated undergraduate/medical school program at the highly esteemed Johns Hopkins University. Following this training he completed an Internship, Residency, and Chief Medical Residency in the Georgetown University Hospital System. This was followed by a two year Fellowship in Pulmonary and Intensive Care Medicine, also at Georgetown University Hospital.

At Georgetown, Dr. Todd participated in formal studies of T cell immune function after harvesting lymphocytes from the lung via fiber optic bronchoscopy. In addition, this training involved intensive care of many persons afflicted with HIV infection, as the lung is a common target following the immunologic breakdown of this condition.

THE VALUE OF DNA/RNA NUCLEOTIDE SUPPLEMENTATION

In this era of an increasingly enlightened public about the health benefits of nutritional supplements, there is a new area perhaps more overlooked than any other. This central area of health and nutrition is the ingestion of dietary nucleic acid bases, NUCLEOTIDES, which the essential building blocks of DNA and RNA.

The main reason these highly important nutrients have been neglected is that the body is able to manufacture nucleic acid bases from amino acids and other basic nutrients. In general, if the body can make a substance from other nutrients that substance has not been considered essential. However, under certain conditions, the body is not able to make enough nucleotides to support the needs of the body's tissues and organs, with a drastic reduction in the potential for health.

Numerous studies in animals and humans show dramatic benefits in health, function, and survival with the supplementation of nucleic acid elements. These effects are so powerful that survival in life threatening assaults ranging from radiation to infection to shock has been markedly increased. From the standpoint of longevity studies, no single method has increased longevity more than supplementing DNA and RNA elements.

Nucleotide supplementation is thus one of the most rejuvenating, immune enhancing, and tissue supporting regimens ever to be discovered.

Numerous published scientific studies indicate very significant health benefits from DNA and RNA component supplementation. Almost every system of the body has documentation of improved health, vitality, or function from providing supplements of these fundamentally important cellular elements, from infancy to advanced age. The following is a brief summary from the vast literature supporting the many published benefits of nucleotide supplementation in the diet.

Cancer
A study in mice assessed whether RNA supplementation improved survival from an aggressive cancer. The animals received a tumor vaccine and then transplants of a tumor cell line. The animals that only received the tumor vaccine all died within three weeks. In sharp contrast, the animals that received a single 2mg injection of RNA (nucleotides) after the tumor vaccine had a 40% long-term survival. Thus the support of an antitumor program **with only a tiny single dose** of RNA provided a dramatic improvement in survival and outcome.

Cellular Immune Enhancement

Natural killer cells and cytotoxic T cells as reviewed are subtypes of effector lymphocytes that have a vital role in immune defense against tumors and virus-infected cells. Recent research suggests that NUCLEOTIDES may play an important role in the mechanism through which these effector cells eliminate the target abnormal cells. In test tube studies, NUCLEOTIDES has been shown to enhance the ability of cytotoxic lymphocytes to rupture the membranes of tumor cells.

Antitumor Effects

In test tube studies, adding NUCLEOTIDES has shown the ability to inhibit the growth of several types of human cancer cell lines. The types of cancer cells inhibited include pancreatic cancer, colon cancer, melanoma, androgen-independent prostate cancer (i.e., not responsive to male hormone manipulation, the most aggressive variant), breast cancer, myeloid and monocytic leukemia (bone marrow derived tumors of blood forming cells), and multidrug resistant colon cancer. In contrast, normal cells from these tissues showed less inhibition of growth or no inhibition at all, suggesting that increasing NUCLEOTIDES outside cells may have a selective inhibitory effect on several cancer cell lines.

Mice injected with the untreated leukemia cell line L1210 died of leukemia within 18 days. In contrast, if the leukemic cells were treated with NUCLEOTIDES before injection, 85% of the recipient mice survived for more than 70 days, a highly significant increase in survival.

In mice and rats, injections of NUCLEOTIDES into the abdominal cavity have significantly slowed the growth of several different types of tumor cell lines, including coloncancer, lymphomas, and breast cancer. NUCLEOTIDES administration resulted in significantly prolonged survival in the treated animals.

Administering NUCLEOTIDES may also enhance the effectiveness of cancer chemotherapeutic agents, increasing the antitumor effect of a given dose, or greatly reducing the dose required for a therapeutic effect. In particular, decreasing the dose of the treatment agents can dramatically reduce the toxicity of these antitumor drugs.

For example adding NUCLEOTIDES to the drug doxorubicin to cultures of human ovarian cancer cells doubled the tumor cells eliminated compared to using doxorubicin alone.

When NUCLEOTIDES was given, 30-50% more doxorubicin accumulated in the cancer cells, whereas giving NUCLEOTIDES to healthy human cells did not increase the accumulation of the drug.

In mouse melanoma cell lines, NUCLEOTIDES increased the entry of several chemotherapeutic agents. The antitumor effects of these agents were additively increased with NUCLEOTIDES treatment. Even more remarkable was the synergistic antitumor effect seen with the drug vincristine; the effective therapeutic dose of this agent was reduced to one-tenth to one-fiftieth of the dose usually required.

In mice with melanoma addition of the NUCLEOTIDES derivative adenosine to the treatment program significantly increased the tumor elimination. In addition, a protective effect was seen on the healthy bone marrow, preventing the usual decrease in white blood cells due to treatment.

Beyond growth inhibition, NUCLEOTIDES may cause some types of tumor cells to burst. In human acute myeloid leukemia, a dose-dependent rupture of the cancer cells was seen using NUCLEOTIDES.

In a randomized human clinical study, intravenous NUCLEOTIDES was given to patients with advanced lung cancer at 2-4 week intervals. Whereas the control patients lost 2 pounds per month, the treated patients had

stable to slightly increased weight. Over the six months of the study, the control patients lost one third of their muscular strength, while the NUCLEOTIDES treated patients lost no strength.

Although some medications may maintain weight in cancer patients, this is usually due to fat gain while muscle is lost. Intravenous NUCLEOTIDES is the first intervention ever studied that appears to be able to maintain muscle mass, body weight, and muscle function in advanced cancer patients.

Thus NUCLEOTIDES may be broadly beneficial in supporting antitumor cell biology. NUCLEOTIDES enhances cellular immune function, inhibits the growth of several types of tumors, and in some cases may be able to cause direct elimination of tumor cells. In addition, NUCLEOTIDES protects from radiation injury and may preserve weight and muscle strength. Further study will be needed to assess the full range of benefits it may provide. Given its high safety profile, NUCLEOTIDES use may be one of the most beneficial adjuncts developed for supportive care, enhancing the results of conventional treatments.

Radiation Injury

Ionizing radiation causes intense free radical generation and molecular fragmentation; the greater the intensity and dose, the greater the harm that occurs to all exposed tissues. The greatest harm tends to occur to cells that are dividing the most rapidly. Radiation is often used for cancer treatment because the tumor cells are more sensitive to radiation than the more slowly dividing normal cells; however, all the cells in the beam path sustain dose related injury.

In a study in mice to determine the protective effects of nucleic acid supplementation, all the animals were exposed to a very high dose of radiation. The survival rate in the control animals was extremely low at 5%. In contrast, the animals that received nucleic acid injections had vastly improved survival ~ ten times higher at 50%.

This suggests a generally strongly protective effect of nucleic acid supplements for all forms of ionizing radiation exposure, whether therapeutic or accidental. Even persons who use airline travel regularly may benefit from protecting their cells from the relatively higher exposure that tends to occur at altitude.

Tissue Regeneration

In order to sustain health, virtually every tissue in the body must regenerate itself regularly. It is now known for example that even neurons in the brain have the capacity to regenerate. Having adequate supplies of all the nucleic acid bases may be one of the most significant limiting factors on whether a tissue will be able to express its greatest capacity for regeneration and self repair.

A study in rats looked at the ability of the liver to regenerate depending on whether or not injections of nucleic acid bases were given. In this study, the rats had 70% of their livers surgically removed. The animals that received IV nucleic acids showed liver regeneration rates that were significantly greater than the untreated control animals.

Any tissue, in order to regenerate, requires the ability to make DNA and RNA to support the process of making new cells. Providing readily absorbed and assimilated DNA and RNA bases can be one of the most powerful ways to assist any tissue to repair and renew itself.

Wound Healing

A wound, surgical or otherwise, results in severing the usual integrity of tissue organization. It is a special case of tissue regeneration in which cells migrate into the area of the wound to either regenerate new tissue or to fill the defect with scar tissue. The type of healing depends on the tissue ~ the liver will tend to restore normal liver cells in the wound, whereas the skin will tend to fill the breach with scar to heal the opening and restore strength.

Several studies in wound healing have assessed the effects of supplemental nucleic acids on wound healing, especially of surgical wounds. Compared to the control group, those receiving the supplements showed more rapid healing, greater tensile strength of the skin, and significantly reduced scarring.

Intestinal Integrity, Maturation, and Bowel Flora

The intestinal lining replaces all of its cells every seven days. Only a single layer thick, this lining is highly dependent on a sufficient supply of nucleic acids to completely regenerate itself every week. If nutritional support is inadequate, defective regeneration of the intestinal mucosal lining impairs the enzymatic stages of digestion, which can lead to a vicious cycle of deteriorating digestion and nutritional status.

In a study in young rats with chronic diarrhea, the effects of nucleic acid supplementation was tested. In the untreated animals the intestinal villi, finger-like absorptive projections, showed a dramatic reduction in height, like a forest that had been chopped down to stumps. The intestinal lining cells showed a drastic reduction of digestive enzymes, the essential final step of digestion that breaks nutrients down to the building block levels that the body can use. These animals were clearly failing to thrive. Upon administration of supplemental nucleic acids, the appearance of the intestinal lining greatly improved, with regeneration of the height of the absorptive intestinal villi. In addition, the enzyme content and function of the Intestinal lining also greatly improved, permitting the animals to recover and thrive robustly.

Human infants also require dietary nucleotides for optimum health, development, and well-being. Human breast milk has a significantly higher content of certain nucleic acid bases than does cows milk. Infants fed formula milk instead of breast milk have been found to have pathological intestinal bacteria that greatly increases their risk of outbreaks of diarrhea; especially in developing countries, such outbreaks can be life threatening.

Studies have shown that if formula milk is supplemented with a nucleic acid profile similar to that in breast milk, infants thus fed have a much healthier profile of intestinal bacteria, typical of infants that have actually been breast fed.

In the nucleic acid supplemented infants, the incidence and severity of diarrhea is reduced significantly to the level seen in breast fed infants. One of the most vital components of breast milk that confers its health and developmental advantages over formula milk thus appears to be its higher content of nucleic acids, making a strong case for such supplementing of all formula milk.

HDL Cholesterol Levels

An additional finding in infants who received nucleic acid supplementation was an improvement in their blood lipid profiles. In particular, the infants receiving added nucleic acids were found to have higher HDL cholesterol levels, the cholesterol fraction that protects against cardiovascular disease the higher the level. It is possible that establishing higher HDL levels early in life may confer an ongoing tendency to cardiac protection.

Growth and Development

Studies in young laboratory animals have assessed the effects of supplementing DNA and RNA elements. Compared to control animals, the supplemented animals grew, developed, and increased muscle mass at a greater rate. Other vital proteins were also built more readily in the treated animals. The intestinal lining in particular matured more robustly in the supplemented animals. Research thus far indicates that the tremendous need for nucleic acids in growth and development is strongly beneficially supported through supplementing these vital nutritional elements.

Cellular Immunity

Cellular immunity refers in particular to immune cells that have the role of identifying cells in the body that

have become abnormal, so that the abnormal cells can be removed. The main cellular changes sought through the cellular immune system are the development of cancer cells or various types of intracellular infection. The goal of the cellular immune system is to eliminate cancer cells or infected cells before they can become established in the body to cause serious illness. The main effectors of cellular immunity are cells that arise in the thymus gland. These cells are often called T cells for their thymic derivation, of which there are several types with varying functions. A special type of T cell called a cytotoxic T cell has the role of finding and sticking to abnormal cells, then releasing substances that selectively digest and clear the renegade cells.

Whereas cytotoxic T cells are generally active in seeking and clearing a wide range of abnormal cells, natural killer cells have a more targeted mission: seeking and destroying any cell that has become a cancer cell. The integrity of cellular immune function, most especially natural killer cell function, is the first line of defense of preventing tumor cells from establishing a stronghold in the body. Many studies have correlated reductions of cellular immune and natural killer cell function with increasing risks of developing cancer; some scientists feel that cancer is primarily a problem of inadequate cellular immunity.

Cytotoxic T cells, natural killer cells, and other types of T cells are also known as lymphocytes. These cells are a major component of the body's lymphoid tissues that protect us from infections and cancers of many types. In addition to the T cells of several types there are also B cell lymphocytes whose role is the production of antibodies. Unlike T cells that act directly cell-to-cell, antibodies are released into the bloodstream to hunt down specific infectious, toxic, or tumor cell molecules. Lymphoid tissues that coordinate the functions of the immune system include the spleen, tonsils, lymph nodes, Payer's patches widespread throughout the intestines, regions of the bone marrow, and most importantly the thymus gland.

The lymphoid tissue and especially cellular immunity has been found to be highly vulnerable to nucleic acid depletion under conditions of stress. In other words, at the time of greatest need for protection, inadequate supplies of DNA and RNA bases can weaken the ability of the body to respond to the threat. An insult or tumor or infection the body might otherwise easily handle can escape control if the lymphoid does not have adequate nutrition to respond.

Numerous studies in animals and humans have shown that supplementing nucleic acid elements has profoundly beneficial effects on boosting the function of lymphoid tissue. In part, the reason for this is that lymphoid tissue is highly dynamic such that cells that have become sensitized to microbial invaders or cancer cells need to divide rapidly to make an army of specifically targeted cells to eliminate the invader. A rich supply of nucleic acids, often beyond that the body can readily make, may be required for all the activities required for expanding the cells that prevent a minor invasion from becoming an overwhelming infection or uncontrolled malignancy.

Published studies have particularly demonstrated that cellular immunity is significantly strengthened with nucleic acid supplementation. Research that has examined natural killer cell function has shown especially dramatic effects on increasing the activity and function of these tumor surveillance and elimination cells. Improved health of body tissues in general and enhanced cellular immunity in particular, likely accounts for the vastly improved outcomes observed in the face of a wide range of minor to life threatening insults.

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