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CHRONIC DISEASES, NUTRITIONAL MODIFICATIONA AND DETOXIFICATION

Exploring the Relationship between Degenerative and Chronic Diseases, Nutritional
Modifications and Detoxification

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Abstract

Nutritional status, toxic burden and immune system status all play a crucial role in the development of disease and illness and maintaining health within the human body. Nutrition and diet, detoxification and supporting the immune system are key components of treating any degenerative or chronic diseases. Degenerative and chronic diseases are now wide spread and affecting many people. This literature review outlines how nutrition, detoxification and supporting the immune system can be, and is, used in treatment of many different degenerative and chronic diseases, such as cancer, digestive issues, immune system issues, and mental health issues. A whole food diet rich in fruits and vegetables as treatment for disease and illness was a common theme in all areas research. The cruciferous vegetables are particularly beneficial in treatment of many different disease states. General guidelines for health maintenance and treatment are outlined.

Keywords: nutrition, diet, cancer, detoxification, digestive issues, immune system issues, mental health

Exploring the Relationship between Degenerative and Chronic Diseases, Nutritional Modifications and Detoxification

Treating degenerative and chronic diseases with nutrition and dietary modifications is not novel. It has just been pushed aside from the mainstream conventional treatment of disease, which is thought to be more powerful and beneficial. While conventional medicine does have a place in treatment of a wide variety of disease states, the importance of diet and lifestyle are often equally important, but overlooked. Whole foods have a vast ability to heal and combat degenerative and chronic diseases. The nutritional status, toxic burden and immune system status of an individual all play a crucial role in the development of disease and illness and maintaining health.

Nutrition and diet, detoxification and supporting the immune system are key components of treating any degenerative or chronic disease. Degenerative and chronic diseases are now wide spread and affecting many people. Ferruzzi (2012) reported that chronic diseases accounted for approximately 70% of all U.S. deaths in 2010. For example, prostate cancer is the second leading cause of cancer death in men (Joseph, 2004). Many, if not all, chronic and degenerative diseases are influenced by diet, toxic exposure and a weak immune system. These factors play an instrumental role in achieving optimal wellness and also in reversing disease.

There are several nutritional treatment claims stating that a particular diet or protocol will reverse disease. Many of these programs are holistic in approach and incorporate nutritional modifications and detoxification. These programs are different from the typical reductionist medical model and are holistic instead. Holistic treatments treat the body as a whole and not just a specific organ or function. They realize that all body systems affect each other. There is a vast

difference between the current reductionist model and the holistic model that these programs implore for treatment of degenerative and chronic disease.

Following are several current nutritional therapies that successfully treat degenerative and chronic diseases using natural holistic means. The Gerson Therapy, developed by Dr. Gerson in the 1930's encompasses three fundamental laws of healing. First, is detoxifying the body, because healing cannot occur in toxic environments. The liver's ability to detoxify is incredibly important in this step. Second, is refilling body cells with nutrients. Especially re-establishing the oxidative metabolism, this is accomplished by restoring the sodium-potassium balance in cells. This can be achieved by increasing potassium and reducing sodium in the diet. Third, is restoring the immune system so the body can mount a healing response. This is what ultimately removes any unwanted tumor tissue or other unwanted pathogens from the body. The Gerson Therapy diet is plant based and consists of multiple juices and coffee enemas daily (Alexander, 2015).

The Kelly Protocol was developed by Dr. William Donald Kelly. It includes therapeutic nutrition, used to correct mineral imbalances, pancreatic enzymes, intended to kill cancer cells and detoxification of the body as its main components. Dr. Kelly believed that the root cause of cancer was due to the body's inability to digest and utilize protein. This is caused by a deficiency of pancreatic enzymes which typically causes a decrease in the ability of the body to fight against malignancy. Within this idea, Dr. Kelly determined that there are ten metabolic types and with a specific nutritional program for each type. However, each type has commonalities such as raw, organic fruits and vegetables and a reduced protein diet (Walters, 1993).

Dr. Johanna Budwig developed a specific diet for the treatment of cancer and other degenerative diseases such as fibromyalgia, diabetes, heart disease and psoriasis, named the

Budwig diet. This diet consists mainly of quark, which is flaxseed oil and cottage cheese mixed together but there is also an emphasis on natural and organic fruits and vegetables (Budwig, no date).

What do all of these different protocol and programs have in common? All have a major focus and emphasis on treating degenerative and chronic diseases with nutrition and detoxification. Success of these alternative nutritional treatments is all anecdotal, thus not technically accepted in the scientific community. This type of research is difficult because every body responds differently when healing through natural means (Alexander, 2015). There has consistently been a controversy on the treating degenerative and chronic disease with natural means, such as nutrition and detoxification. However, there is abundant research on the healing properties of foods and the importance of the immune system in healing, respectively. When combined they support the ideas and methods of these alternative treatments.

This literature review is dual purposed, first is providing the basic fundamental information needed to create a series of pamphlets titled: Resource for Integrated Holistic Nutrition. These pamphlets provide easy to understand information on topics such as: optimal nutritional guidelines; how to detoxify the body; ways to support the immune system; how to support and treat most digestive and mental issues and even most types of cancer with nutritional and lifestyle modifications. Second, is exploring the relationship between degenerative and chronic diseases and treatment with nutrition and detoxification.

Methods

The research for this literature review was procured through several sources including Pub med, Google scholar, google searches and graduate course text books. Boolean terms used

include: “diet”, “nutrition”, “cancer and nutrition”, “cancer and diet”, “cancer and protein restriction”, “immunotherapy and cancer”, “digestive issues”, “digestive issues and nutrition”, “digestive issues and diet”, “immune system issues”, “immune system issues and nutrition”, “immune system issues and diet”, “immunotherapy”, “mental health”, “mental health and nutrition”, “mental health and diet”, “detoxification”, “detoxification and diet”, “detoxification and nutrition”, “healthy diet”, “healthy nutrition guidelines” and “diet for optimal health”.

Diagnostic criteria for research included literature reviews or clinical trials spanning in vitro to animal studies to human studies. All potential study parameters were considered. Research no older than 15 years that met the inclusion criteria were included. However, information regarding alternative nutritional treatments that did not fall into these criteria were added anyway due to the relevance of topic.

Results

Most degenerative and chronic diseases are due to nutritional deficiencies, toxic burden and immunodeficiency conditions within the body. Many diseases can be improved, resolved or corrected if particular lifestyle and nutritional guidelines are followed and implemented. In particular are the following classifications of disorders: digestive issues, mental health issues and cancer.

I. Digestive issues

Digestive issues affect many people in the United States in the form of irritable bowel syndrome (IBS), Crohn’s disease, leaky gut, ulcers, constipation, diarrhea and others. Many of these chronic and degenerative diseases are due to an imbalance of gut bacteria, which is directly

related to the consumption of fruits and vegetable intake. Every human hosts approximately 160 different bacterial strains. The gastrointestinal microbiota is a metabolically active ecosystem within the human body and plays a vital role in health and disease (Whelan, 2013).

Irritable bowel syndrome is a relatively common chronic disorder that is characterized by abdominal pain and altered stool output without organic cause. The gastrointestinal tract, which houses microbiota, is altered in individuals suffering from disorders such as IBS. Probiotic or prebiotic therapies and also elemental diets could be beneficial in a large amount of individuals through modifying the gut microbiota, and also modulating immune responses (Ferguson, 2007). Whelan (2013) found that patients with IBS typically have decreased amounts of bifidobacteria. Studies have found that use of a variety of prebiotics did not have favorable outcomes, some studies found that use of prebiotics actually worsened symptoms. Thus, what is of more importance is the type and dose when determining if there is any clinical benefit for IBS. However, use of probiotics and a low FODMAP diet are recommended in management of IBS (Whelan, 2013).

Crohn's disease is a chronic inflammatory bowel disease. It is characterized by discontinuous transmural inflammation, ulceration and stricturing anywhere in the gastrointestinal tract. There is considerable evidence that gastrointestinal microbiota are directly involved in the pathogenesis, thus nutritional treatments, like prebiotics, may be a safe and effective treatment strategy. Crohn's disease is a result of pro-inflammatory and immune regulatory cytokines. This may be driven by microbiota. Prebiotics may stimulate fecal and mucosal microbiota (bifidobacteria and *F. prausnitzii*) in healthy people and acetate and propionate increase immunoregulatory IL-10 production. Prebiotics may be most beneficial in lower Crohn's disease states, including inflammation. Prebiotics haven't been extremely

successful in treating active Crohn's disease but could be used for disease maintenance (Whelan, 2013).

II. Mental Health Issues

Mental health issues affect many individuals. Common mental health issues include depression, mood disorders, stress, and anxiety. Depression can be caused by heavy metal toxicity, hormonal factors, nutrient deficiency or excess, stress and microbial factors. Deficiencies in B vitamins can lead to depression (Pizzorno, 2013). Neuropsychiatric symptoms are sometimes due to liver disease caused by infection, genetics, or toxic burden (Crone, 2006). Parletta (2013) suggests use of Mediterranean, whole foods diet for treatment of mental illness. Moderate adherence to the DASH diet was associated with lower odds of depression (Valipour, 2015).

Consumption of inulin improved mood, reduced indigestion and participants were less hungry. Participants also noted that recall of information with greater accuracy was improved while consuming inulin (Smith, 2015). Implementation of diet and lifestyle intervention on mental health outcomes in people with depression and anxiety caused these conditions to improve significantly. Support from a dietitian in the management of depression and anxiety is needed (Forsyth, 2015).

III. Cancer

Cancer is typically characterized by unrestrained cellular proliferation, caused by a disrupted cellular metabolism, which is largely affected by the nutrients we consume or don't consume (Hirschey, 2015). Cancer patients often have intestinal issues which further lead to

malabsorption, digestive issues and nutrient deficiencies (Lee, 2015). Ben-Arye (2015) found that patients who made recommended dietary changes had improved quality of life related outcomes, including improved gastrointestinal and emotional issues.

Several categories will be presented including protein, herbs and supplements, vegetables and nutritional stats that relate to treatment of cancer by nutritional means.

a. Protein

In animal studies various foods and food types have been investigated to determine anticancer activity. Reduced dietary protein consumption and intermittent fasting are effective in inhibiting cancer growth and mTORC1 phosphorylation in tumor xenografts of breast cancer in a xenograft mouse model. mTORC1, known as mammalian target of rapamycin complex 1, controls protein synthesis and is also a protein complex functioning as a nutrient, energy and redox sensor. Inhibition of mTOR pathway increases lifespan. Protein restriction may reduce mTORC1 activity in tumors and somatic tissues (Lamming, 2015).

Protein consumption was investigated in a double blind placebo trial in postoperative gastric cancer patients. A low nitrogen and low calorie diet was found to reduce inflammatory reactions, improve immune function and improve quality of life and prognosis in these individuals (Li, 2015).

When the insulin/IGF-1 signaling pathway is reduced in function, an increase in maximal lifespan and health span occurs in many species. Two long-term calorie restriction studies (1 and 6 years) showed that total and free IGF-1 concentrations were significantly lower in moderately protein-restricted individuals. Serum IGF-1 is reduced significantly (from 194 ng mL⁻¹) to 152

ng mL(-1)), when protein intake is reduced from 1.67 g kg(-1) of body weight per day to 0.95 g kg(-1) of body weight per day. Protein appears to be an important factor in anticancer and anti-aging dietary interventions (Fontana, 2008).

b. Herbs and Supplements

Use of rosemary has antitumor activity in animal studies in vitro. The compounds responsible for this activity are carnosic acid, ursolic acid and rosmarinic acid; and various antioxidants (Gonzalez-Vallinas, 2015).

Chen (2015) found that vitamin C used at supra-nutritional doses has considerable promise as a low toxic and effective therapeutic strategy to treat cancer. Anecdotally it is safe and has high efficacy (Chen, 2015).

Breast cancer patients, who received a variety of supplements, in addition to the standard treatment, had higher survival rates than only the standard treatment. The average survival rate of high risk breast cancer patients was 50% after 5 years and the survival rate for low risk breast cancer patients was 90% after ten years (Bjørklund, 2015). Intake of total carotenoids and docosahexaenoic acid could be effective in reducing the risk of breast cancer and improve the survival rate in post-menopausal women (Nkondjock, 2004).

Fructose 1,6-bisphosphate (F1,6BP) is capable of inhibiting the proliferative ability of hepatocellular carcinoma HepG2 cells. Lu, (2013) found that F1,6BP can inhibit HepG2 cell proliferation by inducing reactive oxygen species production, particularly hydrogen peroxide, leading to apoptosis. Blood sugar metabolism plays a crucial role in the development of cancer and reactive oxygen species regulation (Lu, 2013).

c. Vegetables

Carrots contain a substance called falcarinol. It has been found to inhibit 80-95% of cell proliferation in cancer cell growth (Purup, 2009). Rats fed freeze dried carrots in addition to regular feed, caused a delayed or retarded the development of tumors (Kobaek-Larson, 2005).

Cruciferous vegetable consumption has been associated with a reduced risk of cancer in epidemiological studies. Cruciferous vegetable consumption reduces the risk of occurrence of breast, colon, lung and prostate cancer. This is due to isothiocyanates and sulforaphane, which are sulfur containing, water soluble phytochemicals, in broccoli attributing to chemo-protection (Juge, 2007).

Isothiocyanates are chemo-preventive against prostate cancer. They tend to accumulate in human cells, which is critical for their cancer chemo-preventive activity. Isothiocyanates support glutathione 6 transferase and are involved in detoxification of a number of carcinogens which is a reflection of their chemo-protective ability (Joseph, 2004).

Watercress contains isothiocyanates and glucosinolates, which reduce the risk for colorectal cancer. Brassica and related Capparales vegetable consumption is associated with a reduced risk for developing colorectal cancer (Boyd, 2006). Cruciferous vegetable consumption was related to the decreased risk of renal cell carcinoma (Lui, 2013).

Supplementation of watercress showed a decrease in basal DNA damage. Watercress supplementation reduces the risk for cancer because it decreases the amount of damage to DNA and improves antioxidant status due to increased carotenoid concentration. Beta carotene and plasma lutein increased significantly (33% and 100% respectively) after supplementation with watercress (Gill, 2007).

Use of broccoli and watercress extracts on human MDA-MB-231 breast cancer cells showed positive results. Isothiocyanates from broccoli inhibit metalloproteinase 9 activity and in vitro, they can suppress the invasive potential of human MDA-MB-231 breast cancer cells. These observed effects could contribute to the suppression of carcinogenesis by consuming a diet high in cruciferous vegetables (Rose, 2005).

Sulforaphane is an isothiocyanate. It is found in many cruciferous vegetables and has anti-tumor properties (Parnaud, 2004). Exposure of sulforaphane on human breast cancer cells for 3 days inhibited the growth of the breast cancer cells in a dose dependent manner. Specifically, sulforaphane inhibits histone deacetylase and decreases the expression of epidermal growth factor receptor, estrogen receptor-alpha, and human epidermal growth factor receptor. Meaning that, sulforaphane can activate apoptosis, inhibit cell growth, and decrease the expression of key proteins involved in breast cancer proliferation in human breast cancer cells in vitro (Pledgie-Tracy, 2007).

Phenethyl isothiocyanate, a component of many cruciferous vegetables, has shown to exert significant protection against chemically induced cancer in animal models by inhibiting the growth of cancer cells in culture and in vivo. It does so by causing apoptosis and cell cycle arrest, as found in human colorectal cancer cells and human prostate cancer (Hu, 2007). B-phenylethyl isothiocyanate (PEITC) is a glucosinolate precursor. It was found to be capable of mediating apoptosis in hepatoma HepG2 cells, liver cells. High concentrations of PEITC are capable of inducing necrosis. PEITC can block cells in the G2/M phase of the cell cycle, which may be how it offers chemo-protective effects. It also increases reactive oxygen species (Rose, 2003).

IV. Nutritional Status

Individuals with head and neck cancer treated with radiation and who are malnourished are less likely to tolerate the treatment. Usually dietary monitoring and enteral nutrition are implemented for additional nutritional support (Thureau, 2015). Between 21.3 percent and 31.7 percent of individuals with stage 3 and 4 metastatic renal cell carcinoma were at risk for malnutrition according to Gu's (2015) research. Nutritional screening and status is strongly associated with overall survival Gu's (2015). Assessing nutritional status is extremely important in identifying patients who may have poor survival outcomes. It is incredibly important to assess the nutritional status of cancer patients because this lends itself to a clearer understanding and determination of treatment and potential outcome (Weijie, 2015). Personalized diets that were supplemented with functional ingredients had an improved antioxidant status and also improved anti-coagulation in cancer patients (Lee, 2015).

Proving that there is no one size fits all diet or lifestyle that everyone should follow, however, it does prove that nutrition does play a role in healing for everyone. There is definitely an interesting relationship between dietary factors and the progression or regression of degenerative and chronic diseases.

Discussion

Nutrition, detoxification and immune system status, play interesting roles in the development of disease or in health maintenance. Typically, degenerative and chronic disease presents itself when the body is malnourished, toxic and immunocompromised. When adequate nutrition, detoxification measures and immune support are implemented, disease can be reversed. Delving into the relationship between these factors is discussed below.

I. Nutrition

Can diet and nutrition influence our health? Yes. Diet and nutritional status play a huge role in health and healing (Donaldson, 2004). The survival of individuals with degenerative and chronic diseases is strongly associated with their individual nutritional status (Gu, 2015, Weijie, 2015). Thus, nutritional status is a relevant indicator of the likelihood or unlikelihood of disease development.

Several epidemiological studies have investigated and shown an important relationship between dietary habits and degenerative and chronic disease risk. Plant based diets rich in herbs, fruits and vegetables are a known source of molecules that are capable of treating several different degenerative diseases due to their pharmacological properties (Westergaard, 2014).

With digestive issues, nutritional management has been a relatively ideal way to reduce and manage symptoms. The use of probiotics and a low FODMAP diet are recommended in many cases, especially in management of IBS (Whelan, 2013). FODMAP's (Fermentable Oligo-saccharides, Di-saccharides, Mono-saccharides And Polyols) are a group of short-chain carbohydrates. These carbohydrates are poorly absorbed in the small intestine and are rapidly fermented in the gut. A low FODMAP diet reduces the amount of FODMAP's in the diet and has shown to reduce symptoms of IBS (Whelan, 2013, Perez y Lopez, 2015).

Prebiotics have also shown to be effective, in some cases, in the treatment of digestive issues. They are non-digestible, fermentable food components that stimulate the growth and activity of microbial species. Insulin-type fructans, fructose-oligosaccharides, inulin, oligofructose, and galacto-oligosaccharides such as stachyose and raffinose are all examples. Inulin-type fructans is a naturally occurring polysaccharide produced by many different types of plants. It is found in chicory root, Jerusalem artichoke, garlic and wheat. Characteristics of

prebiotics are: resistance to digestion, ferment ability and selectivity, which promotes growth or activity of beneficial bacterial (Smith, 2015). Use of prebiotics had mixed results depending on the type and dose, which is important when determining any clinical benefit for IBS. The microbiota found in the gastrointestinal tract is a metabolically active ecosystem within the human body and plays a vital role in health and disease (Whelan, 2013). Keeping this delicate balance in check requires eating a balanced diet full of fruits and vegetables.

It is interesting that both Whelan et al. (2013) and Perez y Lopez et al. (2015) found that a low FODMAP diet and prebiotics improved IBS and other digestive issues. Use of a FODMAP diet limits the amount of some fermentable food items. While a diet rich in prebiotics contains a lot of fermentable food items. Perhaps it is the limiting of processed and refined foods that ultimately allowed these different diets to be beneficial in treating IBS.

Mental health encompasses a vast array of disorders and diseases, such as depression, mood disorders, stress and anxiety that can all be helped through nutritional management and detoxification. Neuropsychiatric symptoms are sometimes due to liver disease caused by infection, genetics, or toxic burden (Crone, 2006). Incredibly important in managing and improving mental health is improving nutritional status, which will improve the functionality of the immune system and other body organ systems.

Supplementing with a high quality complete B vitamin (Pizzorno, 2013) and consuming less processed foods significantly improved depression and anxiety (Forsyth, 2015). Use of the DASH diet, which is rich in fruits and vegetables, was found to lower the odds of depression (Valipour, 2015). A Mediterranean like diet will help facilitate healthy mental function. B vitamins, antioxidants and omega-3 fatty acids are all necessary for the proper functioning of the

brain. There are many pathways in which these nutrients assist in healthy mental functioning (Parletta, 2009). Fruits and vegetables typically supply all of these essential vitamins and minerals allowing for these processes to function adequately.

Interestingly, inulin, which is also beneficial in digestive issues because it is a prebiotic, also improves mood and memory recall (Smith, 2015). Further justifying the need for a plant based diet to improve mental function. Exercising more, reversing toxicities, balancing hormones, and minimizing stress and pathogenic influences are beneficial to regaining optimal mental health as well (Pizzorno, 2013). Therefore detoxifying, balancing out hormones, establishing nutrient balance, minimizing stress and pathogenic influences are key to regaining optimal mental health.

Cancer is the ultimate degenerative and chronic disease. It progresses in three stages: initiation, what ultimately causes DNA damage; proliferation, continued uncontrolled growth of differentiated cells; and metastasis, cell invasion to other tissues (Boyd, 2006, Pizzorno, 2013). All of these stages can be impacted by nutritional intervention. Nutritional status contributes to the progression and regression of disease, especially cancer. About 30-40 percent of cancers can be prevented by simple lifestyle and dietary measures (Donaldson, 2004).

Many cancers can be attributed to inadequate intakes of fruits and vegetables. In colorectal cancer, insufficient fiber intake was attributed as being the cause in 18% of cancer causes in Australia. If Australians increased their consumption of to at least the recommended intake of fruit, vegetables and fiber, approximately 4% of all cancers could be prevented (Nagle, 2015). This shows that cancer is a global issue and needs to be addressed. Westergaard et al. (2014) isolated many different molecular compounds associated with positive results in treating

colon cancer, including molecules from the common diet, such as garlic, celery and thyme. This research shows how widespread healing molecules are in plants and that a plant based diet is beneficial in treating colon cancer, and likely other cancers and degenerative diseases as well.

Case control and prospective epidemiological studies on fruit and vegetable intake reduce the risk of cancer, especially of the esophagus, stomach and colon. Breast cancer improvement is associated with vegetable intake, but not fruit; while bladder cancer is improved with fruit intake but not vegetable. Ultimately, consumption of both fruits and vegetables has a protective affect against most cancers (Riboli, 2003).

Intake of carrots reduces the incidence of cancers due to the falcarinol content (Kobaek-Larson, 2005). Flavonoids are bioactive compounds that are found in plants. Consuming flavonoids is associated with a reduced risk of degenerative and chronic diseases, such as cardiovascular disease, neurodegenerative disorders and cancer. They act as antioxidants at the molecular level and are also able to modulate several key enzymatic pathways. They play a beneficial role in disease prevention and sources include fruits, vegetables, nuts, seeds, and spices (Kozłowska, 2014).

Consuming more fruits and vegetables, which are rich in carotenoids, may provide benefit in the prevention of breast cancer. Higher intake of β -carotene, lycopene, β -cryptoxanthin, and total carotenoids is associated with a reduced risk of breast cancer in women. Breast cancer risk declines when the intake of dietary carotenoids increases (Huang, 2007). Further pointing to a plant based diet to heal degenerative and chronic diseases.

Gotsis (2015) reviewed the latest research on the health benefits of consuming a Mediterranean diet. A typical Mediterranean diet includes reducing meat intake considerably,

increasing consumption of legumes and vegetables and substituting olive oil for most all other fats (Benetou, 2008).

The Mediterranean diet has been researched extensively and has been shown to be protective against many degenerative and chronic diseases, including chronic inflammation, metabolic syndrome, atherosclerosis, obesity, cognition disorders, pulmonary disorders and diabetes. It decreases the risk of all-cause mortality, cardiovascular mortality and incidence and even likely to reduce the incidence of some cancers (Gerber, 2015, Gotsis, 2015). A Mediterranean like diet is associated with significantly reduced incidence of overall cancer, about a 12% reduction. This reduction is considerably larger than predicted when compared to examining individual Mediterranean diet components (Benetou, 2008). Consuming a Mediterranean diet promotes secretion of anti-inflammatory cytokines, antioxidant cellular and circulating biomarkers and preventing many degenerative diseases due its focus on holistic dietary approach rather than on single nutrients (Gotsis, 2015). This shows that specific dietary components are beneficial, but when consumed as part of a holistic approach to healing have a greater impact.

Meadows (2012), states that metastasis is a major contributing factor of morbidity and mortality of cancer patients. Healthy diet and lifestyle can inhibit the creation of tumors and has a significant impact on cancer progression and survival. The metastatic progression of some cancers can be combated through consumption of a plant based diet. There are many natural phytochemicals in fruits, vegetables and spices that are beneficial in preventing cancer and inhibiting primary tumor growth (Meadows, 2012).

Herbs have long held a medicinal role in treating many different types of illnesses and diseases. Rosemary has antitumor activity in animal studies (Gonzalez-Vallinas, 2015). Breast cancer patients with metastasis to lymph nodes who received a variety of vitamins (vitamin C, vitamin E, beta-carotene, selenium) and essential trace elements, essential fatty acids (gamma-linolenic acid and omega-3 PUFAs), and coenzyme Q₁₀, in addition to standard treatment showed significant improvement over those who didn't. The average survival rate of breast cancer patients increased significantly when consuming these supplements for treatment (Bjørklund, 2015). Supplementing with carotenoids and docosahexaenoic acid may reduce the risk of breast cancer in post-menopausal women as well (Nkondjock, 2004). Proving that supplementation is a necessary and effective method for treatment of breast cancer, if not all cancers and degenerative and chronic diseases.

Of particular interest is blood sugar management. Blood sugar regulation is an important component of cancer progression and regression and reactive oxygen species regulation. In metabolism centered medicine, fructose 1,6-bisphosphate (F1,6BP) has been used to shift the metabolism of glucose to the pentose pathway. F1,6BP is also effective in promoting cancer regression because it can competitively inhibit the glucose uptake of tumor cells. It is an incredibly important intermediate in the process of glucose metabolism. This process also increases the amount of glutathione (Lu, 2013). Taking advantage of this phenomenon can significantly improve the detoxification of the body leading to a decreased risk of developing degenerative and chronic disease.

Interestingly, protein restriction may increase lifespan due to a reduction in mTORC1 activity in tumors and somatic tissues. This phenomenon could be beneficial in treatment of cancer and other age related diseases (Lamming, 2015).

Dr. Gerson's work emphasizes the importance of re-establishing the appropriate sodium-potassium balance in body cells. This is directly related to the diet consumed. Typically a diet high in fruits and vegetables is higher in potassium and lower in sodium than a diet full of processed foods (Alexander, 2015). Reversing degenerative and chronic disease can be achieved through consumption of a whole foods diet. Fruits and vegetables all have specific compounds that are beneficial in treatment of degenerative and chronic disease, and also in maintaining wellness.

II. Detoxification

To restore the body's natural ability to heal itself, it is important to remove all of the toxic components that can contribute to disease progression. Detoxification can be achieved by a variety of nutritional modifications and lifestyle changes.

The liver is the primary detox organ and its capability to detoxify is crucial to the success of all types of detoxification treatments. When there are toxins in the blood stream, the liver takes up these toxins and packages them for elimination (Alexander, 2015) The human body actually detox's in two steps, phase 1 and phase 2, in the liver. Phase 1 takes up toxins and neutralizes them or makes them water soluble and easy for the kidneys to excrete or turns them into intermediate metabolites ready for phase 2 detoxification. In phase 2 detoxification the intermediate metabolites are transferred to one of six different conjugating pathways, all of which ultimately lead to toxins being bound to a specific neutralizing compound and excreted. The conjugating pathways are:

- Methylation- supported by methyl groups and methionine.
- Sulphation- supported by sulphur

- Glutathionation- supported by cysteine, which is a building block for glutathione
- Glucuronidation- supported by glucose
- Acylation- supported by glutamic acid, glycine, taurine and cysteine
- Acetylation- supported by acetic acid

Typically issues arise when there is either a shortage of conjugating substances or there are deficiencies in the enzyme systems that transfer the reactive metabolites to their conjugation partners. Or because there is not enough enzyme co-factors (B vitamins- B5, B6, B12, folic acid and choline, minerals-magnesium, selenium, selenium and zinc). Alternatively, problems can arise when the toxic load is greater than that can be accommodated by phase 2 pathways (Alexander, 2007).

Increasing the amount of conjugating substances in the human body and improving detoxification can be achieved through many avenues, including nutritional management, supplementation and lifestyle modifications.

a. Nutritional Management

Nutritional management is a simple way to promote detoxification. Glucosinolates, which are sulfur containing compounds, forms a different type of isothiocyanate when hydrolyzed. Sulforaphane is a type of isothiocyanate which is thought to prevent and reverse cancer by eliminating carcinogens and enhancing the transcription of tumor suppressor genes. Some research indicates that exposure to isothiocyanates can reduce cancer likelihood. However, the protective effects of isothiocyanates could be influenced by genetic variations (Isothiocyanates, no date). Zhang et al. (2004) “found that you can treat degenerative disease by administering a

pharmaceutically effective amount of a compound that elevates glutathione or at least one Phase II detoxification enzyme in diseased tissue.”

When tissues are disrupted, glucosinolates are hydrolysed to the corresponding isothiocyanates. Isothiocyanates are associated with anticarcinogenic activity through a number of physiological mechanisms including the induction of phase 2 detoxification enzymes and apoptosis (Mithen, 2002, Rose, 2003). Isothiocyanates are capable of induction of glutathione S-transferases (GSTs) and other phase 2 enzymes involved in the detoxification of toxic compounds (Joseph, 2004).

Sulforaphane, capable of halting degenerative and chronic diseases, has shown to have significant chemo-preventive activity (Pledge-Tracy, 2007). It protects cells through induction and regulation of phase 2 detoxification components. These components are capable of elevating cell defense against oxidative damage and promoting the removal of carcinogens (Juge, 2007, Parnaud, 2004, Zhang, 2004). Sulforaphane also suppresses cytochrome P450 enzymes, induces apoptotic pathways (Parnaud, 2004), suppresses cell cycle progression, inhibits angiogenesis and promotes anti-inflammatory activity (Juge, 2007). Increasing the amount of enzymes and components that metabolize harmful toxins and scavenge free-radicals is highly relevant to the chemo-protective effects of increasing vegetable consumption (Zhang, 2004).

D-glucaric acid and the enzyme beta-glucuronidase are extremely beneficial in early detection and prevention of cancer are potentially of great benefit due to their effect on detoxification of the human body in relation to cancer. D-Glucaric acid is formed by oxidizing a sugar with nitric oxide and can be found in many vegetables and fruits. Consumption of fruits and vegetables naturally rich in D-glucaric acid or supplementing with

D-glucaric acid derivatives, such as calcium D-glucarate, seem to be a promising cancer prevention approach. Evidence is pointing towards the use of D-glucaric acid and its derivatives as possible treatment of the cancer by inhibiting beta-glucuronidase (Hanausek, 2003).

Broccoli contains 3-methylsulphinylpropyl and 4-methylsulphinylbutyl glucosinolates (Mithen, 2002). Watercress is particularly high in PETIC, which is an isothiocyanate (Rose, 2003). Consuming foods rich in isothiocyanates and sulfur will promote synthesis of glutathione and other conjugates and reduce toxicity in the body in all degenerative and chronic disease states. Foods high in sulfur include: onions garlic and cruciferous vegetables, like kale, collards, cabbage, cauliflower, watercress and broccoli (Hyman, 2010).

Bioactive whey protein is a source of cysteine and other building blocks for glutathione synthesis. This protein must be made from non-denatured proteins, thus non-pasteurized and non-industrially produced milk containing no pesticides, added hormones or antibiotics. Human and animal studies have shown that adequate protein nutrition is crucial for glutathione homeostasis (Hyman, 2010).

b. Supplementation

Consuming supplements that encourage the production of glutathione and other conjugates is a beneficial way to promote detoxification. These supplements will boost glutathione and other conjugate levels within the human body.

- N-acetyl-cysteine and glycine (Nguyen, 2014)
- Alpha lipoic acid (Pizzorno, 2013)

- Methylation nutrients- folate (active form 5-methyltetrahydrofolate), vitamin B6 (active form P5P) and vitamin B12 (methylcobalamin) (Alexander, 2015)
- Antioxidants- vitamin C and vitamin E (mixed tocopherols) (Pizzorno, 2013)
- Milk thistle (Hyman, 2010, Pizzorno, 2013)
- Beta-carotene (Kaspercyk, 2014)
- Turmeric (Alexander, 2013)
- Schizandra (Alexander, 2013)

c. Lifestyle

Introducing coffee enemas will also increase glutathione and other conjugate production, particularly glutathione-S-transferase enzyme system. This enzyme system is responsible for removing free radicals and detoxifying carcinogens in the small intestine and liver. Coffee enemas increase this system by between 600-700 percent. Coffee contains palmitates which when introduced via an enema activate the enzyme system for producing glutathione. This method will not replenish stores of glutathione building blocks; it only encourages removal of toxins (Alexander, 2015). Ridding the body of amalgam fillings and the home of unnecessary mercury is of utmost importance. Mercury has shown to reduce production of glutathione and glutathione peroxidase activity, thus potentially causing a rise in oxidative stress within the brain and other organs (Pizzorno, 2013). Exercise will encourage production of glutathione as well (Hyman, 2010).

III. Supporting the Immune System

The immune system is a vital component of preventing and reversing degenerative and chronic diseases. While complicated in nature, the immune system requires a steady amount of antioxidants and nutrients to support its function. Dealing with inflammation is a huge part of the immune systems purpose. When inflammation is out of control, degenerative and chronic diseases tend to appear (Pizzorno, 2013).

a. Inflammation

Inflammation occurs when body tissues are injured by bacteria, toxins, trauma or a variety of other causes. These damaged cells release chemicals like, histamines, prostaglandins and bradykinin which cause blood vessels to leak fluids in the tissues. This causes swelling, which isolates the foreign substance, and also attracts white blood cells to the area. Phagocytes then begin to consume the foreign substance and rid it from the body. If the immune system is not functioning properly, then this series of events does not occur. Meaning, that inflammation continues to develop uncontrollably (Pizzorno, 2013).

Inflammation is an important component of degenerative and chronic diseases. It negatively impacts almost all physiological functions, attributing to cancer, cardiovascular, neurodegenerative, autoimmunity disorders and premature aging. Generally, metabolic syndrome, obesity, and diabetes are multifactorial disorders with a strong inflammatory component that is impacted by diet. In these conditions, and many others, diet can reduce pro-inflammatory eicosanoids. These compounds can alter several hormonal signaling cascades that affect the immune system and also gene transcription factors (Ricordi, 2015).

During inflammatory response, reactive oxygen species are produced by activated neutrophils. In chronic inflammation, there is a prolonged production of reactive oxygen species. This weakens antioxidant defenses and results in oxidative stress. The effectiveness of

antioxidant and immune system defense is deficient in individuals with chronic degenerative diseases, especially diseases that are inflammatory or immune system related (Perricone, 2009). Reactive oxygen species levels in tumor cells are typically higher compared with normal cells, and the antioxidant glutathione. Normally, reactive oxygen species levels are in a dynamic equilibrium through enzymatic and non-enzymatic antioxidant defense systems (Lu, 2013).

Metastasis of tumor cells is directly related to the amount of chronic inflammation involved. Inflammation is fostered by angiogenesis and regulated by iron in many infections (Fischer-Fodor, 2015). The immune system is a major component in tumor control. Using a single therapeutic agent is unlikely to be effective in degenerative disease or metastatic cancer treatment, and immunotherapy should be combined with conventional cancer treatments (Apetoh, 2015). However, “immunotherapy is one of the most promising strategies for cancer treatment” (Apetoh, 2015). Dendritic cell immunotherapy is another effective strategy for generating antitumor immunity in cancer treatment, however, nutritional status is an important factor in achieving these beneficial results (Kobayashi, 2014).

The immune systems role in cancer and other degenerative diseases is a growing science. Parental digestion of tumor cells is accomplished via the immune system and this typically occurs due to a healing inflammation. A healing inflammation is where the immune system mounts a response to a foreign material or pathogen. Its symptoms include fever, pain, redness, swelling either body wide or specifically at the site of the tumor. Interestingly, during a healing inflammation old injuries would become symptomatic again and there is typically an increase in the amount of sodium and toxins released, including old, stored drugs and poisons (Alexander, 2015). During healing inflammations, it is increasingly important to provide the body with the

proper nutrients; particularly via increased consumption of conjugate forming fruits and vegetables.

Interestingly, glutathione has diverse effects on the immune system, shown by either stimulating or inhibiting the immunological response that controls inflammation. When glutathione concentrations are altered, autoimmune conditions may be more prominent and inflammation and oxidative stress may increase (Perricone, 2009). This shows how intertwined our nutritional status, toxic burden and immune system status are all interconnected. All are dependent on the others.

b. Supplementation

Supplements that have shown to be power antioxidants and supporters of the immune system are: garlic, turmeric, vitamin D, Eicosapentaenoic acid (EPA) and γ -linolenic acid (GLA), Coenzyme Q10, (Ubiquinol), selenium, zinc, and vitamins C and E. Garlic contains allicin which reduces inflammation in the body, fights infection and boosts the immune system (Pizzorno, 2013). It is capable of many things within the human body including inducing apoptosis and improving immunity in the human body (Charron, 2015).

Turmeric contains curcumin which causes an increase in protein levels in the blood, which enables the immune system to fight and prevent infection. It also reduces redness, swelling, pain and functions well with antibiotics. This makes it an effective option for boosting the immune system (Pizzorno, 2013).

Vitamin D is a major regulator of host defense against infection. It also attenuates inflammation and acquired immunity. A deficiency of vitamin D is significantly associated with and results in an increased risk for infectious diseases (de Castro Kroner, 2015).

Eicosapentaenoic acid (EPA) and γ -linolenic acid (GLA) and antioxidants added to an enteral diet have shown to reduce duration of intensive care units stays in critically ill sepsis-induced acute respiratory distress syndrome patients. Formation of oxidation occurs during development of sepsis. Supplementation with selenium, zinc, vitamin C and vitamin E improves antioxidant capacity. Research has shown that addition of antioxidants decreases mortality rates, secondary infections, moderate decrease in use of mechanical ventilation and a decrease in the length of hospital stay (Shirai, 2015).

Individuals with septic shock have reduced levels of Coenzyme Q10, indicating that cellular energy production is compromised in a diseased state. Ubiquinol, a reduced form of Coenzyme Q10, is capable of increasing plasma Coenzyme Q10 levels. Supplementation with Coenzyme Q10 is also capable of decreasing oxidative stress, preventing mitochondrial damage, having neuro-protective effects and reducing renal and acute liver dysfunction (Donnino, 2015).

Sepsis is severe wide spread body toxicity, it is typically an inability of the immune system to rid the body of toxic and pathogenic substances. It is at the furthest point on the spectrum of body inflammation. Incidence of sepsis was found to be higher in individuals who consumed sugary food and also added fats, fried foods, sugar sweetened beverages and organ meats as primary food groups. Individuals who consume a more plant based diet had a lower incidence of sepsis (Gutierrez, 2015). Like many other degenerative and chronic diseases, sepsis

can definitely be treated through lifestyle and dietary changes. A plant based diet should be encouraged in treatment of sepsis and other degenerative and chronic diseases.

Conclusion

Are diet and nutrition, detoxification and a weak immune system related to disease and illness? Due to the information, resources and references found, the answer is a convincing, yes. These three factors were found to all play increasingly important roles in the development of and in reversing degenerative and chronic disease. It is incredibly important to determine the nutritional status of individuals. Nutritional status will determine deficiencies and make treatment with nutrition and lifestyle changes easier. An anti-inflammatory whole foods diet is capable of treating degenerative and chronic diseases successfully, especially through use of specific nutrients and nutrient combinations. Several important bioactive dietary components can exert their effect through selected inflammatory pathways and through detoxification phases, which can affect metabolic and genetic changes. Implementing a detoxification regime through consumption of a plant based, cruciferous rich diet, exercising more and doing coffee enemas to promote conjugate production and elimination of toxic compounds from the body is necessary in reversing degenerative and chronic diseases. Supporting the immune system through supplementation of crucial nutrients and reducing stress are vital to reversing degenerative and chronic disease or maintaining health.

Exploring the relationship between degenerative and chronic diseases, proper and adequate nutrition, detoxification and supporting the immune system resulted in a number of interesting and intriguing results. There is significant research on the use of plant based diets to heal a variety of diseases and illnesses, including digestive issues, mental health issues and

cancer. Research regarding detoxification and immune system support related to disease was found separately. No research was found that supported all three categories in a single research study. As a whole, all of the research does appear to support the initial thesis; that adequate nutrition, detoxification and supporting the immune system will reverse degenerative and chronic diseases. Evidence that is presented does strongly support using a plant based diet to treat and reverse chronic and degenerative diseases. Perhaps it is time to do research on all of these components together. Since all three categories have beneficial results when studied separately, combining all seems like a next logical choice for research.

Recommendations

Simply put, recommendations for reversing degenerative and chronic disease is consuming a plant based diet rich in cruciferous vegetables and beginning a detoxification regime. This typically looks like an anti-inflammatory diet, which is important in reducing chronic diseases, improving immunity and increasing life span (Ricordi, 2015).

An organic diet free of toxic chemicals, such as insecticides and pesticides, is ideal. Foods grown in organic soil ensures that the minerals will be balanced in the crop and that the resulting food will be rich in antioxidants and hydride ions, which are capable of refueling enzyme systems (Alexander, 2015).

Procure produce and other food items from a local source. "Farm to cell" food consumption is a major factor in achieving and maintaining health (Ferruzzi, 2012). Nutrient potency is determined by genetic makeup, age, health status, bioavailability of the nutrient, and how the food source was grown, harvested, stored and prepared (Bennett, 2015). The metabolic and physiological responses to food and nutrients after consumption vary depending on if the

food is organic and how local the food is. The more local the more beneficial it is after consumption (Ferruzzi, 2012).

Consume a Mediterranean or similar whole foods diet which is associated with reduced risk for chronic disease (Parletta, 2009). Likewise, the DASH diet has been proven to be beneficial in treating a whole host of degenerative diseases, such as depression (Valipour, 2015), cancer, obesity, chronic inflammation, metabolic syndrome, atherosclerosis, cognition disorders, pulmonary disorders and diabetes (Gotsis, 2015). Consider consuming a low FODMAP diet and begin use of pro and prebiotics, for digestive or bowel issues (Whelan, 2013, Perez y Lopez, 2015).

There is no one size fits all approach. Guidance from a qualified nutritionist or medical professional is necessary to achieve optimum health. Ultimately, the following recommendations apply to reversing the vast majority of degenerative and chronic diseases and maintaining wellness.

Wellness and health must be fundamentally supported by reducing stress, sleeping and resting more, exercising and moving throughout the day (Hyman, 2010). Achieving optimum health is also accomplished through consuming a whole foods diet. An ideal diet would be rich in: antioxidants (Parletta, 2009); cruciferous vegetables (due to the isothiocyanates and glucosinolates, sulfur containing and water soluble phytochemicals) (Rose, 2005, Mithen, 2002, Pledgie-Tracy, 2007, Parnaud, 2004. Juge, 2007, Hu, 2007); fruits (Whelan, 2013, Parletta, 2009, Valipour, 2015); legumes (Benetou, 2008); nuts (Alexander, 2015) and high quality animal proteins (Alexander, 2015). Procuring foods from an organic, local, reliable and safe source to ensure quality (Ferruzzi, 2012) and supplementing with nutrients when necessary. Supplements that have shown to be powerful supporters of the immune system and in promoting optimum

health are: vitamin D (de Castro Kroner, 2015); eicosapentaenoic acid (EPA) and γ -linolenic acid (GLA), Coenzyme Q10, (Ubiquinol) (Donnino, 2015, Nkondjock, 2004)); enzyme co-factors like: B vitamins- B5, B6, B12, folic acid and choline and minerals-magnesium, and zinc (Alexander, 2007, Nkondjock, 2004); turmeric (Pizzorno, 2013); garlic (Charron, 2015); and antioxidants like: selenium, zinc, and vitamins C and E (Nkondjock, 2004).

If seriously ill, then consider looking into an alternative nutritional program such as the Gerson Therapy, Kelly Protocol or Budwig Protocol. All of which emphasize adequate nutrition, detoxification and supporting the immune system to reverse degenerative and chronic disease and maintain health. While these programs do not have published statistics on the survival rates of their patients, the current research on dietary and lifestyle changes is definitely pointing in their direction for successful outcomes. As Donaldson et al. (2004) states, cancer can be abated through a plant based diet rich in cruciferous vegetables, antioxidants, and omega 3 fatty acids. As such, these treatments fulfill all these requirements.

Also of importance, is treating the body as a whole, not just a sum of its individual organs and functions. While not extensively researched, holistic treatment is becoming more and more of a popular approach to treating degenerative and chronic diseases and also maintaining wellness. The current model is reductionist in nature. "Interactions between nutrition-health relations cannot be modeled on the basis of a linear cause-effect relation between 1 food compound and 1 physiologic effect but rather from multicausal nonlinear relations (Fardet, 2014)." This makes for difficult research, but it drives home a valid point. The overall nutritional status of an individual contributes to their health. Not a single compound.

Applying these recommendations will not only help maintain wellness, but also reduce the likelihood of developing degenerative and chronic diseases. If degenerative or chronic

disease is already present then these same recommendations apply. All individuals will need individualized treatment plans but the synergy between implementing a nutritional program, supporting the immune system and detoxifying the body all play a crucial role in healing degenerative and chronic diseases. Implementing a nutritional program to support the immune system and promote detoxification is a vital component of treating degenerative and chronic disease.

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