June 2018 - Mid-Month Bonus Newsletter

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Nutrient of the Month: Chlorophyllin

Chlorophyll is a major green pigment in leafy plants that helps them transform light into energy by enabling photosynthesis. Chlorophyll may be considered a botanical analogue of hemoglobin, as their molecular structures are quite similar: hemoglobin centers on iron whereas chlorophyll has magnesium. Because chlorophyll is chemically unstable, for commercial use it is converted into chlorophyllin, which contains in its center a stable copper-sodium salt. Chlorophyll is waxy, but its conversion into chlorophyllin renders it water-soluble. Early research on chlorophyllin examined how it helps control body odors and aids wound healing, while two recent studies have shown beneficial effects of topically-applied chlorophyllin against common acne and photoaging of the skin. However, most recent human and preclinical studies have focused on how it modifies the metabolism and carcinogenic potential of various toxic substances. Chlorophyllin’s unique shape enables it to interact most effectively with flat polycyclic molecules like anthracenes (coal derivatives), heterocyclic amines (as in fried meat), and aflatoxins.

This comprehensive 2015 review cites studies demonstrating that chlorophyllin can intervene at many metabolic steps between exposure to toxins and development of cancer, including

- protecting DNA structure and preventing genotoxin-induced chromosomal damage
- binding with and ‘escorting’ genotoxins and carcinogens out of the body
- promoting cell differentiation, which tends to reduce transformation into cancer cells
- in transformed cells, altering cell signaling and limiting proliferation and adhesion, thereby inhibiting formation and multiplication of tumors
- inhibiting matrix metalloproteinases that disrupt tissue integrity and inhibiting
new blood vessel growth, processes that can support growth and spread of tumors
- suppressing proinflammatory cytokines that promote cancer gene transcription (or 'reading')
- altering expression of numerous genes associated with cell signaling, xenobiotic metabolism (downregulating Phase I hepatic solubilization and upregulating Phase II detoxification), cell life cycle control, antioxidant and DNA repair enzymes, and organized cell death
- in cancer cells, increasing susceptibility to toxins, limiting cell repair processes, and encouraging programmed cell death

Chlorophyllin also shows direct radical scavenging and antioxidant effects, in some models greater than those seen for glutathione or ascorbic acid, and one lab experiment suggests that it may help protect mitochondrial membranes against gamma radiation. Human research on the cancer-preventing mechanisms of chlorophyllin are limited by ethical as well as practical concerns, but in one healthy volunteer, chlorophyllin combined with chitosan apparently reduced absorption of food-borne dioxins (including polychlorinated biphenyls, PCBs) and increased their fecal excretion more than did chitosan alone. In another study, volunteers given both chlorophyll and chlorophyllin showed reduced uptake of aflatoxins, food-borne mycotoxins that can cause liver cancer.

While these studies provide great insight into how chlorophyllin influences metabolic detoxification and chemoprevention, this well-designed study provides a compelling example of how these effects play out differently in cells from genetically unique individuals while showing consistent protective effects among a relatively small study population. Benzo[a]pyrene [BaP] is a polycyclic aromatic hydrocarbon, pro-carcinogen, and very common pollutant related to burning of fossil fuels like coal; it is also found in tobacco smoke and grilled meat, and its metabolites are DNA-binding mutagens. In human breast cells exposed to BaP, pre-treatment with chlorophyllin generally reduced BaP metabolic activation as well as its binding to DNA, though there was a wide range in responsivity among cells from different individuals. Chlorophyllin exposure reduced BaP activation via inhibiting genetic expression of the Phase I hepatic enzyme CYP1A1 in 18 of 20 cases and CYP1B1 in 19 of 20 cases; in the few remaining cases, these enzymes’ activity was increased. From a genetic point of view, it is interesting to note that the alteration in gene expression for these Phase I enzymes occurred along a spectrum, with each individual’s cells responding to a slightly different degree; however, each individual’s cells tended to respond similarly in terms of direction and degree of change in CYP1A1 and CYP1B1 expression, with one exception in which CYP1A1 was induced while CYP1B1 was inhibited by chlorophyllin treatment. Despite these differences, in all 20 cells the binding between BaP and DNA was reduced, though there was no necessary correlation between inhibition of CYP expression and inhibition of BaP-DNA binding, showing a wide range of individuality in response. These results demonstrate overall protection by chlorophyllin even though cells from different persons may respond in a highly individualized manner.

Resource Spotlight: Knock-Out Health-Related Graphics

From Seattle's Institute for Health Metrics and Evaluation (associated with the University of Washington), this website provides a profusion of detailed graphical depictions related to health—many with multiple viewing possibilities for different data aspects. One example shows US personal health care expenditures broken out by disease type; it’s interesting to compare findings for males and females, and commentary is provided on how US health care costs increased by $1 trillion dollars between 1996 and 2013. Another tool allows wide-ranging searches regarding the Global Burden of Disease; one very small search discovers that while Earth’s average human life expectancy is about 72 years, females in the Iwate area of Japan famous for iron bells can hope to live about 87 years. And if you’re not sure what “Global Burden of Disease” encompasses, just check out the related infographic page. It wouldn’t be difficult to spend hours in this extremely informative and eye-catching site.
Related Video: Partnership Announced Between the Institute for Health Metrics and Evaluation and the World Health Organization

Video Link: https://vimeo.com/271538488

PLMI President Dr. Jeffrey Bland shares his perspective on a recently announced alliance that will have a powerful global impact on the advancement of precision public health.

How the Mediterranean Diet Pulls Many Levers

The Mediterranean Diet beneficially impacts longevity, healthspan, risk for cancer or cardiometabolic disease, carbohydrate metabolism—even muscle mass in aging. How can it do all these things? It turns out that this eating pattern manages to impact multiple critical mechanisms associated with biological aging: 1) oxidative stress and inflammation, 2) energy metabolism, 3) genomic stability, 4) the microbiome, 5) hormones and growth factors, and 6) cell signaling networks involved in nutrient-sensing and stress resilience. The Mediterranean Diet encompasses not only dietary but also behavioral patterns: in this region, meat, dairy, sugar, and eggs were traditionally considered luxury items for limited consumption on special occasions while plentiful nuts, olives, fruits, and vegetables were staples, as were the hard work and walking necessary for cultivating crops and sourcing water. The traditional Mediterranean approach to life exemplifies simplicity, sociability, and physicality—all of which often seem to lack in 21st century lives.

Read more: https://academic.oup.com/biomedgerontology/article/73/3/318/4736301

2018 Thought Leaders Consortium: Early-Bird Pricing Ends June 30th

A VERY important dealing is approaching! Early-bird registration pricing for the Sixth Annual Thought Leaders Consortium will end on 6/30/18. Seats are going fast and there will be no wait list established this year. Find attendance details and a registration link here:

www.plminstitute.org

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