

Health Bits and Pieces (HFN 34:2)

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New Light on Cancer Treatment

Light beams are being used for tumor reduction in a very aggressive form of cancer at the University of Texas, San Antonio. Associate professor in the Department of Biology, Matthew Gdovin has developed a new method to kill cancer cells that involves injecting the chemical compound nitrobenzaldehyde into a tumor, then aiming a beam of light at the tissue, which caused the cells to become very acidic inside and induce apoptosis, or cell death. According to Gdovin, “Even though there are many different types of cancers, the one thing they have in common is their susceptibility to this induced cell suicide.” Gdovin estimates that up to 95 percent of the targeted cancer cells are dead after only two hours. He then decided to try the method on triple-negative breast cancer, which is a very rapid-developing type of cancer and one of the most difficult to treat. The mortality rate for triple-negative breast cancer is very high. Only one treatment was required to stop the tumor from growing in mice. Gdovin explains that “All forms of cancer attempt to make cells acidic on the outside as a way to attract the attention of a blood vessel, which attempts to get rid of the acid, Instead, the cancer latches onto the blood vessel and uses it to make the tumor larger and larger.” This method could be especially useful for drug-resistant tumors as well as tumors that are difficult to access such as those in the spine or brainstem and also for patients who do not respond well to radiation.

Kadri N, Gdovin M, Alyassin N, et al., “Photodynamic acidification therapy to reduce triple negative breast cancer growth in vivo,” Journal of Clinical Oncology, 2016 ASCO Annual Meeting (June 3-7, 2016), Vol 34, No 15 suppl (May 20 Supplement), 2016: e12574.

EMFs and Cancer

The long-term health effects of EMF exposure have been a cause of concern for health care authorities and providers for years. Most of the industries responsible for generating EMFs into the environment are dismissive of any potential dangers. There are no long-term studies because this new electromagnetic environmental condition is relatively recent. A meta-analysis by the World Health Organization stated that “radiofrequency electromagnetic fields as possibly carcinogenic to humans.” In other words, a causal association between EMFs and cancer is credible. A recently published case-control study in the *International Journal of Oncology* confirmed “an association between mobile and cordless phone use and malignant brain tumors” that supports “the hypothesis that RF-EMFs play a role both in the initiation and promotion stages of carcinogenesis.”

There is evidence that children, infants, and fetuses may be more sensitive to the effects of exposure. The journal *Pediatric Endocrinology Reviews* reported that a “growing number of studies reveal the impacts on metabolism and endocrine function ... reproductive system and growth ... thyroid functions, adrenal hormones, glucose homeostasis and melatonin levels.” They maintain that “there are unignorable amounts of studies indicating the increased risk of cancer, hematologic effects and cognitive impairment” from RF-EMF and ELF-EMF exposure.

Hardell L, Carlberg M, Söderqvist F, Mild K, "Case-control study of the association between malignant brain tumours diagnosed between 2007 and 2009 and mobile and cordless phone use," *International Journal of Oncology* 2013; Dec; 43(6): 1833–1845. Published online 2013 Sep 24. doi: 10.3892/ijo.2013.2111; PMID: PMC3834325; Sangün Ö, DüNDAR B, Çömlekçi S, Büyükgöbüz A, "The Effects of Electromagnetic Field on the Endocrine System in Children and Adolescents," *Pediatric Endocrinology Reviews* 2015; Dec; 13(2):531-45.

Sugar and Neuroinflammation

A research study has shown that rats that consumed large quantities of liquid solutions containing sugar or high-fructose corn syrup (HFCS) in doses comparable to popular sugar-sweetened soft drinks suffered memory problems and brain inflammation. Scott Kanoski, an assistant professor at the University of Southern California Dornsife College of Letters, Arts and Sciences, and colleagues investigated the effects of sugar and HFCS on 76 rats for 30 days. Three groups were divided to receive food and either an 11% sucrose solution, an 11% HFCS solution, or extra water (control group). The rats were then tested for learning and memory in a maze. The results showed learning impairment in the sucrose and HFCS groups, impaired glucose tolerance and revealed signs of neuroinflammation. There was no similar impact on adult mice, suggesting that adolescence is a time period of significant sensitivity to a diet high in sugars. According to Kanoski, "The brain is especially vulnerable to dietary influences during critical periods of development, like adolescence. Consuming a diet high in added sugars not only can lead to weight gain and metabolic disturbances, but can also negatively impact our neural functioning and cognitive ability."

Hsu TM, Konanur VR, Taing L, Usui R, Kayser BD, Goran MI, Kanoski SE, "Effects of sucrose and high fructose corn syrup consumption on spatial memory function and hippocampal neuroinflammation in adolescent rats," *Hippocampus* 2014, Sep 20. [Epub ahead of print].

Amino Acid for Parkinson's Disease

The amino acid N-acetyl cysteine (NAC) may have a beneficial on the development of Parkinson's disease by enhancing the function of dopaminergic neurons, which produce dopamine, a brain neurotransmitter that is severely deficient in Parkinson's patients. This could lead to a new approach to treatment for this debilitating neurological disorder. The main feature of Parkinson's disease is the progressive destruction of cells in the substantia nigra region of the brain that produce dopamine. The main early symptoms are muscle rigidity and tremors. Brain imaging studies revealed that patients receiving NAC showed improved mental and physical abilities. In the study, Parkinson's patients were divided into two groups. One group received a combination of oral and intravenous (IV) NAC for three months (50mg/kg NAC intravenously once per week and 600mg of oral NAC twice daily on the non-IV days) while the control group received only the typical Parkinson's treatment. The patients receiving NAC had improvements of 4-9% in dopamine transporter binding according to brain scans as well as a 13% increase their Unified Parkinson's Disease Rating Scale (UPDRS) score.

Monti D, Zabrecky G, Kremens D, et al., "N-Acetyl Cysteine May Support Dopamine Neurons in Parkinson's Disease: Preliminary Clinical and Cell Line Data," *PLOS ONE*, 2016; 11 (6): e0157602; DOI: 10.1371/journal.pone.0157602.

The Brain-Gut Connection

Numerous recent studies have shown a connection between gut flora, the microbiome (the system of 100 trillion microorganisms in the intestines), and brain function and behavior.

Foods affect the composition of the microbiome, indicating how diet changes can result in changes in cognition and behavior. Kathy Magnusson, from Oregon State University, and her colleagues fed laboratory mice different diets and then subjected them to several tests. The team observed that “[a] high glycemic diet caused a significant decrease in the level of “cognitive flexibility,” which is the ability to adapt to change. There was also an observed reduction in long-term and short-term memory. These effects were also observed to a lesser degree with the high-fat diet. The proportions of two types of bacteria were implicated in these changes. The researchers noted, “Higher percentages of Clostridiales and lower expression of Bacteroidales in high-energy diets were related to the poorer cognitive flexibility in the reversal trials.” The research team further stated that, “These results suggest that changes in the microbiome may contribute to cognitive changes associated with eating a Western diet.”

Magnusson K, Hauck L, Jeffrey B, et al., “Relationships between diet-related changes in the gut microbiome and cognitive flexibility,” Neuroscience 2015; Volume 300, pp. 128-140.