BONE MARROW (BULALO)

In the Philippines, our old folks usually prepare broth made of the bony portions of beef, commonly referred to as “bulalo”, especially for people who are sick, and their recovery is hastened. In some areas of the country, like in Laguna and Batangas, the old folks call “Bulalo” as “pagkaing pampabata” or “food that will make you young!”

Traditional peoples like the Indians living inside the Rocky Mountain Range in the far North of Canada who consumed large animals did not ignore the marrow hidden away in the bones; in fact, they valued the marrow as an extremely nutritious food. In fact, “For the successful nutrition for nine months of the year was largely limited to wild game, chiefly moose and caribou. During the summer months the Indians were able to use growing plants. During the winter some use was made of bark and buds of trees. I found the Indians putting great emphasis upon the eating of the organs of the animals, including the wall of parts of the digestive tract. Much of the muscle meat of the animals was fed to the dogs. It is important that skeletons are rarely found where large game animals have been slaughtered by the Indians of the North. The skeletal remains are found as piles of finely broken bone chips or splinters that have been cracked up to obtain as much as possible of the marrow and nutritive qualities of the bones. These Indians obtain their fat-soluble vitamins and also most of their minerals from the organs of the animals. An important part of the nutrition of the children consisted in various preparations of bone marrow, both as a substitute for milk and as a special dietary ration” (Nutrition and Physical Degeneration, 6th Edition, page 260).

Bone marrow is of two types: red marrow (also known as myeloid tissue) where the red blood cells, platelets and most white blood cells arise and yellow marrow where some white blood cells are developed. The color of yellow marrow is due to the much higher number of fat cells.

Bone marrow contains two types of stem cells: hemopoietic (which produce blood cells) and stromal (which produce fat, cartilage and bone).

The explorer Vilhjalmur Stefansson describes two types of marrow, one type from the lower leg which is soft "more like a particularly delicious cream in flavor" (the yellow marrow) and another from the humerus and femur that is "hard and tallowy at room temperatures" (the red marrow) (The Fat of the Land, page 27).

Bone Marrow contains so many nutrients that are fabulously fantastic for our health such that, it should also be listed as a functional food or medicinal food (any healthy or fictional food claimed to have a health-promoting or disease-preventing property beyond the basic function of supplying nutrients). It is more so, because most of its nutrients are able to exert a therapeutic effect. These are as follows:

- Docosahexaenoic acid (DHA) and eicosapentaenoic acid (EPA) play big roles in the formation of brain and retinal tissue. Huge concentrations of DHA can be found in fetal brain and neural development, especially during the last trimester. Babies, especially those yet to be born, can really benefit from DHA/EPA might also be a boon to the elderly; as we age, cognitive and visual health becomes more important than ever, and low DHA/EPA levels may contribute to the onset of Alzheimer’s disease, other dementias, and vision problems. Also, there has been some research suggesting DHA/EPA has some beneficial effect on the risk of various cancers, including prostate, breast, and colorectal. Suicidal depression and schizophrenia, too, may be linked with low levels of essential fatty acids like EPA and DHA.

- Hormones: Testosterone, Estrogen, Progesterone, Human Growth Hormone
- Vitamin A, D, E and K
- Minerals: Magnesium, Calcium, Zinc, etc
- Saturated Fats
- Proteins: L-Arginine (which lowers BP in pre-eclampsic women), Glutamate, Aspartic acid, Lysine, Hydroxylysine and Histidine
The following are studies done on some of the nutrients found in bone marrow:

**Alkylglycerols**

The therapeutic use of bone marrow particularly that of calves was first introduced in 1952 by Astrid Brohult, a young Swedish doctor, who hypothesized that a bone marrow extract made from fresh calf bones may stimulate white blood cell production in leukemic children with leukopenia. Although her initial results were uneven, yet improvements in white count and energy were promising, enough for her to ask her husband, a professor of biochemistry at a Swedish university, to analyze the calf bone marrow to see if he could determine what factor was responsible for stimulating white cell production. He established after years of research, that the immune stimulants were alkylglycerols. (Melvyn R. Werbach, Journal of Orthomolecular Medicine Vol. 9, No. 2, 1994)

Alkylglycerols, or AKGs are are group of glyceryl ether lipids: chimyl, batyl, and selachyl alcohols (Krotkiewski M, Przybyszewska M, Janik P. Cytostatic and cytotoxic effects of alkylglycerols (Ecomer). Med Sci Monit. 2003 Nov;9(11):1131-5) occurring naturally in various mammalian tissues, including most organs responsible for producing blood cells, such as the bone marrow and spleen. It is also interesting to note that AKGs are also found in human breast milk, and are now thought to contribute significantly to an infant’s immunity, especially while the immature immune system is at its most vulnerable. As a matter of fact, human breast milk contains up to 10 times more AKGs than does cow’s milk (Hallgren B, Niklasson A, Stallberg G, Thorin H. On the occurrence of 1-O-alkylglycerols and 1-O-[2-methoxylalkyl]glycerols in human colostrum, human milk, cow’s milk, sheep’s milk, human red bone marrow, red cells, blood plasma and a uterine carcinoma. Acta Chem Scand B. 1974;28(9):1029-34; Andreesen, R.: Ether lipids in the therapy of cancer. Prog Biochem Pharmacol, 22:118-131: 1988; Berdel, W.E., Bausert, W.R., Fink, U., Rastetter, J.: Antitumor action of alkyl-hydrophospholipids (Review). Anticancer Res (Greece), 1 (6) P 315, 52: 1981).


Dr. Brohult’s team was surprised to discover that AKGs when given to cervical cancer patients, the tumors regressed even before radiation treatment began, a finding that was soon replicated by others (Brohult A, Brohult J, Brohult S. Regression of tumour growth after administration of alkoxylglycerols. Acta Obstet Gynecol Scand. 1978;57(1):79-83; Boerly B, Hallgren B, Stallberg G. Studies on the effect of methoxy-substituted glycerol ethers on tumour growth and metastasis formation. Br J Exp Pathol. 1971 Jun;52(3):221-30). More recently, other scientists have determined that AKG’s ability to accomplish this feat is by directly interfering with cancer cell signaling, which is crucial to tumor growth and metastasis (Samadder P, Richards C, Bittman R, Bhullar RP, Arthur G. The antitumor ether lipid 1-O-octadecyl-2-O-methyl-rac-glycerophosphocholine (ET-18-OCH3) inhibits the association between Ras and Raf-1. Anticancer Res. 2003...


Other roles of AKGs are:
- It is a powerful vasodilator able to cause an important arterial hypotension, it increases vascular vasodilation and movement of liquid out of the vasculature. (Blank, M.L., Lee, T.C., Fitzgerald, V., Snyder, F.: A specific acetylhidrolase for1-alkyl-2-acetyl-sn-glycero-3-phosphocholine (a hypotensive and platelet-activating lipid) J bioi Chem 256:175-8; 1981).

**Endothelial Progenitor Cells (EPC)**

Reduced EPC levels are associated with endothelial dysfunction and an increased risk of cardiovascular events. Coronary artery disease and its risk factors, such as diabetes, hypercholesterolemia, hypertension and smoking, are associated with a reduced number and impaired functional activity of circulating EPCs. (Besler C, Doerries C, Giannotti G, Lüscher TF, Landmesser U. Expert Rev Cardiovasc Ther. 2008 Sep;6(8):1071-82)

EPC’s as a novel treatment option for complications requiring therapeutic revascularization and vascular repair especially to patients with diabetic complications. Diabetic patients’ EPCs have decreased migratory prowess and reduced proliferative capacity and an altered cytokine/growth factor secretory profile that can accelerate deleterious repair mechanisms rather than support proper vascular repair. Thus, functional manipulation(s) of EPCs to overcome these hurdles is recommended. (Yagna P.R. Jarajapu, Maria B. Grant. Circulation Research. 2010;106:854-869)

Bone marrow–derived endothelial progenitor cells (EPCs) contribute to vascular repair although it is uncertain how local endothelial cell apoptosis influences their reparative function. This study was conducted to determine how the presence of apoptotic bodies at sites of endothelial damage may influence participation of EPCs in retinal microvascular repair. Endothelial lesions where apoptotic bodies were left attached at the wound site showed a fivefold enhancement in EPC recruitment (P < 0.05) compared with lesions where the apoptotic cells had been removed. (Ashay D. Bhatwadekar, Josephine V. Glenn, Tim M. Curtis, et al. Investigative Ophthalmology and Visual Science. 2009;50:4967-4973.)

Endothelial progenitor cells (EPCs) protect kidneys from acute ischemic damage. Mice subjected to unilateral nephrectomy with simultaneous contralateral renal artery clamping for 30, 35, and 40 min, were protected from acute renal failure when pretreated with EPCs. (D. Patschan, S. Patschan, J. T. Wessels, et al. Am J Physiol Renal Physiol 298: F78-F85, 2010. First published November 11, 2009)

Neurovascular dysfunction and senescent endothelium contribute to the progression of Alzheimer disease (AD). Circulating angiogenic cells (CACs), such as endothelial progenitor cells (EPCs), provide a cellular reservoir for the endothelial replacement. Our results indicate that patients with Alzheimer disease (AD) have reduced circulating angiogenic cells, suggesting that an abnormal capacity to regenerate endothelium is associated with AD. Thus, increasing the EPCs level of AD patients will result to better prognosis. (S-T Lee, MD, K. Chu, MD, PhD, K-H Jung, MD, H-K Park, MD, et al. NEUROLOGY 2009;72:1858-1863)

Cholinergic neurons are very important cells in spinal cord injuries because of the deficits in motor, autonomic and sensory neurons. In this study, bone marrow stromal cells (BMSC) were evaluated as a source of cholinergic neurons in a rat model of contusive spinal cord injury. BMSC were isolated from adult rats and trans-differentiated into a neuronal phenotype – cholinergic neuronal cells. The trans-differentiation of BMSC into a cholinergic phenotype is a feasible therapy in spinal cord injury. (Naghdi, Majid, Tiraihi, Taki, et al. Cytotherapy, Volume 11, Number 2, April 2009 , pp. 137-152(16))