In Nutritional Immunology, it's all about the micronutrients as opposed to the macronutrients. Nutrients are substances needed for growth, metabolism and other body functions.

Macronutrients are nutrients that provide calories or energy. Since "macro" means large, macronutrients are nutrients needed in large amounts, namely carbohydrates, fats and protein.[1] The United States Department of Agriculture includes fiber and water in the list of macronutrients as well.[2]

Micronutrients, on the other hand, are needed only in minuscule amounts. These substances are many and varied. They enable the body to produce enzymes, hormones and other substances essential for proper growth and development. As tiny as the amounts are, however, the consequences of their absence are severe.[3] For example, iodine is a micronutrient and an essential component of thyroid hormones. Thyroid hormones regulate many key biochemical reactions, such as protein synthesis and enzymatic activity, targeting major organs like the brain, muscle, heart, pituitary, and kidney.[4] The Recommended Dietary Allowance (RDA) of iodine for adult men and women is 150 micrograms per day. A microgram is 1/1,000,000 of a gram (1×10^{-6})—an incredibly small amount!

But the consequences of a lack of iodine are severe—mental retardation, hypothyroidism, goiter, cretinism, and varying degrees of other growth and developmental abnormalities.

營養免疫學，所探討的主要是微量營養素和與之相對應的巨量營養素。營養，是人體得以生長、新陳代謝、和發揮其它功能的基本物質。

巨量營養素是可以提供熱量和活力的營養。因為“巨量”的意思為大，所以巨量營養素是指那些人體大量需要的營養，具體指碳水化合物、脂肪和蛋白質。[1]美國農業部把纖維和水也列為巨量營養素。[2]

而微量營養素，也就是指人體只需要微小份量的營養素。這些營養素多種多樣，使人體能夠產生酵素、荷爾蒙和其它促進生長發育的重要物質。但是，即使人體對它們的需求量都非常微小，長期的缺失也會產生嚴重的後果。[3]比如，碘是構成甲狀腺激素的一種必要微量營養素，甲狀腺激素控制著許多關鍵的生化反應，比如與大腦、肌肉、心臟、腦垂體和腎臟這些主要器官有關的蛋白合成和酵素活性。[4]

一名成年男性或者女性每天應食用的碘的建議攝入量(RDA)為150微克。每微克為一克的1/1,000,000(1×10^{-6})，這是一個無法想像的微小份量！

但是，如果長期持續地缺碘，就會產生非常惡劣的後果，比如出現智力低下、甲狀腺機能減退、甲狀腺腫大、呆小症

Serious iodine deficiency during pregnancy can result in stillbirth, spontaneous abortion, and congenital abnormalities. However, of far greater significance is the less visible, yet pervasive, reduction in intellectual capacity that iodine deficiency creates.

And what is the weapon with which we attack the problem of iodine deficiency? Iodized salt! A widely-accepted and effective supply of iodine in the diet—so much so, that many people living in developed nations don't even remember the problems caused by lack of iodine in the past.

We might say that while macronutrients make it possible to maintain life, micronutrients are the substances that make it possible for life to grow, prosper and achieve its highest potential. Micronutrients include phytochemicals, antioxidants and polysaccharides that come from plants and which the body uses in microscopic amounts to help produce enzymes and hormones and support its functions.

Science is constantly discovering new phytochemicals in the plant foods we consume. The list seems to be growing daily. Below are a few of the many micronutrients in foods that have been studied.

和不同程度的其它生長發育方面的畸形病症。在妊娠期如果嚴重缺碘，會導致死胎、流產和先天性畸形。而重要的是因缺碘引起的智力降低是很難發現的，但却是很普遍的。

那麼，我們該用甚麼樣的方法來對付缺碘的問題呢？食用加碘鹽！這是一種行之有效而被廣泛接受的食物加碘法，由於被普遍採用，以至於生活在發展中國家的許多人根本就忘了缺碘還會有甚麼問題。

我們也許會說，巨量營養素會讓我們得以生存，微量營養素則是我們的生命得以生長、旺盛並達到最佳狀態的物質。微量營養素包括植物性營養素、抗氧化劑和多醣體，它們都蘊含在植物中，人體只需要微小的份量，來幫助自身形成酵素和荷爾蒙，以輔助身體機能的運作。

科學研究不斷地從我們食用的植物食品中發現新的植物性營養素，所以植物性營養素的名單似乎每天都在加長。以下為食物中已被研究過的眾多的微量營養素中的幾種。

These days, most of us don't need to worry about the amount of macronutrients we consume daily. Food is relatively abundant; our water sources are generally clean and safe. What we are increasingly aware of, however, are the micronutrients in our diet.

Guidelines for Conscious Eating

When consciously eating to acquire the micronutrients your body needs for optimal health and well-being, consider the following guidelines:

- ***Variety is the key.***

Eating, for example, two apples a day, while fulfilling your fruit requirements (2 cups of fruit[5]), satisfying your macronutrient needs and supplying several good micronutrients, doesn't really provide the variety of micronutrients you need. A better choice might be eating an apple and a banana, or having a handful of berries on cereal in the morning and fruit salad with lunch, which gives you a greater variety of fruits and the micronutrients they contain.

現在，絕大多數的人都不需再擔心自己每天所攝入的巨量營養素的份量。我們可食用的食品極其豐富，我們的飲用水一般都清潔安全，那麼，還有甚麼是越來越值得引起我們重視的呢？那就是我們飲食中的微量營養素。

注意規範自己的飲食

要注重自己的飲食，從中獲得身體所需的微量營養素，以保持自身的健康，請遵循以下規則：

- **品種多樣是關鍵。**

我們應該怎樣吃呢？比如，您每天吃兩個蘋果，就達到了您每日的水果需求量（兩杯水果[5]），也滿足了您對巨量營養素的需要，並獲得了幾種有益的微量營養素，但是，這並未給您提供所需要的多種微量營養素。相對這種吃法，每日吃一個蘋果和一根香蕉、或早晨吃一些麥片加一把葡萄而中午吃水果沙拉，顯然是更好的選擇，這樣，您可以從更多樣的水果中獲取更豐富的微量營養素。

MICRONUTRIENT 微量營養素	FOOD SOURCE 食物	FUNCTION 功效
Beta-cryptoxanthin 玉米黃質	pumpkin, papaya, tangerine, peppers, carrots, peaches, plums 南瓜、木瓜、桔子、辣椒、胡蘿蔔、桃子、梅子	antioxidant • reduces the risk of cancer 抗氧化 • 降低患癌風險
Catechins 兒茶素	Camellia sinensis, cocoas and chocolates 茶多酚、可可粉、巧克力	reduces the risk of stroke, heart failure, cancer and diabetes • antioxidant • delay some forms of aging 降低罹患中風、心衰、癌症和糖尿病的風險 • 抗氧化 • 推遲某些形式的衰老
Glycyrrhizin 甘草甜素	licorice root 甘草	may produce anti-inflammatory effects • inhibits liver cell injury • expectorant 具有抗炎症的作用 • 防止肝細胞受損 • 祛痰
Hesperidin 橙皮帶	citrus fruits 柑橘類水果	antioxidant • contributes to the integrity of blood vessels • anti-inflammatory effects 抗氧化 • 維護血管健康 • 具有抗炎症作用
Lipoic acid 硫辛酸	spinach, broccoli and dark green leafy vegetables 菠菜、西蘭花和深綠葉蔬菜	antioxidant • improved memory performance • increase cellular uptake of glucose 抗氧化 • 增強記憶力 • 促進細胞攝取葡萄糖
Lutein 葉黃素	spinach, kale and other leafy green vegetables 菠菜、羽衣甘藍和其它綠葉蔬菜	antioxidant • helps protect eyes from oxidative stress and high-energy light • lowers risk of blindness due to macular degeneration 抗氧化 • 保護眼睛免受氧化壓力和強光的傷害 • 降低因黃斑退化症而引起失明的危險
Lycopene 番茄紅素	tomatoes, watermelon, asparagus 番茄、西瓜、蘆筍	antioxidant • reduces the risk of cancer 抗氧化 • 降低患癌風險
Oligomeric proanthocyanidin (OPC) 原花青素	apples, pine bark, cinnamon, grape seed, cocoa, grape skin 蘋果、松樹皮、肉桂、葡萄籽、可可粉、葡萄皮	antioxidant • stabilizes collagen • maintains elastin • anti-mutagenic 抗氧化 • 穩定膠原 • 維護彈力蛋白 • 抗有機體突變
Pantothenic acid (vitamin B5) 泛酸（維生素B5）	shiitake mushrooms, grains, potatoes 椎茸、穀物、馬鈴薯	participates in a wide array of key biological roles 在許多方面廣泛起到關鍵的生物作用
Phylloquinone (vitamin K) 葉綠醌（維生素K）	greens, okra, plums, peas 綠色植物、秋葵、梅子、豆類	involved in synthesis of proteins • blood clotting • bone metabolism 參與蛋白質的合成 • 凝血 • 骨骼代謝
Quercetin 槲黃素	prickly pear cactus fruit, apples, red grapes, tomatoes, citrus fruit 仙人掌果實、蘋果、紅葡萄、番茄、柑橘類水果	significant anti-inflammatory activity • anti-tumor properties 抗炎性活躍 • 抗腫瘤特性
Resveratrol 白藜蘆醇	red grape skin, Japanese knotweed, mulberry 紅葡萄皮、日本蔓、桑葉	anti-inflammatory • blood-sugar-lowering • counteracts the effects of a high-fat diet 抗炎症 • 降血糖 • 消解高脂飲食的影響
Tangeritin 柑桔黃酮	tangerine and citrus peels 柑橘和柑橘果皮	strengthens the cell wall and protects it from invasion • cholesterol lowering agent • shows potential to reduce risk of cancer 強化細胞壁以防受到侵害 • 含降膽固醇成份 • 其成份具有抗癌潛能
Tryptophan 色氨酸	bananas, soy beans and soy products 香蕉、大豆及豆製品	helps regulate appetite • helps provide better sleep • elevates mood 調解食慾 • 有助睡眠 • 調動情緒
Zeaxanthin 黍黃素	eggs, spinach and other green vegetables 蛋類、菠菜及其它綠色蔬菜	protects against blindness (macular degeneration) 預防失明（黃斑退化症）

- ***Make it colorful!***

Many micronutrients, in particular antioxidants, contribute to the color of fruits and vegetables; therefore, to make sure you get as many beneficial antioxidants in your diet as possible, select from a wide range of different colored plant foods every day. Instead of all red fruits and vegetables, like strawberries, apples and tomatoes, mix it up with blueberries, bananas, carrots and broccoli for that range of delicious colors. Try some of each!

- ***Spice it up!***

Culinary herbs and spices are great sources of micronutrients, and you don't have to use a lot to get that microscopic amount of phytochemicals from them! A lot of current research centers on culinary herbs and spices, such as

- turmeric (curcumin)
- cinnamon (cinnamaldehyde, cinnamyl acetate, and cinnamyl alcohol)
- garlic (thiosulfinates, sulfoxides and dithiins)
- chili peppers (capsaicin)
- parsley (myristicin, limonene, eugenol, alpha-thujene, apiin, apigenin, crisoeriol, and luteolin)[6]

Eating for Life

When we concentrate on getting the macronutrients we need, we are eating to live. When we concentrate on getting the micronutrients we need, we are eating for life—a healthy, vigorous and long life! Most of us today don't have to worry about eating just to live. Food is plentiful and readily available. We are blessed in this regard. Nutritional Immunology helps us to know which foods are the best for supplying those phytochemicals, polysaccharides and antioxidants in the variety we need to maintain our health and our enjoyment of life. We don't have to eat to live anymore; we can concentrate on eating to enjoy a healthy life to its fullest for many, many years!

This article provides important, educational information only; it is not intended to promote any E. Excel products or theory.

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- **讓自己的食物色彩斑斕！**

許多微量營養素，尤其是抗氧化劑，是水果和蔬菜的色源。因此，為確保您每日可以從您的飲食中獲得各種有益的抗氧化劑，請從眾多不同顏色的植物食品中選擇食材。如原來食用的水果和蔬菜全為紅色，像草莓、蘋果和番茄，那麼可考慮從一系列味美色艷的食物中挑選藍莓、香蕉、胡蘿蔔和西蘭花等，加入原來的紅色食品。請每天都嘗試一個新組合！

- **為您的美食調味！**

植物香料和調味料是微量營養素的極佳來源，您並不需要使用太多，就能從中獲得微量的植物性營養素！目前的許多研究都集中在植物香料和調味料上，如：

- 薑黃（薑黃素）
- 肉桂（肉桂醛、醋酸桂皮酯、肉桂醇）
- 蒜（硫代亞磺酸酯、亞碸、二噻英）
- 尖辣椒（辣椒素）
- 歐芹（肉豆蔻醚、檸檬烯、丁香酚、a－側柏烯、芹菜甙、芹菜素、香葉木素和木樨草素）[6]

為生活而食

假如我們只注意攝取巨量營養素，那我們只是在為生存而食；我們應該也注重攝取自身需要的微量營養素，這才是為生活而食－是為健康、強壯和長壽而食！現在，絕大多數的人都不需再為糊口生存而擔心，因為各種食物極大地豐富，並且都加工完好，可供我們隨時食用，我們真的是非常幸運。營養免疫學幫助我們懂得如何在眾多的食品中，辨認出哪些是為我們提供植物性營養素、多醣體和抗氧化劑的最佳食材，以維護我們的健康，享受我們的人生。這樣，我們就不用再僅為生存而食，而是為享受生活而食，我們才可以長長久久地享受充實健康的生活！

此文僅提供重要的知識信息，不作為推銷亞燕產品或理念之用途。