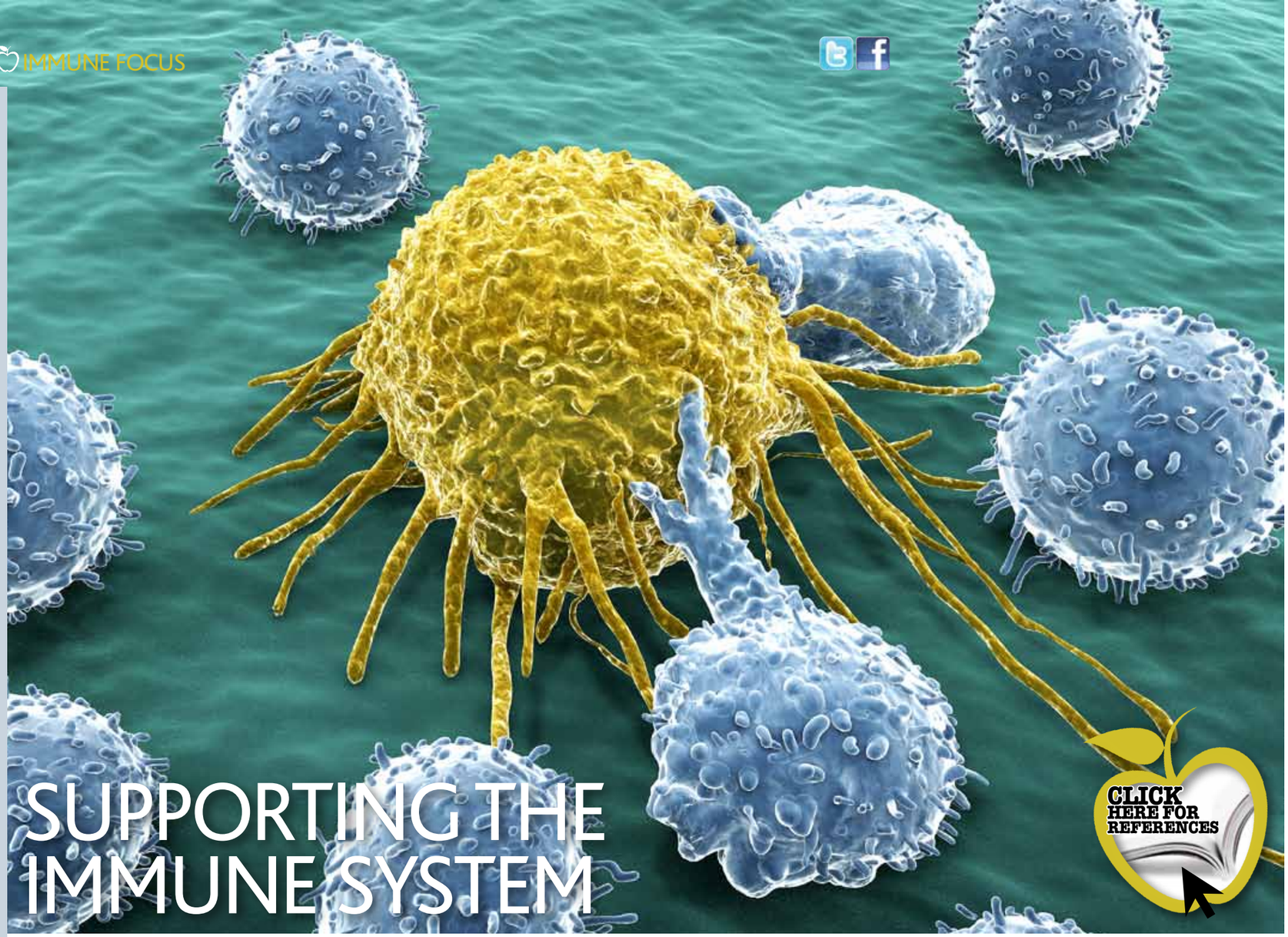


SUPPORTING THE IMMUNE SYSTEM

The immune system is a very intricate, complex and sensitive system which is heavily influenced by an individual's nutritional status. ***Fleur Borrelli*** *explains how the immune system works and suggests supportive botanicals…*

It is a complex system that communicates through immune substances, hormones and neurotransmitters, with all other systems in the body. Three parts work together to eradicate foreign invaders. The immune system is made up of the first line defence (barriers), the second line defence also known as the innate immune system and the third line defence or adaptive immune system which includes the common mucosal immune system.

FIRST LINE DEFENCE

The barriers offer the first protection between the outside world and the inner environment of the body. The intestine, lungs, skin, mucosa and all body orifices are constructed in such a way that potentially harmful organisms should be unable to penetrate[1]. Of all the barriers, the intestine has the largest surface area and is often the most affected in disorders of the first line defence[2]. Intestinal flora, epithelial cells and the enteric nervous system collaborate to protect the body from intruders. The skin, like the intestine, arms itself by producing a large number of biologically-active substances and also has a thick layer of protective bacteria[3].

Detrimental factors such as the overuse of antibiotics, poor diet, stress, toxins and other factors can damage either one of the three parts of the barrier to such an extent that pathogens can penetrate unhindered[4]. At this point the innate immune system can be activated and if the attack goes on for too long then the adaptive immune system steps in.

THE INNATE AND THE ADAPTIVE IMMUNE SYSTEM

Having both an innate and adaptive part of the immune system makes it such a potent defender of the body against intruders. Adaptive immunity develops in the first few years of life, whilst the innate immune system and the first line defence are present and active from birth [5]. Cells of the innate immune system such as neutrophils, macrophages and antigen presenting cells, work very quickly to engulf and ingest invaders. Natural killer cells destroy host cells that become infected with viruses to prevent viral replication. During this process a number of cytokines are produced which activate the adaptive immune system as a backup[6].

The pathogen is then presented to T helper (Th) cells of the adaptive immune system. If the pathogen is presented on the outside of the cell, then the Th-2 system is activated. The Th-2 system is a humoral functioning system, responsible for the development of antibodies and immunological memory. It deals with bacterial invasion, extracellular antigens and disposal of the body's own necrotic tissue.

Conversely, if it is presented inside the cell then the Th-1 system is activated. This is a cellular functioning system also with immunological memory to protect against viral infections, intracellular antigens and cancerous cells[7].

The common mucosal immune system is located within the lumen of a great number of organs and tissues and needs only to be activated when a barrier is not intact. It can neutralise micro-organisms with immunoglobulins. Immunoglobulins are antibodies that deal with one pathogen each - the wider the spectrum of antibodies, the better the protection of the body.

NATURAL INTERVENTIONS

Natural foods and plant materials contain endless numbers of health-giving properties that can be used alongside a healthy diet for therapeutic effect. Current research supports the use of nutritional products and natural active substances to boost immune health.

BETA GLUCANS

Beta glucans are complex fibres from the cell walls of plants, fungi, yeasts and bacteria. Their name comes from their structure; glucose molecules are joined by beta links. According to a study published in the *Oxford Journal of Glycobiology*, it is the ones with "one, three" links that are most effective for immune-modulation[8].

Beta glucans pass through stomach acid unscathed to activate the innate immune system. This is done by mimicking a potential threat to immune health, therefore stimulating neutrophils and macrophages to go to the site of infection or inflammation[9]. Together they render viruses, bacteria and other pathogens harmless by phagocytosis. They also produce cytokines that can activate adaptive immunity through a series of reactions[10].

Beta glucans can be used as a preventative measure to help boost natural immunity and kick start the body's own defence system A study published in the *Journal of Sports Science and Medicine* shows how the physical and emotional effects of stress caused by intense physical exercise and the resulting upper respiratory tract infections can be countered by beta glucans[11]. A recent review published in *The Journal of Nutrition* reports on the beneficial effect of taking beta glucans for canker sores [12].

PELARGONIUM SIDOIDES

Pelargonium Sidoides, an evergreen perennial plant indigenous to South Africa, is a traditional herbal medicinal product. This remedy is produced from the root of the pelargonium which is harvested, chopped and then ground up and made into an extract using alcohol and water. There are a number of active polyphenol compounds in the extract including coumarins, flavonoids and tannins, with anti-bacterial and immune-modulatory effects.

Pelargonium provides immune support in three different ways. First of all by forming a protective coating over the mucous membranes, it prevents bacteria from adhering to the cells along them, thus disallowing the spread of infection. If pathogens have already embedded in the cells, pelargonium encourages the body's own natural defence system, natural killer cells and macrophages, to fight against them[13]. Finally its mucolytic action helps clear up any infection by enhancing cilia movement to expel mucus[14].

Pelagonium can be used at the first sign of an upper respiratory tract infection to help combat some of the symptoms associated with it such as a blocked or runny nose or sore throat[15]. Unlike antibiotics, bacteria do not become resistant to it and it can fight viruses too.

LACTOFERRIN

Lactoferrin is an iron binding glycoprotein produced in high quantity in the breast milk of humans and other mammals. Much research has been done on bovine lactoferrin because of its similarity in structure and function to human lactoferrin. Apolactoferrin, the iron depleted form, has been shown to be important for immune health[16].

Lactoferrin is a critical component in the mediation of the immune response, coordinating interactions between the innate and the adaptive systems. It is a key feature of barrier defence and is produced in nasal, tracheal and other secretions as part of their antimicrobial defence[17]. It is also produced by neutrophils and released during inflammation to contribute to antimicrobial activity[18]. Perhaps its greatest antibacterial action comes from its high binding affinity to iron which deprives iron-requiring bacteria of their essential growth nutrient[19]. It also helps regulate the balance between the Th1 and Th2 systems of adaptive immunity[20].

Because of its versatility, lactoferrin can be used as an anti-bacterial, anti-viral, anti-fungal and anti-parasitic. It may also play an important role in the support of allergic disorders such as asthma, rhinitis and atopic dermatitis due to the ability to reduce oxidative-stress induced hypersensitivity.[21]

The Immune System as 'The Sixth Sense'

According to Professor Blalock's 'sixth sense' theory, our immune system intuitively recognises threats from its immediate environment [33]. This is done by communication between the nervous system and the immune system which are able to detect dangers the body could not otherwise hear, see, smell, taste or touch. Our body can then be mobilised to respond to the challenge.

Another study in the *Behavioural Ecology Journal*[34], sexual attractiveness to the opposite sex was measured by response to the smell on T-shirts that had been worn for two night's sleep. They claim it demonstrates how women may use this 'sixth sense' to choose their mate by smelling an immune system that is, importantly, different from theirs.

RESVERATROL

Resveratrol is a polyphenolic compound found in purple grapes, red wine and some berries. It was thought, when it was discovered in red wine, it might help explain the 'French Paradox'[22]. US National Institutes of Health researchers have now identified how resveratrol may confer its health benefits. It seems that resveratrol inhibits certain types of enzymes known as phosphodiesterases. This triggers a series of events in the cell, leading indirectly to the activation of sirtuin 1 (SIRT 1)[23], an enzyme that regulates cellular reaction to stressors and longevity.

It is the activation of SIRT 1 by resveratrol that provides the most promising strategies for health improvement. It improves energy levels due to an increase in cellular ATP production; the mitochondria work more efficiently using less oxygen, producing less free radicals[24]. It supports fat metabolism by inhibiting the formation of and stimulating the breakdown of white adipose tissue[25]. It might even increase longevity by improving the body's metabolism, defence and repair processes[26].

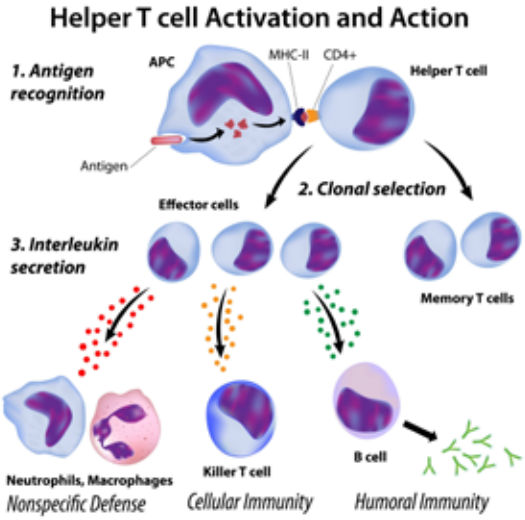
REDUCED GLUTATHIONE

Glutathione, a tripeptide created from cysteine, glutamine and glycine, can be found in all living organisms and cells of the body and the glutathione antioxidant system is one of the major cellular defence mechanisms. It is the reduced form that offers the protective effects as an antioxidant, a detoxifier and stimulator of the immune system. However, with age, illness, stress, fatigue and physical exertion, the body's own production of glutathione can be inadequate[27].

The glutathione status of the cell is an important indicator of cell function and viability. When the cell is subject to oxidative stress by a number of the aforementioned factors, the body's glutathione stores become depleted to a point where the protective mechanisms it can offer, are insufficient. Tissues may then be vulnerable to free radical attack and cells to apoptosis which can play a role in many degenerative disorders[28]. Fortunately, contrary to prior belief, glutathione can be absorbed in significant quantities to promote glutathione levels in cells[29].

Healthy growth and activity of the immune system depends on glutathione. After contact with an antigen, lymphocytes multiply and produce interleukins. This process requires a lot of oxygen and glutathione can help prevent oxidative damage [30]. It also offers anti-viral protection by suppressing the breakdown of viral capsules, preventing their release[31]. It can also prevent the build-up of excessive mucous in the lungs[32].

By using nutritional and botanical products we are able to intervene in the immune process at different stages to help prevent infection as well as to support the general running of the immune system.



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