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Immunostimulation – Activation of physiological defence mechanisms

The desire to enhance the body's own powers of resistance, to strengthen one's immune system, may have a variety of reasons. The physical inactivity of a sedentary lifestyle coupled with conflicts and other stress factors, widespread destruction of vital natural resources, including the contamination of water, air and soil, together with an enhanced awareness of the importance of good health – all these are factors which, in the present climate, prompt in particular those whose health is still intact, to concern themselves with the possibilities of preventive measures. Understandably, people with constantly recurring infection or chronic inflammatory diseases of the respiratory tract (bronchitis, asthma, emphysema) – children and adolescents are affected in ever increasing numbers – are particularly interested in boosting their immune systems. A holistic improvement of resistance, in particular the defence mechanisms of the respiratory tract, should, as far as possible, be achieved by natural and physiological means.

Innate unspecific immunity

Healthy babies are born with a whole range of unspecific defence mechanisms which are collectively termed «natural resistance». These mechanisms are not directed against specific pathogens, but are in constant readiness to fight off potentially harmful micro-organisms. Special anatomical-mechanical and physical factors subserve this defensive stance:

- The ever decreasing caliber of the tiny terminal branches of the lower respiratory tract prevents deep penetration by germ-laden particles, in accordance with particulate size.
- The oxygen tension prevailing in the airways inhibits unlimited growth of anaerobic germs.
- The normal temperature in the perfused mucous membranes offers protection against micro-organisms that grow poorly at 37 °C.
- The mucociliary apparatus, that is the functional combination of mucus secretion and the cilia of the epithelium lining the respiratory tract, traps inhaled bacteria, prevents them from adhering to the epithelium beneath the mucus, and sheds them by expelling mucus. Optimal functioning of this protective, cleansing «moist escalator» depends upon a number of factors, including the pH of the mucus, temperature, sufficient dampness, adequate nasal breathing, and the avoidance of contact with noxious gases. The mucociliary defence is impaired and the risk of infection increased by a drop in body temperature and dry mucous membranes, abnormally narrow nasal passages, and cigarette smoke.
- The cough reflex aids the discharge of particle-laden secretion.

The protective layer of mucus covering the epithelium contains the first-line humoral components of the unspecific defence system:

- Lysozyme: a hydrolase (muramidase) that splits mucopolysaccharides and mucopeptides in the cell wall of bacteria, and is thus bactericidal;
- Transferrin (siderophilin): an iron-binding protein which inhibits the growth of bacteria by interfering with their iron metabolism)
- Fibronectin: important for the inhibition of bacterial adhesion;
- Interferons: fast-acting an-

tiviral and macrophage-activating proteins.

A second unspecific line of defence is located within the lamina propria, that is, below the layer of mucus and epithelium. It is made up of elements of the cellular defence system – phagocytic cells, mostly macrophages and neutrophils: these are capable of spontaneous movement, enter and leave the blood stream, and can migrate through tissue. In addition to performing undirected movements, they can also react to chemotactic stimuli, and can thus be attracted to given sites by a number of mediators of the inflammatory process. They are phagocytic, i.e. they ingest inert and living particles (germs), digest them and, in part, expell them again into the surroundings.

The phagocytosis of microorganisms is improved when the latter are coated with immunoglobulins and complement (elements of the humoral defence system), a condition known as opsonification. Ingestion of such opsonified bacteria is known as «immunophagocytosis». The surface of macrophages and granulocytes is provided with receptors for immunoglobulins and complement, and to these opsonified bacteria firmly attach. By this means, the macrophages usually succeed in killing the pathogens. Otherwise, support by appropriately stimulated lymphocytes and granulocytes is necessary.

Acquired specific immunity

If infective agents have succeeded in breaching the physiological and anatomical barriers of the unspecific defence system, thus posing a threat of further replication and invasion, i.e. the outbreak of an illness, a specific immune response directed towards the particular pathogen (antigen) involved is triggered.

This pathogen- and antigen-specific immune system can react in two ways: via cell-mediated immunity, the major components of which are the T-lymphocytes, and via humoral immunity, whose major components are the B-lymphocytes, mature plasma cells that synthesize antibodies.

T- and B-cells, as they are called for short, develop from the stem cells of the bone marrow. During the process of differentiation, the T-cells are prepared for their various tasks by the activity of the thymus hormone thymosin; B-cells take their name from the fact that they were first discovered fortuitously in chickens, where they are differentiated in the bursa of Fabricius. In humans, the B-cells are probably differentiated in the Peyer's patches, tonsils and appendix where they acquire their ability to produce antibodies (Bursa equivalent).

Among the T-cells, the memory cells store information about antigens. On renewed contact with a specific antigen they pass on this information to the effector T-cells, thus enabling a rapid cell-mediated immune response to take place. The cytotoxic effector T-cells destroy their target cells (pathogens with attached antigens) either by direct attack (killer cells) or via mediation by antibodies (antibody-mediated cytotoxicity). Helper T-cells have the task of activating B-cells to produce specific antibodies. If necessary, this procedure can be suppressed by suppressor T-cells. A balanced ratio of helper and suppressor cells is therefore necessary for normal antibody production. The cell-mediated immune defence also includes the natural killer cells (NK cells) which are activated in an unspecific manner and which can destroy target cells recognized to be foreign, via a direct cytotoxic reaction (without mediation by antibodies).

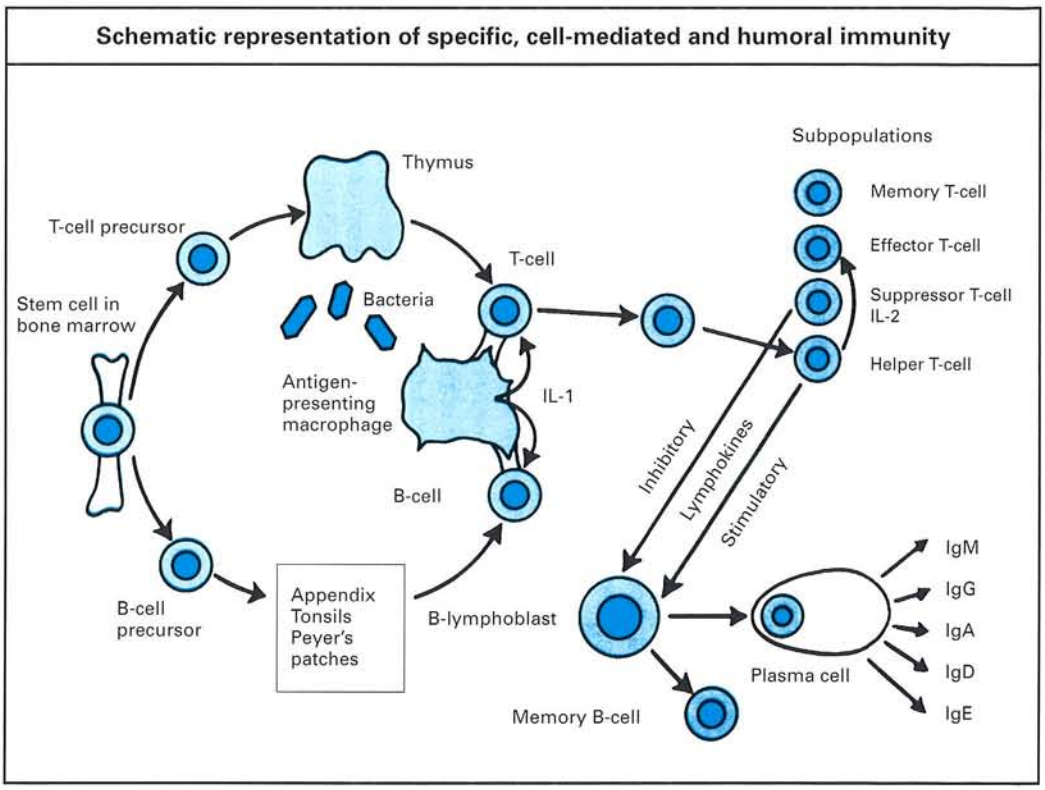
Prevention of infection – not only for the winter

Such illnesses as the common cold and influenza, which are most prevalent in winter, have a considerable socio-medical impact, since they head the statistics for work lost due to illness. And, in general, the winter months make particular demands on the immune system, and the danger of wholesale infections of the respiratory tract is particularly high.

Effective prophylaxis against this type of illness is thus not only of medical, but also of considerable economic, importance, since much of the annual loss of working time due to respiratory diseases occurs during this part of the year. For this reason, appropriate preventive measures should be instituted early on in order to build up effective resistance, in particular of the upper respiratory tract – the centre of bacterial invasion.

Echinaforce® is an ethanolic fresh plant extract. Obtained from the whole plant, it contains the active substances of all the various parts of the American coneflower Echinacea purpurea.

Schematic representation of specific, cell-mediated and humoral immunity



Modern methods of analysis show enormous differences in quality between products obtained from freshly picked plants and those made from dried plants. Investigations have shown that fresh plant preparations are usually superior in terms of the concentration of known active substances.

Dr. h.c. Vogel discovered this plant among the Indians of North America who, among other things, use it to promote wound healing. Present areas of application of Echinaforce® include, in particular, influenza, inflammatory conditions, polyarthritis, disorders of the bladder, poorly healing wounds, and even supportive cancer treatment.

The assumption that Echinaforce® exerts a stimulatory and regulatory effect on the unspecific immune system, thus enhancing the body's own resistance, has been supported by the results of numerous in vivo and cell-culture investigations, of which the following are the most important:

- Echinacea extracts preferentially stimulate granulocytes and macrophages, and also have a certain inhibitory effect on the lymphocyte population.
- Echinacea extracts induce, in vivo, an increase in the total number of leucocytes, due largely to the triggering of an outpouring of granulocytes from the bone marrow into the general circulation.
- Echinacea extracts enhance the activity of granulocytes and macrophages, as reflected in an increase in the phagocytosis rate and an increase in the production of oxygen radicals. This leads to an augmentation of the bactericidal and bacteriostatic activity of these cells.
- Echinacea extracts promote the cellular secretion of cytokines, which are intimately involved in immunoregulatory processes. Among other things, interleukin and tumour necrosis factor activities have been detected in Echinacea-stimulated cell cultures.
- Echinacea extracts manifest antiviral activities, in particular against the viruses causing influenza and herpes.

On the basis of the wealth of immunological data now available, it may be concluded that Echinaforce® possesses unspecific immunostimulatory or immunmodulatory properties. Corresponding classes of substances have been identified in Echinacea extracts, but have not always been identical in terms of their action. It is therefore supposed that the overall effect of Echinacea extracts is based on an additive effect of a number of actions.

Echinacea extracts obtained from different parts of the plant manifest differing degrees of activity. In terms of therapeutic efficacy, therefore, the demand for a whole plant extract makes good sense and is justified.

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