# BNHC E-MAGAZINE

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# Contents

# **Message:** from the President of BioNatural Healing College (BNHC)

Greetings!

First and foremost, I am extremely thankful to Almighty God for granting me this opportunity to present the BioNatural Healing College E- Magazine to our dear readers. Also, I would like to thank you all especially those that are our dear readers that send us their valuable feedback and support. The information provided is for educational purposes only.

We hope this BNHC- E Magazine will be useful to you based with the contribution and dedication of many other respected researchers and colleagues around the globe. Thanking and wishing you all have the best health and prosperous life.

Best regards,

Dr. Nadir Sidiqi Ph.D.

BioNatural Healing College

**BioNatural Healing College** Hope you and your loved ones are staying healthy and safe during this pandemic (COVID-19). What we need to do especially during this uncertain time as follows:

1. Vaccination, Sanitation and Isolation from Social Interaction.

2. Positive Attitude will Increase the Power of Mind and Immune System.

3. Healthy Diet and Drink Plenty of Water (Honey with green tea, vitamin $D_3$, vitamin C), Get Enough Sleep.

4. Exercise (any type of physical activity for 30 minutes daily).

5. A Lot of Prayer to Almighty God (be patient, calm).

**May Almighty God bless, guide us all (Humanity) and grant us the ability to find a cure for the elimination of COVID-19.**

# Milk Formula
## By Prof. Rosalie Stafford

The other day I was at the supermarket, looking at marked-down commodities on the clearance shelves. Because I eat a bio-natural diet, most foods on offer at the supermarket are beyond the pale, but sometimes I do find worthwhile items in the clearance section — little cans of smoked paprika, for example, or jars of curry powder. That day, my attention was caught by a couple of large canisters marked "Hypoallergenic Infant Formula Powder for Babies with Cow-Milk Allergy." Being an obsessive-compulsive label reader, I could not resist.

The other day I was at the supermarket, looking at marked-down commodities on the clearance shelves. Because I eat a bio-natural diet, most foods on offer at the supermarket are beyond the pale, but sometimes I do find worthwhile items in the clearance section — little cans of smoked paprika, for example, or jars of curry powder. That day, my attention was caught by a couple of large canisters marked "Hypoallergenic Infant Formula Powder for Babies with Cow-Milk Allergy." Being an obsessive-compulsive label reader, I could not resist. To my horror, I saw that the first item in the ingredients list was *corn syrup solids*. From there, it didn't get any better: cheap vegetable oils (primarily *palm* and *soy*), then *corn starch*. Those empty calories comprised 98% of the product. The remaining 2% included a range of minerals (such as calcium, potassium, magnesium, etc), vitamins (A, B, D), and lactobacillus.

This supermarket experience raised a number of interesting points: role of corn syrup in obesity; the role of soy as a hormone-disruptor; the role of palm oil monoculture in the destruction of habitat and the destruction of traditional farmsteads. Those are all topics worthy of visiting in a future monthly column. In this column, December 2021, let's focus on milk-allergy and lactose intolerance.

The ability to digest the milk sugar lactose first evolved in dairy farming communities in central Europe, not in more northern groups as was previously thought, finds a new study led by UCL (University College London) scientists published in the journal PLoS Computational Biology.[1]

Those with the trait are pastoralists: people who raise livestock. Hunter-gatherers, who do not keep animals, did not acquire the mutations. Neither did "forest gardeners" who cultivated plants, but not livestock.[2]"I think the most coherent part of the picture is that there's a correlation with the way of life, with pastoralism," says Swallow. "But you have to have the mutation first." Only then could natural selection go to work.[3] The first dairy animal to be domesticated was the sheep around 9,000 years ago. This was followed by goats and cattle in the next thousand years, then donkeys, water buffalo, and horses. In fact, donkeys provide milk that is closest to human mother's milk and was used for sick or orphaned infants. Subsequently, camels, llamas, reindeer, and yaks were domesticated. All of these species were milked by early farmers.[4]

A Brief History of Milk. nutrition and temperance[5]

Surprising History of Milk.

Differentiating milk allergy (IgE and non-IgE mediated) from lactose intolerance: understanding the underlying mechanisms and presentations.[6]

vast majority of studies of infant cow milk allergy are funded by formula manufactures.[7]

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# Understanding the Immune System: A Path to Better Health in the Defense Mechanisms of Human Being

By Dr. Nadir Sidiqi Ph.D.

**Introduction:** The human being is surrounded by many types of harmful microorganisms such as bacteria, viruses, fungi, protozoa as well as other related adverse effects from organisms such as pollens, insects, toxic chemicals, etc. However, the human body would respond to those foreign antigens remarkably with its defense mechanisms. A healthy diet and a healthy lifestyle is the natural remedy to boost the immune system. The purpose of this study is to understand the science of immunology and how important is this knowledge in the protection of human health and well-being.

With sincere gratitude **i**nterestingly, the baby in her mother's womb is free from the pathogens, once he or she comes to the earthy environment, then many harmful microorganisms try to cause him or her disease, but large cells guard group, protect the baby. How amazingly, this mechanism is working in human beings. Therefore, understanding this complex and complicated relationship between the human body and pathogens and their environment is very important in the context of health, defense mechanisms against pathogens within the human body. It would be necessary, first to begin the objectives of this study, with the definition of immunology: Is the science in which the human body defends itself from infectious agents and other foreign substances in its environment. The immune system protects us from pathogens. It has the ability to discriminate (differentiate) between the individual's own cells and harmful invading organisms[1].

In general, context living organisms are capable of immune responses to defend themselves against infectious agents or other adverse related substances in their environment. Organisms are created and designed biochemically and biologically to resist naturally in two ways, therefore, immunology explains, the concept of self is used to indicate the organism, and the concept of non-self to indicate the environment surrounding the organism. Thus, understanding immunological processes, based on defense action from self against non-self (foreign invaders to the human body) and their interaction is crucially important. For instance, a person that all cells and tissues recognize and defend the body against foreign invaders organisms and foreign chemicals. Another example, suppose a person playing volleyball suddenly falls on the ground and a small cut occurs on his leg, microorganisms living on the ground as well on his skin are able to enter his body. They pass into the bloodstream and pass throughout his body. Some of these microorganisms are pathogenic, that is, they may cause illness if not taken care of and in some severe cases even life-threatening. What they do those microorganisms, as soon as those microorganisms enter in a person body, it is immune system job, begins to identify them as foreign to the body. Thus, the body will produce defenses that will protect the human body against any diseases it may cause. As mentioned earlier that immunology is the study that deals with the immune system and immunologists are scientists that engaged in this field searching for how the immune system functions in humans and prevention of various diseases by means of immunizations. The term immunization refers to the protection of an individual animal against a disease by the introduction of killed or weakened disease-causing organisms into it is bloodstream[2]. Immunology: A Short Course by Drs. Richard Coico and Geoffrey Sunshine (Seventh Edition, 2015), explains that the origins of the immune system mechanisms particularly to distinguish self from nonself go far back in evolutionary history, and many related issues, in fact, originated as markers for allowing cells to recognize and interact with each other to set up symbiotic households.

Genetically related sponge colonies that are placed close to each other, for example, will tend to grow toward each other and fuse into one large colony.

Unrelated colonies, however, will react in a different way, destroying cells that come in contact with each other and leaving a zone of rejection between the colonies[3]. However, the concept of immunity from disease dares back at least to Greece in the 5th century BC. Thucydides wrote of individuals who recovered from the plague, which was raging in Athens at the time. These individuals, who had already contracted the disease, recovered and become "immune" or "exempt" Nevertheless, the earliest recognized attempt to intentionally induce immunity to an infectious disease was in the 10th century in China, where smallpox was endemic.

The process of "variolation" involved exposing healthy people to material from the lesions caused by the disease, either by putting it under the skin or more often, inserting powdered scabs from smallpox pustules into the nose. Variolation was known and practiced frequently in the Ottoman Empire, and later this technique become popular in England, mainly due to the efforts of Lady Mary Worthey Montague who survived smallpox but who lost a brother to it as pointed out by Steven Greenberg "A Concise History of Immunology[4]". However, many common diseases are caused by uncontrolled or excessive immune responses, such as rheumatic fever, asthma, and glomerulonephritis, inflammatory bowel disease, and autoimmune thyroiditis in membranous nephropathy (M&N), and multiple sclerosis in bone marrow biopsies (BMB).[5] Cells and tissues of the immune system work together remarkably to protect humans against infectious agents and environmental toxins.

These cells develop from precursors in the bone marrow, after which they circulate in the blood and live in lymphoid organs (lymph nodes, spleen, tonsils) and virtually all the tissues of the body. As described by Abul Abbas MD "Introduction to Immunology", among circulating white blood cells (leukocytes), the major phagocytes (the cell that can ingest bacteria, foreign particles, and other cells) are neutrophils (mature white blood cells) and monocytes (large white blood cells with a round or kidney-shaped nucleus).

These cells ingest and destroy microbes, other injurious agents, and one's own dead and damaged cells. Neutrophils respond rapidly to foreign stimuli and to injury; their reaction is part of acute inflammation. When blood monocytes enter tissues, they mature and are called macrophages. These cells are present under epithelia, in connective tissues, and in all organs. As above article Introduction to Immunology explains that macrophages respond more slowly than do neutrophils, but for longer times; this reaction is typical of chronic inflammation. In addition, macrophages help to repair damaged tissue. Another important cells are lymphocytes, there are two main classes of lymphocytes: B lymphocytes (they mature in the bone marrow), secrete proteins called antibodies, which bind to and eliminate extracellular pathogens. T lymphocytes (which mature in the thymus), and their function mainly to combat microbes that have learned to live inside cells (where they are inaccessible to antibodies).

**Types of the immune system:** The human body immune system is a collection of cells and proteins that function to protect the skin, respiratory passages, intestinal tract, and other areas from foreign antigens, such as microbes (e.g., bacteria, fungi, parasites), viruses, cancer cells, and toxins. As such, the immune system can be divided into two types: innate (non-specific) immunity and adaptive (specific) immunity.

Innate (non-specific) immunity has many characteristics such as the first line of defense, rapid defense, or within hours of encountering an antigen. The innate immune is without immunologic memory to recognize or "memorize" the same pathogen should the body be exposed to it in the future. The adaptive immunity with the characters such as 2nd line of defense delayed as a response to infection, specific for microbes and antigen (can differentiate antigen), memory cell which remembers microbes and give a strong immune response on re-exposure as pointed out by Dr. Samia Hawas "Medical Immunology". Therefore, this makes adaptive immunity is antigen-dependent and antigen-specific that involves a lag time between exposure to the antigen and maximal response reported by Warrington et al., "An introduction to immunology & immunopathology[6].

**Components of innate immunity:**

1. Skin: epithelial barriers of the skin, GI tract, and respiratory tract, which prevent microbe entry (and have to be breached for a microbe to establish infection, e.g., by cut and burns).
2. Phagocytic leukocytes (neutrophils and macrophages)
3. Natural killer (a specialized cell type called natural killer)
4. Antimicrobial proteins: several circulating plasma proteins, the most important of which are the proteins of the complement system (plasma proteins that react with one another to opsonize pathogens and induce a series of inflammatory responses that help to fight infection).

As Abul Abbas, MD describes in his article "Introduction to Immunology" that the innate immune response can prevent and control many infections. However, many pathogenic microbes have evolved to overcome innate immune defenses and to protect ourselves against these infections. We must call for another powerful mechanism as mentioned earlier adaptive immunity.

**Components of adaptive immunity:** lymphocytes and their products, normally silent, however, when activated, these components "adapt" to the presence of infectious agents by activating, proliferating, and creating potent mechanisms for neutralizing or eliminating the microbes. There are two types of adaptive immune response; humoral immunity, mediated by antibodies produced by B (cells) lymphocytes, and cell-mediated immunity, mediated by T (cells) lymphocytes[7]. Let us analyze each component of the innate and adaptive immune systems and their functions according to UC San Francisco Immunology Module Prologue website http://missinglink.ucsf.edu

**Innate immunity components functions:** It is important to note that innate immune reactions generally occur much sooner and are less sustained than adaptive reactions.

**Epithelial barriers:** As mentioned earlier that the epithelia of the skin, respiratory tract and gastrointestinal tract constitute our main defense against infection by microbes. Tight junctions between cells provide a physical barrier; in the respiratory and GI tracts, mucous secretion creates a physical impediment. Anti-microbial chemicals that are secreted by epithelia inhibit microbes' growth, preventing many infections, and in the GI tract, many ingested microbes are killed or neutralized by stomach acid (hydrochloric acids) and digestive enzymes. **Phagocytic leukocytes:** Whenever, if microbes pass through the epithelial barrier, phagocytes such as neutrophils and macrophages ingest microbes into vesicles and can chemically destroy them. In addition, these phagocytes and other cell types such as dendritic cells secrete antimicrobial proteins called cytokines. Macrophages, in particular, secrete cytokines that stimulate inflammation (which causes capillary dilation, leading to increased blood flow and leakiness) and lymphocyte responses. These cells form an important link between innate and adaptive immunity. Therefore, macrophages and dendritic cells act as antigen-presenting cells, which activate cells of the adaptive immune system.

**Dendritic cells:** functions are like phagocytic leukocytes, that are capable of phagocytosing microbes that pass through epithelial barriers. Dendritic cells express receptors that recognize general classes of microbes and are known to make various cytokines in response to various microbes. Dendritic cells are an important initial defense against viruses. More, important dendritic cells are the major cell type that captures and displays antigens to T cells. Thus, dendritic cells play an important role in innate and adaptive immunity.

**Plasma proteins (complement):** are important proteins that circulate and bind the infectious agents and assist to eliminate them. For example, proteins of the complement system (the complement system is also activated by antibodies, and thus play a role in adaptive immunity, as well), which bind to and are activated by pathogens. These complement proteins then cause phagocytosis by interacting with complement protein receptors on the surface of macrophages. This process of coating a microbe's surface with a molecule to enhance ingestion is known as opsonization (the process by which bacteria and cells are altered in such a way that they are more ready and more efficiently engulfed by phagocytes). Furthermore, soluble complement proteins can also recruit additional phagocytes as reported by UC San Francisco Immunology Module Prologue.

**Natural killer cells (NK):** belong to the same lineage of lymphocyte precursors as B cells and T cells, however, express receptors that bind to general classes of bacterial or viral antigens rather than very specific peptide sequences. They use this limited set of activating receptors to detect stressed, infected cells or cells with DNA damage. As a result of they kill these cells, thereby eliminating damaged cells or cells that are reservoirs of infection. NK cells produce macrophage activating cytokine IFN (interferon: any family glycoprotein biological response produced by T cells)-gamma.

**Adaptive immunity components functions:** Scientists describes the adaptive immunity components functions as follows:

**B lymphocytes:** As UC publication describes that bone marrow-derived lymphocytes, or B lymphocytes, comprise 10 percent to percent of circulating peripheral lymphocytes and are also present in the bone marrow and other lymphoid tissues (i.e., spleen, lymph nodes, tonsils, and mucosal tissues). These are the only cells that produce antibodies. B cells recognize antigens via membrane-bound antibodies, which, unlike T cells, whose receptors can only recognize small peptides, are capable of recognizing many different chemicals structures (proteins, lipids, polysaccharides, small chemicals, etc.). When stimulated by a microbial antigen, B cells differentiate into plasma cells, which secrete large amounts of antibodies. These antibodies then bind the microbial antigen, neutralizing the microbe or making it for destruction by phagocytes. After a response, B memory cells persist, which "remember" the particular antigen and are ready to respond faster and more potently to re-exposure.

**T lymphocytes (cells):** T-cell Modulation Group from Cardiff University explains that T-cells are a type of white blood cell that circulate around our bodies scanning for cellular abnormalities and infections. T-cells are broad with several types, however, two types are such as killer T-cells and helper T-cells. Killer T-cells have X-ray vision as they are able to see inside our body's own cells simply by scanning their surface. As a result of that allows killer T-cells to hunt down and destroy cells that are infected with infectious agents or that have become cancerous. Helper T-cells play an important role in all arms of immunity. It is important to understand the role of T-cells in the immune system. Indeed, T-cells are essential for human immunity. One of the examples of T-cells manifest in the devastating effects of a lower than a normal number of just one type of T-cell are all too evident in HIV/AIDS[8]. Thymus-derived lymphocytes, or T lymphocytes, comprise 60 percent to 70 percent of circulating peripheral lymphocytes and are the major population in the spleen and peripheral lymph nodes. Unlike B cells, which recognize circulating antigens of many chemical structures, the vast majority of T-cells (>95%) are only able to recognize peptide fragments that are displayed by specialized molecules called MHC molecules on the surfaces of antigen-presenting cells.

As the UC San Francisco publication describes that this system ensures that T-cells be able to recognize antigens that might be floating in the cytosol or contained within ingested vesicles of various cells. As mentioned above about two types of T-cells there are also major subsets of T-cells that proliferate when stimulated: CD4+ “helper” T-cells secrete soluble molecules which help B cells to produce antibodies and activate macrophages to eliminate endocytosed microbes. CD8+ “cytotoxic” T-cell can also secrete soluble mediators but play a more important role in directly killing virus-infected or tumor cells. As reported that after a response, T memory cells persist, which “remember” particular antigens and are ready to respond faster and more potently to re-exposure. However, this topic is required further detail, which we have discussed here in brief.

**Antibody-mediated vs, cell-mediated immunity:** As mentioned above regarding B cells that arise from hematopoietic stem cells in the bone marrow. Warrington et al, describe that antibody-mediated immunity is the branch of the acquired immune system that is mediated by B-cell antibody production. The antibody production pathway begins when the B-cell's antigen-binding receptor recognizes and binds to antigen in its native form. Therefore, in turn, attracts the assistance of T-cells (helper) which secrete cytokines that help the B-cell multiply and mature into antibody-secreting plasma cells. The secreted antibodies bind to antigens on the surface of a pathogen, flagging them for destruction through pathogen and toxin neutralization, classical complement activation, opsonin promotion of phagocytosis, and pathogen elimination. Upon elimination of the pathogen, the antigen-antibody complexes are cleared by the complement cascade[9]. Furthermore, five types of antibodies are produced by B cells: immunoglobulin A (IgA), IgD, IgE, IgG, and IgM. Each of these antibodies has differing biological functions and recognizes and neutralizes specific pathogens. As the below tables illustrated, specifically table 2 summarizes the various functions of five Ig antibodies[10]. Another important role of antibodies is in containing virus proliferation during the acute phase of infection. It is important to note that they are not generally capable of eliminating a virus once the infection has occurred. Once an infection is established, cell-mediated immune mechanisms are most important in host defense. A study indicates that cell-mediated immunity does not involve antibodies, but rather protects an organism through[11]

- The activation of antigen-specific cytotoxic T-cell that induces apoptosis (a natural process of self-destruction by degradative enzymes in certain cells such as epithelial and erythrocytes) of cells displaying epitopes (a localized region on the surface of an antigen that is capable of eliciting an immune response) of foreign antigen on their surfaces, such as virus=infected cells, cells with intracellular bacteria, and cancer cells displaying tumor antigen.
- The activation of macrophages and natural killer cells (NK), enabling them to destroy the intracellular pathogen.
- The stimulation of cytokine production that further mediate the immune response.

Thus, the above statements, indicate that cell-mediated immunity is directed primarily at infectious agents that survive in phagocytes as well as those that infect non-phagocytic cells. This type of immunity is most effective in eliminating virus-infected cells, but can also participate in defending against fungi, protozoa, cancers, and intracellular bacteria. Warrington et al., explain that defects or malfunctions in either the innate or adaptive immune response can provoke illness or disease. Such disorders are generally caused by an overactive immune response known as hypersensitivity reactions. However, an inappropriate reaction to self is known as autoimmunity or ineffective immune responses known as immunodeficiency, the following information is based on Warrington et al., article "An introduction to immunology and immunopathology".

**Hypersensitivity reactions:** It refers to undesirable responses produced by the normal immune system. There are four types of hypersensitivity reactions as studies reported.

Type I: immediate hypersensitivity

Type II: cytotoxic or antibody-dependent hypersensitivity

Type III: an immune complex disease

Type IV: delayed-type hypersensitivity

Type I hypersensitivity is the most common type of hypersensitivity reaction. It is an allergic reaction provoked by re-exposure to a specific type of antigen, referred to as an allergen. Unlike the normal immune response, the type I hypersensitivity response is characterized by the secretion of IgE by plasma cells. IgE antibodies bind to receptors on the surface of tissue mast cells (found in connective tissue that contains numerous basophilic granules and releases substances such as histamine in response to injury or inflammation of bodily tissues) and blood basophils, causing them to be "sensitized".

Later exposure to the same allergen, cross-links the bound IgE on sensitized cells resulting in degranulation and the secretion of active mediators such as histamine, leukotriene, and prostaglandin that cause vasodilation (an increase in the diameter of a blood vessel), and smooth muscle contraction of the surrounding tissue. For instance, common environmental allergens inducing IgE-mediated allergies include cat, dog, and horse epithelium, pollen, house dust mites, and mold. Another example, food allergies are also a common cause of type I hypersensitivity reactions. However, these types of reactions are more frequently observed in children than adults. Type II hypercreativity reactions are and take anywhere from 2 to 24 hours to develop as reported by the above article. These types of reactions occur when IgG and IgM antibodies bind to the patient's own cell-surface molecules, forming complexes that activate the complement system. Therefore, in turn, leads to opsonization, red blood cell agglutination (the process of agglutinating or "clumping together"), cell lysis, and death. For instance, type II hypersensitivity reactions include erythroblastosis fetalis, Goodpasture's syndrome, and autoimmune anemias. Type III hypersensitivity reactions occur when IgG and IgM antibodies bind to soluble proteins, (here rather than cell surface molecules as in type II hypersensitivity reactions), forming immune complexes that can be deposited in tissues, leading to complement activation, inflammation, the neutrophil influx, and mast cell degranulation. Duration for this type of reaction can take hours, days, or even weeks to develop. For example, systemic lupus erythematosus (SLE), serum sickness, and reactive arthritis. Type IV hypersensitivity reactions is different from the above types, due to cell-mediated and antibody-independent. This type IV is the second most common type of hypersensitivity reaction and usually takes 2 or more days to develop and is caused by the overstimulation of T-cells and monocytes/macrophages which leads to the release of cytokines that cause inflammation, cell death, and tissue damage.

According to the "An introduction to immunology and immunopathology" article, a brief summary of the four types of hypersensitivity reactions is illustrated in Table 3. Let us consider for seeking to understand the autoimmunity and immunodeficiency with respect to this study. **Autoimmunity:** In simple terms, it means immunity against the self. National Institute of Health, describes when an intruder invades a human's body like a cold virus or bacteria on a thorn that pricks a person's skin, a human's immune system protects a person. It tries to identify, kill, and eliminate the invaders that might a person. however, sometimes problems with that infected person's immune system cause it to mistake the body's own healthy cells as invaders and then repeatedly attack them. This is called autoimmune disease. Here are a few names of diseases include: autoimmune hemolytic anemia, alopecia areata, autoimmune hepatitis, dermatomyositis, diabetes type 1, multiple sclerosis, rheumatoid arthritis, etc[12].

**Immunodeficiency:** Immunodeficiency disorders are a group of disorders in which part of the immune system is missing or defective. The body's ability to fight infections is, therefore, impaired. As a result, a child with an immunodeficiency disorder has frequent infections that are generally more severe and last longer than in a healthy child (Encyclopedia.com). immunodeficiency disorders may result from a primary congenital defect (primary immunodeficiency) or may be acquired from a secondary cause (secondary immunodeficiency), such as viral or bacterial infections, malnutrition or treatment with drugs that induce immunosuppression as pointed out by Warrington et al.

**Strategies in supporting the immune system:** the human body is complex and composed of complicated structural and functional various cells, tissues, and organs. As such, there is not any single magic bullet that can immediately restore immune function. As the Encyclopedia of Natural Medicine describes that immune system is truly holistic, as evidenced by the close association of psychological, neurological, nutritional, environmental, and hormonal factors with immune function. Therefore, supporting the immune system is critical to good health. Conversely, good health is critical to supporting the immune system. The best and integrated approach to supporting immune function is a comprehensive plan involving lifestyle changes, stress management, exercise, diet, nutritional supplementation, avoidance of toxins, and the use of herbal medicine. The Encyclopedia of Natural Medicine recommendations as follows:

**Table 1 Summary of non-specific host-defense mechanisms for barriers of innate immunity [1]**

| Barrier | Mechanism |
|---|---|
| **Anatomic** | |
| Skin | • Mechanical barrier retards entry of microbes<br>• Acidic environment (pH 3-5) retards growth of microbes |
| Mucous membrane | • Normal flora compete with microbes for attachment sites<br>• Mucous entraps foreign microbes<br>• Cilia propel microbes out of body |
| **Physiologic** | |
| Temperature | • Body temperature/fever response inhibits growth of some pathogens |
| Low pH | • Acidic pH of stomach kills most undigested microbes |
| Chemical mediators | • Lysozyme cleaves bacterial cell wall<br>• Interferon induces antiviral defenses in uninfected cells<br>• Complement lyses microbes or facilitates phagocytosis |
| **Phagocytic/endocytic barriers** | |
| | • Various cells internalize (endocytosis) and break down foreign macromolecules<br>• Specialized cells (blood monocytes, neutrophils, tissue macrophages) internalize (phagocytose), kill and digest whole organisms |
| **Inflammatory barriers** | |
| | • Tissue damage and infection induce leakage of vascular fluid containing serum protein with antibacterial activity, leading to influx of phagocytic cells into the affected area |

Source: Warrington et al. Allergy, Asthma & Clinical Immunology 2011, 7(Suppl 1):S1 http://www.aacijournal.com/content/7/S1/S1

**Table 2 Major functions of human Ig antibodies [5]**

| Ig antibody | Function |
|---|---|
| IgM | First immunoglobulin (Ig) expressed during B cell development (primary response; early antibody)<br>• Opsonizing (coating) antigen for destruction<br>• Complement fixation |
| IgG | Main Ig during secondary immune response<br>• Only antibody capable of crossing the placental barrier<br>• Neutralization of toxins and viruses<br>• Opsonizing (coating) antigen for destruction<br>• Complement fixation |
| IgD | Function unclear; appears to be involved in homeostasis |
| IgA | Mucosal response; protects mucosal surfaces from toxins, viruses and bacteria through either direct neutralization or prevention of binding to mucosal surface |
| IgE | Associated with hypersensitivity and allergic reactions<br>• Plays a role in immune response to parasites |

Source: Warrington et al. Allergy, Asthma & Clinical Immunology 2011, 7(Suppl 1):S1 http://www.aacijournal.com/content/7/S1/S1

**Table 3 Types of hypersensitivity reactions [6,7]**

| Type | Alternate name | Examples | Mediators |
|---|---|---|---|
| I | Allergy (immediate) | Atopy<br>• — Anaphylaxis<br>• — Asthma<br>• — Allergic rhinitis<br>• — Angioedema<br>• — Food allergy | IgE |
| II | Cytotoxic, antibody-dependent | Erythroblastosis fetalis<br>• Goodpasture's syndrome<br>• Autoimmune anemias, thrombocytopenias | IgG, IgM |
| III | Immune complex disease | Systemic lupus erythematosus<br>• Serum sickness<br>• Reactive arthritis<br>• Arthrus reaction | Aggregation of antigens IgG, IgM<br>Complement proteins |
| IV | Delayed-type hypersensitivity, cell-mediated, antibody-independent | Contact dermatitis<br>• Tuberculosis<br>• Chronic transplant rejection | T cells, monocytes, macrophages |

Source: Warrington et al. Allergy, Asthma & Clinical Immunology 2011, 7(Suppl 1):S1 http://www.aacijournal.com/content/7/S1/S1

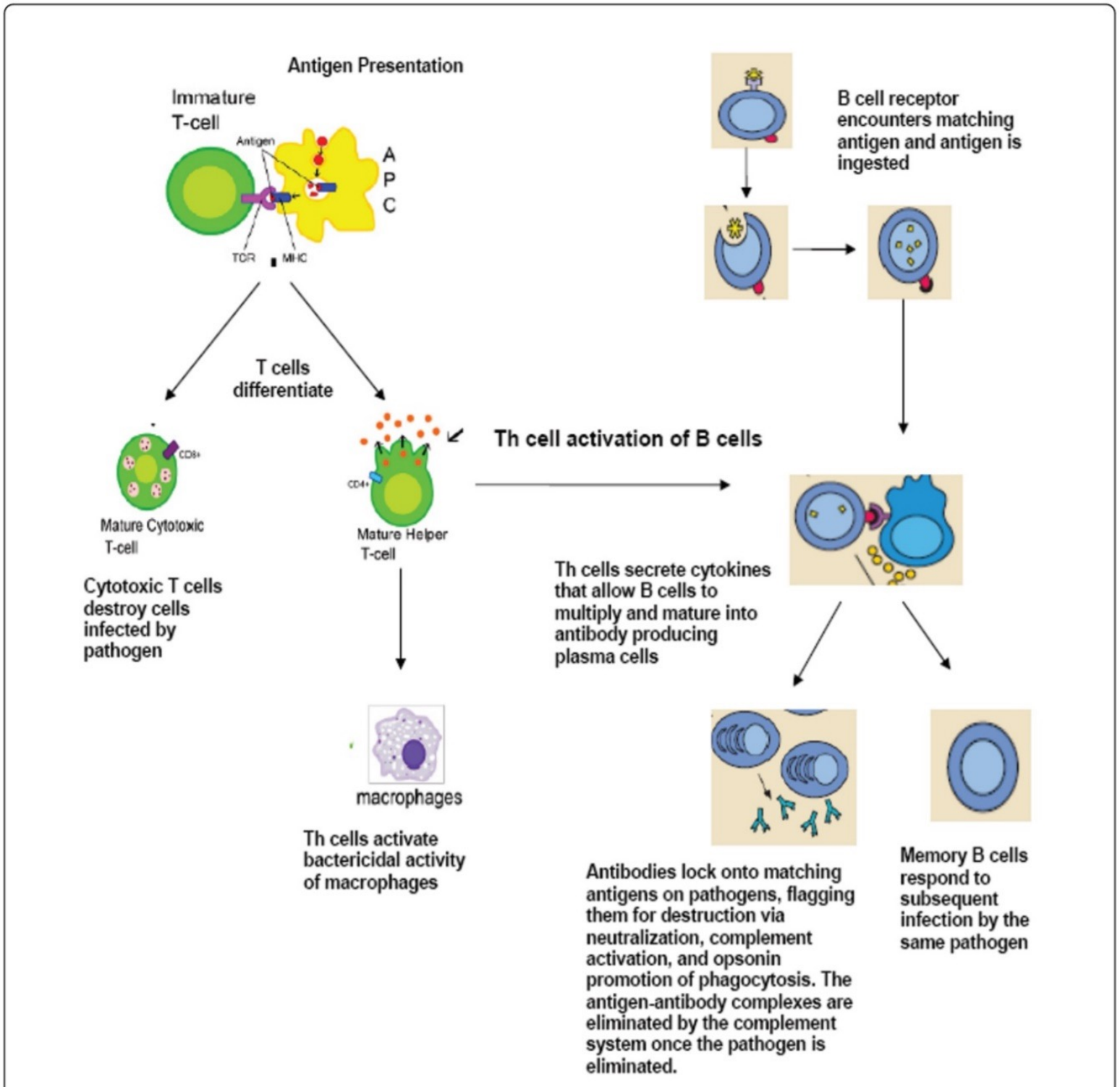


**Figure 2 Adaptive immunity: T-cell and B-cell activation and function.** APC: antigen-presenting cell; TCR: T-cell receptor; MHC: major histocompatibility complex Figure adapted from images available at: http://en.wikipedia.org/wiki/Image:B_cell_activation.png and http://commons.wikimedia.org/wiki/Image:Antigen_presentation.svg

Source: Warrington et al. Allergy, Asthma & Clinical Immunology 2011, 7(Suppl 1):S1 http://www.aacijournal.com/content/7/S1/S1

**Supporting immune function involves a comprehensive approach**

- · The mind and emotions have a tremendous impact on immune function
- · Stress depresses immune function.
- · Too much sugar in the diet leads to lowered white blood cell activity.
- · Nutrient deficiency is the most common cause of low immune function.
- · Key nutrients for supplementation to support the immune system are vitamin A, vitamin C, vitamin D, vitamin E., B vitamins, zinc, selenium.
- · Supporting the thymus, the major gland of the immune system, is one of the primary goals of therapy.
- · The herb astragalus exerts broad-spectrum effects on immune function.
- One of the best researched beta-glucan sources is Wellmune WGP, a whole glucan particle derived from the cell walls of the baker's yeast.
- Best (bed rest is best)
- Drink plenty of fluid especially vegetable juice, soap, herb tea, not fruit juice[13].

It is important to understand that the issues of the above treatment as a general approach to supporting immune function during an active infection. However, is not intended to be a replacement for proper medical care. Proper medical care should be taken when there is any sign or symptom associated with more serious infection such as fever, redness, excessive swelling, severe fatigue, pus formation and other life-threatening health problems, consult the primary care doctor or nearest hospital. As mentioned above about nutritional supplements, it would be useful to state this issue for the purpose to boost the immune system.

**Research in immunology:** Immunologists are involved in research to understand more about new therapies that will improve the immune system, some of the research activities at Harvard Medical School as follows:

1. Transcriptional profiling and proteomics of the many different subsets and functional states of cells of the immune system.

2. In vivo confocal and multiphoton imaging of pathogen-host cell interactions

3. Studies of the manipulations of the intestinal microbiome on immune responses and autoimmune diseases

4. Evaluation of blockade of T-cell inhibitory molecules for the treatment of cancer; and

5. The use of inhibitory micro RNAs to modulate immune responses.

Similarly, School of Medicine Department of Immunology & Microbiology at the University of Colorado several research projects are conducted by their researcher colleagues: the Alper lab is focused on understanding the regulation of the innate immune response, particularly as it relates to the basis for inflammatory diseases.

Research on understanding how islet-reactive CD4 T-cells are activated in the context of T1D and investigating their contribution to the pathogenesis of autoimmune diabetes.In vivo biology and signaling in naïve and autoreactive human B cells, the molecular function of autoimmunity risk alleles operative in regulatory signaling pathways in B cells, and STING function in B cells.Research interest is to elucidate the mechanisms of signaling control of class switch recombination and its application in autoimmunity.

Work on the identification of antigens that are targeted by disease triggering T cells in type 1 diabetes and other autoimmune diseases. Use advanced proteomic and chemical strategies in combination with T-cell immunology. It is their goal to predicate, prevent and reverse autoimmunity. Research focuses on understanding how T cell tolerance is maintained or broken by cellular and environmental factors at the disease site during autoimmunity, particularly in diabetes. Work in the laboratory addresses the regulation of normal lymphocyte development by transcriptional and epigenetic mechanisms; oncogenes and leukemogenesis; and transcriptional control of autoimmunity.

Research on the cell biology of the mononuclear phagocyte system with relation to inflammation, innate and adaptive immunity, and maintenance of, or return to, normal tissue homeostasis.

Research on to enable a deeper understanding of normal pediatric immune development, dysregulated immune processes in children with immunodeficiency, autoimmunity, and overlap between the two[14].

**Conclusion:** Immunology is the science that deals with two important aspects of human beings in the context of health and disease: first how important is to understand that the human body immune system which is composed of cells, tissues, organs,s and the immune system that work together remarkably to protect the humans against infectious agents and environmental toxins. Secondly, crucially important to know about the complexity of reactions in the recognition and responses of the body's immune system against infectious agents and other related toxic chemicals. Furthermore, the immune system can be divided into two types: innate (non-specific) immunity and adaptive (specific) immunity. Innate (non-specific) immunity has many characteristics such as the first line of defense, rapid defense, or within hours of encountering an antigen. The innate immune is without immunologic memory to recognize or “memorize” the same pathogen should the body be exposed to it in the future. The innate immune, with its components such as skin: epithelial barriers of the skin, GI tract, and respiratory tract, which prevent microbe entry (and must be breached for a microbe to establish infection, e.g., by cut and burns). Phagocytic leukocytes (neutrophils and macrophages), natural killer (a specialized cell type called natural killer).

Antimicrobial proteins: several circulating plasma proteins, the most important of which are the proteins of the complement system (plasma proteins that react with one another to opsonize pathogens and induce a series of inflammatory responses that help to fight infection). The adaptive immunity with the characters such as 2nd line of defense delayed as a response to infection, specific for microbes and antigen (can differentiate antigen), memory cell which remembers microbes and give a strong immune response on re-exposure. The adaptive immunity comprises of several components, B (cells) lymphocytes that bone marrow-derived lymphocytes, or B lymphocytes, comprise 10 percent to percent of circulating peripheral lymphocytes and are also present in the bone marrow and other lymphoid tissues (i.e., spleen, lymph nodes, tonsils and mucosal tissues). T lymphocytes (cells): that T-cells are a type of white blood cell that circulate around our bodies scanning for cellular abnormalities and infections. T-cells are broad with several types; however, two types are such as killer T-cells and helper T-cells. Killer T-cells have X-ray vision as they can see inside our body's own cells simply by scanning their surface. It is important to note that a nutritional and healthy diet along with exercise, and getting enough sleep plays a vital role in boosting the immune system, which will lead to reducing susceptibility to cold, flu, and cancer.

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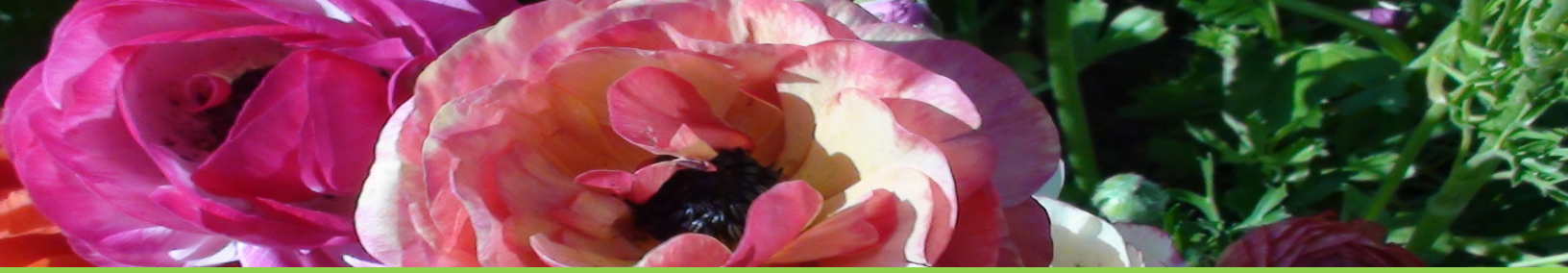

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