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YOGA: THE NATURAL IMMUNITY BOOSTER

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Abstract

Since the 1970s, meditation and other stress‑reduction techniques have been studied as possible treatments for depression and anxiety. One such practice, yoga, has received less attention in the medical literature, though it has become increasingly popular in recent decades. The tremendous spread of infectious viral disease spread throughout the world. The only weapon to fight against this life threatening disease is to build our natural defense mechanism which depends upon the immune system of the body. The traditional yogic practices are found to be very effective to boost our immunity. The asana and the pranayama along with simple, natural diet are sufficient to boost our immunity and promote a healthy life.

Keywords: *Asanas, Pranayama, Yoga and Immunity*

INTRODUCTION

While the global population is growing rapidly, and people are living longer, our living environment has changed substantially. There is therefore a greater need to support our health and wellbeing, primarily our immune system, at different stages throughout our life. These concerns regarding immunity have become more important, given the periodic outbreaks of infectious diseases such as SARS (Severe acute respiratory syndrome), MERS (Middle East respiratory syndrome), and now the coronavirus pandemic, that within a few months, has led to more than three million cases across the world .

Yogic lifestyle, yogic diet, yogic attitudes, and various yogic practices help humans to strengthen themselves and develop positive health, thus enabling them to withstand stress better. This yogic "health insurance" is achieved by normalizing the perception of stress, optimizing the reaction to it, and by releasing the pent up stress effectively through various yogic practices. Yoga is a holistic and integral science of life dealing with physical, mental, emotional, and spiritual health of the individual and the society (1).

OVERVIEW OF IMMUNE SYSTEM

The immune system is a real-time example of evolution, as our body creates and modifies molecules of the immune system in response to invading pathogens. Many pathogens respond to this immune pressure by evolving themselves.

The immune system exhibits many of the mathematical features that make biology interesting (2). At a deeper level, the emergence of the adaptive immune system in jawed vertebrates, several hundred million years ago is an example of spontaneous emergence of modularity, a symmetry breaking phase transition by which biology itself emerged from organic chemistry several billion years ago (3-5). Finally, the response of the immune system induces a complementary evolutionary dynamics in pathogens.

The Immune System "Starting Lineup" The immune system is an amazing and somewhat complex system, with the lymph vessels serving as its delivery (or highway) system. Lymph is a semi-clear liquid that carries needed water, oxygen and nutrients that have been transferred through the blood system (via the walls of the capillaries) to the cells themselves. Together, the lymph and lymph vessels transport uninvited guests and cell waste from the cells and their

surroundings to the lymph nodes to be filtered, processed and drained. Lymph nodes are found Throughout the body (including the sides of the neck) and frequently enlarge as they respond to new white blood cell production during an infection. For instance, when a person's glands are swollen, there's a good chance that his or her body is trying to fight something. Although any biologist would accuse us of oversimplifying the definitions, let's take a look at some of the major players of the immune system: T Cells. Most of the cells that make up the immune system are white blood cells. One type of white blood cell, the lymphocytes, includes two major groups referred to as "T cells" and "B cells." T cells have receptors on their surface that interact with molecules (i.e., small particles of a substance composed of two or more atoms) that are found in other cells of the body. By "hooking up" to the molecules, T cells can recognize the matter as something that is supposed to be in the body, or recognize it as a foreign substance or invader like a virus or bacterium. Once an invader is detected, the different types of T cells either work to directly destroy them or work to assist other immune cells in coordinating an attack. Cytokines and Chemokines. One of the responses that T cells can mount against a trespasser is to secrete cytokines and chemokines. Cytokines are molecules that can activate other immune system cells that are nearby, or signal them to grow or to die. Chemokines are small groups of cytokines that attract more immune system cells to the area of the body where they are needed. B Cells and Antibodies. Certain cytokines released by T cells will activate and direct another type of lymphocyte, the B cells, to make specific antibodies (aka, immunoglobulin) against a foreign substance. Antibodies then seek the invaders and bind them to sites on their surface known as antigens. By binding to an antigen, an antibody can either neutralize the foreign object directly or mark it for destruction by other members of the immune system.

Phagocytes. Phagocytes are white blood cells that are either stationary or circulate through the bloodstream and ingest harmful substances and dead or dying cells. A certain class of phagocytes, known as "professional" phagocytes (e.g., macrophages, neutrophils, monocytes, dendritic cells and mast cells), also possesses receptors on their surface (somewhat like those found on T cells). Once they have successfully engulfed a foreign invader, they will display part of its remains on their receptor and then present it to other cells of the immune system (including lymphocytes in the lymph nodes) to stimulate a larger response to the infectious agent (6).

CELLULAR ELEMENT OF IMMUNE RESPONSE

An intact immune response includes contributions from many subsets of leukocytes. The different leukocyte subsets can be discriminated morphologically by a combination of conventional histological stains, and by analysis of the spectrum of glycoprotein differentiation antigens that are displayed on their cell membranes. These differentiation antigens are detected by their binding of specific monoclonal antibodies. These cell phenotype-determining antigens are assigned cluster of differentiation (CD) numbers. There are currently over 350 defined CD antigens. Updates are issued by Human Cell Differentiation Molecules (HCDM), an organization that organizes periodic Human Leukocyte Differentiation Antigen (HLDA) workshops at which newly identified cell surface molecules are defined and registered. The next HLDA workshop (HLDA9) will be held in Barcelona, Spain, and the summary of authorized CD molecules will be published at http://www.hcdm.org/.

Mature, circulating leukocytes differentiate from hematopoietic stem cells (Figure 1). These stem cells can be recognized by their own spectrum of defining cell surface antigens and can be purified from bone marrow, peripheral blood, and the placenta.[4] The recognition that pluripotent hematopoietic stem cells can be purified in substantial quantities has accelerated progress in hematopoietic cell transplantation and provides considerable promise for somatic cell-based gene therapy (7).

Formation of the full complement of immune system cells begins when a pluripotent hematopoietic stem cell differentiates into the common myeloid progenitor cell or the common lymphoid progenitor. The common lymphoid progenitor differentiates further into the four

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major populations of mature lymphocytes: B cells, T cells, natural killer (NK) cells, and NK-T cells. These lymphocyte subsets can be discriminated by surface phenotype. B cells are phenotypically defined by their expression of the B cell receptor for antigen, membrane anchored Ig. Subsets of B cells have been defined that differ in the types of antigen to which they respond and in the types of antibody they produce. T cells are defined by their cell surface expression of the TCR, a transmembrane heterodimeric protein that binds processed antigen displayed by antigen presenting cells (APC). As will be discussed below, T cells exist in several functionally significant subtypes and subsets of those types. NK cells are defined morphologically as large granular lymphocytes. They are distinguished by their lack of either TCR or surface Ig. They recognize their virus-infected or tumor cell targets using a complex collection of activating and inhibitory cell surface receptors.5 And NK-T cells share characteristics of both NK cells and T cells (8).

Hematopoietic Stem Cell-Derived Cell Lineages

Pluripotent hematopoietic stem cells differentiate in bone marrow into common lymphoid or common myeloid progenitor cells. Lymphoid stem cells give rise to the B cell, T cell, and NK cell lineages. The myeloid stem cells give rise to a second level of lineage specific colony form unit (CFU) cells that go on to produce neutrophils, monocytes, eosinophils, basophils, mast cells, megakaryocytes, and erythrocytes. Monocytes differentiate further into macrophages in peripheral tissue compartments. Dendritic cells (DC) appear to develop primarily from a DC precursor that is distinguished by its expression of the Flt3 receptor. This precursor can derive from either lymphoid or myeloid stem cells or gives rise to both classical DC and plasmacytoid DC. Classical DC can also derive from differentiation of monocytoid precursor cells. Modified (7-9).

Key Factors of Immune System :

The immune system is designed to detect and destroy foreign invaders inside the body like bacteria and viruses. When working optimally, the immune system can prevent sickness when we're exposed to germs. Several factors like sleep, diet, stress and hygiene can affect the immune system's performance, and any offsets in these behaviors can cause havoc on immune function.

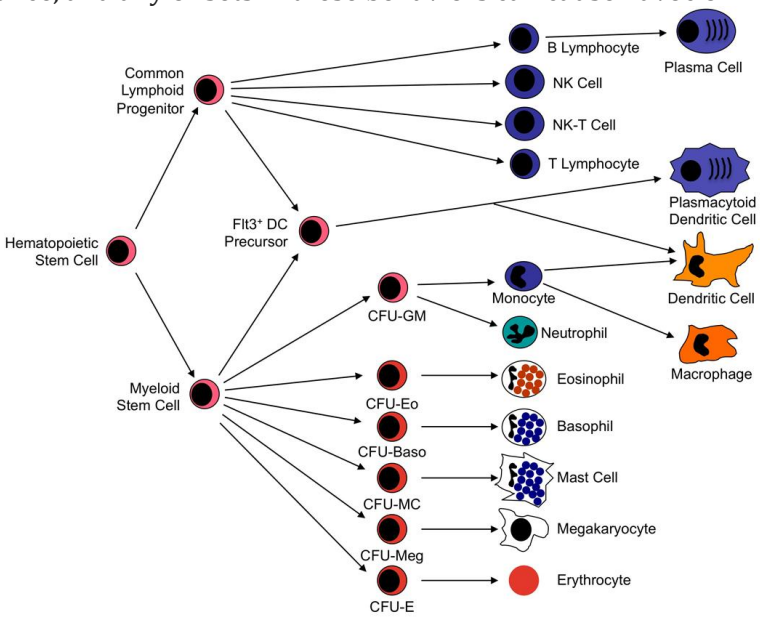

Figure 1 : Mature, circulating leukocytes differentiate from hematopoietic stem cells

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HAND WASHING

People tend to overestimate their hygiene. Studies show that only 67% of people wash their hands after using a public restroom, vs. 85% who report washing their hands after public

restroom use (10,11). And even if you do wash your hands, you may not be doing it correctly: Centers for Disease Control recommends 15 seconds of scrubbing your hands with soap.

SLEEP CYCLES

The immune system is influenced by the sleep-wake cycles of our circadian rhythms. Studies suggest that while we're sleeping we have **decreased levels of the stress hormone cortisol**, which can suppress immune function, and increased signals that activate the immune system (12). Even though we know that sleep is important, it can be difficult to get enough, especially during busy times of the year. According to a Gallup survey, 56% of adults say they get enough sleep. However, 7 hours is the minimum recommended amount of sleep for adults and only 40% of us are averaging 6.8 hours of sleep per night (13).

NUTRIENTS FROM FOOD

Everywhere we turn, we see PSAs, news stories and blogs boasting the importance of fruits and vegetables for a plethora of health reasons, and the same applies to immune health. Studies show vitamins C, A, E, B6 and B12 and minerals like iron and zinc are important for the maintenance of immune function, all of which can be found in fruits and veggies (14). If you're a clean-eating enthusiast, you're probably getting enough of these vitamins and minerals, but many of us aren't. The Dietary Guidelines for Americans recommends **4.5 cups of fruit and vegetables** per day (15).

CORTISOL LEVELS

Another challenge that plagues our immune system is a familiar foe to many of us. STRESS. Hectic work schedules and abundant daily responsibilities can leave us frazzled. Increased levels of the stress hormone, cortisol, makes it difficult for the immune system to function properly (16).

PHYSICAL ACTIVITY

The regular practice of physical exercise should be positive to health; however, parameters such as volume and intensity need to be considered for the prescribed programs to obtain the best results. Generally speaking, exercise of moderate intensity promotes protection against infections caused by intracellular microorganisms, since it guides the immune response to a predominance of Th1 cells. Conversely, high-intensity activities cause increases the concentrations of anti-inflammatory cytokines (Th2 pattern), presumably to decrease damage in muscular tissue resulting from inflammation, although it may result in an increase of susceptibility to infections. Figure 2 summarizes the main effects of physical exercise in the immunological system (17).

ROLE OF YOGA

Mind-body therapy is a concern worldwide. Researchers are looking for safe and effective therapies and can be widely used for many diseases. Survey of the National Department of Health, United States 2007 said at least 19% of Americans aged adults do mind-body therapy. Mind-body therapy consists of Tai Chi, Qi Gong, meditation, and Yoga (18). Yoga is a complementary therapy that is recognized worldwide. Yoga is a spiritual therapy originated in India. This therapy is called spiritual because it integrates the mind, body, and soul (19). The integration is obtained based on the technique of yoga that consists of Yama and Nyama, Asana, Pranayama, Pratayara, Dharana, Dhyana, dam Samadhi. Based on these, yoga widely adopted as a complementary and alternative therapy in the treatment of disease (19).

Yoga provides benefits that complex, including physical postures and body, reduce stress, lower blood pressure, reduce fatigue, reduce asthma, improve circulation and boost the immune system. Many studies have proven the benefits of yoga include arthritis (20), stress (21), metabolic syndrome (22), asthma (23), pain(23) and depression (24).

Yoga techniques that provide the most impact are the asanas, breathing exercises, pranayama, and meditation. It is proven from different studies using these techniques provide good results on the reaction of anti-inflammatory and amount of immune (26-32. Besides the technique, Sudarshan Kriya, Kirtan Kriya, Kundalini Yoga and Meditation Yoga is a positive influence (33,34).

ASTANGA YOGA

Yoga (asthanga) is often depicted metaphorically as a tree and comprises eight aspects, or "limbs" [Patanjali codified the ancient marvel of yoga as asthanga which is one of the six schools of Indian philosophy and is known as Yoga Darshan[2]]: yama (universal ethics), niyama (individual ethics), asana (physical postures), pranayama (breath control), pratyahara (control of the senses), dharana (concentration), dyana (meditation), and samadhi (bliss) (35). Each limb is connected with the whole, in the same way that bodily limbs are all connected. If someone pulls the body by the leg, the rest of the body will automatically follow. In the same way, when one pulls one of the eight limbs of yoga, the others will naturally come. They are not stages to be achieved in succession (35).

BENEFITS AND HEALTH IMPACT

Many people in the USA today claim to practice yoga for its health benefits without consciously adopting Hindu religious perspectives which underlies the practice and usually become apparent in more advanced stages of instruction. Elementary courses of hatha yoga focus on physical exercises consisting of various postures and breathing techniques. A growing body of research evidence supports the belief that certain yoga techniques may improve physical and mental health through down-regulation of the hypothalamo pituitary adrenal (HPA) axis and the sympathetic nervous system. The stress and stress-induced disorders like hypertension and angina are fast growing epidemics and bane of "modern" society. The holistic science of yoga is the best method for prevention as well as management of stress and stress-induced disorders. Numerous studies have shown yoga to have an immediate down-regulating effect on both the HPA axis responses to stress. Effectiveness of yoga against stress management is well established (36).

EFFECTS OF ASANAS AND PRANAYAMA

Stress is one of the leading causes of sickness, and when we're chronically stressed, the deep tissue that surrounds our organs, muscles, bones, tendons, and ligaments (called fascia) is compromised. Because fascia is made up of nerves, we need to move and stretch our body so that this fascia can be "rung out." Consider our organs and tissue to be like sponges, absorbing what we put into our bodies. By stretching and moving, we release the stagnant energy within our cells, allowing it to remove the harmful toxins in our bodies. Alongside this, our blood needs oxygen to keep the body healthy and aid in cell growth. Intentional breath-work gives our blood the boost of oxygen required to generate new circulation. When doing asanas (yoga poses) and pranayama breathing, we're helping this circulation process in our systems, which leads to health and stronger immunity. Simply explained, yoga is "movement linked with breath." By incorporating yoga into our routines, we can significantly strengthen our body's ability to combat sickness. Yoga is most effective and time tested immunity enhancer that we can adopt for the healthy life (37-39).

Table 2. Represent few Asanas which are effective for stimulating our lymphatic system and boost our immunity.

Table -2 List of Asanas for Immunity and Health

Serial No.	Name of Yogic Asana
1	Shavasana (Corpse pose)
2	Half Lord of the Fishes (Ardha Matsyendrasana) ...
3	Makarasana(Crocodile pose)
4	Forward Fold (Uttanasana) ...
5	Legs Up the Wall (Viparita Karani)
6	Satubandha Asanas (bridge Pose)
7	Tadasana (Mountain Pose)
8	Trikonasana (Triangle Pose)
9	Sarvangasana (Shoulder stand)
10	Bhujangasana (Cobra Pose)

PRANAYAM: YOGIC BREATHES

1. Deep Breathing: Deep Breathing should be a part of our everyday life. It not only can lengthen the years that we get to live, but can make us happier, more productive and energetic living them too. Breathing deeply is a well-known stress reliever and has a multitude of health benefits as well. However, in our high stress busy lives, we often breathe very shallowly most of the time. But with a little effort, deep breathing can become an easy and unconscious part of our daily life. By making a conscious decision to focus on our breath for a part of each day, we can make it so that we regularly breathe deeper without having to think about it at all.

Benefits: Deep Breathing makes calmer. It helps to detoxify the body. Deep Breathing relieves pain. It makes us happier. It helps to improve posture. Breathing stimulates the lymphatic system and increases our cardiovascular capacity. Deep Breathing gives energy and improves digestion. Deep Breathing strengthens the major organs of the body and mainly helps to regulate weight.

2. Anulom-Vilom Pranayam/ Nadi shodhan Pranayam

Nadis are subtle energy channels in the human body that can get blocked due to various reasons. The Nadi Shodhan pranayama is a breathing technique that helps clear these blocked energy channels, thus calming the mind. This technique is also known as Anulom Vilom pranayama. Nadi Shodhan pranayama helps relax the mind and prepares it to enter a meditative state. Practicing it for just a few minutes every day helps keep the mind calm, happy and peaceful. It helps in releasing accumulated tension and fatigue.

Benefits: It is an Excellent breathing technique to calm and center the mind. Works therapeutically for most circulatory and respiratory problems. Releases accumulated stress in the mind and body effectively and helps relax. Helps harmonize the left and right hemispheres of the brain, which correlate to the logical and emotional sides of our personality. Helps purify and balance the nadis - the subtle energy channels, thereby ensuring smooth flow of prana (life force) through the body. Maintains body temperature. Helps in improvement of immunity.

3. Omkar/ Om chanting: Om clears the obstacles from mind. It is a sound that can remind of that state of feeling. When say Om remember the totality of the being that is the very core of this existence, which is free from misery and which is all love, unconditional love. The sound Om

reminds of the Lord of the Creation. "Then the understanding of soul, the Self happens, and there will be an absence of obstacles, that is, obstacles in path will vanish."(Patanjali Yoga Sutra 29). When this feeling of elevation, totality of consciousness comes to then witness consciousness dawns in and mind gets totally transformed. Clarity begins in thinking. Clarity begins in feeling. The whole body undergoes a transformation; so alive, so full of prana, and all the obstacles in path are removed. Just the memory of Lordship, of the Divine can remove obstacles from mind. This is the beauty of omkar.

4. **Kapalabhati:**

Kapalabhati means skull shining breath and is one of the cleansing techniques of yoga. If there is mucus in the air passages or tension and blockages in the chest it is often helpful to breathe quickly. In this practice the diaphragm and associated muscles are used to "pump" the air rapidly out of the lungs in a forced exhalation. This is followed by a rapid but passive inhalation. "Bhati" means "that which brings lightness." One must be careful with this technique because there is a danger of creating great tension with the breath or one pathway, yoga has been shown to have immediate psychological effects: decreasing anxiety and increasing feelings of emotional, social, and spiritual well‐being These reviews have contributed to the large body of research evidence attesting to the positive health benefits of yoga. The purpose of this article is to present a comprehensive review of the literature regarding the impact of yoga on a variety of health outcomes and conditions (40)

Conclusions: This study postulates that mind– body exercise such as yoga couples sustained muscular activity with internally directed focus, producing a temporary self‐contemplative mental state and immunity. It also triggers neurohormonal mechanisms that bring about health benefits, evidenced by the suppression of sympathetic activity. The asanas are responsible to stimulate the lymphatic system and promote immunity and the pranayamas are beneficial for regulating the neuroendocrine system which facilitates to boost the immunity of an individual. Thus, it reduces stress and anxiety, improves autonomic and higher neural center functioning. Considering the scientific evidence discussed thus far, it is fair to conclude that yoga can be beneficial in the prevention and cure of diseases and works as a natural immunity booster where adequate sleep , natural simple digested food are associated with it.

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