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Concept of *Vyadhikshamatva* with special reference to Immune tolerance and Auto-Immunity

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ABSTRACT

Lives embrace the states of health and disease. Ayurveda, the unbeaten science deals with these states of life. Ayurveda incorporates both the preventive and curative aspects of human ailments, promising it as a holistic science. This holistic approach of Ayurveda resembles to the entire function of *Vyadhikshamatva*. This can steer away from the origin and or progression of various diseases. *Vyadhikshamatva* is a broad concept comprising the whole modern understanding of immunology and other gross and subtle factors paying attention to the prevention and progression of diseases in human body. The least understood arm of immunology is the origin and mechanism regarding development of autoimmune disorders. The following article "Concept of *Vyadhikshamatva* with special reference to Immune tolerance and Autoimmunity" is reviewed through Ayurvedic classics in integration to modern medical facts in the causation and the course of the disease with reference to immunity, immune tolerance and autoimmunity.

Key words: *Vyadhikshamatva*, Immune tolerance, Autoimmunity, Ayurveda.

INTRODUCTION

Immune system is defined as a sophisticated and highly evolved network of integrated body system including organs, tissues, cells and cell products with a mission to provide resistance and or retaliation to foreign agents or invaders physiologically.[1] When the immune system does not function properly it leaves the body open for attacks from a vast array of ailments. Therefore, a healthy immune system is like a carefully balanced teeter totter. Tip it one way and your immune system weakens leaving you vulnerable to pathogens. Tip it the other way and your immune system becomes over active and attacks your own healthy tissues. Such overactive immune system causes a spectrum of autoimmune diseases.

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Components of immune system and its functions

Immune system comprises of different organs or tissues such as the primary lymphoid organs like thymus and bone marrow, whereas the secondary lymphoid organs include the spleen, tonsils, lymph vessels, lymph nodes, adenoids, skin and liver.[2] Cells comprising immune system are lymphocytes, monocytes and macrophages, mast cells and basophils, neutrophils and eosinophils.[3]

Lymphocyte is the master of human immune system. Morphologically lymphocytes are homogenous but, they are heterogeneous in functioning. Lymphocytes are of three categories – T – lymphocytes, B – lymphocytes and Natural Killer cells (NK cells). All the three lymphocytes are formed from lymphoid precursor cells in bone marrow, which further

undergo maturation and differentiation in the bone marrow (B – cells) and thymus (T – cells). This facilitates them to acquire certain genetic and immune surface characters which determine their type and function. T – lymphocytes are typically found in para cortical areas of lymph nodes, para arteriolar sheaths of the spleen, thymus, bone marrow and peripheral blood.[4]. It accounts for 60% to 70% of circulating lymphocytes in blood. Thus it plays a pivotal role in cell mediated immunity. Depending on functional activity T – cells have two major subtypes – T – helper cells and T – suppressor cells. T – helper cells promote and enhance the immune reaction whereas, T – suppressor cells, suppress immune reaction but are cytotoxic and actually destroy the invading antigen. Natural killer cells (NK cells) are part of the natural or innate immunity, which recognize antibody – coated target cells and bring about killing of the target directly.[5]

Monocytes and macrophages function for antigen recognition, they possess cell surface receptors to several extracellular molecules like receptors for cytokines, selectins, integrins etc. These receptors recognize the organisms and initiates intracellular mechanism in macrophages. The next crucial function is phagocytosis. Antigen that has been recognised by the macrophages due to antigen recognition (opsonisation) will be engulfed by the process of cell eating mechanism by macrophages.[6]

Macrophages provide secretory function, where it releases important substances such as cytokines – like IL – 1, IL – 2, IL – 6, IL – 8, IL – 10, IL – 12, Tumor Necrosing Factor Alpha (TNF Alpha) and prostaglandins – PGE, thrombaxone – A, leukotrienes which are chemical mediators of inflammation. These can be included as cellular products in immune system. When macrophages fail to deal with the invading antigen, it act as antigen – presenting cells for presenting to immune competent T – cells or B – cells. Then these lymphoid cells will tackle such antigens.[7]

Basophils and mast cells are involved in mediating inflammation in allergic reactions and have a role in wound healing.[8] Polymorphonuclear neutrophils or microphages have a similar role to that of macrophages and act as first line of defence, whereas the eosinophils containing lysosomal enzymes, peroxidase and chemical mediators of inflammation play a role in allergic reactions and intestinal helmenthiais finally inciting inflammation.[9]

Immune system disorder – Autoimmunity

Disequilibrium in immune system can culminate in vast array of diseases. This disequilibrium can be in two directions, where it can cause abnormally low activity or over activity of the immune system. In case of immune system over activity, the body attacks and damages its own tissues (autoimmune diseases or to an extend hypersensitivity reactions). Hypersensitivity is a state of altered reactivity in which the body reacts with an exaggerated immune response to what is perceived as a foreign substance, this fits into the concept of *Asatmya*. Immune deficiency diseases decrease the body's ability to fight invaders ending in immune deficiency disorders, which in Ayurveda designates as *Ojokshaya*.

In normal circumstance, there will be absence of activation of pathogenic auto reactivity and is termed as immune tolerance. But, when there is an abnormal activation of T or B – cells or both with no evidence of other causes such as infection or malignancies or mechanisms breaking the equilibrium of immune tolerance of the body is called autoimmunity.[10]

Immune tolerance arises due to certain mechanisms. First is the theory of clonal elimination. T – cells maturing in the thymus acquire the ability to distinguish self from non – self. These T – cells are then eliminated by apoptosis for the tolerant individual. Second is the concept of clonal energy in which the T – lymphocytes which have acquired the ability to distinguish self from non – self are not eliminated but instead become non – responsive and inactive. The third mechanism is through suppressor T – cells. According to this mechanism, the tolerance is achieved by a population of specific suppressor T – cells which does not allow the antigen responsive cells to proliferate and differentiate.[11]

Theories of Autoimmune Pathogenesis

When mechanism of immune tolerance fails, autoimmunity breaks off. Those mechanisms or theories through which autoimmunity can raise include immunological factors where there is failure of immunological mechanism of tolerance initiating auto immunity. E.g. polyclonal activation of B – cells, generation of self – reacting B cells, decreased T – suppressor and increased T – helper cell activity, fluctuation of anti – idiotype network control and sequestered antigen released from tissues. Similarly genetic factors also play a role in pathogenesis of autoimmunity by increased expression of class II HLA antigens on tissues involved in auto immunity and increased familial incidence of some of the auto immune disorders. The third probable mechanism is through microbial factors – where there is an infection with micro-organisms particularly viruses and less often bacteria and mycoplasma has been implicated in pathogenesis of auto immune diseases.[12]

Types of Autoimmune diseases

Depending upon the type of auto antibody formation, the auto immune diseases are broadly classified into two groups – organ specific diseases and organ non – specific (systemic) diseases. In organ specific diseases, the auto antibodies formed react specifically against an organ or target tissue component and cause its chronic inflammatory destruction. Whereas, organ non – specific diseases, the auto antibodies are formed which react with antigens in many tissues and thus cause systemic lesions.[13]

Ayurvedic outlook on Immunity, Immune tolerance and Autoimmune manifestation

The modern understanding of immunity fits in the broad concept of *Vyadhikshamatva* in Ayurveda. The process of preventing of disease development and capacity to resist disease are jointly known as *Vyadhikshamatva*.[14] Chakrapani has described this in two aspects – antagonistic to the strength and virulence of disease (*Vyadhi Bala Virodhitva*) and the capacity to inhibit, contain or bind the causes on factors of disease (*Vyadhi Utpadaka Vibandhakatva*). *Vyadhi Bala Virodhitva* is concerned with the action or process after the disease has manifested in the body. This process indicates the further escalation of the virulence of the disease is inhibited and the diseases process is contained. *Vyadhi Utpada Vibandhakatva* controls the disease during the *Samprapti* only. This is actually the prevention of the manifestation of disease.[15]

According to Charaka, not all human beings are equally capable of *Vyadhikshamatva*. This is due to the different nutritional status of the individuals because *Ojas*, *Bala* and *Vyadhikshamatva* are dependent on nutritious food. A change in the nutritional capacity of food leads to the change in the *Bala* and *Vyadhikshamatva*. It may also be further pointed out that the constitutional status or *Prakruti* also differs from individual to individual and therefore the *Vyadhikshamatva.*[16]

In Ayurvedic literature, the natural inherent strength or power of the body which is responsible for the health is termed as *Bala*. *Bala* depends upon the health status of *Dhatu*, *Prakruti*, *Desha*, *Kala* and *Ojas.*[17] *Bala* is classified into three types – *Sahaja*, *Kalaja* and *Yukti Kruta.*[18]

Sahaja Bala refers to the inherent characteristics property of an individual present since birth. And this is formed from the time of formation of *Garbha* based on excellence of *Shukra* and *Arthava*. The understanding of *Sahaja Bala* resembles to the innate immunity. Innate immunity refers to nonspecific defence mechanism that come into play immediately or within hours of an antigen's appearance in the body. These mechanisms include physical barriers such as skin, chemicals in the blood and immune system cells that attack foreign cells in the body.[19]

Kalaja Bala refers to the strength attained by the individual due to the impact of seasonal variation and ageing phenomenon, which is temporary. In modern science, it resembles the acquired or adaptive immunity. Specifically mentioning, the immunity developed by an individual after any infection in due course of subject's life.[20] The third type mentioned is the *Yuktikruta Bala*. It is gained by the planned

implementation of combination of diet, medication and other regimen by the patient as planned by the physician. In modern medical literature it is the acquired immunity where in it includes active immunity induced by vaccination and passive immunity due to administration of antibody containing preparation.[21]

Immune tolerance and Autoimmunity

In normal state, in a healthy human body – *Vata*, *Pitta* and *Kapha Dosha* irrespective of opposite qualities coexist each other rather than contradicting each other. This is termed as *Sahaja Satmya,*[22] which the conventional system coined as the so called immune tolerance. Hence, this is the reason why the body's own immune cells are not attacking self from Ayurvedic point of view. But, due to the influence of *Daiva* (past deeds or unknown factors) or due to *Svabhavika Karanas* [23] (in which we can include all the probable theories or mechanism of initiating autoimmune reaction such as microbial, genetic, immunological) potentially paving way to imbalance or disequilibrium or destability to the *Sahaja Satmya*, there by the immune cells (leucocytes) lose the ability to identify self from non – self or foreign agents.

To be more specific, on looking into the features told in *Vata Prakruti* individuals, depicting the features of *Vata* itself, it includes certain *Gunas* like the *Sheegra Guna,*[24] by virtue there are other two *Gunas* mentioned in the literature as *Alpasmruti* (lesser remembrance – abnormality to WBCs) and *Sheegra Grahita* (early identification of tissue). The above mentioned features occur at the level of *Raktha* i.e. to be precise at the level of WBCs in the recognition of body tissues. This mechanism leads to the mistaken judgement of the body tissues as an external antigen. Whereas, while describing the *Pitta Pradhana Lakshana* by Charaka, it has been mentioned the feature of *Pitta* such as *teekshna Guna*[25] of *Pitta* by virtue of its leading to *Teekshna Agni* and *Teekshna Parakrama*. This causes the attack of immune system, here to the body's own tissues.[26] This cascade of abnormal and noxious reaction drive an autoimmune disorder sequence. This is nothing but the impaired functioning of *Dosha (ojovisramsa* – as it is the malfunctioning and displacement of *Doshas*[27]).

The manifestation of diseases – spectrum of autoimmune disorders in different body parts depend on the cause and the site engaged by the cause. To be precise the area where *Kha Vaigunya* has been manifested progress to the *Dosha Dushya Samurchana* and ultimately culminates in the manifestation of disease. Even in the modern medical literature the autoimmune disorders are classified as organ specific and organ non – specific or systemic based on the auto antibodies engaging the site.[28]

As there is *Prakopa* of *Vata* and *Pitta* there is no question in the status of *Kapha*. There will be comparative reduction of *Kapha* or to an extend *Malarupi Kapha* is formed (altered leucocytes). *Kapha Dosha* is acknowledged as *Balakrut* i.e. confers strength to the body. *Bala* is one of the synonyms of *Kapha Dosha*. *Bala* can be interpreted here as the *Slaishmika Ojas* or *Apara Ojus* which bestows *Vyadhikshamatva Shakti* i.e. power to resist and overcome the forces or factors which bring about diseases and decay.[29] To be precise according to *Acharya* Dalhana, *Ojas* is the essence of all *Dhatus* which are *Moortimat.*[30] So, *Ojas* is a substance (that can be interpreted as the white fraction of blood – the white blood cells or leucocytes) and the *Bala* imparted is the functional outcome or component.[31] Both are decided by *Kapha Dosha* even though *Vata* and *Pitta* has its own role in judgement and attack. When *Anyadosha* (except *Kaphadosha*) *Prakopa* occur, it cause *Kshaya* to *Kapha* relatively or formation of *Malarupi Kapha* (altered leucocytes) ending in immune system malfunctioning.

CONCLUSION

Ayurvedic concept of understanding immune mechanism is vast but precise. *Vyadhikshamatva* entails different dimensions of modern immunology and potential immunopathological insight. The mechanism of autoimmunity is least understood in the field of immunology. The ancient science of Ayurveda holds a strong insight in the understanding of immune tolerance told as *Sahaja Satmya* and

understanding of autoimmunity as *Ojovisramsa* where there is malfunctioning of *Dosha* (*Kriya Sannirodha*).

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