

Mechanistic Overview of Immune Modulatory Effects of Environmental Toxicants

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Abstract: The immune system is an integrated organization, comprising of specific organs, cells and molecules playing a crucial role in the maintenance of health. The purpose of this paper is to give a mechanistic overview of toxic effects of various chemicals and pharmacological agents, and their interaction with the various components of the immune system that leads to modulation of the immune responses. Studies suggest that many chemical agents present in the environment like; heavy metals, agrochemicals, and various types of hydrocarbons possess immune toxicity and cause either structural, functional or compositional changes in various components of the immune system that alters immune response. There is present a complex bidirectional relationship between central nervous system (CNS) and the immune system. And receptors for neuropeptides, neurotransmitters, and hormones are located on lymphoid organs. Therefore, we are of the opinion that Endocrine Disrupting Chemicals (EDCs) present in our environment may be indirectly involved in causing immune toxicity *via* neuroendocrine channels, and *vice versa* many neurological disorders may be associated with environmental pollutants utilizing immuno-neuroendocrine pathways.

Keywords: Environmental pollutants, heavy metals, immunotoxicity, immunosuppression, pesticides.

INTRODUCTION

The immune system is an integrated organization comprising of specific cells and molecules. The cellular components of the immune system are derived from hematopoietic stem cells in bone marrow, which include polymorphonuclear (PMN) leukocytes and lymphocytes. PMN leukocytes are further classified as basophils, eosinophils, neutrophils, mast cells, monocytes, dendritic cells and macrophages. And lymphocytes include B- and T-lymphocytes, and natural killer (NK) cells. Plasma cells which secrete antibodies are derived from B-lymphocytes. And in thymus the T- lymphocytes are differentiated into distinct types of cells, CD4 T-helper cells, and CD8+ cytotoxic T-cells [1].

ENVIRONMENTAL POLLUTANTS AND IMMUNE SYSTEM

Heavy industrialization and scientific developments have led to the addition of detrimental chemicals to the environment in the form of heavy metals, agrochemicals, and various types of hydrocarbons posing constant health threat. According to various toxicity studies, it has been indicated

that the immune system is a potential target for toxic assault of many chemicals present in our environment. These pollutants have the ability to modulate the normal physiology of immune system in humans and experimental animals and compromise the host defense mechanisms [2-4].

MECHANISMS OF IMMUNOTOXICITY LINKED TO VARIOUS ENVIRONMENTAL POLLUTANTS

Environmental pollutants induce immunotoxicity by disturbing the homeostasis. They cause structural, functional, and compositional changes in various components of the immune system or indirectly show an effect on various metabolic and hormonal pathways. The outcome, as a result of altering the normal homeostasis may be either suppression or stimulation of the immune system. We focused on toxic effects of pollutants which cause structural, compositional, and functional changes in the immune system.

COMPOSITIONAL CHANGES IN IMMUNE SYSTEM

Compositional changes include alteration in the profile of colony forming unit (CFU) in bone marrow, changes in hematologic cellular parameters, alteration in circulating immunoglobulins level, alteration in CD3+, CD4+, CD8+ B220+, in spleen and alteration in CD4+/CD8+ or CD4-/CD8-, ratio in thymus [5]. T- Lymphocytes, B-lymphocytes and NK cells, present in the blood and lymphatic system are responsible for the specific adaptive immune response. Any type of toxic effect experienced by lymphocytes leads to

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