

Immune dysfunction and clinical immunology

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Introduction

The immune system is a highly regulated and balanced system and when the balance is disturbed, disease can result. Research in this area involves studying disease that is caused by immune system dysfunction. Much of this work has significance in the development of new therapies and treatments that can manage or cure the condition by altering the way the immune system is working or, in the case of vaccines, priming the immune system and boosting the immune reaction to specific pathogens. Immunodeficiency disorders involve problems with the immune system that impair its ability to mount an appropriate defence.

As a result, these are almost always associated with severe infections that persist, recur and/or lead to complications, making these disorders severely debilitating and even fatal. There are two types of immunodeficiency disorders: primary immunodeficiencies are typically present from birth, are generally hereditary and are relatively rare. Such an example is common variable immunodeficiency (CVID). Secondary

immunodeficiencies generally develop later in life and may result following an infection, as is the case with AIDS following HIV infection.

Autoimmune diseases occur when the immune system attacks the body it is meant to protect. People suffering from autoimmune diseases have a defect that makes them unable to distinguish 'self' from 'non-self' or 'foreign' molecules. The principles of immunology have provided a wide variety of laboratory tests for the detection of autoimmune diseases. Autoimmune diseases may be described as 'primary' autoimmune diseases, like type-1 diabetes, which may be manifested from birth or during early life; or as 'secondary' autoimmune diseases, which manifest later in life due to various factors. Rheumatoid arthritis and multiple sclerosis are thought to belong to this type of autoimmunity. Also, autoimmune diseases can be localised, such as Crohn's Disease affecting the GI tract, or systemic, such as systemic lupus erythematosus (SLE).

Allergies are hypersensitivity disorders that occur when the body's immune system reacts against harmless foreign substances, resulting in damage to the body's own tissues. Almost any substance can cause allergies (an allergen), but most commonly, allergies arise after eating certain types of food, such as peanuts, or from inhaling airborne substances, such as pollen, or dust. In allergic reactions, the body believes allergens are dangerous and immediately produces substances to attack them. This causes cells of the immune system to release potent chemicals like histamine, which causes inflammation and many of the symptoms associated with allergies. Immunology strives to understand what happens to the body during an allergic response and the factors responsible for causing them. This should lead to better methods of diagnosing, preventing and controlling allergic diseases. Asthma is a debilitating and sometimes fatal disease of the airways. It generally occurs when the immune system responds to inhaled particles from the air, and can lead to thickening of the airways in patients over time. It is a major cause of illness and is particularly prevalent in children. In some cases it has an allergic component, however in a number of cases the origin is more complex and poorly understood.