International Scholars Journals

African Journal of Immunology Research ISSN 2756-3375 Vol. 9 (4), pp. 001-002, December, 2022.
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Perspective

Significance of immunoglobulin G and its function

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Received: 14-Nov-2022, Manuscript No. AJIROA-22-82845; Editor assigned: 18-Nov-2022, PreQC No. AJIROA-22-82845 (PQ); Reviewed: 02-Dec-2022, QC No. AJIROA-22-82845; Revised: 09-Dec-2022, Manuscript No. AJIROA-22-82845 (R); Published: 16-Dec-2022

DESCRIPTION

Immunoglobulin G (Ig G) is a type of antibody. Immunoglobulin G accounts for approximately 75% of serum antibodies in humans and is the most common type of antibody found in the bloodstream. IgG molecules are produced and released by plasma B cells. Each IgG antibody has two paratopes.

Role in diagnosis

Immunoglobulin G measurement can be a diagnostic tool for certain conditions, such as autoimmune hepatitis, when indicated by certain symptoms. Clinically, measured levels of Immunoglobulin G antibodies are generally considered indicators of an individual's immune status against specific pathogens. A common example of this practice is titers taken to demonstrate serologic immunity to measles, mumps, and rubella (MMR), hepatitis B virus, and varicella, among others.

Immunoglobulin G testing is not indicated to diagnose allergy and there is no evidence that it has any relation to food intolerance.

Function

Antibodies are a major component of humoral immunity. Immunoglobulin G is the main type of antibody found in blood and extracellular fluid, which allows it to control infection of body tissues. By binding to many types of pathogens such as viruses, bacteria, and fungi, Immunoglobulin G protects the body from infection.

It does this using several mechanisms,

- Immunoglobulin G -mediated binding of pathogens causes their immobilization and mutual binding through agglutination; Immunoglobulin G coating the surfaces of pathogens (known as opsonization) allows them to be recognized and ingested by phagocytic immune cells, leading to the elimination of the pathogen itself,
- Immunoglobulin G activates all the classical pathways of the complement system, the immune protein production cascade that leads to the elimination of the pathogen.
- Immunoglobulin G also binds and neutralizes toxins.
- Immunoglobulin G also plays an important role in cell-mediated cytotoxicity (ADCC) and intracellular antibody-mediated proteolysis, in which it binds to TRIM21 (the receptor with the highest affinity for IgG in humans) to direct tagged virions to proteasomes in the cytosol.
- Immunoglobulin G is also associated with type II and type III hypersensitivity reactions.

Immunoglobulin G antibodies are generated after class switching and maturation of the antibody response, so they are mainly involved in the secondary immune response.

Immunoglobulin G is secreted as a monomer that is small in size, allowing it to easily perfuse tissues. It is the only antibody isotype that has receptors to facilitate passage through the human placenta, thereby providing protection to the fetus in utero. Along with IgA secreted into breast milk, residual Immunoglobulin G absorbed by the placenta provides the newborn with humoral immunity before his own immune system develops. Colostrum contains a high percentage of Immunoglobulin G, especially bovine colostrum. In individuals with prior immunity to the pathogen, Immunoglobulin G appears about 24–48 hours after antigenic stimulation.

Thus, in the first six months of life, the newborn has the same antibodies as the mother, and the child can defend itself against all pathogens that the mother encountered in her life (even if only through vaccination) until these antibodies are degraded. This repertoire of immunoglobulins is crucial for newborns, who are very susceptible to infections, especially in the area of the respiratory and digestive systems.

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Immunoglobulin Gs are also involved in the regulation of allergic reactions. According to Finkelman, there are two pathways by which systemic anaphylaxis antigens can cause systemic anaphylaxis in mice through the classical pathway by cross-linking IgE bound to the mast cell receptor FcεRI, stimulating the release of both histamine and Platelet-Activating Factor (PAF). In an alternative pathway, antigens form complexes with Immunoglobulin G, which then cross-link the macrophage receptor FcγRIII and stimulate only PAF release.

Immunoglobulin G antibodies can prevent IgE-mediated anaphylaxis by trapping a specific antigen before it binds to mast cell-associated IgE. Consequently, Immunoglobulin G antibodies block systemic anaphylaxis induced by small amounts of antigen, but may mediate systemic anaphylaxis induced by larger amounts.