Commentary

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Is Biomedicine Function Requires Great Antibody Diversity

Hassan Antonio*

Department of Diagnostic Laboratory Unit, University of Michael Okpara of Agriculture, Abia State, Nigeria

***Corresponding author:** Hassan Antonio, Department of Diagnostic Laboratory Unit, University of Michael Okpara of Agriculture, Abia State, Nigeria Email: hantonio@gmail.com

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Description

Antibody molecules are essentially required to carry out two principal roles in immune defence to recognise and bind to foreign material (antigen). The host needs to be able to recognise a wide variety of different structures it has been estimated that a human being is capable of producing antibodies against more than 10' different molecular structures. This is described as antibody diversity. To trigger the elimination of foreign material in molecular terms this involves the binding of certain molecules (effector molecules) to anti body coated foreign material to trigger complex elimination mechanisms, e.g. the complement system of proteins, phagocytosis by cells like neutrophils and macrophages. The effector systems are generally triggered only by antibody molecules clustered togather as on a foreign cell surface and not by free unliganded antibody.

This is crucial considering the high serum concentration of some antibodies. The requirements imposed on the antibody molecule by the function are during a sense quite opposite. Function requires great antibody diversity. Function requires commonality, i.e. it is not practical for Nature to devise a different molecular solution for the problem of elimination for cach!Wren, antibody molecule. In fact the conflicting requirements are elegantly met by the antibody structure represented. The structure consists of three units. Two of the units are identical and involved in binding to antigen the Fragment Antigen Binding (FAB) (Fragment Antigen Binding) arms of the molecule. These units contain regions of sequence which vary greatly from one antibody to a different and confer on a given antibody its unique binding specificity. The existence of two Fab arms greatly enhances the affinity of antibody for antigen within the normal situation where multiple copies of antigenic determinates is presented to the host. The third unit Fragment Crystalline (FC) is involved in binding to effector molecules. The antibody molecule features a fourchain structure consisting of two identical heavy chains spanning Fab and Fc and two identical light chains associated only with Fab.

The five classes of antibodies or immunoglohulins termed Immunoglobulin G (IgG), Immunoglobulin M (IgM), Immunoglobulin A (IgA), Immunoglobulin D (IgD) and Immunoglobulin E (IgE) differ in their heavy chains termed respectively. The differences are most pronounced in the regions of the antibody classes and this leads to the triggering of different effector functions on binding to antigen. Antigen might lead to complement activation whereas Immunoglobulin E (IgE) recognition (possibly of the same antigen) might lead to mast cell degranulation and anaphylaxis (increased vascular permeability and smooth muscle contraction). Structural differences also cause differences within the polymerisation state of the monomer unit. Immunoglobulin G (IgG) and Immunoglobulin E (IgE) are generally monomeric whereas Immunoglobulin M (IgM) occurs as a pentamer. Immunoglobulin a (IgA) occurs predominantly as a monomer in serum and as a dimer in seromucous secretions.

The major antibody in the serum is Immunoglobulin G (lgG) and as this is the bestunderstood antibody in terms of structure and function we shall consider it shortly. The other antibody classes will then be considered in relation to Immunoglobulin G (IgG). First, however, a very brief overview of the structure and function of the different immunoglohulins will be presented ING is the major antibody class in normal human serum forming about 70% of the total immunoglobulin. It is evenly distributed between intra and extravascular pools.

Conclusion

Immunoglobulin G (IgG) may be a monomeric protein and may be divided into four subclasses in humans. It is the main antibody of secondary immune responses. GM represents about 10% of total scrum immunoglohulin and is largely confined to the intravascular pool. It forms a pentameric structure and is that the predominant antibody produced early in an immune reaction. Serving because the first line of defense against bacteremia. As a membranebound molecule on the surface of B lymphocytes it's important as an antigen receptor in mediating.