



Scientific Glossary

-A-

Accessory cell: Cell required for, but not actually mediating, a specific immune response. Often used to describe antigen-presenting cells (APC; see below).

Affinity: A measure of the binding constant of a single antigen combining site with a monovalent antigenic determinant.

Agglutination: The aggregation of particulate antigen by antibodies. Agglutination applies to red blood cells as well as to bacteria and inert particles covered with antigen.

Allelic: Relating to one of a series of two or more alternate forms of a gene that occupy the same position or locus on a specific chromosome.

Allelic exclusion: The ability of heterozygous lymphoid cells to produce only one allelic form of antigen-specific receptor when they have the genetic endowment to produce both. Genes other than those for the specific receptors are usually expressed codominantly.

Allergen: An antigen responsible for producing allergic reactions by inducing IgE formation.

Allergy: A term covering immune reactions to non-pathogenic antigens, which lead to inflammation and deleterious effects in the host.

Allogeneic: Having a genetic dissimilarity within the same species.

Allograft: A tissue transplant (graft) between two genetically nonidentical members of a species.

Allotypes: Antigenic determinants that are present in allelic (alternate) forms. When used in association with immunoglobulin, allotypes describe allelic variants of immunoglobulins detected by antibodies raised between members of the same species.

Alternate (Alternative) pathway: The mechanism of complement activation that does not involve activation of the C1, C4, C2 pathway by antigen-antibody complexes, and begins with the activation of C3.

Anaphylatoxin: Substance capable of releasing histamine from mast cells.

Anaphylaxis: Immediate hypersensitivity response to antigenic challenge, mediated by IgE and mast cells. It is a life-threatening allergic reaction, caused by the release of pharmacologically active agents.

Antibody: Serum protein formed in response to immunization; antibodies are generally defined in terms of their specific binding to the immunizing antigen.

Antibody-dependent, cell-mediated cytotoxicity (ADCC): A phenomenon in which target cells, coated with antibody, are destroyed by specialized killer cells (NK cells and macrophages), which bear receptors for the Fc portion of the coating antibody (Fc receptors). These receptors allow the killer cells to bind to the anti-body-coated target.

Antigen: Any foreign material that is specifically bound by specific antibody or specific lymphocytes; also used loosely to describe materials used for immunization. Antigens may also be immunogens if they are able to trigger an immune response, or haptens if not.

Antigen-binding site: The part of an immunoglobulin molecule that binds antigen specifically.

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Antigen-presenting cell (APC): A specialized type of cell, bearing cell surface class II MHC (major histocompatibility complex) molecules, involved in processing and presentation of antigen to inducer, or helper, T cells. Examples: macrophage, dendritic cells.

Antigen receptor: The specific antigen-binding receptor on T or B lymphocytes; these receptors are transcribed and translated from rearrangements of V genes.

Antigen processing: Large molecules are broken down (processed) within macrophages into peptides and presented within the groove of MHC molecules.

Atopy: A term used by allergists to describe IgE-mediated anaphylactic responses in humans, usually genetically determined.

Autograft: A tissue transplant from one area to another on a single individual.

Autoimmunity (autoallergy): An immune response to “self” tissues or components. Such an immune response may have pathological consequences leading to autoimmune diseases.

Avidity: The summation of multiple affinities, for example when a polyvalent antibody binds to a polyvalent antigen.

-B-

B lymphocyte (B cell): The precursors of antibody-forming plasma cells; these cells carry immunoglobulin and class II MHC (major histocompatibility complex) antigens on their surfaces.

Basophil: A polymorphonuclear leukocyte., whose basophils granules contain heparin, histamine and other vasoactive amines. Within tissues, these cells are known as mast cells q.v.

Blocking antibody: A functional term for an antibody molecule capable of blocking the interaction of antigen with other antibodies or with cells.

-C-

Carrier: A large immunogenic molecule or particle to which an antigenic determinant is attached, allowing the determinant to become immunogenic.

Cell-mediated cytotoxicity (CMC): Killing (lysis) of a target cell by an effector lymphocyte.

Cell-mediated immunity (CMI): Immune reaction mediated by T cells; in contrast to humoral immunity, which is antibody mediated. Also referred to as delayed-type hypersensitivity.

Chimeric antibody: An antibody comprised of human and non human components, usually refers to an antibody with a mouse variable region and human constant region.

Chemotaxis: Migration of cells along a concentration gradient of an attractant.

Class I, II and III MHC molecules: Proteins encoded by genes in the major histocompatibility complex (q.v.). Class I molecules are designated HLA-A, B, or C. Class II molecules are designated DP, DQ or DR.

Class switch: See isotype switch.

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Classical pathway: The mechanism of complement activation initiated by antigen-antibody aggregates and proceeding by way of C1, C4 and C2.

Clonal deletion: The loss of lymphocytes of a particular specificity due to contact with either “self” or artificially introduced antigen.

Clonal selection theory: The prevalent concept that specificity and diversity of an immune response are the result of selection by antigen of specifically reactive clones from a large repertoire of preformed lymphocytes, each with individual specificities.

Cluster determinant (CD): Cluster of antigens with which antibodies react that characterize a cell surface marker.

Combinatorial joining: The joining of segments of DNA to generate essentially new genetic information, as occurs with Ig genes during the development of B cells. Combinatorial joining allows multiple opportunities for 2 sets of genes to combine in different ways.

Complement: A series of serum proteins involved in the mediation of immune reactions. The complement cascade is triggered classically by the interaction of antibody with specific antigen.

Complement components: An enzymatic system of serum proteins triggered by the classical and alternative pathways, and resulting in target cell lysis, phagocytosis, opsonization and chemotaxis.

Complement receptor: A structure found on erythrocytes, lymphocytes, neutrophils, monocytes and macrophages that binds C3 fragments.

Constant region (C region): The invariant carboxyl-terminal portion of an antibody molecule, as distinct from the variable region which is at the amino-terminal of the chain.

Cross-reactivity: The ability of an antibody, specific for one antigen, to react with a second antigen; a measure of relatedness between two different antigenic substances.

Cytokines: Soluble substances secreted by cells, which have a variety of effects on other cells, e.g. Interleukin 1 (IL-1).

Cytotoxic (Cytolytic) T cell: Cell that kills target cells bearing appropriate antigen within the groove of an MHC class I molecule that is identical to that of the T cell.

-D-

D gene: A small segment of immunoglobulin heavy-chain and T-cell receptor DNA, coding for the third hypervariable region of most receptors.

Delayed type hypersensitivity (DTH): A T cell-mediated reaction to antigen, which takes 24-48 hours to develop fully, and which involves release of lymphokines and recruitment of monocytes and macrophages. Also called c cell-mediated immunity.

Determinant: Part of the antigen molecule which binds to an antibody-combining site or to a receptor on T cells (see hapten and epitope).

Differentiation antigen: A cell surface antigenic determinant found only on cells of a certain lineage and at a particular developmental stage; used as an immunologic marker.

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Domain: A compact segment of an immunoglobulin molecule, made up of about 110 amino acids around an S-S bond, and encoded by a unique segment of DNA, surrounded by nontranslated sequences.

DR antigens: MHC class II molecules found on B cells and antigen-presenting cells of humans.

-E-

Enhancing antibodies: Antibodies which enhance the survival of a graft or of a tumor.

Enzyme-linked immunosorbent assay (ELISA): An assay in which an enzyme is linked to an antibody and a coloured substrate is used to measure the activity of bound enzyme and, hence, the amount of bound antibody.

Eosinophil: A polymorphonuclear leukocyte with large eosinophilic (i.e. red) cytoplasmic granules.

Eosinophil chemotactic factor of anaphylaxis (ECF-A): A substrate released from mast cells during anaphylaxis which attracts eosinophils.

Epitope: A single antigenic site on a complex antigenic molecule or particle.

Equivalence zone: In a precipitin reaction, the region in which the concentration of antigen and antibody leads to maximal precipitation.

Exon: The region of DNA coding for a protein or a segment of a protein.

-F-

Fab: Fragment of antibody containing the antigen-binding site, generated by cleavage of the antibody with the enzyme papain, which cuts at the hinge region N-terminally to the inter-H-chain disulphide bond and generates two Fab fragments from one antibody molecule.

F(ab')₂: A fragment of an antibody containing two antigen-binding sites generated by cleavage of the antibody molecule with the enzyme pepsin which cuts at the hinge region C-terminally to the inter-H-chain disulphide bond.

Fc: Fragment of antibody without antigen-binding sites, generated by cleavage with papain; the Fc fragment contains the C-terminal domains of the heavy immunoglobulin chains.

Fc receptor (FcR): A receptor on a cell surface with specific binding affinity for the Fc portion of an antibody molecule. Fc receptors are found on many types of cells.

Fluorescent antibody: An antibody coupled with a fluorescent dye, used with a fluorescence microscope to detect antigen on cells, tissues, or microorganisms.

-G-

Genotype: All of the genes possessed by an individual; in practice it refers to the particular alleles present at the loci in question.

Germ line: Refers to genes in germ cells as opposed to somatic cells, that is, genes in their unrearranged state rather than those rearranged for production of a protein.

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HLA complex: See 'Major histocompatibility complex'.

H-2 complex: The major histocompatibility complex situated on chromosome 17 of the mouse; contains subregions K, I and D.

Haplotype: A particular combination of closely linked genes on a chromosome inherited from one patient.

Hapten: A compound, usually of low molecular weight, that is not itself immunogenic but that, after conjugation to a carrier protein or cells, becomes immunogenic and induces antibody, which can bind the hapten alone in the absence of carrier.

Heavy chain (H chain): The larger of the two types of chains that comprise a normal immunoglobulin or antibody molecule.

Helper T cells: A class of T cells which help trigger B cells to make antibody against thymus-dependent antigens. Helper T cells also help generate cytotoxic T cells.

Hinge region: A flexible, open segment of an antibody molecule that allows bending of the molecule. The hinge region is located between Fab and Fc and is susceptible to enzymatic cleavage.

Histocompatibility: Literally, the ability of tissues to get along; in immunology, it means identity in all transplantation antigens. These antigens, in turn, are collectively referred to as histocompatibility antigens.

Humoral immunity: Any immune reaction that can be transferred with immune serum is termed humoral immunity (as opposed to cell-mediated immunity). In general, this term refers to resistance that results from the presence of specific antibody.

Humanisation: a technique for inserting non human complementarity-determining regions (CDRs) into human framework regions.

Hybridoma: A hybrid cell that results from the fusion of an antibody-secreting cell with a malignant cell; the progeny secrete antibody without stimulation and proliferate continuously both in vivo and in vitro.

Hypersensitivity: State of reactivity to antigen that is greater than normal for the antigenic challenge; hypersensitivity is the same as allergy and denotes a deleterious outcome rather than a protective one.

Hypervariable regions: Portions of the light and heavy immunoglobulin chains that are highly variable in amino acid sequence from one immunoglobulin molecule to another, and that, together, constitute the antigen-binding site of an antibody molecule. Also, portions of the T-cell receptor which constitute the antigen-binding site.

-I-

Ia: "Immune response-associated" proteins, found on B cells and antigen-presenting cells of mice; an old term now replaced with MHC (major histocompatibility complex) class II molecules.

Idiotypic: The combined antigenic determinants (idiotopes) found on antibodies of an individual that are directed at a particular antigen; such antigenic determinants are found only in the variable region.

Immune adherence: The adherence of particulate antigen coated with C3b to tissue having cells with C3b receptors.

Immune complex: Antigen bound to antibody.

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Immune modulators: Substances that control the expression of the immune response.

Immune response (Ir) gene: A gene controlling an immune response to a particular antigen; most genes of this type are in the MHC (major histocompatibility complex), and the term is rarely used to describe other types of Ir genes outside the MHC.

Immunogen: A substance capable of inducing an immune response (as well as reacting with the products of an immune response). Compare with antigen.

Immunoglobulin (Ig): A general term for all antibody molecules. Each Ig unit is made up of two heavy chains and two light chains and has two antigen-binding sites.

Interferon: A group of proteins having antiviral activity and capable of enhancing and modifying the immune response.

Interleukins: Glycoproteins secreted by a variety of leukocytes which have effects on other leukocytes.

Internal image: A spatial configuration of the combining site of an anti-idiotypic antibody which resembles the epitope to which the idiotype is directed.

Intron: A segment of DNA that does not code for protein; the intervening sequence of nucleotides between coding sequences or exons.

Isohemagglutinins: Antibodies to major red blood cell antigens present normally as a result of inapparent immunization by cross-reactive antigens in bacteria, food, etc.

Isotypes: Classes of antibody that differ in the constant region of their heavy chain (Fc portion); distinguishable also on the basis of reaction with antisera raised in another species. These differences also result in different biological activities of the antibodies.

-J-

J chain (joining chain): A polypeptide involved in the polymerization of immunoglobulin molecules IgM and IgA.

J gene: A gene segment coding for the J or joining segment in immunoglobulin DNA; V genes translocate to J segments in L chains, and to D and J segments in H chains. Also, codes for a portion of the T-cell receptor.

-K-

K cell: An effector lymphocyte with Fc receptors which allow it to bind to and kill antibody-coated target cells.

Killer T cell: A T cell with a particular immune specificity and an endogenously produced receptor for antigen, capable of specifically killing its target cell after attachment to the target cell by this receptor. Also called cytotoxic T cell.

-L-

Light chain (L chain): The light chain of immunoglobulin is a structural feature that occurs in two forms: kappa and lambda.

Linkage disequilibrium: The frequency, in a population of linked genes, which is governed by factors other than change.

Lymphocyte: Small cell with virtually no cytoplasm, found in blood, in all tissue, and in lymphoid organs, such as lymph nodes, spleen, and Peyer's patches, and bears antigen-specific receptors.

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Lymphokines: Soluble substances secreted by lymphocytes, which have a variety of effects on lymphocytes and other cell types.

-M-

Macrophage: A large phagocytic cell of the mononuclear series found within tissues. Properties include phagocytosis, and antigen presentation to T cells.

Macrophage-activating factor (MAF): Actually several lymphokines, including interferon, released by activated T cells, which together induce activation of macrophages, making them more efficient in phagocytosis and cytotoxicity.

Major histocompatibility complex (MHC): A cluster of genes on chromosome 6 in humans, encoding cell surface molecules that are polymorphic and that code for antigens which lead to rapid graft rejection between members of a single species which differ at these loci. Several classes of protein such as MHC class I and II proteins are encoded in this region. These in humans, are known as 'Human leukocyte antigens' (HLA).

Mast cell: Tissue located cell probably derived from basophils. Possesses receptor for Fc of IgE. Participates in 'Immediate hypersensitivity' reactions.

Memory: In the immune system, memory denotes an active state of immunity to a specific antigen, such that a second encounter with that antigen leads to a larger and more rapid response.

MHC class I molecule: A molecule encoded to genes of the MHC which participates in antigen presentation to cytotoxic T (CD8+) cells.

MHC class II molecule: A molecule encoded by genes of the MHC which participates in antigen presentation to helper T (CD4+) cells.

MHC restriction: The ability of T lymphocytes to respond only when they 'see' the appropriate antigen in association with "self" MHC class I or class II proteins on the antigen presenting cells.

Migration inhibition factor (MIF): A lymphokine that inhibits the motility of macrophages in culture.

Minor histocompatibility antigens: These antigens, encoded outside the MHC, are numerous, but do not generate rapid graft rejection or primary responses of T cells in vitro. They do not serve as restricting elements in cell interactions.

Mitogen: A substance that stimulates the proliferation of many different clones of lymphocytes.

Mixed lymphocyte reaction (MLR): When lymphocytes from two individuals are cultured together, a proliferative response is generally observed, as the result of reactions of T cells of one individual to MHC antigens on the other individual's cells.

Monoclonal: Literally, coming from a single clone. A clone is the progeny of a single cell. In immunology, monoclonal generally describes a preparation of antibody that is monogenous, or cells of a single specificity.

Monocyte: Large circulating white cell, 2-10% of total white cells, phagocytic, indented nucleus. Migrates to tissues, where it is known as a macrophage.

Monokines: Soluble substances secreted by monocytes, which have a variety of effects on other cells.

Murine antibody: An antibody derived solely from mouse proteins.

Myeloma: A tumor of plasma cells, generally secreting a single species of immunoglobulin.

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-N-

NK cell: Naturally occurring, large, granular, lymphocyte-like killer cells that kill various tumour cells; they may play a role in resistance to tumors. Also, they participate in ADCC. They do not exhibit antigenic specificity, and their number does not increase by immunization.

Null cells: An early population of lymphocytes bearing neither T-cell nor B-cell differentiation antigens.

-P-

Paratope: An antibody combining site that is complementary to an epitope.

Passive immunization: Immunization by the administration of preformed antibody into a nonimmune individual.

Phagocytosis: The engulfment of a particle or a microorganism by leukocytes.

Phenotype: The physical expression of an individual's genotype.

Plasma cell: End-stage differentiation of a B cell to an antibody-producing cell.

Polyclonal activator: A substance that induces activation of many individual clones of either T or B cells. See Mitogen.

Polymorphism: Literally, "having many shapes"; in genetics polymorphism means occurring in more than one form within a species; the existence of multiple alleles at a particular genetic locus.

Polymorphonuclear leukocyte: White cell, granular cytoplasm. Neutral staining (neutrophil) – most frequent, phagocytic. Basophilic staining – basophil q.v. Eosinophilic staining – eosinophil q.v.

Primary lymphoid organs: Organs in which the maturation of T and B lymphocytes take place and antigen-specific receptors are first acquired.

Primary responses: The immune response to a first encounter with antigen. The primary response is generally small, has a long induction phase or lag period, consists primarily of IgM antibodies, and generates immunologic memory.

-R-

Radioallergosorbent test (RAST): A solid-phase radioimmunoassay for detecting IgE antibody specific for a particular allergen.

Radioimmunoassay (RIA): A widely used technique for measurement of primary antigen-antibody interactions, and for the determination of the level of important biological substances in mixed samples. It takes advantage of the specificity of the antigen-antibody interaction and the sensitivity that derives from measurement of radioactively labelled materials.

Reticuloendothelial system: A network of phagocytic cells.

-S-

Secondary lymphoid organs: Organs in which antigen-driven proliferation and differentiation of B and T lymphocytes takes place.

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Secretory component: A surface receptor on epithelial cells lining mucosal surfaces which binds dimeric IgA and transports it through the cell into mucosal secretions.

Slow-reacting substance of anaphylaxis (SRS-A): A group of leukotrienes released by mast cells during anaphylaxis which induces a prolonged constriction of smooth muscle. This prolonged constriction is not reversible by treatment with antihistamines.

Suppression: A mechanism for producing a specific state of immunologic unresponsiveness by the induction of suppressor T cells. This type of unresponsiveness is passively transferable by suppressor T cells or their soluble products.

-T-

T cell: A lymphocyte which undergoes a developmental stage in the thymus.

Titre: The reciprocal of the last dilution of a titration giving a measurable effect; e.g. if the last dilution giving significant agglutination is 1:128, the titre is 128.

Tolerance: Diminished or absent capacity to make a specific response to an antigen, usually produced as a result of contact with that antigen under nonimmunizing conditions.

-V-

Vaccination: Originally referred to immunization against smallpox with the less virulent cowpox (vaccinia) virus; more loosely used for any immunization against a pathogen. **Antibody:** Serum protein formed in response to immunization; antibodies are generally defined in terms of their specific binding to the immunizing antigen.