

## Glossary

**5-hydroxytryptamine** A vasoactive amine present in platelets and a major mediator of inflammation in rodents.

**Acute phase proteins** Serum proteins whose levels increase during infection or inflammatory reactions.

**ADCC (antibody-dependent cell-mediated cytotoxicity)**. A cytotoxic reaction in which Fc receptor-bearing killer cells recognize target cells via specific antibodies.

**Adjuvant**. A substance that non-specifically enhances the immune response to an antigen.

**AFCs (antibody-forming cells)**. Functionally equivalent to plasma cells.

**Affinity maturation** The increase in average antibody affinity frequently seen during a secondary immune response.

**Affinity**. A measure of the binding strength between an antigenic determinant (epitope) and an antibody-combining site (paratope).

**Agreptope** The portion of an antigen or antigen fragment which interacts with an MHC molecule.

**Allele** Intraspecies variance at a particular gene locus.

**Allergen** An agent, e.g. pollen, dust, animal dander, that causes (IgE-mediated reactions).

**Allergy**. Originally defined as altered reactivity on second contact with antigen; now usually refers to a Type I hypersensitivity reaction.

**Allogenic**. Refers to intraspecies genetic variations.

**Allotype** The protein product of an allele which may be detectable as an antigen by another member of the same species.

**Altered self** The concept that the combination of antigen and a self MHC molecules interacts with the immune system in the same way as an allogenic MHC molecule.

**Alternative pathway**. The activation pathways of the complement system involving C3 and factors B, D, P, H and I, which interact in the vicinity of an activator surface to form an alternative pathway C3 convertase.

**Amplification loop** The alternative complement activation pathway, which acts as a positive feedback loop when C3 is split in the presence of an activator surface.

**Anaphylatoxins** Complement peptides (C3a and C5a) which cause mast cell degranulation and smooth muscle contraction.

**Anaphylaxis** An antigen-specific immune reaction mediated primarily by IgE which results in vasodilation and constriction of smooth muscles, including those of the bronchus, and which may result in death of the animal.

**Antibody.** A molecule produced by animals in response to antigen which has the particular property of combining specifically with the antigen which induced its formation.

**Antigen presentation** The process by which certain cells in the body (antigen-presenting cells) express antigen on their cell surface in a form recognizable by lymphocytes.

**Antigen processing** The conversion of an antigen into a form in which it can be recognized by lymphocytes.

**Antigen** A molecule which induces the formation of antibody.

**APCs (antigen-presenting cells).** A variety of cell types which carry antigen in a form that can stimulate lymphocytes.

**Atopy.** The clinical manifestation of Type I hypersensitivity reactions including eczema, asthma and rhinitis.

**Autologous** Part of the same individual.

**Autosomes** Chromosomes other than the X or Y sex chromosomes.

**Avidity** The functional combining strength of an antibody with its antigen which is related to both the affinity of the reaction between the epitopes and paratopes, and the valencies of the antibody and antigen.

**BCG (Bacille Calmette Guerin).** An attenuated strain of *Mycobacterium tuberculosis* used as a vaccine an adjuvant or a biological response modifier in different circumstances.

**Biozzi mice** Lines of mice selectively bred to produce low or high antibody responses to a variety of antigens (originally sheep erythrocytes).

**Bradykinin** A vasoactive nonapeptide which is the most important mediator generated by the kinin system.

**Bursa of Fabricius** A lymphoepithelial organ found at the junction of the hind gut and cloaca in birds which is the site of B cell maturation.

**Bystander lysis** Complement-mediated lysis of cells in the immediate vicinity of a complement activation site, which are not themselves responsible for the activation.

**C domains** The constant domains of antibody and the T-cell receptor. These domains do not contribute to the antigen-binding site and show relatively little variability between receptor molecules.

**C genes** The gene segments which encode the constant portion of the immunoglobulin heavy and light chains and the  $\alpha$ ,  $\delta$ ,  $\gamma$  and  $\epsilon$  chains of the T-cell antigen receptor.

**C1-C9.** The components of the complement classical and lytic pathways which are responsible for mediating inflammatory reactions, opsonization of particles and lysis of cell membranes.

**Capping** A process by which cell surface molecules are caused to aggregate (usually using antibody) on the cell membrane.

**Carrier:** An immunogenic molecule, or part of a molecule that is recognized by T cells in an antibody response.

**CD markers** Cell surface molecules of leucocytes and platelets that are distinguishable with monoclonal antibodies and may be used to differentiate different cell populations.

**Cell cycle** The process of cell division which is divisible into four phases G<sub>1</sub>, S, G<sub>2</sub> and M. DNA replicates during the S phase and the cell divides in the M mitotic phase.

**Chemokinesis** Increased random migratory activity of cells.

**Chemotaxis** Increased directional migration of cells particularly in response to concentration gradients of certain chemotactic factors.

Chimaerism. The situation in which cells from genetically different individuals coexist in one body.

**Class I/II restriction** The observation that immunologically active cells will only cooperate effectively when they share MHC haplotypes at either the class I or class II loci.

**Class I/II/III MHC molecules** Three major classes of molecule coded within the MHC. class I molecules have one MHC encoded peptide complexed with microglobulin, class II molecules have two MHC encoded peptides which are noncovalently associated, and class III molecules are other molecules including complement components.

**Class switching** The process by which an individual B cell can link immunoglobulin heavy chain C genes to its recombined V gene to produce a different class of antibody with the same specificity. This process is also reflected in the overall class switch seen during the maturation of an immune response.

**Classical pathway.** The pathway by which antigen-antibody complexes can activate the complement system, involving components C1, C2 and C4, and generating a classical pathway C3 convertase.

**Clonal selection** The fundamental basis of lymphocyte activation in which antigen selectively stimulates only those cells which express receptors for it to divide and differentiate.

**Clone** A family of cells or organisms having a genetically identical constitution.

**CMI (cell-mediated immunity).** A term used to refer to immune reactions that are mediated by cells rather than by antibody or other humoral factors.

**Cobra venom factor.** A cobra complement component equivalent to mammalian Cab.

**Complement.** A group of serum proteins involved in the control of inflammation, the activation of phagocytes and the lytic attack on cell membranes. The system can be activated by interaction with the immune system.

**ConA (concanavalin A).** A mitogen for T cells.

**Congenic Animals** which are genetically constructed to differ at one particular locus.

**Conjugate** A reagent which is formed by covalently coupling two molecules together, such as fluorescein coupled to an immunoglobulin molecule.

**Constant regions** The relatively invariant parts of immunoglobulin heavy and light chains, and the  $\alpha$ ,  $\beta$ ,  $\gamma$  and  $\delta$  chains of the T-cell receptor.

**Contrasuppression** The action of a group of T cells which renders T-helper cells resistant to action of T-suppressors.

**CORs (complementarity-determining regions).** The sections of an antibody or T-cell receptor V region responsible for antigen or antigen-MHC binding.

**CR1 CR2 CR3.** Receptors for activated C3 fragments.

**CSFs (colony stimulating factors).** A group of cytokines which control the differentiation of haemopoietic stem cells.

**Cyclophosphamide** A cytotoxic drug frequently used as an immunosuppressive.

**Cyclosporin** An immunosuppressive drug that is particularly useful in suppression of graft rejection

**Cytokines** A generic term for soluble molecules which mediate interactions between cells.

**Cytophilic.** Having a propensity to bind to cells.

**Cytostatic.** Having the ability to stop cell growth.

**Cytotoxic** Having the ability to kill cells.

**Degranulation Exocytosis** of granules from cells such as mast cells and basophils.

**Dendritic cells** A set of cells present in tissues, which capture antigens and migrate to the lymph nodes and spleen, where they are particularly active in presenting the processed antigen to T cells.

**Desotope** The part of an MHC molecule which links to antigen or processed antigen.

**DNP (dinitrophenol)**. A commonly used hapten. Genome. The total genetic material contained within the cell.

**Domain** A region of a peptide having a coherent tertiary structure. Both immunoglobulins and MHC Class I and Class II molecules have domains.

**Dominant idiotypes** Individual idiotypes which are present on a large proportion of the antibodies generated to a particular antigen.

**dsDNA** Double-stranded DNA.

**DIH (delayed type hypersensitivity)**. This term includes the delayed skin reactions associated with Type IV hypersensitivity.

**Effector cells** A functional concept which in context means those lymphocytes or phagocytes which produce the end effect.

**Endogenous** Originating within the organism. Endothelium. Cells lining blood vessels and lymphatics.

**Enhancement** Prolongation of graft survival by treatment with antibodies directed towards the graft alloantigens.

**Epitope** A single antigenic determinant. Functionally it is the portion of an antigen which combines with the antibody paratope.

**Epstein-Barr virus (EBV)**. Causal agent of Burkitt's lymphoma and infectious mononucleosis, which has the ability to transform human B cells into stable cell lines.

**Exon** Gene segment encoding protein.

**Fab** The part of an antibody molecule which contains the antigen-combining site, consisting of a light chain and part of the heavy chain; it is produced by enzymatic digestion.

**Factors B, P, O, H, and I** Components of the alternative complement pathway.

**Fc** The portion of an antibody that is responsible for binding to antibody receptors on cells and the C1q component of complement.

**Framework segments** Sections of antibody V regions which lie between the hypervariable regions.

**Freund's adjuvant** An emulsion of aqueous antigen in oil. Complete Freund's adjuvant also contains killed *Mycobacterium tuberculosis*, while incomplete Freund's adjuvant does not.

**GALT (gut-associated lymphoid tissue)**. Refers to the accumulations of lymphoid tissue associated with the gastrointestinal tract.

**Genetic association** A term used to describe the condition where particular genotypes are associated with other phenomena, such as particular diseases.

**Genetic restriction** The term used to describe the observation that lymphocytes and antigen-presenting cells cooperate most effectively when they share particular MHC haplotypes.

**Genotype** The genetic material inherited from parents; not all of it is necessarily expressed in the individual.

**Germ line** The genetic material which is passed down through the gametes before it is modified by somatic recombination or maturation.

**Giant cells** Large multinucleated cells sometimes seen in granulomatous reactions and thought to result from the fusion of macrophages.

**GVH (graft versus host)** disease. A condition caused by allogeneic donor lymphocytes reacting against host tissue in an immunologically compromised recipient.

**H-2** The mouse major histocompatibility complex.

**Haplotype** A set of genetic determinants located on a single chromosome.

**Hapten** A small molecule which can act as an epitope but is incapable by itself of eliciting an antibody response.

**Helper (TH) cells** A functional subclass of T cells which can help to generate cytotoxic T cells and cooperate with B cells in production of antibody response. Helper cells recognize antigen in association with class II MHC molecules.

**Heterologous** Refers to interspecies antigenic differences.

**HEV (high endothelial venule)**. An area of venule from which lymphocytes migrate into lymph nodes.

**Hinge** The portion of an immunoglobulin heavy chain between the Fc and Fab regions which permits flexibility within the molecule and allows the two combining sites to operate independently. The hinge region is usually encoded by a separate exon.

**Histamine** A major vasoactive amine released from mast cell and basophil granules.

**Histocompatibility**. The ability to accept grafts between individuals.

**HLA** The human major histocompatibility complex. Homologous. The same species.

**hnRNA (heteronuclear RNA).** The fraction of nuclear RNA which contains primary transcripts of the DNA prior to processing to form messenger RNA.

**Humoral** Pertaining to the extracellular fluids, including the serum and lymph.

**Hybridoma** Cell line created *in vitro* by fusing two different cell types, usually lymphocytes, one of which is a tumour cell.

**Hypervariable region** The most variable areas of the V domains of immunoglobulin and T-cell receptor chains. These regions are clustered at the distal portion of the V domain and contribute to the antigen-binding site.

**ICAM-1 (intercellular adhesion molecule-1).** Cell surface molecule found on a variety of leucocytes and non-haematogenous cells which interacts with LFA-1 and is involved in cell traffic.

**Idiotype** A single antigenic determinant on an antibody V region.

**Idiotype** The antigenic characteristic of the V region of an antibody.

**Immune-complex** The product of an antigen-antibody reaction which may also contain components of the complement system.

**Immunofluorescence** A technique used to identify particular antigens microscopically in tissues or on cells by the binding of a fluorescent antibody conjugate.

**Interferons (IFNS).** A group of mediators which increase the resistance of cells to viral infection, and act as cytokine. IFN is also an important immunological mediator.

**Interleukins (IL-1-IL-10).** A group of molecules involved in signalling between cells of the immune system.

**Intron** Gene segment between exons not encoding protein.

**Ir gene** A group of immune response (Ir) genes determining the level of an immune response to a particularly antigen or foreign stimulus. A number of them are found in the major histocompatibility complex.

**Isoelectric focusing** Separation of molecules on the basis of charge. Each molecule will migrate to the point in a pH gradient where it has no net charge.

**Isologus** Of identical genetic constitution.

**Isotype** Refers to genetic variation within a family of proteins or peptides such that every member of the species will have each isotype of the family represented in its genome (e.g. immunoglobulin classes).

**J chain** A monomeric polypeptide present in polymeric IgA and IgM, and essential to their formation.

**J genes** Sets of gene segments in the immunoglobulin heavy and light chain genes, and in the genes for the chains of the I-cell receptor, which are recombined during lymphocyte ontogeny and contribute towards the genes for variable domains.

**K (kappa) chains** One of the immunoglobulin light chain isotypes.

**K cell** A group of lymphocytes which are able to destroy their target by antibody-dependent cell-mediated cytotoxicity. They have Fc receptors.

**Karyotype** The chromosomal constitution of a cell which may vary between individuals of a single species, depending on the presence or absence of particular sex chromosomes or on the incidence of translocations between sections of different chromosomes.

**Kinins** A group of vasoactive mediators produced following tissue injury.

Kupffer cells. Phagocytic cells which line the liver sinusoids.

**Langerhans' cells.** Antigen-presenting cells of the skin which emigrate to local lymph nodes to become dendritic cells, they are very active in presenting antigen to T cells.

**Large granular lymphocytes (LGLs).** A group of morphologically defined lymphocytes containing the majority of K cell and NK cell activity They have both lymphocyte and monocyte/macrophage markers.

**Leukotrienes** A collection of metabolites of arachidonic acid which have powerful pharmacological effects.

**LFAs (leucocyte functional antigens).** A group of three molecules which mediate intercellular adhesion between leucocytes and other cells in an antigen non-specific fashion.

**Ligand** A linking (or binding) molecule.

**Line** A collection of cells produced by continuously growing a particular cell culture *in vitro*. Such cell lines will usually contain a number of individual clones.

**Linkage disequilibrium.** A condition where two genes are found together in a population at a greater frequency than that predicted simply by the product of their individual gene frequencies.

**Linkage.** The condition where two genes are both present. In close proximity on a single chromosome and are usually inherited together.

**Locus** The position on a chromosome at which a particular gene is found.

**LPR (lymphoproliferation gene).** A gene found in MRL mice which is involved in the generation of autoimmune phenomena.

**LPS (lipopolysaccharide).** A product of some Gram-negative bacterial cell walls which can act as a B cell mitogen.

**Ly antigens** A group of cell surface markers found on murine T cell which permit the differentiation of T cell subpopulations.

**Lymphokines** A generic term for molecules other than antibodies which are involved in signalling between cells of the immune system and are produced by lymphocytes (of Interleukins)

**Lytic pathway.** The complement pathway effected by components C5-C9 that is responsible for lysis of sensitized cell plasma membranes.

**MALT (mucosa-associated lymphoid tissue).** Generic term of lymphoid tissue associated with the gastrointestinal tract, bronchial tree and other mucosa.

**Membrane attack complex (MAC).** The assembled terminal complement components C5b-C9 of the lytic pathway which becomes inserted into cell membranes

**MHC (major histocompatibility complex).** A genetic region found in all mammals whose products are primarily responsible for the rapid rejection of grafts between individuals, and function in signalling between lymphocytes and cells expressing antigen.

**MHC restriction** A characteristic of many immune reactions in which cell cooperate most effectively with other cells sharing an MHC haplotype.

**MF (migration inhibition factor).** A group of peptides produced by lymphocytes which are capable of inhibiting macrophage migration.

**Mitogens** Substances which cause cells, particularly lymphocytes, to undergo cell division.

**MLRIMC (mixed lymphocyte reaction mixed lymphocyte culture).** Assay system for T cell recognition of allogeneic cells in which response is measured by proliferation in the presence of the stimulating cells.

**Monoclonal** Derived from a single clone, for example, monoclonal antibodies, which are produced by a single clone and are homogenous.

**Myeloma** A lymphoma produced from cells of the B cell lineage.

**Neoplasm** A synonym for cancerous tissue.

**Network theory.** A proposal first put forward by Jerne (since developed) which states that T cells and B cells mutually inter-regulate by recognizing idiotypes on their antigen receptors.

**NIP (4-hydroxy, 5-iodo, 3-nitrophenylacetyl).** A commonly used hapten.

**NK (natural killer)** cells. A group of lymphocytes which have the intrinsic ability to recognize and destroy some virally infected cells and some tumour cells.

**NP (4-hydroxy, 3-nitrophenylacetyl)**. A hapten which partially cross-reacts with NIP.

**Nude mouse** A genetically athymic mouse which also carries a closely linked gene producing a defect in hair production.

**NZB/W** An F<sub>1</sub> strain of mouse which is a model for systemic lupus erythematosus. The parental NZB strain also suffers from autoimmunity.

**O genes** Sets of gene segments lying between the V and J genes in the immunoglobulin heavy chain genes, and in the T cell receptor and J chain genes which are recombined with V and J genes during ontogeny.

**OKT**. A group of monoclonal antibodies used to identify T cell surface markers in humans, now superseded by the CD nomenclature.

**Opsonization** A process by which phagocytosis is facilitated by the deposition of opsonins (e.g. antibody and C3b) on the antigen.

**p<sub>2</sub>-microglobulin** A monomeric polypeptide encoded outside the MHC that is non-covalently associated with the MHC-encoded polypeptides of class I molecules.

**PAF (platelet activating factor)**. A factor released by basophils which causes platelets to aggregate.

**PALS (periarteriolar lymphatic sheath)**. The accumulations of lymphoid tissue constituting the white pulp of the spleen.

**Paratope** The part of an antibody molecule which makes contact with the antigenic determinant (epitope).

**Pathogen** An organism which causes disease.

**PC (phosphorylcholine)**. A commonly used hapten which is also found on the surface of a number of microorganisms.

**PCA (passive cutaneous anaphylaxis)**. The technique used to detect antigen-specific IgE, in which the test animal is injected intravenously with the antigen and dye, the skin having previously been sensitized with antibody.

**PFC (plaque forming cell)**. An antibody-producing cell detected *in vitro* by its ability to lyse antigen-sensitized erythrocytes in the presence of complement.

**PHA (phytohaemagglutinin)**. A mitogen for T cells.

**Phagocytosis** The process by which cells engulf material and enclose it within a vacuole (phagosome) in the cytoplasm.

**Phenotype** The expressed characteristics of an individual (of genotype).

**Pinocytosis** The process by which liquids or very small particles are taken into the cell.

**Plasma cell** An antibody-producing B cell which has reached the end of its differentiation pathway.

**Poleweed mitogen** A mitogen for B and T cells.

**Polyclonal** A term which describes the products of a number of different cell types (cf. monoclonal).

**Primary lymphoid tissues** Lymphoid organs in which lymphocytes complete their initial maturation steps; they include the fetal liver, adult bone marrow and thymus, and bursa of Fabricius in birds.

**Primary response** The immune response (cellular or humoral) following an initial encounter with a particular antigen.

**Prime** To give an initial sensitization to antigen.

**Prostaglandins** Pharmacologically active derivatives of arachidonic acid. Different prostaglandins are capable of modulating cell mobility and immune responses.

**Pseudalleles** Tandem variants of a gene: they do not occupy a homologous position on the chromosome .

**Pseudogenes** Genes which have homologous structures to other genes but which are incapable of being expressed, e.g. *J $\kappa$ 3* in the mouse.

**Radioimmunoassay (RIA).** A number of different, sensitive techniques for measuring antigen or antibody titres, using radiolabelled reagents.

**Receptor:** A cell surface molecule which binds specifically to particular extracellular molecules.

**Recombination** A process by which genetic information is rearranged during meiosis. This process also occurs during the somatic rearrangements of DNA which occur in the formation of genes encoding antibody molecules and T-cell antigen receptors.

**Recurrent idotype** An idio type present in the immune response of different animals or strains to a particular antigen.

**Respiratory burst.** Increase in oxidative metabolism of phagocytes following uptake of opsonized particles.

**Reticuloendothelial system** A diffuse system of phagocytic cells derived from the bone marrow stem cell which are associated with the connective tissue framework of the liver, spleen, lymph nodes and other serous cavities.

**Rosetting** A technique for identifying or isolating cells by mixing them with particles or cells to which they bind e.g. sheep erythrocytes to human T cells) The rosettes consist of a central cell surrounded by bound cells.

**Secondary response** The immune response which follows a second or subsequent encounter with a particular antigen.

**Secretory component** A polypeptide produced by cells of some secretory epithelia which is involved in transporting secreted polymeric IgA across the cell and protecting it from digestion in the gastrointestinal tract.

**Skin test** A reaction in the skin following injection or contact with an antigen/allergen.

**SLE (systemic lupus erythematosus)**. An autoimmune disease of humans usually involving anti-nuclear antibodies.

**Somatic mutation** A process occurring during B cell maturation and affecting the antibody gene region, which permits refinement of antibody specificity.

**Suppressor (Ts) cell** A subpopulation of T cells which act to reduce the immune responses of other T cells or B cell suppression may be antigen-specific, idio-type-specific, or non-specific in different circumstances.

**Synergism** Cooperative interaction.

**Syngenic** Strains of animals produced by repeated inbreeding so that each pair of autosomes within an individual is identical.

**T15**. An idiotype associated with anti-phosphorylcholine antibodies, named after the TEPC 15 myeloma prototype sequence.

**Tandem duplicates** Adjacent copies of related genes linked together on a chromosome.

**T-cell receptor (TCR)**. The T-cell antigen receptor consisting of either an  $\alpha\beta$  dimer (TCR-2) or a  $\gamma\delta$  dimer (TCR-1) associated with the CD3 molecular complex.

**T-dependent T-independent antigens** T-dependent antigens require immune recognition by both T and B cells to produce an immune response. T-independent antigens can directly stimulate B cells to produce specific antibody.

**Thy**. A cell surface antigen of mouse T cells which has allotypic variants.

**TNF (tumour necrosis factor)**. A cytokine released by activated macrophages that is structurally related to lymphotoxin released by activated T cells.

**Tolerance** A state of specific immunological unresponsiveness.

**Transformation** Morphological changes in a lymphocyte associated with the onset of division. Also used to denote the change to the autonomously dividing state of a cancer cell.

**V domains** The N-terminal domains of antibody heavy and light chains and the  $\alpha$ ,  $\beta$ ,  $\gamma$  and  $\delta$  chains of the T-cell receptor which vary between different clones and form the antigen-binding site

**V genes** Sets of genes which encode the major part of the V domains of antibody heavy and light chains and the  $\alpha$ ,  $\beta$ ,  $\gamma$  and  $\delta$  chains of the T-cell receptor, and become recombined with appropriate sets of D and J genes during lymphocyte ontogeny.

**Vasovactive amines** Products such as histamine and 5-hydroxytryptamine released by basophils, mast cells and platelets which act on the endothelium and smooth muscle of the local vasculature.

**White pulp** The lymphoid component of spleen, consisting of periarteriolar sheaths of lymphocytes and antigen-presenting cells.

**$\lambda$  chains** One of the immunoglobulin light chain isotypes.

**Xenogenic** Referring to interspecies antigenic differences) cf. heterologous