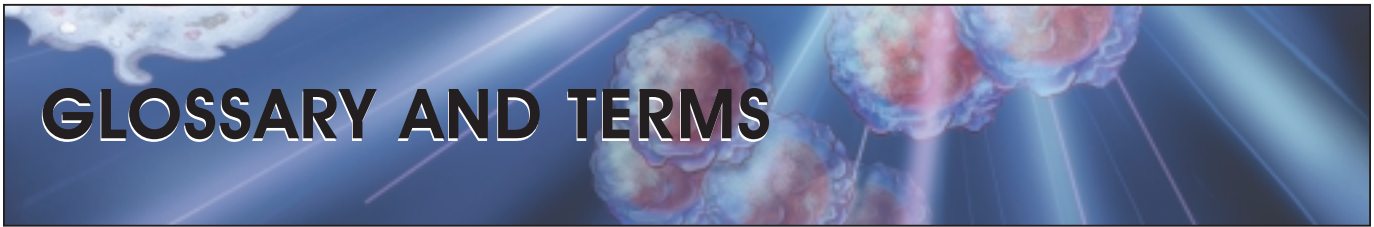


APPENDIX F:



Appendix F.i.

GLOSSARY

Adipocyte – Fat cell.

Adult stem cell – An undifferentiated cell found in a differentiated tissue that can renew itself and (with certain limitations) differentiate to yield all the specialized cell types of the tissue from which it originated.

Allogenic – Two or more individuals (or cell lines) are stated to be allogeneic to one another when the genes at one or more loci are not identical in sequence in each organism.

Amnion – The innermost intrauterine membrane around the fetus and the amniotic fluid.

Anterior visceral endoderm (AVE) – Specific tissue structure arising in the early embryo that helps establish the anterior-posterior axis of the organism.

Antibody – A Y-shaped protein secreted by B cells in response to an antigen. An antibody binds specifically to the antigen that induced its production. Antibodies directed against antigens on the surface of infectious organisms help eliminate those organisms from the body.

Antigen – A substance (often a protein) that induces the formation of an antibody. Antigens are commonly found on the surface of infectious organisms, transfused blood cells, and transplanted organs.

Antigen presenting cells (APCs) – One of a variety of cells within the body that can process antigens and display them on their surface in a form recognizable by T cells.

Apoptosis – Genetically programmed cell death.

Astrocyte – One of the large neuroglia cells of nervous tissue.

Autoantibody – An antibody that reacts with antigens found on the cells and tissues of an individual's ownbody. Autoantibodies can cause autoimmune diseases.

Autoimmune disease – A condition that results from T cells and/or antibodies that attack the cells or tissues of an individual's own body.

Autologous transplant – Transplanted tissue derived from the intended recipient of the transplant. Such a transplant helps avoid complications of immune rejection.

Axis – A straight line passing through a spherical body between its two poles. The central line of the body or any of its parts. The vertebral column. The central nervous system. An artery that when created, immediately divides into a number of branches.

B cells – Also known as B lymphocytes. Each B cell is capable of making one specific antibody. When stimulated by antigen and helper T cells, B cells mature into plasma cells that secrete large amounts of their specific antibody.

Blastocoel – The cavity in the blastula of the developing embryo.

Blastocyst – A preimplantation embryo of 30-150 cells. The blastocyst consists of a sphere made up of an outer layer of cells (the trophoctoderm), a fluid-filled cavity (the blastocoel), and a cluster of cells on the interior (the inner cell mass).

Blastula – An early stage in the development of an ovum consisting of a hollow sphere of cells enclosing a cavity called the blastocoel.

Bone marrow – The soft, living tissue that fills most bone cavities and contains hematopoietic stem cells, from which all red and white blood cells evolve. The bone marrow also contains mesenchymal stem cells that a number of cells types come from, including chondrocytes, which produce cartilage.

Bone marrow (BM) cell – Refers to both hematopoietic and mesenchymal (stromal) cells.

Bone marrow stem cell (BMSC) – One of at least two types of multipotent stem cells: hematopoietic stem cell and mesenchymal stem cell.

Bone marrow transplantation (BMTx) – Trans-plantation of bone marrow from one individual to another. Autologous BMTx is a process in which a patient's healthy bone marrow is withdrawn and preserved, then injected back into the patient to restore the production of healthy blood and immune cells by the bone marrow. This strategy is often used in patients with certain types of cancer who have undergone radiation therapy or chemotherapy that destroys the bone marrow cells.

Bone morphogenetic proteins (BMPs) – Proteins that are involved in the formation of embryonic bone. BMPs operate at several stages in this formation of bone, beginning with the early stages of morphogenesis and continuing to late postnatal life. BMPs also play a critical role in the development of the central nervous system.

Brain-derived neurotrophic factor (BDNF) – A growth factor synthesized in the brain that stimulates neurite outgrowth and supports survival of neurons.

Cavitation – A process that occurs during the formation of the blastocyst and establishes the polarity of embryonic cells.

Cell cycle – The orderly sequence of events by which the cell duplicates its contents and divides into two.

Chimera – An organism composed of cells derived from at least two genetically different zygotes. Theoretically, the zygote could be from separate species.

Chondrocytes – Cartilage cells.

Chorion – The multilayered, outermost fetal membrane. As pregnancy progresses, part of the chorion becomes the placenta.

Chromosomes – Nucleic acid-protein structures in the nucleus of a cell. Chromosomes are composed chiefly of DNA, the carrier of hereditary information. Chromosomes contain genes, working subunits of DNA that carry the genetic code for specific proteins, interspersed with large amounts of DNA of unknown function. A normal human body cell contains 46 chromosomes; a normal human gamete, 23 chromosomes.

Cleavage – The process of cell division in the very early embryo before it becomes a blastocyst.

Clonality – A line of cells that is genetically identical to the originating cell; in this case, a stem cell.

Cluster differentiation (CD) – Cell membrane molecules used to classify leukocytes into subsets.

Colony-forming cells – Groups of cells growing on a solid nutrient surface with each group being created from the multiplication of an individual cell.

Colony-stimulating factors – Diffusible proteins that stimulate the proliferation of hematopoietic stem cells.

Cripto – Transcription factor expressed by pluripotent stem cells and early embryos.

Cyclin-dependent kinase (Cdk protein) – Protein kinase that has to be complexed with a cyclin protein in order to act; different Cdk-cyclin complexes are thought to trigger different steps in the cell-division cycle by phosphorylating specific target proteins.

Cytokines – A generic term for a large variety of regulatory proteins produced and secreted by cells and used to communicate with other cells. One class of cytokines is the interleukins, which act as inter-cellular mediators during the generation of an immune response.

Cytoplasm – The contents of a cell other than the nucleus; cytoplasm consists of a fluid containing numerous structures, known as organelles, that carry out essential cell functions.

Decidual cells – A cellular matrix that first surrounds an implanted embryo and later occupies most of the endometrium.

Dendrite – Extension of a nerve cell, typically branched and relatively short, that receives stimuli from other nerve cells.

Differentiation – The process whereby an unspecialized early embryonic cell acquires the features of a specialized cell such as a heart, liver, or muscle cell.

Diploid – A cell or tissue having two chromosome sets, as opposed to the haploid situation of gametes, which have only one chromosome set.

DNA – Deoxyribonucleic acid, a chemical found primarily in the nucleus of cells. DNA carries the instructions for making all the structures and materials the body needs to function.

DNA methylation – A type of chemical modification of DNA that regulates gene expression.

Ectoderm – The upper, outermost of the three primitive germ layers of the embryo; it gives rise to skin, nerves, and brain.

Egg cylinder – An asymmetric embryonic structure that helps to determine the body plan of the mouse.

Embryo – In humans, the developing organism from the time of fertilization until the end of the eighth week of gestation, when it becomes known as a fetus.

Embryoid bodies (EBs) – Clumps of cellular structures that arise when embryonic stem cells are cultured. Embryoid bodies contain tissue from all three of the germ layers: endoderm, mesoderm, and ectoderm. Embryoid bodies are not part of normal development and occur only in *in vitro* conditions.

Embryonal carcinoma (EC) cells – A type of pluripotent stem cell derived from teratocarcinoma (usually a testis tumor).

Embryonic disk – A group of cells derived from the inner cell mass of the blastocyst, which later develops into an embryo. The disc consists of three germ layers known as the endoderm, mesoderm, and ectoderm.

Embryonic germ (EG) cells – Cells found in a specific part of the embryo/fetus called the gonadal ridge that normally develop into mature gametes.

Embryonic stem (ES) cells – Primitive (undifferentiated) cells from the embryo that have the potential to become a wide variety of specialized cell types.

Endoderm – Lower layer of a group of cells derived from the inner cell mass of the blastocyst; it later becomes the lungs and digestive organs.

Epiblast – Gives rise to the ectoderm and mesoderm. The mesoderm then displaces the hypoblast cells and forms the entodermal cell layer on its inner surface.

Epidermal growth factor (EGF) – A protein that stimulates epidermal and various other cells to divide.

Epithelium – The layer of cells forming the epidermis of the skin. These cells serve the general functions of protection, absorption, and secretion, and play a specialized role in moving substances through ducts, in the production of germ cells, and in the reception of stimuli. Their ability to regenerate is excellent; the epithelium may replace itself as frequently as every 24 hours.

Erythroid cell – Red blood cells.

Ex vivo – Outside the living body.

Extracellular matrix – The microenvironment next to a cell that allows for structural support, orientation, and connections for cell-to-cell interactions and formation of connective tissues.

Extraembryonic tissues – Intrauterine tissues that support the embryo's placenta, umbilical cord, and amniotic sac.

Feeder cell layer – Cells that are utilized in co-culture to maintain pluripotent stem cells. Cells usually consist of mouse embryonic fibroblasts.

Fertilization – The process whereby male and female gametes unite.

Fetal calf serum – A type of culture medium often used in the culture of stem cells. It provides a number of growth factors.

Fibroblast – Cells that give rise to connective tissue.

Fluorescence-activated cell sorting (FACS) – A technique that can separate and analyze cells, which are labeled with fluorochrome-conjugated antibody, by their fluorescence and light scattering patterns.

Follistatin – An inhibitory factor produced during embryonic development that affects the growth and differentiation of the pancreas.

Gap junctions – Communicating cell-cell junctions that allow ions and small molecules to pass from the cytoplasm of one cell to the cytoplasm of another cell.

Gastrula – Animal embryo at an early stage of development in which cells are enclosed in a sheath to form the beginning of a gut cavity.

Gene – A functional unit of heredity that is a segment of DNA located in a specific site on a chromosome. A gene Directs the formation of an enzyme or other protein.

Genital Ridge – Formation of a genital ridge requires at least two genes, *WT-1*, which is also important in early kidney formation, and *SF-1*, required for the development of both the gonads and adrenal glands.

Genome – The complete genetic material of an organism.

Genomic imprinting – A biochemical phenomenon that determines, for certain specific genes, which one of the pair of identical genes, the mother's or the father's, will be active in that individual.

Germ cell – A sperm or egg, or a cell that can become a sperm or egg. All other body cells are called somatic cells.

Gestation – The period of development of an organism from fertilization of the ovum until birth.

Glia – The nonneuronal or supporting tissue (neuroglia) of the brain and spinal cord.

Glial cells – Supporting cells of the nervous system, including oligodendrocytes and astrocytes in the vertebrate central nervous system and Schwann cells in the peripheral nervous system.

Glial fibrillary acidic protein (GFAP) – A structural protein specifically produced by astrocytes. GFAP is often used as a marker of astrocytes.

Glucagon – A hormone consisting of a straight chain of proteins composed of 29 amino acid residues that can be extracted from certain pancreatic cells.

Glycoprotein – A compound consisting of a carbohydrate and a protein.

Gonadal ridge –Anatomic site in the early fetus where primordial germ cells (PGCs) are formed.

Gonads – The embryonic sex gland before it becomes a definitive testis or ovary.

Gooseoid – Gene that encodes a transcription factor that is important for determining craniofacial orientation and features in the vertebrate embryo.

Graft-versus-host disease (GVHD) – A condition that occurs following bone marrow transplantation in which the donor-derived T cells attack the host's tissues.

Granulocyte – A type of white blood cell filled with microscopic granules that are little sacs containing enzymes, compounds that digest microorganisms. Neutrophils, eosinophils and basophils are all types of granulocytes. They are named by the staining features of their granules in the laboratory.

Granulose cells – Cells surrounding and maintaining the ovarian follicle.

Green fluorescent protein (GFP) – Fluorescent-protein dye used to tag and trace particular genes and cells of interest.

Hanging drop method – A technique used to culture embryonic stem cells so that they develop into embryoid bodies.

Haploid – Refers to a gamete having one chromosome set, as opposed to the diploid situation of cells or tissues, where there are two chromosome sets.

hCNS – Human central nervous system stem cell.

Hematopoiesis – Generation of blood cells, mainly in the bone marrow.

Hematopoietic stem cell (HSC)– A stem cell from which all red and white blood cells evolve.

Hepatic – Relating to the liver.

Hepatocyte – Liver cell.

hES cell – Human embryonic stem cell; a type of pluripotent stem cell.

Hoechst dye – A dye used to identify hematopoietic stem cells (HSCs).

Hox genes – Consists of at least 38 encoded nucleotides that contain genes found in four clusters on four different chromosomes. An important function of hox genes in blood is the regulation of cell proliferation.

HSC markers – Cell-surface molecules that are used to identify hematopoietic stem cells.

Hybridoma – A hybrid cell produced by the fusion of an antibody-producing cell and a multiple myeloma cell. The cell has the capability to produce a continuous supply of identical antibodies.

Hydroxyapatite – A natural mineral structure that contains calcium and phosphate ions that provide the power for the formation of bones and teeth.

Hypoblast – The inner cell layer, or endoderm, which develops during the formation of the embryonic germ layers.

Identical twinning – Process in which genetically identical organisms arise from symmetrical division and separation of totipotent cells.

Immune-function assay – A general term for a number of tests based on an immune cell's ability to carry out a particular immune function.

Immune system cells – White blood cells or leukocytes that originate from the bone marrow. They include antigen presenting cells, such as dendritic cells, T and B lymphocytes, and neutrophils, among many others.

Immunocompromised mice – These genetically altered mice are used for transplantation experiments because they usually do not reject the transplanted tissue.

Immunofluorescence – The detection of antibodies by using special proteins labeled with fluorescein. When present, the specific organism or antibody is observed as a fluorescent material when examined microscopically while illuminated with a fluorescent light source.

Immunogenic – Relating to or producing an immune response.

Immunohistology – Examination of tissues through specific immunostaining techniques.

Immunophenotyping – Identification of various types of immune cells by sorting them according to their cell-surface markers.

In utero – In the uterus.

In vitro – Literally, "in glass;" in a laboratory dish or test tube; an artificial environment.

In vitro fertilization (IVF) – An assisted reproduction technique in which fertilization is accomplished outside the body.

In vivo – In the living subject; in a natural environment.

Indomethacin – An anti-inflammatory, antipain, and antifever drug. Its primary use is in rheumatoid arthritis and degenerative joint disease when aspirin-based products are ineffective or cannot be tolerated.

Inner cell mass – The cluster of cells inside the blastocyst. These cells give rise to the embryonic disk of the later embryo and, ultimately, the fetus.

Insulin-promoting factor 1 – A transcription factor expressed in the pancreas and necessary for the production of insulin.

Interleukin – Selected peptide or protein that primarily mediates local interactions between white blood cells.

Irradiate – Application of radiation from a source (heat, light, Xrays) to a structure or organism.

Karyotype – The full set of chromosomes of a cell arranged with respect to size, shape, and number.

Keratin – An extremely tough protein substance found in hair, nails, skin, and cornea.

Keratinocytes – Cells that synthesize keratin and are found in the skin, hair, and nails. A fibrous protein is produced by keratinocytes and may be hard or soft. The hard keratin is found in hair and nails. The soft keratin is found in the epidermis of the skin in the form of flattened non-nucleated scales that slough continually.

Knock-out mouse – A mouse that has had one or both copies of a specific gene deleted or inactivated.

Lacunae – The spaces occupied by cells (e.g., chondrocytes and osteocytes) of calcified tissues.

Lefty – A developmental factor that helps determine right-left asymmetry in vertebrates.

Leptin – A hormone produced by the placenta and fetal tissues that acts as a growth factor and modulator of metabolic and immune functions.

Leukemia inhibitory factor (LIF) – A growth factor necessary for maintaining mouse embryonic stem cells in a proliferative, undifferentiated state.

Leukocyte – A white blood cell or corpuscle.

Leukocytes are formed from undifferentiated stem cells that give rise to all blood cells.

Leukocyte common antigen – Cell-surface molecule found on white blood cells and white blood cell progenitors. Also referred to as CD45.

Lineage surface antigen (Lin) – A mixture of monoclonal antibodies that are directed against antigens found on mature hematopoietic cells of different lineages. A usual Lin mix includes eight different antibodies directed against B and T cells, myeloid cells, and erythroid cells.

Lipase – An enzyme produced by many tissues. Lipase is an important regulator of fat in the blood. A deficiency of this enzyme leads to low levels of high-density lipoproteins (HDLs).

Lipid – Any one of a group of fats or fatlike substances characterized by their insolubility in water and solubility in fat solvents such as alcohol, ether, and chloroform.

Lymph nodes – Widely distributed lymphoid organs within the lymphatic system where many immune cells are concentrated.

Lymphatic system – A network of lymph vessels and nodes that drain and filter antigens from tissue fluids before returning lymphocytes to the blood.

Lymphocyte – A cell present in the blood and lymphatic tissue.

Lymphoid – A shape or form that resembles lymph or lymph tissue.

Macrophage – A monocyte that has left the circulation and settled and matured in a tissue. Because of their placement in the lymphoid tissues, macrophages serve as the major scavenger of the blood, clearing it of abnormal or old cells and cellular debris as well as pathogenic organisms.

Major histocompatibility complex (MHC) – A group of genes that code for cell-surface histocompatibility antigens. These antigens are the primary reason why organ and tissue transplants from incompatible donors fail.

Marker – See Surface marker.

Mast cell – A large tissue cell that does not circulate in the blood. They are also important in producing the signs and symptoms of hypersensitivity reaction, such as those of an insect sting, and certain forms of asthma.

Maternal gene product – A product in the male organism of a gene from the X chromosome.

Meiosis – A process where two successive cells divide and produce cells, eggs, or sperm that contain half the number of chromosomes in the somatic cells. During fertilization, the nuclei of the sperm and ovum fuse and produce a zygote with the full chromosome complements.

Melanocyte – A cell that produces the dark pigment melanin; responsible for the pigmentation of skin and hair.

Memory – The ability of antigen-specific T or B cells to “recall” prior exposure to an antigen and respond quickly without the need to be activated again by CD4 helper T cells.

Memory cells – A subset of antigen-specific T or B cells that “recall” prior exposure to an antigen and respond quickly without the need to be activated again by CD4 helper T cells.

Mesenchymal stem cells (MSCs) – Cells from the immature embryonic connective tissue. A number of cell types come from mesenchymal stem cells, including chondrocytes, which produce cartilage.

Mesoderm – The middle layer of the embryonic disk, which consists of a group of cells derived from the inner cell mass of the blastocyst. This middle germ layer is known as gastrulation and is the precursor to bone, muscle, and connective tissue.

Metaphase – A stage of mitosis where chromosomes are firmly attached to the mitotic spindle at its equator but have not yet segregated toward opposite poles.

Microtubule – An elongated, hollow tubular structure present in the cell. Microtubules help certain cells maintain their rigidity, convert chemical energy into work, and provide a means of transportation of substances in different directions within a cell.

Monoclonal – From a single cell.

Monoclonal antibody (MoAb) – An exceptionally pure and specific antibody derived from hybridoma cells. Because each of the clones is derived from a single B cell, all of the antibody molecules it makes are identical.

Monocyte – A white blood cell derived from myeloid stem cells.

Mononucleocyte – A cell containing a single nucleus. Generally refers to a white blood cell.

Morphology – The shape and structural makeup of a cell, tissue, or organism.

Morula – A solid mass of cells that resembles a mulberry and result from the cleavage of an ovum.

Mouse embryonic fibroblast (MEF) – Mouse embryonic fibroblast cells are used as feeder cells when culturing pluripotent stem cells.

Multipotent stem cells – Stem cells that have the capability of developing cells of multiple germ layers.

Myelin – A fatty sheath that covers axons of nerve cells. It is produced by oligodendrocytes and provides an insulation for nerve conduction through the axons.

Myelin basic protein (MPB) – A structural protein within the myelin sheath surrounding neurons.

Myelin sheath – Insulating layer of specialized cell membrane wrapped around vertebrate axons. This sheath is produced by oligodendrocytes in the central nervous system and by Schwann cells in the peripheral nervous system.

Myeloid – Marrow-like, but not necessarily originating from bone marrow.

Myeloid stem cells – Precursors to the other lines of blood cells: erythrocytes, granulocytes, monocytes, and platelets. The second-generation cells are still pluripotent but their developmental potency is limited because neither can form an offspring of the other type.

Myocyte – A muscular tissue cell.

MyoD1 – A group of four basic myogenic regulatory factors (helix-loop-helix transcription) and a newly discovered factor called muscle enhancer factor-2 which appears to work away from the other three factors. However, all four of the factors in this MyoD family have the capacity of converting nonmuscle cells into cells expressing the full range of muscle proteins.

Myosin – A protein in muscle fibers.

Myosin light chain – There are four light chain subunits containing complex molecules that form contractile units in skeletal muscle.

Nestin – An intermediate filament protein found in cells such as neural and pancreatic precursors.

Neural crest – A band of cells that extend lengthwise along the neural tube of an embryo and give rise to cells that form the cranial, spinal, and autonomic ganglia, as well as becoming odontoblasts, which form the calcified part of the teeth.

Neural plate – A thickened band of ectoderm along the dorsal surface of an embryo. The nervous system develops from this tissue.

Neural stem cell (NSC) – A stem cell found in adult neural tissue that can give rise to neurons, astrocytes, and oligodendrocytes.

Neural tube – The embryological forerunner of the central nervous system.

Neuroectoderm – The central region of the early embryonic ectoderm, which later forms the brain and spinal cord, as well as evolving into nerve cells of the peripheral nervous system

Neuroepithelium – A specialized epithelial structure that forms the termination of a nerve of a special sense, i.e., olfactory cells, hair cells of the inner ear, and the rods and cones of the retina. It is the embryonic layer of the epiblast that develops into the cerebrospinal axis.

Neurofilament (NF) – A type of intermediate filament found in nerve cells.

Neuron – A nerve cell, the structural and functional unit of the nervous system. A neuron consists of a cell body and its processes, an axon, and one or more dendrites. Neurons function by the initiation and conduction of impulses and transmit impulses to other neurons or cells by releasing neurotransmitters at synapses.

Neurosphere – A primitive neural tissue that arises when embryonic stem cells are grown in certain culture conditions.

NMDA receptor – (*N*-methyl-d-aspartate receptor). A neurotransmitter receptor for excitatory synapses.

Nodal – A knob-like protrusion.

Node – A knot, knob; a protrusion or swelling; a constricted region; a small, rounded organ or structure.

Notochord – Forms the axial skeleton in embryos of all chordates. In vertebrates, it is replaced partially or completely by vertebrae.

Oligodendrocyte – Cell that provides insulation to nerve cells by forming a myelin sheath around axons.

Oocyte – Developing egg; usually a large and immobile cell.

Osteocalcin (OC) – A cytokine produced by osteoblasts that promotes bone formation.

Osteoclast – A giant multi-nuclear cell formed in the bone marrow of growing bones.

Osteocyte – A cell from the bone tissue.

Osteoprogenitor – A cell-type that differentiates into a mature osteocyte.

Ovarian follicle – An external, fluid-filled portion of the ovary in which oocytes mature before ovulation.

Oviduct – The passage through which the ova travel from the ovary into the uterus.

Pancreatic polypeptide – An endocrine protein produced by islet cells of the pancreas.

Paracrine factors – Cytokines or hormones that act on cells or tissues within an extremely limited area.

Passage – A round of cell growth and proliferation in culture.

Placenta – The oval or discoid spongy structure in the uterus from which the fetus derives its nourishment and oxygen.

Plasticity – The ability of stem cells from one adult tissue to generate the differentiated types of another tissue.

Pluripotent stem cell (PSC) – A single stem cell that has the capability of developing cells of all germ layers (endoderm, ectoderm, and mesoderm).

Polarity – The presence of an axial, non symmetric gradient along a cell or tissue.

Population doublings – A doubling in the number of cells when grown in culture.

Precursor Cells – In fetal or adult tissues, these are partly differentiated cells that divide and give rise to differentiated cells. Also known as progenitor cells.

Pre-implantation embryo – The very early, free-floating Embryo, from the time the egg is fertilized until implantation in the mother's womb is complete.

Primary germ layers – The three initial embryonic germ layers—endoderm, mesoderm, and ectoderm—from which all other somatic tissue-types develop.

Primitive streak – The initial band of cells from which the embryo begins to develop. The primitive streak establishes and reveals the embryo's head-tail and left-right orientations.

Radioimmunoassay – A sensitive method of determining the concentration of a substance, particularly a protein-bound hormone, in blood plasma.

Retinoic acid – A metabolite of vitamin A.

Ribonucleic acid (RNA) – A chemical that is similar in structure to DNA. One of its main functions is to translate the genetic code of DNA into structural proteins.

Ribosome – Any of the RNA- and protein-rich cytoplasmic organelles that are sites of protein synthesis.

Schwann cell – In the embryo, Schwann cells grow around the nerve fiber, forming concentric layers of cell membrane (the myelin sheath).

Side population (SP) stem cell – Two examples of multipotent stem cell populations found in bone marrow and skeletal muscle. SPs are not yet fully characterized. Their significance is their unexpected ability to differentiate into cell types that are distinct from their tissue of origin.

Signal transduction pathways – Relay of a signal by the conversion from one physical or chemical form to another. In cell biology, signal transduction is the process in which a cell converts an extracellular signal into a response.

Somatic cell nuclear transfer – The transfer of a cell nucleus from a somatic cell into an egg from which the nucleus has been removed.

Somatic cells – Any cell of a plant or animal other than a germ cell or germ cell precursor.

Somatostatin – A hormone that inhibits the secretion of insulin and gastrin.

Steel factor – See stem cell factor.

Stem cell – A cell that has the ability to divide for indefinite periods in culture and to give rise to specialized cells.

Stem cell antigen 1 (Sca-1) – Cell-surface protein on bone marrow cell, indicative of hematopoietic stem cells and mesenchymal stem cells.

Stem cell factor (SCF) – Relatively undifferentiated cell that can continue dividing indefinitely, throwing off daughter cells that can undergo terminal differentiation into particular cell types. (Also known as steel factor).

Stromal cell – A non-blood cell that is derived from blood organs, such as bone marrow or fetal liver, which is capable of supporting growth of blood cells in vitro. Stromal cells that make this matrix within the bone marrow are also derived from mesenchymal stem cells.

Sulfated proteoglycan – Molecules found primarily in connective tissues and joint fluids and that provide lubrication.

Surface marker – Surface proteins that are unique to certain cell types capable of detection by antibodies or other detection methods.

Syncytiotrophoblast – A multinucleated cell formed from the cells of the trophoblast. Only a small area of the syncytiotrophoblast is evident at the start of the formation of the embryo, but this cell tissue is highly invasive, quickly expands and soon surrounds the entire embryo.

Syncytium – A mass of cytoplasm containing many nuclei that are enclosed by a single plasma membrane. This is usually the result of either cell fusion or a series of incomplete division cycles in which the nuclei divide but the cell does not.

T cells – A type of white blood cell that is of crucial importance to the immune system. Immature T cells migrate to the thymus gland in the upper chest cavity, where they mature and differentiate into various types of mature T cells and become active in the immune system in response to a hormone called thymosin and other factors. T-cells that are potentially activated against the body's own tissues are normally killed or changed ("down-regulated") during this maturation process.

Telomerase – An enzyme that is composed of a catalytic protein component and an RNA template and that synthesizes DNA at the ends of chromosomes and confers replicative immortality to cells.

Telomere – The end of a chromosome, associated with a characteristic DNA sequence that is replicated in a special way. A telomere counteracts the tendency of the chromosome to shorten with each round of replication.

Tenocyte – Tendon-producing cell.

Teratocarcinoma – A tumor that occurs mostly in the testis.

Teratogen – A drug or other agent that raises the incidence of congenital malformations.

Teratoma – A tumor composed of tissues from the three embryonic germ layers. Usually found in ovary and testis. Produced experimentally in animals by injecting pluripotent stem cells, in order to determine the stem cells' abilities to differentiate into various types of tissues.

Thiazolidinediones – A class of antidiabetes drugs that enhances the activity of insulin.

Thrombopoietin – Growth factor for the proliferation and differentiation of platelet forming cells called megakaryocytes.

Thymus – A lymphoid organ located in the upper chest cavity. Maturing T cells go directly to the thymus, where they are “educated” to discriminate between self and foreign proteins. (See tolerance induction.)

Tissue culture – Growth of tissue in vitro on an artificial medium for experimental research.

Tolerance – A state of specific immunologic unresponsiveness. Individuals are normally tolerant to their own cells and tissues. Autoimmune diseases occur when tolerance fails.

Tolerance induction – The “education” process that T cells undergo to discriminate between self and foreign proteins. This process takes place primarily in the thymus. In addition to inactivating or deleting self-reactive T cells, those T cells that can recognize the body’s MHC proteins, but not be activated solely by this recognition, are also selected to leave the thymus (circulate through the body).

Totipotent – Having unlimited capability. The totipotent cells of the very early embryo have the capacity to differentiate into extra embryonic membranes and tissues, the embryo, and all postembryonic tissues and organs.

Transaminase – An enzyme that catalyzes chemical reactions in the body in which an amino group is transferred from a donor molecule to a recipient molecule.

Transcription – Making an RNA copy from a sequence of DNA (a gene). Transcription is the first step in gene expression.

Transcription factor – Molecules that bind to RNA polymerase III and aid in transcription.

Transgene – A gene that has been incorporated from one cell or organism and passed on to successive generations.

Translation – The process of forming a protein molecule at a ribosomal site of protein synthesis from information contained in messenger RNA.

Trophectoderm – The outer layer of the developing blastocyst that will ultimately form the embryonic side of the placenta.

Trophoblast – The extraembryonic tissue responsible for negotiating implantation, developing into the placenta, and controlling the exchange of oxygen and metabolites between mother and embryo.

Trypsin – An enzyme that digests proteins. Often used to separate cells.

Undifferentiated – Not having changed to become a specialized cell type.

Unipotent – Refers to a cell that can only develop in a specific way to produce a certain end result.

Vascular – Composed of, or having to do with, blood vessels.

Villi – Projections from the surface, especially of a mucous membrane. If the projection is minute, as in a cell surface, it is called a microvillus.

Vimentin – The major polypeptide that joins with other subunits to form the intermediate filament cytoskeleton of mesenchymal cells. Vimentin may also have a role in maintaining the internal organization of certain cells.

White blood cell (WBC) – The primary effector cells against infection and tissue damage. WBCs are formed from the undifferentiated stem cell that can give rise to all blood cells. Also known as a leukocyte.

X inactivation – The normal inactivation of one of the two X chromosomes in females.

Y chromosome – The chromosome which determines male gender.

Yolk sac – Vital to the embryo for the formation of primordial and other cells that form the embryo. In mammals, it is small and devoid of a yolk.

Zona pellucida – A thick, transparent noncellular layer that surrounds and protects the oocyte.

Zygote – A cell formed by the union of male and female germ cells (sperm and egg, respectively).

Appendix F.ii.

TERMS

AGM – The region where the aorta, gonads, and fetal kidney mesh.

ALS – A myotrophic lateral sclerosis. Also known as Lou Gehrig's disease.

BME – Beta-mercaptoethanol.

BMP-1 to BMP-9 – Bone morphogenetic proteins that are signaling molecules.

BRCA1 – Breast Cancer Gene 1.

BRCA2 – Breast Cancer Gene 2.

C/EBC – CCAAT/Enhancer binding protein.

CD4 – Helper T cells that are instrumental in initiating an immune response by supplying help in the form of special cytokines to both CD 8 cytotoxic T cells and B cells.

CD8 – Cytotoxic (killer) T cells that are capable of killing infected cells once activated by cytokines secreted by antigen-specific CD4 helper T cells.

CMV – Cytomegalovirus.

EBs – Embryoid bodies.

EG – Embryonic germ cell.

ES – Embryonic stem cell.

FACS – Fluorescence-activated cell sorting.

Fas receptor (CD95) – Fatty acid synthase.

FGF-1 to FGF-10 – Fibroblast growth factor 1 to 10. A growth factor molecule.

GATA4 – Transcription factor. Important in embryonic stem differentiation into yolk sac endoderm.

GATA6 – Important for embryonic stem cell differentiation into heart smooth muscle.

GCSF – Granulocyte-colony stimulating factor.

Gdf-5 – Growth/differentiation factor – 5. A growth factor molecule.

GDNF – Glial cell-derived neurotrophic factor. A growth factor molecule.

GFP – Green fluorescent protein.

Gp130 – Glycoprotein. Signal transducing receptor of Cytokines.

Gsc – Goosecoid. A signaling molecule.

hCNS-SC – Human central nervous system stem cell.

Hesx1 – Pituitary transcription factor.

Hex – Hexosaminidase. Enzyme for processing lipid (fat).

HGF – Hepatic growth factor molecule. Also a scatter factor.

HLAs – Human leukocyte antigens.

Hoxa-d – Homeobox-containing a to d. A transcription factor.

HPC – Hematopoietic progenitor cell.

HSC – Hematopoietic stem cell.

ICM – Inner Cell Mass.

IVF – In vitro fertilization.

LIF – Leukemia inhibitory factor. A growth factor molecule.

Lim1 – A transcription factor molecule.

Mac-1 (CD11b) – Antigen found in blood cells. Indicative of murine and progenitor cells.

MPC – Mesenchymal progenitor cell.

MR4 – Metabolic regulator. Important for electron transport and ATP synthesis.

MSC – Mesenchymal stem cell.

Myf-5 – Myogenic regulatory factor molecule.

NK – Natural killer lymphocytes.

NSC – Neural stem cell.

Oct4 – Octamer binding gene. Important for germ cell generation.

Otx2 – A transcription factor molecule.

Pax-1 to Pax-9 – Paired box 1-9. A transcription factor molecule.

PDGF – Platelet-derived growth factor.

PDX-1 – A transcription factor molecule.

PECAM 1 – Platelet. Endothelial cell adhesion molecule.

SDF-1/CXCR4 – Stromal-derived factor and its receptor.

SHH – Sonic hedgehog.

SMA – Alpha-smooth muscle actin.

SP – Side population stem cell.

Stat 3 – Signal Transducers and Activators of Transcription 3.

T3 – Triiodothyronine. A thyroid hormone important for hematopoietic cells.

TGF- β 1 to TGF- β 5 – Transforming growth factors.

TPO/mpl – Thrombopoietin and receptor.

VEGF – Vascular endothelial growth factor.

Wnt1 – A signaling molecule.

XIST – X-inactive specific transcript. Uncertain function.