



GLOSSARY

Cultivated Meat

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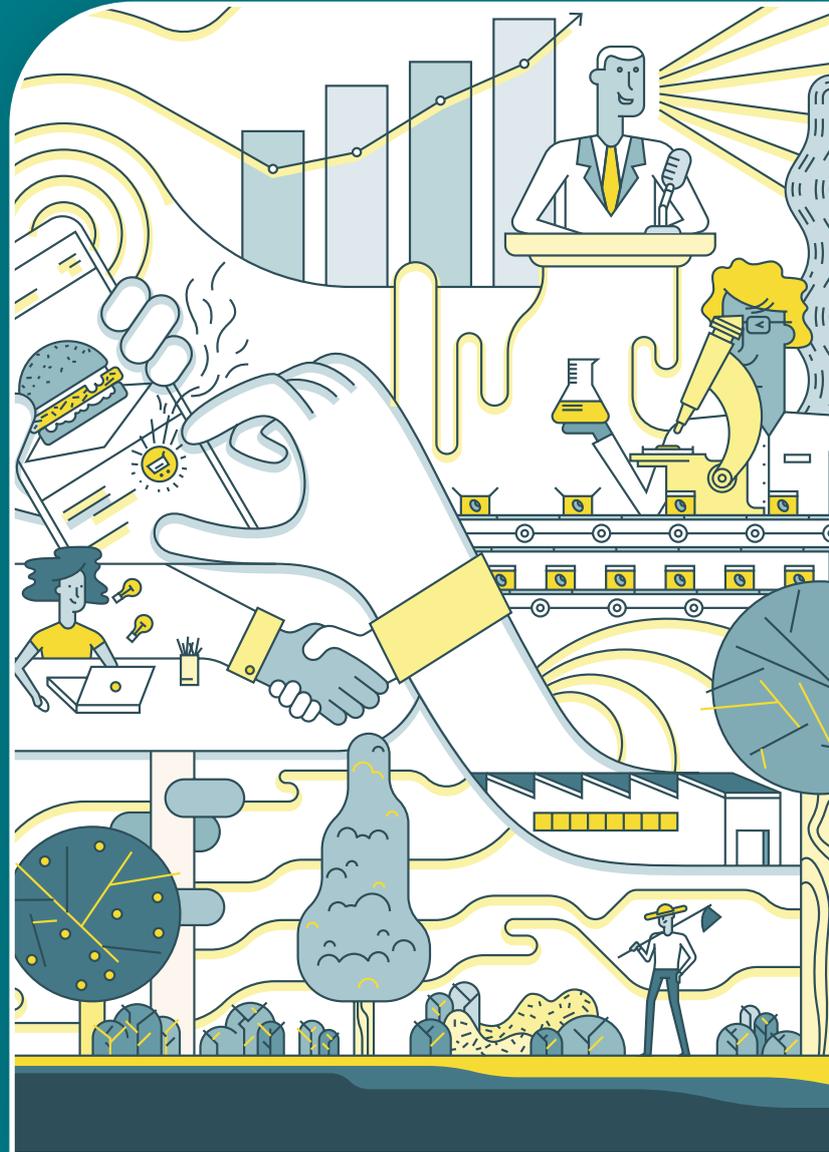
PORTO, Luismar Marques; BERTI, Fernanda Vieira. Glossary: Cultivated meat.
São Paulo: Tiki Books: The Good Food Institute Brasil Team, 2022.

DOI: https://doi.org/10.22491/cultivated_meat_glossary

The Good Food Institute Brasil

We are a global nonprofit organization working to transform the food supply chain.

We have teams in the United States, Brazil, Israel, India, Japan, and countries in Europe and Asia-Pacific. We support the alternative protein sector to develop meat, eggs, and dairy replacement products through different technologies (plant-based, cultivated, or fermentation).



To this end, the institution offers its services free of charge to society through three program areas:



Corporate Engagement

We support the food and ingredients industry, restaurants, and retailers in developing, improving, and distributing alternative protein products. We assist startups and investors in preparing business plans, financing, communication, marketing, and regulation. Additionally, we gather, analyze and release data and information relevant to the market.



Science and Technology

We work to develop, finance, and promote the scientific knowledge around the production process of meat, eggs, and dairy products made from plants, grown from cells, or obtained through fermentation. We promote the training of professionals and disseminate technical and scientific knowledge within the field of alternative proteins.



Public Policy

We work directly with government agents and policymakers. We also foster communication between the government and market agents to ensure that the current regulatory framework allows for the full development of Brazil's alternative protein sector.

With this work, GFI seeks solutions to solve four major current challenges:

- 1** Feeding almost ten billion people in a safe, fair, and sustainable manner by 2050.
- 2** Mitigating the climate impacts resulting from the current food production system.
- 3** Reducing the role of the food sector in the emergence of new infectious diseases, some with pandemic potential.
- 4** Creating a food production chain that does not depend on animals.

GFI is building a world where alternative proteins are no longer alternatives, they are the default choice.



Presentation

The Cultivated Meat Glossary, commissioned by The Good Food Institute Brazil, is a document with a vast list of terms related to cell culture technology, including cell culture, tissue engineering and bioprocessing. The terms and their respective definitions are organized in alphabetical order.

Since the subject of cultivated meat is broad and multidisciplinary, this glossary contains acronyms, abbreviations, concepts and jargon terms (specific technical terminology) covering biological sciences, engineering, food technology, and regulatory terms.



The primary purpose of this document is to present terms unknown to the reader interested in cultivated meat and cellular agriculture technologies, as well as to act as reference material for the audience of technical animations, students and experts in the field.

The glossary should be helpful to all agents interested in cultivated meat. In particular, those who wish to promote the production processes of this technology and who wish to learn or consult terms that may involve in their research, enterprise or regulation, whether academic, business, governmental, public or private agents.



How to read?

The listed terms have been grouped into topics according to their main context. These topics are color coded as follows:

Cells

Terms related to cell culture, cellular and molecular biology.

Bioreactors

Terms related to bioengineering, tissue engineering, bioreactors and bioprocesses.

Scaffolds

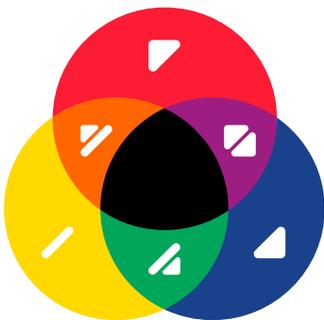
Terms related to support structures usually made from biomaterials.

Culture Media

Terms related to cell culture media.

Others

Terms not included in the topics above.



Chromatic accessibility

[ColorADD®](#) is a universal, inclusive language that enables the colorblind to identify colors whenever it is a factor of identification, orientation, or choice. By using symbols, this system can simulate the additive properties of color and represent primary and secondary colors and shades.

How to navigate?

The document's navigation system has action links that help to locate terms. They work as follows:

Page

Initial Letter

Shows the initial letter of the terms on the page.

Alphabetical Index

Shows the page where the terms with a given initial letter begin. Click to go there.

Return

Click to return to the alphabetical index page.



Alphabetical Index

A	12	N	30
B	14	O	31
C	16	P	32
D	19	Q	34
E	20	R	35
F	21	S	36
G	22	T	38
H	24	U	39
I	25	V	40
J	26	W	41
L	27	X	42
M	28	Z	43

3D cell culture

A 3D cell culture is an artificially created environment in which biological cells are permitted to grow or interact with their surroundings in all three dimensions. Unlike 2D environments (e.g. a Petri dish), a 3D cell culture allows cells in vitro to grow in all directions, similar to how they would in vivo. These three-dimensional cultures are usually grown in bioreactors, small capsules in which the cells can grow into spheroids, or 3D cell colonies. Approximately 300 spheroids are usually cultured per bioreactor.

3D printing

The manufacturing of solid objects by the deposition of layers of material (such as plastic) in accordance with specifications that are stored and displayed in electronic form as a digital model.

adhesion

1) Steady or firm attachment: adherence; 2) the action or state of adhering; 3) the abnormal union of separate tissue surfaces by new fibrous tissue resulting from an inflammatory process, or also the newly formed uniting tissue; 4) the molecular attraction exerted between the surfaces of bodies in contact.

adventitious agent

Contaminating microorganism of the cell culture or starting and/or raw materials, including bacteria, fungi, mollicutes (mycoplasmas or spiroplasmas), mycobacteria, rickettsia, protozoa, parasites, agents causing TSEs and viruses that have been unintentionally introduced into the manufacturing process of a biological product. The source of the contaminant may be the legacy of the cell line, the raw materials used in the culture medium to propagate the cells (in banking, in production or in their legacy), the environment, personnel, equipment or elsewhere.

agitated vessel

See stirred tank reactor (STR).

Airlift Reactor (ALR)

Pneumatically agitated bioreactor where the injection of a gas stream into a specific reactor compartment, the riser, causes the reaction broth to circulate between the riser and an interconnected downcomer compartment containing a smaller (or negligible) gas phase.

allergen

1) A substance, protein or nonprotein, capable of inducing allergy or specific hypersensitivity. 2) A purified protein of a food (such as milk, eggs, or wheat), bacterium, or pollen. Allergens are used to test a patient for hypersensitivity to specific substances. They are also used to desensitize or hyposensitize allergic individuals.

alternative protein

Alternative proteins refer to meat, egg, or dairy products that are plant-based, cultivated, or fermentation-derived.

American Type Culture Collection (ATCC)

ATCC is a private, nonprofit organization dedicated to the acquisition, preservation, authentication, and distribution of diverse biological materials. ATCC was founded by scientists in 1925 to serve as a national repository and distribution center for cultures of microorganisms. Since that time, viruses, animal and plant cell cultures, and recombinant DNA materials have been added. ATCC is now the largest general service culture collection in the world, with collections in six areas: Bacteriology, Cell Culture, Molecular Biology, Mycology, Protistology, and Virology.

amino acid

Organic molecule containing both an amino group and a carboxyl group. Those that serve as building blocks of proteins are alpha amino acids, having both the amino and carboxyl groups linked to the same carbon atom.

animal-cell-based

Refers to foods based on animal cells that are grown in cell cultures (in vitro), starting from a small number of cells taken from a live animal.

antibiotic

Substance such as penicillin or streptomycin that is toxic to microorganisms. Often a natural product of a particular microorganism or plant.

antibody

Protein secreted by activated B cells in response to a pathogen or foreign molecule. Binds tightly to the pathogen or foreign molecule, inactivating it or marking it for destruction by phagocytosis or complement-induced lysis.

antigen

A molecule that can induce an adaptive immune response or that can bind to an antibody or T cell receptor.

antimicrobial agents

Class of substances that can destroy or inhibit the growth of pathogenic groups of microorganisms, including bacteria, viruses, parasites, and fungi.

Antimicrobial Resistance (AMR)

Antimicrobial resistance is a result of drug resistance in which antibiotics and other antimicrobial medicines become ineffective and infections become increasingly difficult or impossible to treat.

antiseptics

Elimination of microorganisms from the skin, mucosa or living tissue, with the aid of antiseptics, microbiocidal or microbiostatic substances. See also sterilization, disinfection, decontamination, asepsis, cleaning.

apoptosis ▾

Form of programmed cell death, in which a "suicide" program is activated within an animal cell, leading to rapid cell death mediated by intracellular proteolytic enzymes called caspases.

asepsis ▾

Methods used to prevent contamination of a particular material or surface. See also sterilization, disinfection, decontamination, antisepsis, cleaning.

asymmetric cell division ▾

Cell division in which some important molecule or molecules are distributed unequally between the two daughter cells, causing these cells to become different from each other.

autocrine ▾

Secretion of a substance that influences the cell that secreted it.

autophagy ▾

Digestion of cytoplasm and worn-out organelles by the cell's own lysosomes.

basal medium

Amino acids, vitamins, glucose, and inorganic salts, which are essential factors in cell growth and metabolism.

batch process

A batch process is one in which a series of operations are carried out over a period of time on a separate, identifiable product or material. It is different from a continuous process, during which all operations occur at the same time and the material being processed is not divided into identifiable portions.

bench scale

See laboratory scale.

biocompatibility

A measure of how a biomaterial interacts in the body with the surrounding cells, tissues and other factors. A biomaterial is considered to have good biocompatibility if it does not generate a vigorous immune response, resists build-up of proteins and other substances on its surface that would hinder its function, and is resistant to infection.

bioconversion

Bioconversion, also known as biotransformation, is the conversion of organic materials, such as plant or animal waste, into usable products or energy sources by biological processes or agents, such as certain microorganisms or other cells.

bioengineering

Bioengineering (or biological engineering) is a discipline that applies engineering principles of design and analysis to biological systems and biomedical technologies. Examples of bioengineering research include bacteria engineered to produce chemicals, new medical imaging technology, portable disease diagnostic devices, and tissue engineered organs.

bioinformatics

The branch of biology that is concerned with the acquisition, storage, display and analysis of biological information. Analysis of biological information includes statistical and computational methods to model biological processes.

biological activity

Biological activity is the capacity of a specific molecular entity to achieve a defined biological effect on a target. It is measured in terms of potency or the concentration of the molecular entity needed to produce the effect. A biological activity is determined by means of a biological assay.

biological engineering

See bioengineering.

biological reactor

See bioreactor.

biomass

Biomass is a term used in various contexts. In bioprocessing, it refers to a mass of animal cells or microorganisms used to produce an industrial product. In cultivated meat production, biomass is the collection of cells obtained after proliferation and differentiation. Once separated from the culture medium, this biomass can serve as an ingredient for further processing into the final product.

biomaterial

Any matter, surface, or construct that interacts with biological systems. Biomaterials can be derived from nature or synthesized in the laboratory using metallic components, polymers, ceramics, or composite materials. Medical devices made of biomaterials are often used to replace or augment a natural function. Examples include heart valves, hip replacements, and materials used regularly in dentistry and surgery. In cellular agriculture, it is expected that the biomaterial, when used as a support (scaffolds), is recognized as safe for human consumption.

biomimetic

Using biological form and function seen in nature to inspire the design of solutions to engineering problems.

biomolecule

A biomolecule is a chemical compound found in living organisms. These include chemicals that are composed of mainly carbon, hydrogen, oxygen, nitrogen, sulfur and phosphorus. Biomolecules are the building blocks of life and perform important functions in living organisms.

bioprinting

The incorporation of biological materials into additive manufacturing techniques, either by directly depositing cells layer-by-layer or indirectly by 3D printing biologically active materials for later use in cellular applications.

bioprocess

A bioprocess is a specific process that uses complete living cells, such as animal cells, or their components (e.g., bacteria, enzymes, chloroplasts) to obtain desired products, for instance cultivated meat.

bioproduct

Bioproducts or bio-based products are materials, chemicals and energy derived from renewable biological resources. Cultivated meat is a highly complex bioproduct, which uses animal cells to obtain an edible product, similar to meat obtained from slaughtered animals.

bioreactor

System developed to carry out a bioprocess, which presents an ideal environment to growth cells and synthesis of a bioproduct of interest. A simple glass flask can be considered as a bioreactor, but this term is normally applied to more complex equipment, which allow the homogenization of the culture medium with cells, keeping controlled (or sometimes just monitored) process variables such as temperature, pH and dissolved oxygen.

Biosafety Level (BSL)

Specific combinations of work practices, safety equipment, and facilities, designed to minimize the exposure of workers and the environment to infectious agents. Biosafety level 1 applies to agents that do not ordinarily cause human disease. Biosafety level 2 is appropriate for agents that can cause human disease, but whose potential for transmission is limited. Biosafety level 3 applies to agents that may be transmitted by the respiratory route which can cause serious infection. Biosafety level 4 is used for the diagnosis of exotic agents that pose a high risk of life-threatening disease, which may be transmitted by the aerosol route and for which there is no vaccine or therapy.

biosensor

A device that uses biological material, such as DNA, enzymes and antibodies, to detect specific biological, chemical, or physical processes and then transmits or reports this data.

blastocyst

The modified blastula of a placental mammal having an outer layer composed of the trophoblast.

brownian motion

A random movement of microscopic particles suspended in liquids or gases resulting from the impact of molecules of the surrounding medium.

buffer

Solution of weak acid or weak base that resists the pH change that would otherwise occur when small quantities of acid or base are added.

by-product

A by-product or byproduct is a secondary product derived from a production process, manufacturing process or chemical reaction; it is not the primary product or service being produced.

c-GMP facility

It is a production facility for the manufacturing of pharmaceutical or cellular products. It includes the manufacturing space, the storage warehouse for raw and finished product and support laboratory areas.

cadherin

Member of the large cadherin superfamily of transmembrane adhesion proteins. Mediates homophilic Ca^{2+} -dependent cell-cell adhesion in animal tissues.

capability of a process

Ability of a process to produce a product that will fulfill the requirements of that product. The concept of process capability can also be defined in statistical terms (ISO 9000:2005).

capsid

Protein coat of a virus, formed by the self-assembly of one or more types of protein subunit into a geometrically regular structure.

carbon food print

It is the total amount of greenhouse gas emissions that come from the production, use and end-of-life of a product or service. It includes carbon dioxide—the gas most commonly emitted by humans—and others, including methane, nitrous oxide, and fluorinated gases, which trap heat in the atmosphere, causing global warming.

carcinogenesis

The generation of cancer.

carcinogenicity

Producing or tending to produce cancer. Display of the full set of chromosomes of a cell, arranged with respect to size, shape, and number.

cartilage

Form of connective tissue composed of cells (chondrocytes) embedded in a matrix rich in type II collagen and chondroitin sulfate proteoglycan.

cDNA clone

Clone containing double-stranded cDNA molecules derived from the protein-coding mRNA molecules present in a cell.

cDNA library

Collection of cloned DNA molecules representing complementary DNA copies of the mRNA produced by a cell.

cell

A small usually microscopic mass of protoplasm bounded externally by a semipermeable membrane, usually including one or more nuclei and various other organelles with their products, capable alone or interacting with other cells of performing all the fundamental functions of life, and forming the smallest structural unit of living matter capable of functioning independently.

cell banking

A facility for keeping cells frozen at extremely low temperatures. Refers to the process by which a specific type of cell is replicated, and stored (cryopreserved) for later use.

cell culture

Cell culture is the process by which cells are grown under controlled conditions, generally outside their natural environment. After the cells of interest have been isolated from living tissue, they can subsequently be maintained under carefully controlled conditions.

cell cycle (cell-division cycle)

Reproductive cycle of a cell: the orderly sequence of events by which a cell duplicates its chromosomes and, usually, the other cell contents, and divides into two.

cell density

Refers to the number of cells in a volume specific.

cell differentiation

It is the process in which a cell changes from one cell type to another. Usually, the cell changes to a more specialized type.

cell division

It is the process by which a parental cell gives rise to two daughter cells. The process involves both nuclear division and cytokinesis and can either produce two equal cells (symmetric cell division) or two cells with different cellular fates (asymmetric cell division).

cell line

A cell is considered primary until its first subculture (passaging), after which it is called cell line. After successive subcultures of a very heterogeneous primary culture, containing many types of cells in the original tissue, a more homogeneous cell line appears. A cell line can be serially propagated in culture, either by a limited number of cell divisions or indefinitely. Finite-lived cell lines are usually diploid and still maintain some degree of differentiation. However, they enter into senescence after a certain number of divisions.

cell maturation

A developmental process, independent of morphogenetic (shape) change, that is required for a cell to attain its fully functional state.

cell migration

Cell migration is the process by which cells move from one location to another by adopting different motility modes, such as mesenchymal, amoeboid or collective migration. Cell motility is observed in unicellular organisms, is essential for the development and maintenance of multicellular organisms, and is also involved in immune responses and pathological conditions.

cell passage

The splitting (dilution) and subsequent redistribution of a monolayer or cell suspension into culture vessels containing fresh media, also known as subculture.

cell reprogramming

Changing the function of a cell using chemical, protein or even mechanical force. Most commonly, a cell, like a skin cell, may be treated with protein factors that reprogram it to become a stem cell that can then be reprogrammed, with various protein or chemical factors, to function as a different type of cell such as a liver, heart or nerve cell.

cell sorting

Cell sorting is defined as the separation of a heterogeneous mixture of cells into purified fractions of homogeneous cells. In this context it will also include the isolation of individual cell types from a heterogeneous mixture of cells. In this context cell refers to prokaryotic and eukaryotic cells.

cell suspension

A liquid medium containing individual cells dispersed. This suspension enables the transfer of cells to culture systems (e.g., culture flasks) where cells can grow and multiply.

cell type

Cell types are defined by evolutionary units that differ according to their evolutionary lineages rather than their phenotypic similarities and are characterized by their ability to evolve gene expression states independently of each other.

cell-based meat

Cell-based meat is produced using animal cell culture technology, where meat is produced from animal cells using a combination of biotechnology, tissue engineering, molecular biology and synthetic processes. See cultivated meat.

cellular agriculture

Cellular agriculture focuses on the production of agriculture products from cell cultures using a combination of biotechnology, tissue engineering, molecular biology, synthetic biology, biomaterials (scaffolds) and bioprocess and bioreactor engineering to create and design new methods of producing proteins, fats, and tissues.

cellulose

Long, unbranched chains of glucose; major constituent of plant cell walls. When produced by microorganisms, it is in the form of nanofibers (nanocellulose).

chemical biology

Name given to a strategy that uses large-scale screening of hundreds of thousands of small molecules in biological assays to identify chemicals that affect a particular biological process and that can then be used to study it.

chemically-defined culture media

A chemically defined medium is a growth medium suitable for the in vitro cell culture of human or animal cells in which all of the chemical components are known. Standard cell culture media commonly consist of a basal medium supplemented with a source of nutrients and other ill-defined factors.

cholesterol

An abundant lipid molecule with a characteristic four-ring steroid structure. An important component of the plasma membranes of animal cells.

chondrocytes

Cartilage cells.

codon

Sequence of three nucleotides in a DNA or mRNA molecule that represents the instruction for incorporation of a specific amino acid into a growing polypeptide chain.

collagen

Fibrous protein rich in glycine and proline that is a major component of the extracellular matrix in animals, conferring tensile strength. Exists in many forms: type I, the most common, is found in skin, tendon, and bone; type II is found in cartilage; type IV is present in basal laminae.

Continuous Stirred Tank Reactor (CSTR)

A reaction vessel in which the feed is continuously added and the products continuously removed. The vessel (tank) is continuously stirred to maintain a uniform concentration within the vessel.

conventional meat

Meat obtained through conventional method where the animal is slaughtered to obtain meat.

CRISPR

A defense mechanism in bacteria using small noncoding RNA molecules (crRNAs) to seek out and destroy invading viral genomes through complementary base-pairing and targeted nuclease digestion. The genomic editing method by the CRISPR/Cas9 method technique started a new revolution in synthetic biology, now followed by other even more advanced techniques.

chromatography

Chromatography is a laboratory technique for the separation of a mixture. The mixture is dissolved in a fluid called the mobile phase, which carries it through a system on which a material called the stationary phase is fixed.

cross-contamination

Inadvertent transfer of bacteria or other contaminants from one surface, substance, etc., to another especially because of unsanitary handling procedures.

cross-flow filtration

Also known as tangential flow filtration, is a type of filtration system used in the biotechnology manufacturing. Cross-flow filtration gets its name because the majority of the feed flow travels tangentially across the surface of the filter, rather than into the filter.

cryopreservation

Storage of cells and tissues by keeping them frozen under conditions where their viability is preserved.

cryovial

Special vial used for cryopreservation. A cryovial has to satisfy special conditions such as tightness of closure even at extremely low temperatures and extreme temperature changes encountered during freezing and thawing.

cultivated meat

Cultivated meat is animal meat produced using cell culture technology. It comprises the same cell types arranged in the same or similar three-dimensional structure as animal tissues, and thus replicates the sensory and nutritional profile of conventionally produced meat, seafood, or organ meat products.

culture medium

a mix of nutritive substance, usually dissolved in an agar gel or liquid medium, in which cultures of bacteria, fungi, animal cells, or plant cells are grown. Also called growth media.

cytoplasm

Contents of a cell that are contained within its plasma membrane but, in the case of eukaryotic cells, outside the nucleus.

cytoskeleton

System of protein filaments in the cytoplasm of a eukaryotic cell that gives the cell shape and the capacity for directed movement. Its most abundant components are actin filaments, microtubules, and intermediate filaments.

deep RNA sequencing

See RNA-seq.

Deoxyribonucleic Acid (DNA)

Polynucleotide formed from covalently linked deoxyribonucleotide units. The store of hereditary information within a cell and the carrier of this information from generation to generation.

DNA cloning

1) The act of making many identical copies (typically billions) of a DNA molecule —the amplification of a particular DNA sequence;
2) Also, the isolation of a particular stretch of DNA (often a particular gene) from the rest of the cell's genome.

DNA library

Collection of cloned DNA molecules, representing either an entire genome (genomic library) or complementary DNA copies of the mRNA produced by a cell (cDNA library).

downstream processing

It is concerned with the extraction of desired products from the upstream biomass. It refers to the purification of biosynthetic products from their crude preparation like tissue fluids or fermentation broth. In downstream processing, the products which are desired are purified and separated through fermentation or enzyme reactions. The desired products are temperature sensitive, have multiple items to separate, in aqueous medium they are diluted, may have properties similar to contaminants. Downstream processing means recovery of desired products from its crude extract.

Dulbecco's Modified Eagle Medium (DMEM)

It is a widely used basal medium for supporting the growth of many different mammalian cells. Cells successfully cultured in DMEM include primary fibroblasts, neurons, glial cells, HUVECs, and smooth muscle cells, as well as cell lines such as HeLa, 293, Cos-7, and PC-12.

**Dulbecco's Modified Eagle Medium/
Nutrient Mixture F-12 (DMEM/F-12)**

It is a widely used basal medium for supporting the growth of many different mammalian cells. Cells successfully cultured in DMEM/F-12 include MDCK, glial cells, fibroblasts, human endothelial cells, and rat fibroblasts.

electroporation

Application of an external electrical field to increase the permeability of the cell membrane. It is usually used in molecular biology as a way of introducing some substance into a cell such as a drug, protein, or piece of DNA that can change the cell's function.

electrospinning

A method for the production of fibers which utilized electrical forces to draw out nanoscale threads of melted polymer material.

Embryonic Stem cells (ES cells)

Undifferentiated cells derived from the inner cell mass of the blastocyst; these cells have the potential to give rise to all cell types in the fully formed organism and undergo self-renewal.

endocytosis

Uptake of material into a cell by an invagination of the plasma membrane and its internalization in a membrane-enclosed vesicle. See also pinocytosis and phagocytosis.

endothelial cell

Flattened cell type that forms a sheet (the endothelium) lining all blood and lymphatic vessels.

Environmental and Social Risk Management (ESRM)

Environmental and Social Risk Management (ESRM) can be defined as the conscious and coordinated effort in appraising the potential and/or existing impact of various productive activities on their environment and people.

epigenetic inheritance

Inheritance of phenotypic changes in a cell or organism that do not result from changes in the nucleotide sequence of DNA. Can be due to positive feedback loops of transcription regulators or to heritable modifications in chromatin such as DNA methylation or histone modifications.

equilibrium dissociation constant (KD)

It is the basic parameter to evaluate the binding properties of the drug-receptor.

ex vivo

Ex vivo (Latin: "out of the living") literally means that which takes place outside an organism. In science, ex vivo refers to experimentation or measurements done in or on tissue from an organism in an external environment with minimal alteration of natural conditions.

exosome

Large protein complex with an interior rich in 3'-to-5' RNA exonucleases; degrades RNA molecules to produce ribonucleotides.

Extracellular Matrix (ECM)

The environment secreted by cells which biochemically and structurally supports a cellular network.

extracellular vesicles

Extracellular vesicles is a generic name given to particles released naturally from cells. Extracellular vesicles are delimited by a lipid bilayer and cannot self-replicate. These particles are involved in intercellular communication.

extrusion

A process used to generate fibrous texture in meat alternatives. Extruders squeeze a dough-like substance through a perforated plate or die to generate pieces of the desired shape. For production of plant-based alternative proteins, two extrusion methods are in use today. High-moisture extruders create large pieces of meat-like fibrous texture such as chicken strips. Low-moisture extruders produce small, dry granules, called texturized vegetable protein, or TVP, that can then be rehydrated and used in ground-meat products such as burgers.

extrusion bioprinting

Direct contact bioprinting mechanism that relies on pressure or displacement to force material through the syringes.

fat

Energy-storage lipid in cells. Composed of triglycerides— fatty acids esterified with glycerol.

fermentation

Anaerobic energy-yielding metabolic pathway involving the oxidation of organic molecules. Anaerobic glycolysis refers to the process whereby pyruvate is converted into lactate or ethanol, with the conversion of NADH to NAD⁺.

Fetal Bovine Serum (FBS)

Fetal bovine serum (FBS) is the liquid fraction remaining after the blood drawn from bovine fetus coagulates. Through centrifugation, cells, coagulation fibrinogens, and proteins are removed to produce serum.

fixed bed reactor

A fixed bed reactor is a cylindrical tube filled with catalyst pellets with reactants flowing through the bed and being converted into products. The catalyst may have multiple configuration including: one large bed, several horizontal beds, several parallel packed tubes, multiple beds in their own shells.

food print

It is the result of everything it takes to get your food from the farm to your plate.

food safety

According to CODEX, food safety is the assurance that food will not cause harm to the consumer when it is prepared and/or eaten according to its intended use.

foodborne pathogens

Foodborne pathogens (e.g. viruses, bacteria, parasites) are biological agents that can cause a foodborne illness event.

freeze-drying

Freeze-drying, also known as lyophilisation or cryodesiccation, is used to dry unstable or heat-sensitive products at low temperature, thus protecting the material from heat damage and chemical decomposition.

fungus (plural fungi)

Kingdom of eukaryotic organisms that includes the yeasts, molds, and mushrooms. Many plant diseases and a relatively small number of animal diseases are caused by fungi.

gas disperser

Gas dispersers are devices, equipment or means used to inject gases into the bioreactor; they are usually located under the impeller, with the distance and size depending on the impeller type.

gene

Region of DNA that is transcribed as a single unit and carries information for a discrete hereditary characteristic, usually corresponding to 1) a single protein (or set of related proteins generated by variant post-transcriptional processing), or 2) a single RNA (or set of closely related RNAs).

gene expression profile

In the field of molecular biology, gene expression profiling is the measurement of the activity (the expression) of thousands of genes at once, to create a global picture of cellular function. These profiles can, for example, distinguish between cells that are actively dividing, or show how the cells react to a particular treatment. Many experiments of this sort measure an entire genome simultaneously, that is, every gene present in a particular cell.

gene regulation

Gene regulation refers to the mechanisms that act to induce or repress the expression of a gene. These include structural and chemical changes to the genetic material, binding of proteins to specific DNA elements to regulate transcription, or mechanisms that modulate translation of mRNA.

genetic code

The set of rules specifying the correspondence between nucleotide triplets (codons) in DNA or RNA and amino acids in proteins.

genetic engineering

Genetic engineering is the process of using recombinant DNA (rDNA) technology to alter the genetic makeup of an organism. Traditionally, humans have manipulated genomes indirectly by controlling breeding and selecting offspring with desired traits. Genetic engineering involves the direct manipulation of one or more genes. Most often, a gene from another species is added to an organism's genome to give it a desired phenotype.

genome

The totality of genetic information belonging to a cell or an organism; in particular, the DNA that carries this information.

genome annotation

Process attempting to mark out all the genes (protein-coding and noncoding) in a genome and ascribing them particular functions.

genomic engineering

1) Genomic engineering is the synthetic assembly of complete chromosomal DNA that is more or less derived from natural genomic sequences. Genomic engineering is the top-down, global approach to synthetic biology; to be distinguished from bottom-up, local genetic circuit engineering; 2) a set of concepts and tools that uses engineering approach to transfer genomic information into bioproducts/bioprocesses.

genomic library

Collection of cloned DNA molecules representing an entire genome.

genomics

Genomics is the study of the full genetic complement of an organism (the genome). It employs recombinant DNA, DNA sequencing methods, and bioinformatics to sequence, assemble, and analyse the structure and function of genomes.

genotoxicity

Genotoxicity refers to the ability of a compound interact with DNA and/or the cellular components such as the spindle apparatus and topoisomerase enzymes that regulates the fidelity of the genome.

genotype

Genetic constitution of an individual cell or organism. The particular combination of alleles found in a specific individual.

GFI

The Good Food Institute is a nonprofit working internationally to accelerate alternative protein innovation. Access <https://gfi.org>.

Good Cell Culture Practice (GCCP)

GCCP is a guideline to encourage consensus among all interested in the use of in vitro systems, in order to establish and maintain best laboratory practices, to promote effective quality control systems, to facilitate education and training, to support editors journals and to help any authority who needs to interpret and apply based on in vitro data.

Good In vitro Method Practices (GIVIMP)

GIVIMP provides guidance for test method developers and end users of resulting data on key elements of in vitro methods. GIVIMP tackles ten important aspects related to in vitro work: 1) Roles and responsibilities, 2) Quality considerations, 3) Facilities, 4) Apparatus, material and reagents, 5) Test systems, 6) Test and reference/control items, 7) Standard operating procedures (SOPs), 8) Performance of the method, 9) Reporting of results, 10) Storage and retention of records and materials.

Good Laboratory Practice (GLP)

GLP is a quality system of management controls for research laboratories and organizations to ensure the uniformity, consistency, reliability, reproducibility, quality, and integrity of products in development for human or animal health (including pharmaceuticals) through non-clinical safety tests; from physico-chemical properties through acute to chronic toxicity tests.

Good Manufacturing Practice (GMP)

According to ANVISA, Good Manufacturing Practices are the procedures necessary to ensure the quality of food, including, at a minimum, the sanitary requirements of buildings, the maintenance and sanitation of facilities, equipment and utensils, the control of supply water, the integrated vector and urban pest control, control of hygiene and health of handlers and the control and quality assurance of the final product.

growth factor

Extracellular signal protein that can stimulate a cell to grow. They often have other functions as well, including stimulating cells to survive or proliferate. Secreted growth factors bind to transmembrane growth factor receptors to stimulate cell signalling cascades that promote proliferation, apoptosis and differentiation. Examples include epidermal growth factor (EGF) and platelet-derived growth factor (PDGF).

growth kinetics

Kinetics of growth refers to the rate at which the number of individual cells (or, more general, of active biomass) changes in a defined system.

Ham's F-12 Nutrient Mix

It was designed for serum-free single-cell plating of Chinese Hamster Ovary (CHO) cells. F-12 has since been used for serum-free growth of CHO cultures as well as serum-supplemented growth of other mammalian cells, including chondrocytes and rat prostate epithelial cells.

harvesting

The process of culturing cells involves the introduction of a host population to a growth medium, allowing the population to reproduce quickly in a nutrient-rich environment. The process of isolating target cells from a growth medium is called cell harvesting.

Hayflick limit

The Hayflick limit, or Hayflick phenomenon, is the number of times a normal somatic, differentiated human cell population will divide before cell division stops.

Hazard Analysis and Critical Control Points (HACCP)

Hazard Analysis and Critical Control Points or HACCP, is a systematic preventive approach for food safety in relation to biological, chemical, physical hazards, including allergens and radiological substances, in food production processes. HACCP aims to prevent, eliminate or reduce hazards to acceptable levels to ensure that food is safe at consumption.

heat exchanger

The equipment used for heat exchange in bioreactors usually may have an external jacket or coil through which steam or cooling water is circulated. Alternatively, helical or baffle-type coils may be located internally. Another method is to pump liquid from the reactor through a separate heat exchange unit.

heat-inactivated serum

Serum that has been heated to 56°C for 30–60 minutes to remove any enzymatic or other protein activity normally present.

HEPES (4-(2-hydroxyethyl)-1-piperazineethanesulfonic acid)

It is a zwitterionic organic chemical buffering agent and is categorized as a "good" buffer which derives from a set of buffers described by Dr. Norman Good and his colleagues in 1966.

hollow fiber

A hollow fiber bioreactor (HFB) is a three-dimensional high-density continuous perfusion cell culture system that provides an in vivo-like environment through the use of porous fibers that mimic blood capillaries. Its mechanism consists of a bundle of semi-permeable porous tubes (hollow fibers) arranged in parallel, contained in an external cylinder.

horizontal gene transfer

Gene transfer between bacteria via natural transformation by released naked DNA, transduction by bacteriophages, or sexual exchange by conjugation.

hybrid bioprinting

Utilizing multiple bioprinting mechanisms in one system to overcome the limitations of each mechanism.

hydrogel

A biomaterial made up of a network of polymer chains that are highly absorbent and as flexible as natural tissue. It is a polymeric, gel material in which the main component is water. Hydrogels have a number of uses including as scaffolds for tissue engineering, as sustained release drug delivery systems, and as biosensors that are sensitive to specific molecules such as glucose.

immortalisation

A process that allows cells to multiply indefinitely in culture.

immortalised cell line

Cells that have undergone a genetic alteration for immortalisation and that, as a result, are capable of multiplying for long periods in vitro, being able to be expanded and cryopreserved as cell bank deposits. A continuous cell line is generally more homogeneous, more stable and therefore more reproducible than a heterogeneous population of primary cells. Cells can therefore be cultured for prolonged periods in vitro. Mutations necessary for immortality can occur naturally or be intentionally induced for experimental purposes. Immortalised cell lines are a very important tool for research in biochemistry and cell biology of multicellular organisms. Immortalised cell lines are also widely used in biotechnology.

in silico

Latin, it is a modern word usually used to mean experimentation performed by computer and is related to the more commonly known biological terms in vivo and in vitro. In silico pharmacology (also known as computational therapeutics, computational pharmacology) is a rapidly growing area that globally covers the development of techniques for using software to capture, analyse and integrate biological and medical data from many diverse sources.

in situ

Latin, in the natural or normal place. Used to indicate procedures that are performed at the normal site of an organ or tissue.

in vitro

Latin, in glass. Used to indicate procedures that are performed outside of a living body, in a test tube or culture dish.

in vivo

Latin, in the living body. Used to indicate procedures that are applied within a living body.

induced pluripotent stem cells (iPS cells)

Cells that are induced by artificial expression of specific transcription regulators to look and behave like the pluripotent embryonic stem cells that are derived from embryos.

industrial scale

In terms of conventional bioreactors, reaction vessels or vessels with total volumes that are generally above 15,000 L.

inoculum

A small amount of material containing cells, bacteria, viruses, or other microorganisms that is used to start a culture.

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jetting bioprinting

Originating from inkjet printers, this noncontact bioprinting mechanism uses pressure pulses to apply bioink in predetermined locations.

laboratory scale

In terms of conventional bioreactors, reaction vessels or vessels with volumes that are generally between 100 and 2,500 mL.

laser-assisted bioprinting

Bioprinting mechanism that uses a focused laser to generate high-pressure bubbles that propel cell-containing material onto a substrate.

lentiviral transduction

A method to deliver genes of interest within of a cell.

lipid bilayer (phospholipid bilayer)

Thin double sheet of phospholipid molecules that forms the core structure of all cell membranes. The two layers of lipid molecules are packed with their hydrophobic tails pointing inward and their hydrophilic heads outward, exposed to water.

livestock

Animals such as cattle and sheep which are kept on a farm are referred to as livestock. They may be used for several purposes, particularly for the consumption of their meat.

mass balance

A mass balance (also called a material balance) is an application of the principle of conservation of mass to the analysis of physical systems. By accounting (measuring) of material entering and leaving a system, mass flows can be identified which may be unknown or difficult to be known without this technique.

mass transfer coefficient

Mass transfer coefficient is just analogous to the Heat transfer coefficient. It is a proportionality constant to the difference in the concentrations and the rate of mass transfer.

Master Cell Bank (MCB)

It is defined as an aliquot of a single pool of cells that generally has been prepared from the selected cell clone under defined conditions, dispensed into multiple containers, and stored under defined conditions. The MCB is used to derive all working cell banks (WCB).

meat

The soft substance consisting of muscle and fat that is found between the skin and bones of an animal or a human.

meat product

It means any product capable of use as human food that is made wholly or in part from any meat or other part of the carcass of any non-avian animal (See meat).

medium

The nutrient solution in which animal cells and microorganisms are grown. The composition of the media varies greatly between animal cells and microorganisms, as does the cost. The hefty price tag is due to the cost of the highly purified specialty ingredients needed, including macronutrients like sugar and amino acids, micronutrients such as vitamins, and growth factors (the signaling molecules that trigger cell growth). Growth factors are the most expensive component of animal-cell-culture media today. Microorganisms do not require growth factors, however, so their media is considerably less expensive.

mesenchymal stem cells

Term used to describe cells isolated from connective tissue, tissue that involves tissues and organs. Mesenchymal stem cells (MSCs) are obtained from tissues such as fat and umbilical cord. Not all mesenchymal stem cells (MSCs) are alike and their characteristics depend on which tissue these cells were obtained and how they were isolated and grown. They can also be called mesenchymal stromal cells.

metabolic engineering

Metabolic engineering is the use of genetic engineering to modify the metabolism of an organism. Metabolic engineering is concerned with the behaviour and properties of reaction networks, including their structure, stoichiometry, kinetics. It can involve the optimization of existing biochemical pathways or the introduction of pathway components, most commonly in bacteria, yeast or plants, with the goal of high-yield production of specific metabolites for medicine or biotechnology. In bioprocessing, metabolic engineering is used to redesign metabolic pathways so that the performance of cell cultures is improved.

metabolomics

Metabolomics refers to the systematic identification and quantification of the small molecule metabolic products (the metabolome) of a biological system (cell, tissue, organ, biological fluid, or organism) at a specific point in time. Mass spectrometry and NMR spectroscopy are the techniques most often used for metabolome profiling.

microcarrier

A microcarrier is a support matrix allowing for the growth of adherent cells in bioreactors.

microorganism-based

Refers to foods based on microorganisms (including fungi, bacteria, yeast, and microalgae) that are grown in a bioreactor.

Minimum Essential Medium (MEM)

It is one of the most commonly used of all cell culture media. MEM can be used with a variety of suspension and adherent mammalian cells, including HeLa, BHK-21, 293, HEP-2, HT-1080, MCF-7, fibroblasts, and primary rat astrocytes. We offer a variety of MEM modifications for a range of cell culture applications.

monoclonal antibody

A type of protein made in the laboratory that can bind substances in the body, including different types of cells. There are many kinds of monoclonal antibodies. A monoclonal antibody is made so that it binds to only one substance. They can be used alone or to carry drugs, toxins, or radioactive substances directly to different types cells. The monoclonal antibody secreted by a cell, particularly a hybridoma cell line. Because the hybridoma is generated by the fusion of a single B cell with a single tumor cell, each hybridoma produces antibodies that are all identical.

muscle stem cells (satellite cells)

Myosatellite cells, also known as satellite cells or muscle stem cells, are small multipotent cells with very little cytoplasm found in mature muscle. Satellite cells are precursors to skeletal muscle cells, able to give rise to satellite cells or differentiated skeletal muscle cells. They have the potential to provide additional myonuclei to their parent muscle fiber, or return to a quiescent state. More specifically, upon activation, satellite cells can re-enter the cell cycle to proliferate and differentiate into myoblasts.

mycoplasma

Mycoplasma refers to a genus of bacteria which lack a cell wall and it is currently considered the smallest known cell at about 0.1 micron (μm) in diameter.

myoblast

Mononucleated, undifferentiated muscle precursor cell. A skeletal muscle cell is formed by the fusion of multiple myoblasts.

myofibril

Long, highly organized bundle of actin, myosin, and other proteins in the cytoplasm of muscle cells that contracts by a sliding filament mechanism.

myosin

Type of motor protein that uses the energy of ATP hydrolysis to move along actin filaments.

nanoparticle

Ultrafine particles between 1 and 100 nanometers in size. The size is similar to that of most biological molecules and structures. Nanoparticles can be engineered for a wide variety of biomedical uses including diagnostic devices, contrast agents, physical therapy applications, and drug delivery vehicles. Nanoparticles are generally 1,000 times smaller than microparticles.

next-generation sequencing

High-throughput sequencing technology that processes sequences in parallel, producing thousands or millions of sequences at once from a sample. Examples of methods and technologies include 454 pyrosequencing, Illumina and Ion Torrent. Each method has different attributes, such as length of a typical sequence read, accuracy, number of reads per run, time for a run and costs. As a result, the choice of method should take into account the purpose for which the data are to be generated. Significant bioinformatics using curated (trusted) databases are needed to analyse the considerable amount of data generated in each sequencing run.

omics

The branches of science known informally as omics are various disciplines in biology whose names end in the suffix -omics, such as genomics, proteomics, metabolomics, metagenomics and transcriptomics.

omics tools

A set of methods and technologies, including those covered in disciplines such as genomics, transcriptomics, proteomics, metabolomics, etc.

organelle

Subcellular compartment or large macromolecular complex, often membrane-enclosed, that has a distinct structure, composition, and function. Examples are nucleus, nucleolus, mitochondrion, Golgi apparatus, and centrosomes.

osteoclast

Macrophage-like cell that erodes bone, enabling it to be remodeled during growth and in response to stresses throughout life.

oxygen transfer

In bioreactors, it is the transport of oxygen, contained on the surface of the injected air bubbles, to the liquid medium (bulk), and later to the interior of scaffolds and/or cells immersed in the culture medium.

oxygen transfer coefficient

It usually refers to the constant volumetric mass transfer coefficient. $k_L a$ is a gas transfer coefficient, a measurement of the capacity of the bioreactor to transfer oxygen into the cultures. $k_L a$ is influenced by factors such as bioreactor geometry, gas flow, superficial gas velocity, impeller type and speed, and power input for mixing per unit reaction volume.

paracrine

A kind of chemical signaling in which the target cell is close to the cell that is secreting the chemical, as in neurotransmission.

pathogen (adjective pathogenic)

An organism, cell, virus, or prion that causes disease.

peptide

Peptides are short chains of between two and fifty amino acids, linked by peptide bonds. Chains of fewer than ten or fifteen amino acids are called oligopeptides, and include dipeptides, tripeptides, and tetrapeptides.

perfusion

The process of oxygen and other vital nutrients being delivered from the bloodstream to tissues and cells.

phenotype

The observable character (including both physical appearance and behavior) of a cell or organism.

Phosphate-buffered Saline (PBS)

Phosphate-buffered saline. A solution containing water, sodium chloride, sodium phosphate, and in some cases, potassium chloride and potassium phosphate. The ions and osmolarity are matched to those found in the human body.

pilot scale

In terms of conventional bioreactors, reaction vessels or vessels with volumes that are generally between 100 and 1,000 L.

pilot unit

See pilot scale.

plant-based

Refers to foods that are produced from plants and can be used as direct substitutes of conventional animal-based products, such as meat, seafood, milk, eggs, and dairy. We do not include traditional plant-based foods such as pulses, tofu, and tempeh in our definition of plantbased alternative proteins.

plant-based meat

Plant-based meat is produced directly from plants. Instead of relying on an animal to convert plants into meat, we can make meat more efficiently by skipping the animal and turning plant ingredients directly into meat. Unlike cultivated meat, which is animal meat, vegetable meat only tries to imitate the animal product.

Plug Flow Reactor (PFR)

Tubular reactor with uniform, pistoned (plug) flow.

pluripotent

Describes a cell that has the potential to give rise to all or almost all of the cell types of the adult body.

polymer

A large molecule composed of many repeating subunits. Polymers range from familiar synthetic plastics such as polystyrene to natural biopolymers such as DNA. Polymers have unique physical properties, including strength, flexibility and elasticity.

Polymerase Chain Reaction (PCR)

Technique for amplifying specific regions of DNA by the use of sequence-specific primers and multiple cycles of DNA synthesis, each cycle being followed by a brief heat treatment to separate complementary strands.

primary cells

Cells placed into culture immediately after an embryo, tissue, or organ is removed from an animal or human and homogenized, minced, or otherwise separated into a suspension of cells.

prion

Prion is a term first used to describe the mysterious infectious agent responsible for several neurodegenerative diseases found in mammals, including Creutzfeldt-Jakob disease (CJD) in humans. The word itself derives from 'proteinaceous infectious particle'; it refers to the initially heretical hypothesis that the infectious agent causing those diseases consists only of protein, with no nucleic acid genome. (All previously known pathogens, such as bacteria and viruses, contain nucleic acids, which enable them to reproduce.) The prion hypothesis explained why the mysterious infectious agent is resistant to ultraviolet radiation, which breaks down nucleic acids, but is susceptible to substances that disrupt proteins.

prion disease

Transmissible spongiform encephalopathy (TSE)—such as Kuru and Creutzfeldt-Jakob disease (CJD) in humans, scrapie in sheep, and bovine spongiform encephalopathy (BSE, or "mad cow disease") in cows—that is caused and transmitted by an infectious, abnormally folded protein (prion). See also prion.

process qualification

Confirming that the manufacturing process as designed is capable of reproducible commercial manufacturing.

process validation

process validation is defined as the collection and evaluation of data, from the process design stage through commercial production, which establishes scientific evidence that a process is capable of consistently delivering quality product. Process validation involves a series of activities taking place over the lifecycle of the product and process.

progenitor cell

Progenitor cells are cells that are similar to stem cells but instead of the ability to become any type of cell, they are already predisposed to develop into a particular type of cell.

programmed cell death ▾

A form of cell death in which a cell kills itself by activating an intracellular death program.

prokaryote ▾

Single-celled microorganism whose cells lack a well-defined, membrane-enclosed nucleus. Either a bacterium or an archaeon.

protein ✎

The major macromolecular constituent of cells. A linear polymer of amino acids linked together by peptide bonds in a specific sequence.

proteomics ✎

Study of all the proteins, including all the covalently modified forms of each, produced by a cell, tissue, or organism. Proteomics often investigates changes in this larger set of proteins—in "the proteome"—caused by changes in the environment or by extracellular signals.

quality

The degree to which a set of inherent properties of a product, system, or process fulfils requirements.

Quality Management System (QMS)

QMS is a term that refers to a system in charge of documenting all processes, responsibilities, and procedures for achieving quality objectives and policies. A QMS allows companies to direct and coordinate their operations to meet both regulatory and customer requirements while also improving its efficiency and effectiveness on a regular basis.

quantitative RT-PCR (reverse transcription–polymerase chain reaction)

Technique in which a population of mRNAs is converted into cDNAs via reverse transcription, and the cDNAs are then amplified by PCR. The quantitative part relies on a direct relationship between the rate at which the PCR product is generated and the original concentration of the mRNA species of interest.

radiation

The emission of energy as electromagnetic waves or as moving subatomic particles, especially high-energy particles that cause ionization.

reactor in aqueous phase

See submerged cultivation.

receptor

Any protein that binds a specific signal molecule (ligand) and initiates a response in the cell. Some are on the cell surface, while others are inside the cell.

recombinant proteins

Proteins made from biotechnological processes.

regenerative medicine

A broad field that includes tissue engineering but also incorporates research on self-healing – where the body uses its own systems, sometimes with the help of foreign biological material to rebuild tissues and organs.

regulatory agencies

A regulatory agency or regulatory authority, is a government authority that is responsible for exercising autonomous dominion over some area of human activity in a regulatory or monitoring capacity.

Regulatory Impact Analysis (RIA)

Regulatory Impact Analysis (RIA) is the systematic process of evidence-based analysis that seeks to assess, based on the definition of a regulatory problem, the possible impacts of alternative actions available to achieve the intended objectives to guide and subsidize decision making.

retrovirus

RNA-containing virus that replicates in a cell by first making an RNA–DNA intermediate and then a double-strand DNA molecule that becomes integrated into the cell's DNA.

risk

In the food context, the food safety risk is a function of the probability of an adverse health effect and the severity consequent to food hazards.

risk assessment

A systematic process of organizing information to support a risk decision to be made within a risk-management process. It consists of the identification of hazards, and the analysis and evaluation of risks associated with exposure to those hazards. See risk evaluation.

risk management

Risk management is the identification, evaluation, and prioritization of risks (defined in ISO 31000 as the effect of uncertainty on objectives) followed by coordinated and economical application of resources to minimize, monitor, and control the probability or impact of unfortunate events or to maximize the realization of opportunities.

roller bottle

See rotating wall vessel (RWV).

Roswell Park Memorial Institute 1640 medium (RPMI 1640)

RPMI 1640 was originally developed to culture human leukemic cells in suspension and as a monolayer. RPMI 1640 medium has since been found suitable for a variety of mammalian cells, including HeLa, Jurkat, MCF-7, PC12, PBMC, astrocytes, and carcinomas.

rotating wall vessel (RWV)

The rotating wall vessel (RWV) is the most commonly used bioreactor that reduces shear stress since the cells are grown in a microgravity environment. The RWV was originally invented by NASA and currently has several derivatives of the original design that are implemented today. There are three common derivatives called the slow lateral turning vessel (STLV), the high aspect ratio vessel (HARV) and rotating wall perfused vessel (RWPV). The STLV is currently available for commercial production.

sanitization

Sanitization can refer to Cleaning and Disinfection of an area or an item. The sanitizing is mostly used in the food preparation areas and refers to eliminating or reducing bacteria by cleaning and disinfecting.

scaffold

A structure on which animal cells are grown to make them form muscle tissue that resembles structured cuts of meat. Can be made from many materials, including plant polymers and even extruded soy protein.

scaling

A set of studies, analysis, procedures, calculations and projects aimed at expanding the scale, aiming at production in equipment with greater volume and/or processing capacity. See also scale up.

semi-batch operation

In a semi-batch process, the materials are added during processing and discharged at the end of processing. In a semi-continuous process, the material is simultaneously charged and discharged from the process, but for a discrete time period.

semi-continuous operation

See semi-batch operation.

sensor (biosensor)

In medicine and biotechnology, sensors are tools that detect specific biological, chemical, or physical processes and then transmit or report this data. Some sensors work outside the body while others are designed to be implanted within the body. Sensors help health care providers and patients monitor health conditions. Sensors are also used to monitor the safety of medicines, foods and other environmental substances we may encounter.

serum-free culture medium

See serum-free medium.

serum-free medium

A culture medium that does not use serum of any kind, particularly fetal bovine serum and, preferentially, no animal derived component.

shear (shear stress)

Shear or shear stress is the relationship between the force exerted by a fluid divided by the area of interaction between one layer and another. Viscous shear reduces the difference in velocity between adjacent fluid layers or streamlines.

skeletal muscle cell

A skeletal muscle cell is long and threadlike with many nuclei and is called a muscle fiber. Muscle cells (including myocytes and muscle fibers) develop from embryonic precursor cells called myoblasts.

small interfering RNAs (siRNAs)

Short (21–26 nucleotide) double-stranded RNAs that inhibit gene expression by directing destruction of complementary mRNAs. Production of siRNAs is usually triggered by exogenously introduced double-stranded RNA.

small nuclear RNA (snRNA)

Small RNA molecules that are complexed with proteins to form the ribonucleoprotein particles (snRNPs) involved in RNA splicing.

small nucleolar RNA (snoRNA)

Small RNAs found in the nucleolus, with various functions, including guiding the modifications of precursor rRNA.

somatic cell

Any cell of a plant or animal other than cells of the germ line. From Greek soma, body.

specific-pathogen-free

Specific-pathogen-free (SPF) is a term used for laboratory animals that are guaranteed free of particular pathogens. Use of SPF animals ensures that specified diseases do not interfere with an experiment. For example, absence of respiratory pathogens such as influenza is desirable when investigating a drug's effect on lung function.

spheroids

A 3D conglomerate of cells, often organized into a sphere-shape.

spinner

A Spinner is a type of bioreactor which features an impeller, stirrer or similar device to agitate the contents (usually a mixture of cells, medium and products like proteins that can be harvested). The vessels are usually made out of glass or stainless steel with port holes to accommodate sensors, medium input or gas flow.

stem cell

Cells that have both the capacity to self-renew (make more stem cells by cell division) and to differentiate into mature, specialized cells.

stem-cell niche

The specialized microenvironment in a tissue in which self-renewing stem cells can be maintained.

steroid hormones

Hormones, including cortisol, estrogen, and testosterone, that are hydrophobic lipid molecules derived from cholesterol that activate intracellular nuclear receptors.

Stirred Tank Reactor (STR or Continuous STR)

The continuous stirred-tank reactor (CSTR), also known as vat- or backmix reactor, mixed flow reactor (MFR), or a continuous-flow stirred-tank reactor (CFSTR), is a common model for a chemical reactor in chemical engineering and biological engineering. A CSTR often refers to a model used to estimate the key unit operation variables when using a continuous agitated-tank reactor to reach a specified output.

stochastic

Random. Involving chance, probability, or random variables.

structural biology

The study of the structure of large biomolecules like proteins and nucleic acids, how the structure relates to the function of the molecule, and how alterations in structure affect function. Various methods such as crystallography are used to gain information about the structure of a molecule. This information is often analyzed with bioinformatics techniques to obtain or solve the structure of the molecule.

subculture

Subculture or passaging refers to transferring cells grown in a culture system to a new one. This procedure is crucial for maintaining cell cultures over time.

synthetic biology

Synthetic biology (SynBio) is a multidisciplinary area of research that seeks to create new biological parts, devices, and systems, or to redesign systems that are already found in nature. It is a branch of science that encompasses a broad range of methodologies from various disciplines, such as biotechnology, genetic engineering, molecular biology, molecular engineering, systems biology, membrane science, biophysics, chemical and biological engineering, electrical and computer engineering, control engineering and evolutionary biology.

The Good Food Institute

See GFI.

tissue culture

Tissue culture is the growth of tissues or cells in an artificial medium separate from the parent organism.

tissue engineering

An interdisciplinary and multidisciplinary field that aims at the development of biological substitutes that restore, maintain, or improve tissue function.

totipotent

It describes the cell that is capable of giving rise to all the different types of cells in an organism and the embryonic attachments such as the placenta and umbilical cord.

toxicity

Toxicity is the degree to which a chemical substance or a particular mixture of substances can damage an organism. Toxicity can refer to the effect on a whole organism, such as an animal, bacterium, or plant, as well as the effect on a substructure of the organism, such as a cell (cytotoxicity) or an organ such as the liver (hepatotoxicity).

trace element

A trace element, also called minor element, is a chemical element whose concentration (or other measure of amount) is very low (a "trace amount"). They are classified into two groups; essential and non-essential. Essential trace elements are needed for many physiological and biochemical processes in both plants and animals.

transcriptomics

Is the study of the transcriptome—the complete set of RNA transcripts that are produced by the genome, under specific circumstances or in a specific cell— using high-throughput methods, such as microarray analysis.

trickle bed reactor

A trickle bed bioreactor, or drip bed, is a reactor that uses the downward movement of a liquid and the downward or upward movement of gas over a compacted bed of particles, for instance a substrate or a scaffold.

unit operation

In chemical engineering and related fields, a unit operation is a basic step in a process. Unit operations involve a physical change or chemical transformation such as separation, crystallization, evaporation, filtration, polymerization, isomerization, and other reactions.

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Vascular Endothelial Growth Factor (VEGF)

Secreted protein that stimulates the growth of blood vessels.

viability assay

One or more fluorescent reagents used to determine the health of cells in a sample.

virus

Virus with a capsid surrounded by a lipid bilayer membrane (the envelope), which is often derived from the host-cell plasma membrane when the virus buds from the cell.

wave bioreactor

The WAVE Bioreactor™ system is a cell culture platform suitable for applications in gene and cell therapy and regenerative medicine. Culture medium and cells only come into contact with a presterilized, disposable chamber known as the Cellbag™ bioreactor, which is placed on a rocking platform. The rocking motion of the platform induces waves to mix and transfer oxygen to the culture medium to create an optimal environment for cell growth.

western blotting

Technique by which proteins are separated by electrophoresis and immobilized on a paper sheet and then analyzed, usually by means of a labeled antibody. Also called immunoblotting.

withdrawal period

The time that must elapse between the last administration of a veterinary medicine and the slaughter or production of food from that animal, to ensure that the food does not contain levels of the medicine that exceed the maximum residue limit.

Working Cell Bank (WCB)

It is more commonly required at the later stages of therapeutic development and manufacturing. This bank is produced from a single vial of the master cell bank (MCB) that have been grown for several passages and cryopreserved.

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x-ray crystallography ▾

Technique for determining the three-dimensional arrangement of atoms in a molecule based on the diffraction pattern of X-rays passing through a crystal of the molecule.

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zygote

Diploid cell produced by fusion of a male and female gamete. A fertilized egg.

References

- Alberts, B., Johnson, A., Lewis, J., Morgan, D., Raff, M., Roberts, K., Walter, P., Wilson, J., & Hunt, T. (2017).
- Biologia Molecular da Célula (L. B. Lima, Ed.; 6° Edição, Vol. 1). ARTMED EDITORA LTDA.
- Alberts, B., Johnson, A., Lewis, J., Raff, M., Roberts, K., & Walter, P. (2002). Molecular biology of the cell. New York: Garland Science.
- Alterthum, F., Schmidell, W., de Almeida Lima, U., & de Oliveira Moraes, I. (2021). Biotecnologia Industrial: Engenharia Bioquímica.
- Kilikian, B. V., & Pessoa, A. J. (2020). Purificação de Produtos Biotecnológicos: operações e processos com aplicação industrial (2° edição, Vol. 1).
- Blucher. Moraes, Â. M., Augusto, E. F. P., & Castilho, L. R. (2008). Tecnologia do Cultivo de Células Animais de Biofármacos e Terapia Gênica (1° Edição, Vol. 1). Roca.
- WHO:
<https://www.who.int/en/news-room/fact-sheets/detail/antimicrobial-resistance>
- General guidelines and orientation guide for the elaboration of RIA:
https://www.gov.br/economia/pt-br/assuntos/air/o-que-e-air/diretrizesgeraisguiaorientativo_AIR.pdf
- Codex Alimentarius:
<https://www.fao.org/fao-who-codexalimentarius/en/>
- ANVISA:
<https://www.gov.br/anvisa/pt-br>

Note: Most definitions used for each term were taken literally and/or adapted from the reference materials. The definitions that were not found in the reference materials were prepared by the authors or adapted from the literature available on the internet.

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