mRNAs as Medicines: Glossary Terms

How to Use This Document

This document contains the definitions for glossary terms found throughout **mRNAs as Medicines**, listed in alphabetical order, as well as the module and lesson where they are first used or identified in the course.

Within the modules, a book icon will pop up from time-to-time, indicating the presence of a glossary term.

- If the term appears in on-screen text, it will be highlighted
- If the term is spoken during an animation, the icon and glossary term will briefly appear on the bottom right of the screen

Be sure to have this file open as you proceed through the modules to help you define any glossary terms that may not be familiar.

Glossary Terms

adaptive immune system: Part of the immune system that provides protection from pathogen-specific diseases and can create memory of specific pathogens.

Module 2: Learning About Medicines | mRNA medicines and the innate immune system

adenine: A nitrogenous base that is part of the genetic code of DNA and RNA; in DNA, it pairs with thymine; in RNA, it pairs with uracil.

Module 1: Introduction to Proteins and mRNAs | mRNA structure

aerosolization: The suspension of very small solid, liquid, or lipid particles in a gas.

Module 3: Applications for mRNA Medicines | Non-immunogenic mRNA therapeutics

amino acids: The building blocks of proteins.

Module 1: Introduction to Proteins and mRNAs | Protein structure

antigen presenting cell (APC): A type of immune cell that shows pieces of pathogens to other immune cells to start an immune response.

Module 3: Applications for mRNA Medicines | Prophylactic mRNA vaccines, part 1

antigen: Any substance capable of eliciting an immune response or binding with an antibody.

Module 3: Applications for mRNA Medicines | Prophylactic mRNA vaccines, part 1

attenuated: Weakened bacteria or viruses used in vaccines to prevent disease without causing illness in otherwise healthy individuals.

Module 3: Applications for mRNA Medicines | Prophylactic mRNA vaccines, part 1

bacteria: Tiny, single-celled organisms that can be found everywhere; some bacteria are beneficial and help with processes like digestion, while others can cause infections; bacteria are often employed in biological manufacturing processes.

Module 1: Introduction to Proteins and mRNAs | Proteins and their roles in human health

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B cell: A lymphocyte (immune cell/white blood cell) that synthesizes and secretes antibodies as part of the adaptive immune system.

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bioreactors: Devices used to grow bacteria or mammalian cells to produce useful substances (e.g., a DNA plasmid or a protein medicine).

Module 2: Learning About Medicines | Medicines: Small molecules and proteins

bivalent vaccine: A vaccine that works by stimulating an immune response against 2 different antigens simultaneously, such as 2 different viruses or other microorganisms.

Module 3: Applications for mRNA Medicines | Prophylactic mRNA vaccines, part 2

cell culture: The growth of microorganisms or eukaryotic cells in the laboratory.

Module 2: Learning About Medicines | What makes mRNA suitable as a medicine?

cell membrane: The lipid bilayer that surrounds all cellular contents and defines the outer surface of a cell.

Module 1: Introduction to Proteins and mRNAs | Proteins and their roles in human health

Central Dogma of Biology: The principle that proteins are made using information in messenger RNA, which in turn is made from DNA.

Module 1: Introduction to Proteins and mRNAs | Where do mRNAs come from?

chromosome: A linear strand of DNA and associated proteins that carries a portion of the genetic information necessary to create and maintain a living organism.

Module 1: Introduction to Proteins and mRNAs | Where do mRNAs come from?

clinical trials: Research studies conducted to test how well a new medical approach works in people.

Module 3: Applications for mRNA Medicines | mRNA therapeutics that stimulate the immune system

codons: Groups of 3 nucleotides in a strand of mRNA that carry the genetic codes for specific amino acids.

Module 1: Introduction to Proteins and mRNAs | How cells make proteins and know what proteins to make

COVID-19: A viral disease caused by the SARS-CoV-2 virus, leading to a global pandemic and spurring the development of mRNA vaccines.

Module 1: Introduction to Proteins and mRNAs | Proteins and their roles in human health

cytokine: A small signaling protein produced and released by immune cells to affect the functioning of other cells.

Module 2: Learning About Medicines | mRNA medicines and the innate immune system

cytoplasm: The region inside a eukaryotic cell outside the nucleus and bounded by the outer cell membrane; the cytoplasm contains various organelles required for maintaining life (e.g., endosomes and mitochondria) and is the site of protein synthesis.

Module 1: Introduction to Proteins and mRNAs | Where do mRNAs come from?

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cytosine: A nitrogenous base that is part of the genetic code of DNA and RNA; in DNA and RNA, it pairs with guanine.

Module 1: Introduction to Proteins and mRNAs | mRNA structure

cytotoxic T cell: A lymphocyte (immune cell/white blood cell) that can detect and destroy microorganisms or cancerous cells.

Module 1: Introduction to Proteins and mRNAs | Where do mRNAs come from?

deoxyribonucleic acid (DNA): The molecule that carries the genetic instructions for life, made up of 4 nucleotides arranged in a double helix.

Module 1: Introduction to Proteins and mRNAs | Where do mRNAs come from?

dose-dependent: Refers to the effects of treatment with a drug; if the effects change when the dose of the drug is changed, then the effects are said to be dose-dependent.

Module 2: Learning About Medicines | What makes mRNA suitable as a medicine?

endocytosis: The process by which cells ingest materials that could not otherwise cross cell membranes; endocytosis involves the invagination of the outer cell membrane to engulf the material to be ingested.

Module 2: Learning About Medicines | Anatomy of a lipid nanoparticle

endosome: The intracellular organelle that results from the process of endocytosis.

Module 2: Learning About Medicines | Anatomy of a lipid nanoparticle

enzymes: Proteins that speed up chemical reactions in the body without themselves being consumed.

Module 3: Applications for mRNA Medicines | Non-immunogenic mRNA therapeutics

functional: Able to perform or carry out normal activity.

Module 1: Introduction to Proteins and mRNAs | Proteins and their roles in human health

genetic code: The sequence of bases in the DNA and mRNA of living cells that provides the instructions for the synthesis of proteins.

Module 1: Introduction to Proteins and mRNAs | How cells make proteins and know what proteins to make

genomic: Related to the complete set of genetic information in an organism.

Module 1: Introduction to Proteins and mRNAs | Where do mRNAs come from?

glucose-6-phosphatase: An enzyme found mainly in the liver and kidney that catalyzes the hydrolysis of glucose-6-phosphate into glucose and inorganic phosphate; it plays an important role in blood sugar regulation by releasing glucose into the bloodstream during periods of fasting.

Module 1: Introduction to Proteins and mRNAs | Proteins and their roles in human health

guanine: A nitrogenous base that is part of the genetic code of DNA and RNA; in DNA it pairs with cytosine; in RNA it pairs with cytosine and uracil.

Module 1: Introduction to Proteins and mRNAs | mRNA structure

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hormone: A secreted substance transported through the blood to chemically stimulate cells or tissues and alter their functional activity.

Module 3: Applications for mRNA Medicines | Non-immunogenic mRNA therapeutics

immediate-early signaling events: Rapid cellular responses triggered by the body in reaction to stress or regulatory signals.

Module 3: Applications for mRNA Medicines | Non-immunogenic mRNA therapeutics

immunogenic: Something capable of eliciting an immune response.

Module 2: Learning About Medicines | What makes mRNA suitable as a medicine?

immunogenic mRNA medicines: mRNA medicines that work by eliciting an adaptive immune response to protect against an infectious agent or eliminate cancer.

Module 3: Applications for mRNA Medicines | mRNA therapeutics that stimulate the immune system

inborn metabolic diseases: Diseases caused by abnormal biochemistry due to a mutation in the genomic DNA that results in an absent or deficient enzyme.

Module 3: Applications for mRNA Medicines | mRNA therapeutics that stimulate the immune system

initiation codon: The codon in mRNA (AUG) that signals the position at which the ribosome should initiate protein synthesis and encodes the amino acid methionine; also known as the start codon.

Module 1: Introduction to Proteins and mRNAs | How cells make proteins and know what proteins to make

innate immune sensor: A protein whose job it is to detect a molecular feature shared by many different pathogens; innate immune sensors serve as an early warning system to alert the body of a potential infection.

Module 2: Learning About Medicines | mRNA medicines and the innate immune system

innate immune system: Part of the immune system that defends against infections but is not pathogen specific.

Module 2: Learning About Medicines | mRNA medicines and the innate immune system

interferon: A signaling protein released by cells in response to the presence of a virus.

Module 2: Learning About Medicines | mRNA medicines and the innate immune system

lipids: Fats or fatlike substances characterized by their insolubility in water.

Module 1: Introduction to Proteins and mRNAs | Proteins and their roles in human health

lipid nanoparticle (LNP): Tiny particles made of fats used to deliver medicines like mRNA to specific parts of the body.

Module 2: Learning About Medicines | Anatomy of a lipid nanoparticle

lipid transport complexes: Natural particles consisting of fats and proteins utilized by the body to transport fats and lipids from one location to another.

Module 2: Learning About Medicines | Anatomy of a lipid nanoparticle

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major histocompatibility complex class 1 (MHC-1): Cell-surface proteins that display antigenic peptide fragments for cytotoxic T-cell recognition and aid in the ability of the immune system to determine self from non-self.

Module 3: Applications for mRNA Medicines | mRNA therapeutics that stimulate the immune system

maximum tolerated dose (MTD): The highest dose of a drug or treatment that does not cause unacceptable side effects.

Module 3: Applications for mRNA Medicines | Prophylactic mRNA vaccines, part 2

median: A value in an ordered set of values that has an equal number of values above and below it; for example, in the series of 5, 8, 100, 101, and 120, the median is 100.

Module 2: Learning About Medicines | What makes mRNA suitable as a medicine?

messenger RNA (mRNA): A type of RNA that ferries genetic instructions from DNA to the cell's protein synthesis machinery.

Module 1: Introduction to Proteins and mRNAs | mRNA structure

mitochondria: Organelles in the cytoplasm that serve as cellular powerhouses; mitochondria are essential for converting the energy stored in fats to a form useable by other cellular processes.

Module 1: Introduction to Proteins and mRNAs | Proteins and their roles in human health

monomer: Any molecule that can be attached to similar molecules to form a polymer.

Module 1: Introduction to Proteins and mRNAs | Protein structure

multiplexed: Sending multiple messages, signals, etc., simultaneously through the same system; for mRNA medicines, this means delivering multiple mRNA sequences as part of the same medicine.

Module 2: Learning About Medicines | What makes mRNA suitable as a medicine?

multiprotein complex: Large protein assemblies consisting of more than one protein subunit.

Module 1: Introduction to Proteins and mRNAs | Protein structure

neoantigens: New peptides (antigens) displayed on the surfaces of cancer cells when certain mutations occur in tumor DNA; they play an important role in helping the body mount an adaptive immune response against cancer cells.

Module 3: Applications for mRNA Medicines | mRNA therapeutics that stimulate the immune system

nitrogenous base: The side chain that gives each nucleotide its identity; the 4 nitrogenous bases in RNA are adenine (A), cytosine (C), guanine (G) and uracil (U).

Module 1: Introduction to Proteins and mRNAs | mRNA structure

non-germline: Germline cells are those that make eggs (in the ovaries) and sperm (in testes), so can pass genetic information on to the next generation; all other cells in the body (the overwhelming majority) are non-germline; this means that mutations in non-germline cells cannot be passed on to one's children.

Module 3: Applications for mRNA Medicines | mRNA therapeutics that stimulate the immune system

non-immunogenic mRNA medicines: mRNA medicines that produce a therapeutic effect without needing to elicit an immune response.

Module 3: Applications for mRNA Medicines | Non-immunogenic mRNA therapeutics

mRNAs as Medicines: Glossary Terms

nucleotides: The structural units or monomers that make up strands of RNA and DNA; nucleotide monomers are connected to one another by phosphodiester bonds attached to a pentose sugar and a nitrogenous base; the 4 nitrogenous bases in RNA are adenine (A), cytosine (C), guanine (G) and uracil (U); in DNA, uracil is replaced with thymine (T).

Module 1: Introduction to Proteins and mRNAs | mRNA structure

nucleus: The large organelle in eukaryotic cells that contains the chromosomes and where RNA is transcribed from DNA.

Module 1: Introduction to Proteins and mRNAs | Proteins and their roles in human health

organelle: A subcellular compartment surrounded by an intracellular membrane.

Module 1: Introduction to Proteins and mRNAs | Proteins and their roles in human health

pathogen: A microorganism capable of causing disease.

Module 2: Learning About Medicines | What makes mRNA suitable as a medicine?

peptide bond: The chemical bond that connects amino acid building blocks to one another to form a polypeptide chain.

Module 1: Introduction to Proteins and mRNAs | Protein structure

phosphate: A salt or functional group containing a phosphorous atom bonded to 4 oxygen atoms.

Module 1: Introduction to Proteins and mRNAs | mRNA structure

phosphodiester bond: A covalent bond in RNA or DNA that holds a polynucleotide chain together by joining a phosphate group in the sugar of one nucleotide to the hydroxyl group in the sugar of the next nucleotide.

Module 1: Introduction to Proteins and mRNAs | mRNA structure

polyethylene glycol (PEG): A polymer used in many medicines and personal care products to facilitate delivery of the active ingredient.

Module 2: Learning About Medicines | Anatomy of a lipid nanoparticle

polymer: A molecular chain formed by connecting of 2 or more monomers.

Module 1: Introduction to Proteins and mRNAs | Protein structure

polypeptide: A chain of 2 or more amino acid monomers.

Module 1: Introduction to Proteins and mRNAs | Protein structure

potency: The strength of a medicine.

Module 3: Applications for mRNA Medicines | Prophylactic mRNA vaccines, part 2

prophylactic: Pertaining to the prevention of disease; an agent or regimen that contributes to the prevention of disease.

Module 3: Applications for mRNA Medicines | Prophylactic mRNA vaccines, part 1

protein replacement therapies: Therapies involving the supply of a protein lost from or lacking by the body.

Module 3: Applications for mRNA Medicines | Non-immunogenic mRNA therapeutics

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recombinant: Pertaining to genetic material combined from different sources.

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regenerative medicine: A field of medicine that aims to repair or replace damaged cells, tissues, or organs, often using stem cells.

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replication: The act of copying or duplicating a cell and its DNA.

Module 3: Applications for mRNA Medicines | mRNA therapeutics that stimulate the immune system

ribosome: The cell's protein factory, where mRNA is decoded and proteins are made.

Module 1: Introduction to Proteins and mRNAs | How cells make proteins and know what proteins to make

ribonucleic acid (RNA): A polymer consisting of nucleotides made of ribose, phosphoric acid, and the 4 nitrogenous bases (adenine, cytosine, guanine, and uracil); RNA is much less chemically stable than DNA, so serves as a temporary copy of the information permanently stored in DNA.

Module 1: Introduction to Proteins and mRNAs | Where do mRNAs come from?

RNA polymerase: An enzyme that catalyzes the polymerization of nucleotides to construct an RNA molecule complementary to the base sequence of a DNA gene.

Module 1: Introduction to Proteins and mRNAs | Where do mRNAs come from?

side chain: The linkage of atoms branching off from a common chemical core that defines a particular class of molecules; its side chain gives each amino acid or nucleotide its unique identity.

Module 1: Introduction to Proteins and mRNAs | Protein structure

subunit: A single thing (e.g., protein) that is part of a larger thing; a subdivision of a unit.

Module 1: Introduction to Proteins and mRNAs | How cells make proteins and know what proteins to make

surfactant: A substance that helps mix water with oils or fats, commonly used in medical applications to help deliver medicines or aid in breathing.

Module 2: Learning About Medicines | Anatomy of a lipid nanoparticle

sugar: In nucleotide monomers, the 5-carbon ring that serves as the attachment point between a nitrogenous base and the phosphate; the sugar-phosphate backbone is the strand along which nitrogenous bases are distributed in RNA and DNA.

Module 1: Introduction to Proteins and mRNAs | mRNA structure

termination codons: Codons in mRNA (i.e., UAA, UAG, UGA) that signal where protein synthesis should end during translation; also known as stop codons.

Module 1: Introduction to Proteins and mRNAs | How cells make proteins and know what proteins to make

therapeutic effect: The beneficial result of a treatment or medicine in improving a patient's condition.

Module 3: Applications for mRNA Medicines | Non-immunogenic mRNA therapeutics

therapeutic proteins: Proteins, such as antibodies or enzymes, used to treat disease.

Module 2: Learning About Medicines | Medicines: Small molecules and proteins

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transcription: The process of constructing RNA using DNA as a template, resulting in the transfer of genetic information to the RNA; in human cells, this occurs in the nucleus; transcription can also be carried out in a purely biochemical reaction containing DNA, RNA polymerase and the 4 RNA nucleotides.

Module 1: Introduction to Proteins and mRNAs | Where do mRNAs come from?

transient: Not lasting; of brief duration; short-lived.

Module 2: Learning About Medicines | What makes mRNA suitable as a medicine?

translation: The synthesis of proteins from information contained in mRNA.

Module 1: Introduction to Proteins and mRNAs | How cells make proteins and know what proteins to make

uracil: A nitrogenous base found in RNA but not DNA; in RNA, it can pair with adenine and guanine.

Module 1: Introduction to Proteins and mRNAs | mRNA structure

vaccine: A substance that stimulates the immune system to protect against disease, typically containing weakened or inactive parts of a pathogen.

Module 2: Learning About Medicines | Medicines: Small molecules and proteins

von Gierke disease: A glycogen storage disease with onset usually in the first year of life, also known as glycogen storage disease type Ia, or GSD1a; a genetic disorder caused by glucose-6-phosphatase deficiency.

Module 1: Introduction to Proteins and mRNAs | Proteins and their roles in human health