

# Glossary

## *Mismatch: Human Origins and Modern Disease*

**Alzheimer's Disease:** A progressive, human-specific neurodegenerative disorder that primarily affects memory, thinking, and behavior, and is the most common cause of dementia in older adults.

**Amino acids:** Organic compounds that are the building blocks of **proteins** and participate in a number of processes such as neurotransmitter transport and biosynthesis. Amino acids are encoded by the **genome** as different three **nucleotide** codes.

**Amyloid:** Protein aggregates that appear starch-like that can accumulate in various organs and tissues, leading to a group of diseases known as **amyloidosis**.

**Amyloidosis:** A condition in which proteins form **amyloids** and build up in organs and tissues throughout the body. The amyloids are resistant to break down and removal, and instead accumulate and interfere with normal function.

**Anovulatory infertility:** Failure of the ovaries to release an egg during the menstrual cycle.

**Anthropocene:** The proposed geologic epoch defined by human influence on the Earth. There is yet to be consensus for when the anthropocene began with suggestions ranging from the start of the agricultural revolution to the first atomic explosion.

**ApoE3:** One of the three main isoforms of the **apolipoprotein E** (ApoE) **gene**, and it's considered to have a neutral effect on the risk of developing **Alzheimer's disease**, unlike **ApoE4**, which is a risk factor, and ApoE2, which is associated with reduced risk.

**ApoE4:** A variant of the **apolipoprotein E** (ApoE) **gene** that significantly increases the risk of developing late-onset **Alzheimer's disease**, and it's the most common genetic risk factor for sporadic Alzheimer's.

**Apolipoprotein E:** A protein involved in **lipid** metabolism, helping transport cholesterol and other fats through the bloodstream to various tissues.

**Apoptosis:** A form of preprogrammed cell death by which cells self-destruct when no longer needed or are damaged beyond repair. Apoptosis does not trigger an immune response.

**Autoimmune disease:** Conditions in which the body's **immune system** mistakenly attacks its own healthy tissues and organs.

**Bacteria:** A type of **prokaryotic** microorganism. Unlike **eukaryotes**, bacterial cells do not contain a nucleus and rarely harbour membrane-bound organelles. Bacteria were among the first life forms to evolve on Earth, and can be found in most every habitat, including soil, water, acidic hot springs, radioactive waste, the deep biosphere of the earth's crust, and in and on other living organisms as **symbionts** and **parasites**. Bacteria can be beneficial, such as those comprising the gut flora, or pathogenic and cause **infectious disease**. However, the vast majority of the bacteria in the body are rendered harmless by the protective effects of the immune system.

**Biocultural reproduction (BCR):** The set of marriage and kinship based rules for extra-maternal cooperation in the production, feeding, and care of offspring.

**Bipedalism:** The ability to walk upright on two legs, involving adaptations in the skeletal and muscular systems to support and propel the body using only the lower limbs.

**Breast cancer:** A malignant disease that develops in the breast tissue, typically in the **epithelium** of the milk ducts or lobules.

**Breast-feeding:** The process of feeding an infant with milk from a mother's breast.

**Cancer:** A disease caused by an uncontrolled division of abnormal cells in a part of the body.

**Carcinogenic polycyclic hydrocarbons:** A class of organic compounds composed of two or more fused aromatic rings, some of which are known to be carcinogenic and are formed during incomplete combustion of organic materials.

**Carcinoma:** A cancer of **epithelial** origin.

**Cartilage:** A type of tough, fibrous, elastic connective tissue that is rich in **polysaccharides** and with no nerve or blood supply of its own.

**Childbirth:** The process of giving birth to a child.

**Cytokines:** A broad and loose category of small **proteins** secreted by certain cells of the **immune system** and are important in cell signaling and have an effect on other cells.

**Deoxyribonucleic acid (DNA):** The **molecule** of inheritance, which consists of **sequences** of the four **nucleotide** bases: Adenine, Thymine, Guanine, and Cytosine.

**DNA sequence:** The specific order of the **nucleotide** bases along a strand of **DNA**.

**Dysmenorrhea:** A condition characterized by painful or uncomfortable menstrual cramps.

**Embryo:** The early stage of development for a **multicellular** organism.

**Embryogenesis:** The development of an **embryo** after fertilization of an egg cell.

**Endometrial tissue:** The innermost lining layer of the uterus. Synonymous with **endometrium**.

**Endometriosis:** A condition resulting from the appearance of **endometrial tissue** outside the uterus and causing pelvic pain.

**Endometrium:** The innermost lining layer of the uterus. Synonymous with **endometrial tissue**.

**Epithelial tissue:** 1. A tissue consisting of one or more layers of compactly joined cells of various types and sizes that cover a surface or line a cavity. 2. Pertaining to or involving the outer layer of the skin. Also called **epithelium**.

**Epithelium:** A type of tissue composed of tightly packed cells that line the surfaces of the body and its internal organs. It serves as a protective barrier, and in some cases, it also performs functions like absorption, secretion, and sensation.

**Eukaryote:** Organisms whose cells have a nucleus enclosed within membranes.

**Evolutionary mismatch:** A situation where an organism's evolved traits, once advantageous, become maladaptive due to rapid environmental changes, leading to potential health problems or challenges in modern life.

**Exposome:** A term used to describe the totality of environmental exposures that an individual experiences throughout their lifetime, from conception to death.

**Foraging:** Searching for wild food or provisions as opposed to cultivating food crops or breeding livestock.

**Gene:** A DNA sequence which encodes a specific function.

**Gene expression:** The process by which the information contained within a **gene (nucleotide sequence)** is used to direct **RNA** and/or **protein** synthesis and dictate cell function. Nearly all of the cells in the body contain identical genes, but only a subset of this information is used or expressed at any time. The genes expressed in a cell determine what that cell can do.

**Gene regulation:** Alterations of **gene** expression/activity.

**Genome:** The totality of **DNA** in a cell. Also refers to the DNA sequence that typifies an individual or **species**.

**Glycans:** One of the four classes of major biomolecules. Glycans consist of varying numbers of sugars (**monosaccharides**) attached to **proteins** or **lipids** or secreted as free glycans. Glycans are essential biomolecules whose functions can be divided into three broad categories: structural and modulatory properties (including nutrient storage and sequestration), specific recognition by other molecules, and molecular mimicry of host glycans.

**Glycosidic bond:** A type of covalent bond that joins a carbohydrate to another molecule, which may be another carbohydrate or a different type of molecule.

**Grandmother hypothesis:** One of the explanations for the post-menopausal life stage of human females (and general long lives of humans), a life stage that does not exist in any non-human primate. It is hypothesized that the evolution of grandmothers is an advantage for humans. Grandmothers who invest energy into the offspring of their children reduce the reproductive cost of parenting through social kin-networking. This can further off-set the resource cost of childrearing and brain-building as parents are freed to provision for resources. An increase in resource procurement may reduce the inter-birth interval by allowing for earlier weaning and more offspring production.

**Gut microbiome:** The ecosystem of **microbes** that live in the intestines.

**Hadza hunter-gatherers:** An indigenous ethnic group of traditionally nomadic **hunter-gatherers** from the central Rift Valley and Serengeti Plateau of Tanzania. Tourism,

encroachment by pastoralists, and land rights disputes critically threaten their way of life.

**Host:** A living organism on or in which a **parasite**, **pathogen**, commensal or **symbiont** lives (see **Parasitism**).

**Hunter-gatherers:** People whose livelihood relies on **foraging**: hunting animals, fishing, and gathering wild plants and other resources for sustenance.

**Hyperandrogenism:** A medical condition in females characterized by excess levels of androgens, male sex hormones, such as testosterone.

**Immune system:** The biological defense system of an organism that protects against disease.

**Immunity:** The capability of **multicellular** organisms to resist harmful microorganisms from entering it and compromising its biological systems. The balanced state of adequate biological defenses to fight infection, disease, or other unwanted biological invasion, while having adequate tolerance to avoid allergy, and **autoimmune diseases**. It critically relies on recognition of both self and non-self.

**Infection:** The invasion of an organism's organs or tissues by **pathogens**, their multiplication, and the reaction of the **host** tissues to the pathogens.

**Infectious disease:** The capability of producing infection or spreading disease to others. Synonymous with communicable and transmissible.

**Inflammation:** An often-painful localized redness, swelling, and heat that is the body's response to an injury or infection. While uncomfortable, it indicates that your body is working hard to repair itself or to defend against infection.

**Inflammatory diseases:** Conditions that involve a prolonged or excessive immune response, leading to inflammation in the body.

**Inter-birth interval:** The amount of time between consecutive births.

**Lactation:** The process of producing and secreting milk from the mammary glands.

**Lipids:** One of the four classes of major biomolecules. The overall name for **DNA** and **RNA**, which are composed of **nucleotides**. DNA is double-stranded and more stable while RNA is single-stranded and less stable.

**Menstruation:** The regular discharge of blood and mucosal tissue from the inner lining of the uterus through the vagina.

**Metabolic disorders:** A group of conditions that affect the body's ability to process and use nutrients, such as carbohydrates, fats, and proteins.

**Metabolism:** The conversion of food into energy and the chemical building blocks for **proteins**, **lipids**, **nucleic acids**, and **glycans** as well as the elimination of metabolic wastes.

**Metabolite:** Any substance produced during **metabolism**.

**Metabolomics:** The scientific study of the set of **metabolites** present within an organism, cell, or tissue.

**Microbe:** A microorganism, especially a **bacterium** causing disease or fermentation.

**Molecule:** A group of two or more atoms covalently bonded together to form the smallest fundamental unit of a chemical compound that can take part in a chemical reaction.

**Monosaccharide:** A simple sugar; the most basic unit of a carbohydrate or **glycan**.

**Multicellularity:** The condition of being composed of more than one cell, with cells that are specialized and cooperate to perform different functions within an organism.

**NFkB:** A family of **proteins** (transcription factors) crucial for regulating various biological processes, including **immunity**, **inflammation**, cell growth, and **apoptosis**, and is activated by diverse stimuli like **cytokines** and bacterial products.

**Nrf2:** A **protein** (transcription factor) that acts as a master regulator of cellular responses against oxidative stress, regulating genes involved in antioxidant defense, detoxification, and other processes.

**Nucleic acid:** One of the four classes of major biomolecules. The overall name for **DNA** and **RNA**, which are composed of nucleotides. DNA is double-stranded and more stable while RNA is single-stranded and less stable.

**Nucleotide:** Molecular building blocks for **DNA** and **RNA**. Specifically, they consist of three components: a 5-carbon sugar, a phosphate group, and a nitrogenous base. The type of sugar, either deoxyribose or ribose, determines if the resulting **nucleic acid** is DNA or RNA.

**Oligo-anovulation:** Infrequent (oligo-) or absent (anovulation) ovulation. It is a common cause of irregular menstrual cycles and infertility in women of reproductive age.

**Ontogenetic phase:** A specific stage or period within an organism's developmental history, encompassing changes in its **phenotype** (physical characteristics) and behavior from fertilization to adulthood, influenced by **genes**, environment, and maternal effects.

**Osteoarthritis:** A chronic disorder characterized by the degradation of cartilage and underlying bone in joints and can lead to severe pain and mobility limitations.

**Parasite:** An organism that lives on or in a **host** organism at the expense of the host.

**Parasitism:** A close relationship between two organisms where one benefits at the expense of the other.

**Pathogen:** A **bacterium**, **virus**, or other microorganism that can cause disease.

**Peptide:** A short chain of **amino acids** linked by **peptide bonds**. A peptide is a short **protein**.

**Peptide bonds:** A covalent chemical bond that forms between two **amino acids**, linking them together in a **peptide** or **protein** chain. It occurs when the carboxyl group (-COOH) of one amino acid reacts with the amino group (-NH<sub>2</sub>) of another amino acid, releasing a molecule of water (a process called dehydration or condensation).

**Phenotype:** Observable traits of an organism that result from interactions between genes and environment during development.

**Placenta:** A flattened circular organ, primarily of fetal origin, in the uterus of pregnant eutherian mammals, nourishing and maintaining the fetus through the umbilical cord.

**Placentation:** The process of forming and developing the placenta, the organ that facilitates nutrient and gas exchange between the mother and developing fetus during pregnancy.

**Polycystic ovaries:** Ovaries that contain a large number of small, fluid-filled sacs called follicles, or cysts, just under the surface. These cysts are usually immature follicles that failed to develop properly during the menstrual cycle and did not release an egg (ovulate).

**Polycystic Ovary Syndrome (PCOS):** A syndrome defined by the presence of two of three of the following criteria: **oligo-anovulation**, **hyperandrogenism** and **polycystic ovaries**. It is the leading cause of **anovulatory infertility** and can be debilitating for some people with ovaries.

**Polysaccharide:** A large, complex carbohydrate made up of many **monosaccharides** (simple sugars) linked together by **glycosidic bonds**.

**Pre-Menstrual Syndrome:** Any of a complex of symptoms (including emotional tension and fluid retention) experienced by some women in the days immediately before menstruation.

**Progesterone:** A steroid and sex hormone involved in the menstrual cycle, pregnancy, and **embryogenesis** of invertebrates and mammals.

**Prokaryote:** Unicellular organisms that lack a membrane-bound nucleus, mitochondria, or any other membrane-bound organelle. This definition is now debated as some "prokaryotes," such as archaea ("extremophiles"), are more closely related to **eukaryotes**.

**Protein:** One of the four classes of major biomolecules. Proteins are **molecules** encoded by **DNA sequences** and composed of **amino acids** connected by **peptide bonds**. These range in size from a few amino acids (short peptides) to large molecules (long polypeptides) comprised of thousands of amino acids.

**Regulatory elements:** Binding sites on chromosomes for **transcription factors**, which are involved in **gene** regulation.

**Retrograde menstruation:** A medical condition in which menstrual blood flows backward through the fallopian tubes and into the pelvic cavity instead of leaving the body through the vagina. This backward flow can carry **endometrial** cells into the abdominal cavity, where they can implant and grow.

**Ribonucleic acid (RNA):** A **molecule** essential in **gene** coding, decoding, regulation, and expression. RNA consists of **sequences** of the four **nucleotide** bases: Adenine, Uracil, Guanine, and Cytosine. Types of RNA include messenger RNA (mRNA), transfer RNA (tRNA), ribosomal RNA (rRNA), small nuclear RNA (snRNA), and other non-coding RNAs. Some viruses including Influenza A and SARS-CoV-2 have RNA genomes.

**Sequence:** The linear order of the **nucleotide** building blocks, which encodes individual form and function.

**Species:** A population whose individuals can mate with one another to produce viable and fertile offspring. This is a debated definition and the concept is problematic for extinct fossil organisms for which **DNA** is not available. This definition is problematic in regard to **bacteria** as they can exchange genetic material across widely separate taxa.

**Spontaneous decidualization:** A process that occurs in the **endometrium** in the absence of pregnancy.

**Symbiont:** An organism that lives in a **symbiosis** providing benefits to its **host**.

**Symbiosis:** A close and long-term biological interaction between two different biological organisms, be it mutualistic, commensalistic, or **parasitic**.

**Transcription:** The first step in **gene expression** during which the nucleotide sequence of DNA is transcribed into an RNA molecule that can ultimately be translated into protein.

**Transcription factor:** Proteins that initiate and regulate the **transcription** of **genes**. Transcription factors bind to specific sequences of **DNA** called **regulatory elements**, or other proteins that do so, and directly or indirectly affect the initiation of transcription. The activities of transcription factors determine where and when genes are expressed.

**Tsimane horticulturalists:** A **forager**-horticulturalist group from the Bolivian Amazon who subsist on slash-and-burn horticulture, primarily plantains, rice, and sweet potatoes, while also foraging and hunting.

**Uterine endometrial fibroblasts:** Cells within the uterine lining (**endometrium**) that play a crucial role in endometrial function, implantation, and **endometriosis**.

**Virus:** A submicroscopic **infectious** agent 10 million times smaller than a human that relies on a living **host** cell for metabolic processes and replication. Like living organisms, viruses possess **genes** and evolve by natural selection. Unlike living organisms, viruses lack cellular structure, do not have their own metabolism, instead relying on a living host cell for production of materials, and replication through self-assembly inside a host cell.

*This glossary is the product of the symposium speakers, anthropogeny faculty, and CARTA staff.*