

Advanced Molecular Detection and Pathogen Genomics: A Glossary

Advanced Molecular Detection (AMD) is an initiative at the Centers for Disease Control and Prevention integrating the latest next-generation genomic sequencing technologies with bioinformatics and epidemiology expertise across the agency and the nation to find, track, and stop disease-causing pathogens faster and with greater efficiency.

Term	Definition
Antimicrobial Resistance (AMR)	Antimicrobial resistance is the ability of microbes to grow in the presence of a medicine that would normally kill them or limit their growth. Antimicrobial resistance makes it harder to eliminate infections from the body as existing drugs become less effective.
Bioinformatics	Bioinformatics is an interdisciplinary field of study combining biology, computer science, engineering, mathematics, and statistics that uses computation to extract knowledge from biological data. It includes the collection, storage, retrieval, manipulation and modelling of data for analysis, visualization or prediction through the development of algorithms and software.
Clade	Clade is a term used in taxonomy to denote a group of descendants of one common ancestor. In pathogenic genomics, a clade is group of microbes with a common genetic ancestor.
Genome	A genome is an organism's complete set of DNA, including all of its genes. Each genome contains all of the information needed to build and maintain that organism. In humans, a copy of the entire genome—more than 3 billion DNA base pairs—is contained in all cells that have a nucleus.
Genomics	Genomics refers to a branch of biotechnology concerned with applying the techniques of genetics and molecular biology to the genetic mapping and DNA sequencing of sets of genes or the complete genomes of selected organisms, with organizing the results in databases, and with applications of the data (as in medicine or biology)
Isolate	An isolate refers to bacteria or other disease-causing microbe, isolated from a specimen (e.g., stool, blood, food).
Metagenomics	Metagenomics is the process by which the metagenome is generated. It involves sequencing all DNA extracted from a sample followed by assembly of sequence reads or mapping them to a reference database and annotation of the genes. Metagenomics is used to analyze DNA acquired from environmental samples, in order to study the community of microorganisms present, without the necessity of obtaining pure cultures.
Mutation rate	Frequency of new mutations in a single gene or organism over time. ¹
Next Generation Sequencing (NGS)	Next-generation sequencing refers to high-throughput DNA sequencing technologies. Millions or billions of DNA strands can be sequenced in parallel, yielding substantially more throughput and minimizing the need for the fragment-cloning methods that are often used in the earlier Sanger method for sequencing of genomes.

Pathogen	A pathogen is an infectious microorganism or agent, such as a virus, bacterium, protozoan, or fungus.
Pathogen Genomics	Pathogen genomics is the application and utility of advances in DNA sequencing to identify and obtain genetic information from disease causing microbes for the purpose of diagnosing infections, investigating outbreaks, describing transmission patterns, monitoring antimicrobial resistance, and developing vaccines and other interventions.
Pulse-field gel electrophoresis (PFGE):	Pulse Field Gel Electrophoresis (PFGE) is a genotyping technique used for the separation of large DNA molecules (entire genomic DNA) using enzymes and applying specimens to a gel matrix under an electric field that periodically changes direction.
PulseNet	PulseNet is a network run by the CDC, bringing together public health public and food regulatory agency laboratories around the United States. Cooperating groups share testing results, which act as fingerprints to distinguish strains of organisms such as E.coli, Salmonella, Shigella, Listeria, and Campylobacter. The collaboration supports rapid identification of large-scale outbreaks.
RNA virus	Virus that has ribonucleic acid, rather than DNA, as its genetic material. SARS CoV-2, the virus that causes COVID-19 disease, is an RNA virus.
SPHERES	SARS-CoV-2 Sequencing for Public Health Emergency Response, Epidemiology and Surveillance, a new national genomics consortium to coordinate sequencing of SARS-CoV-2 (the virus that causes COVID-19 disease) across the United States.
Spillover	A single event during which a pathogen from 1 species moves into another species; such movement can result in an outbreak.
Terabyte	One trillion bytes of data. The Library of Congress adds 5 terabytes of data per month to its archives.
Transmission dynamics	Factors involved in how infectious diseases spread from person to person, including contagiousness and how it is transmitted.
Whole Genome Sequencing (WGS):	Whole Genome Sequencing is the technology that determines the genetic code (genome) of an organism (for example, people, bacteria, and viruses).