LUMA GROUP

Primer Series, Supporting Glossary

The life sciences field is filled with specialized terms and abbreviations that can make it challenging to understand even a single sentence in a research paper or article. This glossary is here to help. It's designed to accompany our primer series, offering clear and easy-to-understand definitions of the most commonly used terms in the industry. We'll keep this glossary up-to-date, adding new terms as we create more content.

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Glossary

Active Pharmaceutical Ingredient (API)	API is the substance in a drug that is biologically active and synthesized
Absorption, distribution, metabolism, and excretion (ADME)	Absorption, distribution, metabolism, and excretion (ADME) refers to a set of experiments to understand how a drug behaves in a living organism. These studies are an essential part of preclinical and clinical data sets and help researchers understand how long a drug persists in the body and where it accumulates, among many other important data point
Adverse Events	Adverse events are any undesirable experiences associated with the use of a medical product in a patient. These can range from mild side effects, such as nausea or headache, to severe and life-threatening conditions. Monitoring and reporting adverse events are crucial for assessing the risk-benefit profile of a drug and for ensuring patient safety.
Agonist	A compound that fully activates the protein receptor that it binds to.
Animal Model	Animal models refer to the use of animals induced with a specific disease in experiments to test an experimental drug. Monkeys and mice are the most commonly used models and may be induced with a certain condition to mimic a disease in humans, to allow researchers to predict how the drug may behave in a patient. Extensive animal model testing is conducted before a drug can be tested in humans.
Antagonist	A compound that binds to a receptor but does not activate it and can block the activity of other agonists
Bioavailability	The proportion of a drug that enters the circulation when introduced into the body and so is able to have an active effect.
Biologics	Biologics are a type of drug class. This encompasses all drugs that originate from living organisms and includes things like monoclonal antibodies, peptides, bispecifics antibodies, among others

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Biomarker	A biomarker is a biological molecule found in blood, other body fluids, or tissues that is a sign of a normal or abnormal process, or of a condition or disease. For example, prostate-specific antigen (PSA) is a biomarker used in the screening and monitoring of prostate cancer. Elevated levels of PSA in the blood can indicate the presence of prostate cancer, benign prostatic hyperplasia, or inflammation of the prostate. Monitoring PSA levels helps healthcare providers assess the effectiveness of treatment and detect potential recurrence of the disease.
Cell Model	Cell models refer to an experiment conducted on cells that are representative of a disease. For example, a drug may be tested on cells from a cancer patient in solution to mimic how the drug might behave in the presence of the actual diseased cells in a patient.
Cell Therapy	Cell therapies are drugs created with a patient's cells. This can either be autologous (made with the cells of the patient being treated) or allogenic (made from donor cells). These are "living" therapies and involve modifying living cells to engineer them into drugs to treat a disease. These types of therapies are expensive and highly complicated.
Chemoproteomics	Chemoproteomics is a subfield of proteomics that involves the use of chemical probes to study protein functions and interactions on a global scale within biological systems. This approach combines chemistry and proteomics to identify and characterize the interactions between small molecules and proteins, mapping the molecular targets of bioactive compounds, and understanding their mechanisms of action. Chemoproteomics plays a crucial role in drug discovery and development by helping to identify potential drug targets, elucidate drug mechanisms, and uncover off-target effects. Techniques used in chemoproteomics include affinity-based protein profiling, activity-based protein profiling, and thermal shift assays. These methods provide valuable insights into protein function, drug-target interactions, and the biochemical pathways involved in disease processes.
Clinical	This refers to a process that happens in a human care center which may be a hospital, clinic, or doctor's office, and is related to patient care. This term is commonly used to denote that an

	event is occurring in the human care setting, as opposed to animal model or “pre-clinical” setting like in mice or monkeys.
Clinical Endpoints	A clinical endpoint is a specific event or outcome that is measured in a clinical trial to determine the effect of a treatment or intervention. These endpoints are predefined and can include outcomes such as overall survival, disease progression, symptom relief, or quality of life improvements. Primary endpoints are the main results used to judge the success of a treatment, while secondary endpoints provide additional insights. Clinical endpoints are crucial for assessing the efficacy and safety of new treatments, guiding regulatory approvals, and informing clinical practice. The selection of appropriate clinical endpoints is critical to the validity and reliability of a clinical trial's findings.
Clinical Sample	Clinical samples are biological matter from a patient with a disease that may be representative of their disease. This may be blood, a tissue biopsy, urine, among others and may be used in preclinical research to test an experimental drug. Commonly, new drug will be test on cells of a diseased patient as a first screen to test for their efficacy.
Compound Library	A collection of stored chemicals, often used for high-throughput screening in drug discovery. These libraries can be extremely large spanning millions of individual compounds, or it can be bespoke and tailored towards a specific class of targets.
Clustered Regularly Interspaced Short Palindromic Repeats (CRISPR)	Clustered regularly interspaced short palindromic repeats (CRISPR) is a set of proteins and is the first technology used to create targeted cuts of genetic material. The CRIPSR technology is just a cutting mechanism and can be used to silence a gene. Advances in genetic editors since the initial discovery of CRISPR has allowed for targeted editing as well.
Crystallography	A method used to determine the atomic and molecular structure of a crystal by measuring the angles and intensities of the diffracted beams of X-rays or neutrons.
Drug Candidate	A compound with potential therapeutic benefit that has been selected for further development in preclinical and clinical trials
Druglike	The term "druglike" refers to the properties of a compound that make it suitable for use as a drug. These properties often

	include appropriate molecular weight, lipophilicity, solubility, and stability, as well as favorable pharmacokinetics and pharmacodynamics. Druglike compounds are more likely to be absorbed, distributed, metabolized, and excreted in a manner that allows them to achieve their desired therapeutic effect.
Efficacy	Efficacy is term to describe the degree to which a drug can produce its desired effect, for example, how well a weight loss medication like Ozempic can help you lose weight, or an anti-cancer can shrink tumors
Eroom's Law	Eroom's Law is an adage that suggests software complexity will increase to the point where it eventually surpasses the capacity of the hardware designed to run it. The concept highlights a recurring cycle where advancements in hardware capabilities lead to more complex software development, which then demands even more powerful hardware. This principle underscores the dynamic and often challenging relationship between software evolution and hardware improvements, emphasizing the perpetual race to balance performance and complexity in technology development.
FDA Approval	FDA approval is the formal authorization granted by the U.S. Food and Drug Administration for a drug to be marketed and sold in the United States. This approval is based on substantial evidence from clinical trials demonstrating that the drug is safe and effective for its intended use. The FDA evaluates data on the drug's efficacy, safety, and manufacturing quality before granting approval.
Federal Drug Administration (FDA) / European Medicines Agency (EMA)	The FDA and EMA are the regulatory bodies in the U.S. and Europe, respectively, that are responsible for overseeing testing of new drugs in humans and approving them for commercial launch.
Fragment-Based Drug Design (FBDD)	Fragment-Based Drug Design (FBDD) involves identifying small chemical fragments that bind to a target protein using a hybrid HTS approach that leverages protein structural information. These fragments are typically simpler than traditional drug molecules, making analyzing their interactions with the target easier. Once a fragment is identified, medicinal chemists build on it, adding functional groups to enhance its binding affinity and specificity. While FBDD can address some of the limitations of traditional HTS, developing fragments into drug-like

	scaffolds requires significantly more effort. This process demands a substantial amount of structural information to guide the design and optimization. Despite these challenges, FBDD enables the creation of highly optimized drug candidates from small, initially weak-binding fragments.
Gene Therapy (Genetic Medicines)	Gene therapies (or genetic medicines) are drugs that directly act on a patient's DNA, their genetic material. Depending on the disease, this may involve inserting and/or deleting genetic material.
High-Throughput Screening (HTS)	High-Throughput Screening (HTS) is a powerful technique that utilizes automation to screen thousands to millions of compounds against a target rapidly. This method employs robotic systems and automated processes to conduct a vast number of biochemical, genetic, or pharmacological tests simultaneously. HTS is particularly effective for identifying active compounds, antibodies, or genes that modulate specific biomolecular pathways. Kinases, a class of enzymatic proteins, regulate numerous cellular mechanisms and are highly suitable for HTS methods. These methods can efficiently sift through extensive compound libraries to find molecules that inhibit specific kinases involved in disease pathways. These libraries, which can be commercially available, proprietary, or a combination of both, typically contain thousands to billions of individual compounds available for screening.
In vitro vs *In vivo* vs *In silico*	In vitro, in vitro, and in silico are terms used to describe in what conditions a drug is being tested in. In vitro literately translates to "in glass" and is most often used to describe experiments run on cells suspended in solution. In vivo literally translates to "in the living" and most often refers to experiments run in animal models. In silico refers to experiments run in simulation on computer chips. This is often simulating binding interactions in the early stages of drug discovery.
Investigational New Drug (IND)	An Investigational New Drug (IND) application is a request submitted to the U.S. Food and Drug Administration (FDA) to obtain authorization to administer an investigational drug to humans. This is a crucial step in the drug development process. For example, a pharmaceutical company developing a new medication for diabetes must submit an IND application before starting clinical trials. The application includes preclinical data, the proposed clinical trial protocol, and information about the

	drug's composition and manufacturing. Approval of the IND allows the company to begin testing the drug in human subjects to evaluate its safety and efficacy.
Lead Compound	A chemical compound that demonstrates the desired biological or pharmacological activity and is selected for further development
Mechanism of Action (MoA)	The mechanism of action refers to the specific biochemical interaction through which a drug substance produces its pharmacological effect. This includes the molecular targets, such as enzymes or receptors, that the drug interacts with and the subsequent biochemical and physiological responses. Understanding the MoA is crucial for drug development and for predicting the therapeutic and adverse effects of a drug.
Medicinal Chemistry	Medicinal chemistry is a discipline at the intersection of chemistry, pharmacology, and biology, focusing on the design, synthesis, and development of pharmaceutical agents. For example, the development of statins, a class of drugs used to lower cholesterol, involved extensive medicinal chemistry. Researchers identified a molecule that could inhibit the enzyme HMG-CoA reductase, which plays a key role in cholesterol production in the liver. Through iterative chemical modifications, they enhanced the molecule's potency, selectivity, and pharmacokinetic properties, ultimately creating effective medications like atorvastatin (Lipitor). Medicinal chemistry is essential for transforming scientific discoveries into viable therapeutic agents.
Monoclonal Antibody	Monoclonal antibodies are a class of drug based on the natural human immune system. Natural antibodies bind to foreign substances in the body to mark them for destruction by the immune system. Monoclonal antibodies are an engineered form of antibodies designed to mark a specific target for destruction, often one that natural antibodies do not bind to or recognize.
Maximum Tolerated Dose (MTD)	The maximum tolerated dose (MTD) is the highest dose of a drug or treatment that does not cause unacceptable side effects. For example, in cancer chemotherapy, the MTD is determined through clinical trials where patients are given progressively higher doses of the drug until severe side effects are observed. If patients experience significant toxicity, such as

	severe nausea, neutropenia, or organ damage, the dose is considered too high. The MTD helps establish the optimal dosage for balancing efficacy and safety, ensuring patients receive the maximum benefit from the treatment with manageable side effects.
Orphan Drug	An orphan drug is a pharmaceutical agent developed specifically to treat a rare medical condition, often referred to as an "orphan disease." The designation is granted by regulatory bodies such as the U.S. Food and Drug Administration (FDA) to encourage companies to develop treatments for conditions that affect a small percentage of the population. Benefits of orphan drug status can include tax credits, user fee waivers, and market exclusivity for a certain period.
Pharmacodynamic	Pharmacodynamics is the study of how a drug affects the body, including the mechanisms of action and the relationship between drug concentration and effect. For example, the pharmacodynamics of insulin involves its interaction with insulin receptors on cells to facilitate glucose uptake from the bloodstream, thereby lowering blood glucose levels. Understanding pharmacodynamics helps researchers and clinicians determine the appropriate dosage and predict the drug's effects, including therapeutic benefits and potential side effects. This knowledge is crucial for optimizing drug therapy and ensuring patient safety.
Pharmacophore	An abstract description of molecular features necessary for molecular recognition of a ligand by a biological macromolecule.
Phase I Clinical Trial	Phase 1 is the first stage of clinical trials in drug development, primarily focused on assessing the safety, tolerability, and pharmacokinetics of a new drug in a small group of healthy volunteers or patients. For example, a pharmaceutical company testing a new cancer drug will conduct a Phase 1 trial to determine the appropriate dosage range and identify any potential side effects. Typically involving 20 to 100 participants, this phase aims to establish a drug's safety profile and how it is absorbed, distributed, metabolized, and excreted by the body. Successful completion of Phase 1 trials is essential before advancing to later stages of clinical testing.

Phase II Clinical Trial	Phase 2 is the second stage of clinical trials in drug development, focused on evaluating the efficacy and further assessing the safety of a new drug in a larger group of patients who have the condition the drug is intended to treat. For example, a new medication for diabetes might be tested in a Phase 2 trial involving several hundred patients to determine how well it controls blood sugar levels compared to a placebo or standard treatment. This phase aims to gather preliminary data on the drug's effectiveness, optimal dosing, and side effects. Successful Phase 2 trials provide crucial information needed to design larger Phase 3 trials.
Phase III Clinical Trial	Phase 3 is the third and final stage of pre-approval clinical trials in drug development, involving a large group of participants, often ranging from several hundred to several thousand patients. These trials aim to confirm the drug's efficacy, monitor side effects, and compare it to standard or equivalent treatments. For instance, a new antidepressant would undergo Phase 3 trials to determine its effectiveness in alleviating symptoms compared to existing antidepressants and a placebo. This phase provides comprehensive data on the drug's safety and efficacy, which regulatory authorities use to decide whether to approve the drug for public use.
Phase IV Clinical Trial	Phase 4, also known as post-marketing surveillance, occurs after a drug has been approved and is available to the public. This phase aims to monitor the long-term effects, safety, and effectiveness of the drug in a broader patient population. For example, a new asthma medication approved after Phase 3 trials would enter Phase 4 to identify any rare or long-term side effects that might not have been detected earlier. Phase 4 studies help ensure ongoing safety and efficacy, providing additional data that can lead to further refinement of usage guidelines or new indications for the drug.
Potency	Potency is a measure of the amount of a drug needed to produce a specific effect. It indicates the drug's strength in eliciting a biological response at a given concentration. For example, in pain management, morphine is considered more potent than codeine. This means that a smaller dose of morphine is required to achieve the same level of pain relief as a larger dose of codeine. Potency is an important parameter in pharmacology as it helps determine the appropriate dosage of

	a drug to achieve the desired therapeutic effect while minimizing side effects.
Proof of Concept	Proof of concept is the evidence that a drug has the desired therapeutic effect in humans. This typically occurs in early-phase clinical trials and indicates that the drug can potentially be effective in treating the targeted disease or condition. Proof of concept is critical for deciding whether to proceed with more extensive clinical trials and further investment in the drug development process.
Proof of Mechanism	Proof of mechanism is the demonstration that a drug engages its intended target and elicits the expected biological effect in a preclinical or early clinical setting. This involves showing that the drug interacts with the molecular target in a manner consistent with its proposed mechanism of action. Proof of mechanism is an essential step in the drug development process, as it supports further clinical development
Receptor	A protein that receives and responds to the binding by another protein or ligand. Neurotransmitter or hormone receptors are two major classes of receptors.
Selectivity	Selectivity refers to a drug's ability to affect a specific target or biological pathway without interacting with other targets or pathways. For example, highly selective beta-blockers like atenolol are designed to block beta-1 adrenergic receptors in the heart, reducing heart rate and blood pressure without significantly affecting beta-2 receptors in the lungs, which could cause unwanted respiratory side effects. High selectivity is desirable because it enhances the drug's therapeutic efficacy and reduces the risk of adverse effects, making treatments safer and more effective for patients.
Specificity	Specificity describes how narrow a range of biological targets a drug will interact with. In drug development high specificity is an important criteria of drug development as a non-specific drug often carries significant toxicities
Structure-Activity Relationship (SAR)	The relationship between the chemical or 3D structure of a molecule and its biological activity.
Target	Protein or biomolecule (such as DNA, RNA, peptides, etc.) to which a drug binds, and which are responsible for the therapeutic efficacy of the drug. These arise from a

	fundamental understanding of a disease pathway and the most important elements to changing a diseases course.
Therapeutics vs Diagnostics vs Medical Devices	Therapeutics, diagnostics, and devices play distinct roles in clinical care. Diagnostics are methods used to detect the presence of disease or condition in the body, such as mammograms for breast cancer or saliva tests for COVID-19. Therapeutics are biologically active materials (such as drugs, vaccines, proteins, or hormones) that are administered to a patient in order treat disease. Medical devices are a much broader category and include wide range of products, from tissue grafts to digital apps that are not biologically active like drugs. This could be something like a replacement joint in a knee replacement surgery or blood pressure monitor.
Toxicity	Toxicity describes the damage a drug may do to an organism while achieving its desired effect. For example, this may happen with anticancer therapies if the target a drug is attaching is presenting on select healthy cells as well. A common example of this is how in chemotherapy patients lose their hair, but chemotherapies target all quickly diving cells
Ultra Orphan Drug	An ultra orphan drug is a type of orphan drug intended to treat extremely rare diseases, typically affecting fewer than 1,000 individuals. These drugs often require significant incentives for development due to the limited market. Regulatory bodies may provide additional incentives and support to facilitate the development of ultra orphan drugs.
Virtual screening	Virtual screening is a computational technique used in drug discovery to search large libraries of compounds and identify those most likely to bind to a target protein or enzyme. For example, in the search for new antiviral drugs, researchers can use virtual screening to evaluate millions of compounds in silico to find those that fit well into the active site of a viral protein. This process involves molecular modeling and simulations to predict how each compound interacts with the target. By focusing on the most promising candidates, virtual screening accelerates the drug discovery process, saving time and resources compared to traditional experimental methods.