Chapter-15

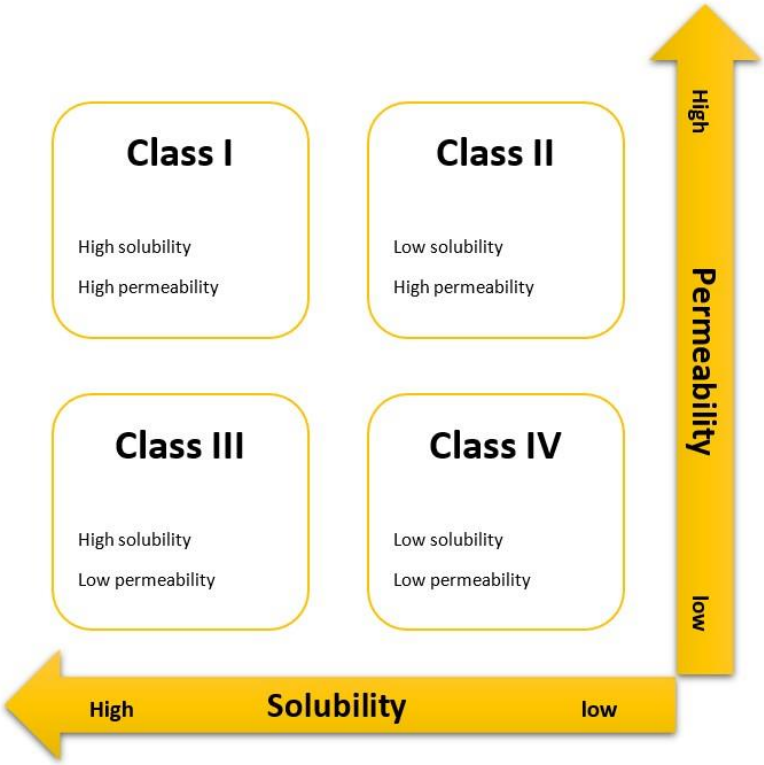
Introduction to BCS system of classification, Basic concepts of Clinical Trials, ANDA, NDA, New Drug development, Schedule Y. Brand v/s Generic, Trade name concept, Introduction to Patent Law and Intellectual Property Rights, Emergency Use Authorization.

Introduction to BCS system of classification:

The Bio pharmaceutics Classification System (BCS) is a scientific framework developed to predict the behavior of a drug product in the human body based on its physicochemical properties.

The BCS classifies drugs into four categories (BCS Class I to IV) based on their solubility and permeability.

- BCS Class I drugs are highly soluble and highly permeable, meaning they dissolve readily in the gastrointestinal tract and are easily absorbed into the bloodstream.
  Examples of BCS Class I drugs include caffeine and ibuprofen.
- BCS Class II drugs are poorly soluble but highly permeable.
- These drugs may have difficulty dissolving in the gastrointestinal tract, but once absorbed, they can pass through cell membranes easily.
  Examples of BCS Class II drugs include ketoconazole and danazol.
- BCS Class III drugs are highly soluble but poorly permeable, meaning they dissolve easily in the gastrointestinal tract but may have difficulty passing through cell membranes.
  Examples of BCS Class III drugs include atenolol and cimetidine.
- BCS Class IV drugs are poorly soluble and poorly permeable, meaning they have difficulty dissolving in the gastrointestinal tract and passing through cell membranes.
  Examples of BCS Class IV drugs include griseofulvin and diazepam.



Basic concepts of Clinical Trials:

- Clinical trials are research studies that test how well new medical treatments, devices, or procedures work in humans.
- They are research studies in which people volunteer to help find answers to specific health questions.
- When carefully conducted, they are the safest and fastest way to find new treatments and ways to improve health.

Basic concepts of clinical trials:

1. Study design: A clinical trial is designed to answer a specific research question or hypothesis. The design of the study determines how the intervention will be tested and how the data will be collected and analyzed.

2. Randomization: Participants in clinical trials are randomly assigned to different groups, such as the treatment group and the control group. Randomization helps to ensure that the groups are similar in terms of important characteristics, such as age, gender, and disease severity, and that any observed differences between the groups are due to the intervention being tested.

3. Blinding: Blinding refers to whether the participants, researchers, and/or data analysts are aware of which group a participant has been assigned to. Blinding helps to prevent bias in the study results.

4. Informed consent: Before participating in a clinical trial, participants must provide informed consent. Informed consent involves providing detailed information about the study, including its risks and benefits, and obtaining the participant's voluntary agreement to participate.

5. Endpoint: An endpoint is a measurable outcome that is used to evaluate the effectiveness of the intervention being tested. Endpoints can be clinical (such as disease progression or death) or surrogate (such as blood pressure or cholesterol levels).

6. Phase: Clinical trials are often conducted in phases.

    - Phase I trials test the safety and tolerability of a new intervention in a small group of healthy volunteers.
    - Phase II trials test the effectiveness and safety of the intervention in a larger group of patients.
    - Phase III trials test the effectiveness and safety of the intervention in an even larger group of patients, and compare the intervention to standard treatment or placebo.
    - Phase IV trials are conducted after the intervention has been approved for use, and evaluate its long-term safety and effectiveness.

Abbreviated New Drug Application (ANDA):

- An Abbreviated New Drug Application (ANDA) is a type of application that a generic drug manufacturer must submit to the U.S. Food and Drug Administration (FDA) when seeking approval to market and sell a generic version of an existing, FDA-approved brand-name drug.
- A generic drug product is one that is comparable to an innovator drug product in dosage form, strength, route of administration, quality, performance characteristics, and intended use.

New Drug Application (NDA):

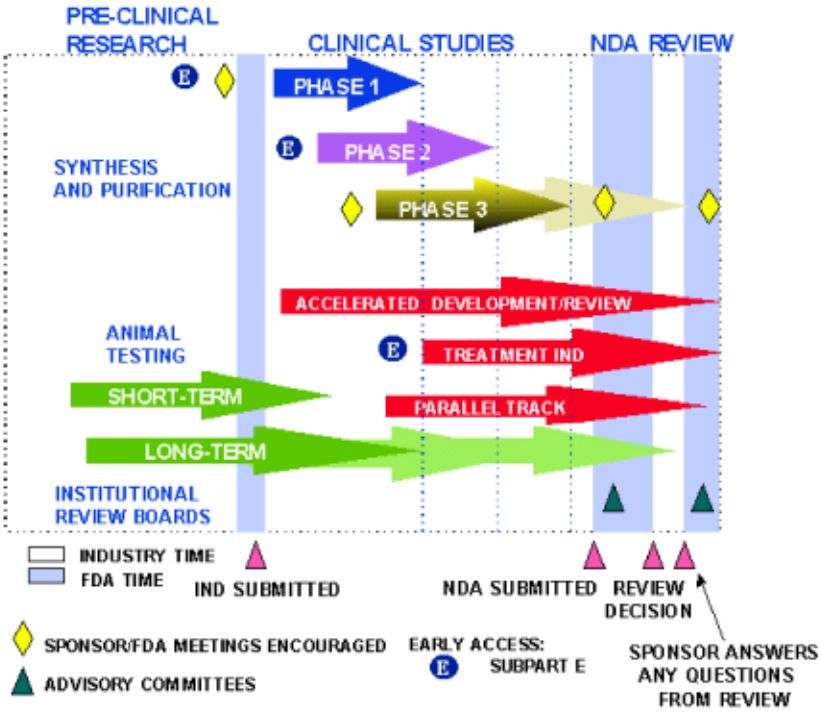
- A New Drug Application (NDA) is a regulatory submission that a pharmaceutical company files with the US Food and Drug Administration (FDA) to seek approval to market a new drug for human use.
- The NDA contains all the data and information about the drug that has been collected during the drug development process, including data from preclinical studies, clinical trials, manufacturing and quality control, and labeling information.
- The NDA serves as a comprehensive document that provides the FDA with all the necessary information to make a decision on whether to approve the drug for marketing.
- The FDA reviews the NDA to determine if the drug is safe and effective for its intended use and if the benefits of the drug outweigh the risks.

The goals of the NDA are to provide enough information to permit FDA reviewer to reach the following key decisions:

- Whether the drug is safe and effective in its proposed use(s), and whether the benefits of the drug outweigh the risks.
- Whether the drug's proposed labeling (package insert) is appropriate, and what it should contain.
- Whether the methods used in manufacturing the drug and the controls used to maintain the drug's quality are adequate to preserve the drug's identity, strength, quality, and purity.

New Drug development:

- New drug development is the process of discovering, designing, and testing new medications for treating specific diseases or health conditions.
- It involves a long and complex process of research and development, which begins with identifying potential drug targets and compounds that can modify those targets.
- The process includes various stages, such as pre-clinical testing, clinical trials, regulatory approval, and post-marketing surveillance.



- New drug development is a complex and time-consuming process, often taking several years or even decades to bring a new drug to market.
- However, it is a critical component of modern medicine, as it allows researchers to identify new treatments for previously untreatable diseases, and improve existing treatments to better meet the needs of patients.

Schedule Y:

- Schedule Y is a part of the Drugs and Cosmetics Act, 1940 in India. It lays out the guidelines for clinical trials of drugs and medical devices that are conducted in India.
- The purpose of Schedule Y is to ensure that clinical trials are conducted in an ethical and safe manner, while also maintaining the quality of the data obtained from these trials.
- The guidelines laid out in Schedule Y are mandatory for all clinical trials conducted in India, and failure to follow these guidelines can result in legal action.

The key components of Schedule Y include:

1. Clinical trial approval process: All clinical trials in India must be approved by the Drug Controller General of India (DCGI) before they can begin. The application for approval must include detailed information about the drug or device being tested, the study design, and the qualifications of the investigators conducting the trial.

2. Informed consent: Before participating in a clinical trial, all participants must provide informed consent. This means that they must be fully informed about the purpose of the trial, the potential risks and benefits, and any other relevant information that may impact their decision to participate.

3. Ethics committee: Each clinical trial must have an independent ethics committee that is responsible for reviewing and approving the study design, ensuring that the trial is conducted in an ethical manner, and protecting the rights and welfare of the participants.

4. Monitoring and reporting: Clinical trials must be monitored throughout the study to ensure that they are being conducted in accordance with the approved study design and ethical guidelines. Any adverse events or other issues must be reported to the DCGI and the ethics committee in a timely manner.

Brand v/s Generic:

(Credit: Pharmaeducation)

Features	Generic Drugs	Brand Name Drugs
Definition	A generic drug is an off-patent pharmaceutical product that is manufactured by a pharmaceutical company in the same strength, dosage form, route of administration, safety, quality, performance characteristics, and intended use after expiring the patent of the relevant brand name drug (Innovator drug).	A Brand name drug is a pharmaceutical product that is developed and marketed under a patent or registered trademark by a pharmaceutical company. But it is approved after establishing the drug's safety and effectiveness through animal and clinical (human) studies. Also, brand name drugs known as innovator drugs.
Patents	Off patent.	Patent protected.
Trade Name	Marketed under the Generic name of the drug.	Marketed under a unique proprietary name given by the company.
Application	ANDA required for USFDA approval.	NDA required for USFDA approval.
Manufactured by	Manufactured by several pharmaceutical companies after patents expiration of the relevant brand name drug.	Developed and manufactured by an innovator company.
Animal & Clinical study	Not required to perform.	Essential to perform.
Price	Cheaper.	Costly than generic drugs.
Appearance (Color, Shape, Size)	Look different from relevant brand name drug.	Unique look as design during product development.
Name variation	Same Generic drug name in any country.	Same or different brand names in different countries.
Excipients	May contain the same or altered but acceptable excipients from relevant brand name drug.	Uses acceptable excipients by the innovator company during development.
Availability	After expiration of patents and exclusivities	From product launch after proving the safety and effectiveness.
Examples	Paracetamol tablet	Tylenol, Para, NAPA, Mapap, Nortemp, Ofirmev, Acamol. Acetalgin, Calpol, Febridol, Hedanol, Daleron, Depo.

Trade name concept:

- A trade name is a term used to refer to a company or business entity's name, often used to identify and distinguish it from other similar entities in the market. It is also sometimes referred to as a "business name" or "doing business as" (DBA) name.
- Trade names can be registered with the government to protect the name from being used by other businesses in the same industry, but this is not always necessary.
- A trade name is a name used by a business or company to identify itself and distinguish it from others in the market. It can be registered or unregistered, and is often used interchangeably with the terms "company name" or "business name".
- Trademark, which is a legal protection for a specific symbol, word, or phrase used to identify a particular brand, a trade name is simply the name that a company uses to conduct business.

Introduction to Patent Law:

A patent is an exclusive right granted for an invention, which is a product or a process that provides, in general, a new way of doing something, or offers a new technical solution to a problem.

To get a patent, technical information about the invention must be disclosed to the public in a patent application.

- The history of Patent law in India starts from 1911 when the Indian Patents and Designs Act, 1911 was enacted.
- The Patents Act, 1970 is the legislation that till date governs patents in India. It first came into force in 1972.
- The Office of the Controller General of Patents, Designs and Trade Marks or CGPDTM is the body responsible for the Indian Patent Act.
- The Patent Office has its headquarters in Calcutta and has branches in New Delhi, Chennai and Mumbai. The office of the CGPDTM is based in Mumbai. Nagpur hosts the office of the Patent Information System and also the National Institute for Intellectual Property Management.
- The Controller General supervises the Act's administration and also offers advice to the government on related matters.
- The Patents Act has been repeatedly amended in 1999, 2002, 2005, 2006 respectively. These amendments were required to make the Patents Act TRIPS compliant. TRIPS stands for Trade-Related Aspects of Intellectual Property Rights.
- The major amendment in the Patent Act was in 2005, when product patents were extended to all fields of technology like food, drugs, chemicals and microorganisms. The Rules under Patent Act were also amended in 2012, 2013, 2014.

Salient features of the Patents (Amendment) Act 2005 related to product patents:

1. Extension of product patent protection to products in sectors of drugs, foods and chemical.
2. Term for protection of product patent shall be for 20 years.
3. Introduction of a provision for enabling grant of compulsory license for export of medicines to countries which have insufficient or no manufacturing capacity; provided such importing country has either granted a compulsory license for import or by notification or otherwise allowed importation of the patented pharmaceutical products from India (in accordance with the Doha Declaration on TRIPS and Public Health)
4. Section 3 (d) regarding patentability.

Intellectual Property rights:

- Intellectual Property rights mean providing property rights through patents, copyrights and trademarks. Holders of intellectual property rights have a monopoly on the usage of property or items for a specified time period.
- The term intellectual property began to be used in the 19th Century. Only in the 20th century did it become part of the world's legal systems.

Type of Intellectual Property rights:

The 4 main types of intellectual property are listed below.

- **Patents** – It is used for protecting new inventions, ideas, or processes. Patent holders need to pay periodic government renewal fees. An approved patent is for a limited time period. Know more about Patents Act in India.
- **Copyrights** – It protects the ideas, examples would be written works, music, art, etc.
- **Trademarks** – It is something that protects the symbols, colors, phrases, sounds, design etc.
- **Trade Secrets** – It may be strategies, systems, formulas, or other confidential information of an organization that provides them a competitive advantage in the market.

Emergency Use Authorization:

- The Emergency Use Authorization (EUA) authority allows FDA to help strengthen the nation's public health protections against chemical, biological, radiological, and nuclear (CBRN) threats including infectious diseases, by facilitating the availability and use of medical countermeasures (MCMs) needed during public health emergencies.
- EUA allows the FDA to authorize the use of an unapproved medical product, or the use of an approved medical product for an unapproved purpose, during an emergency. This authorization is granted when the FDA determines that the benefits of the product outweigh its known and potential risks, and that there are no adequate, approved, and available alternatives to the product for the intended use.
- EUA can be granted for a variety of medical products, including drugs, vaccines, and diagnostic tests, among others. During the COVID-19 pandemic, EUA has been used extensively to accelerate the development and distribution of COVID-19 vaccines, treatments, and diagnostic tests.