SNS COLLEGE OF PHARMACY AND HEALTH SCIENCES

Affiliated To The Tamil Nadu Dr. MGR Medical University, Chennai

Approved by Pharmacy Council of India, New Delhi.

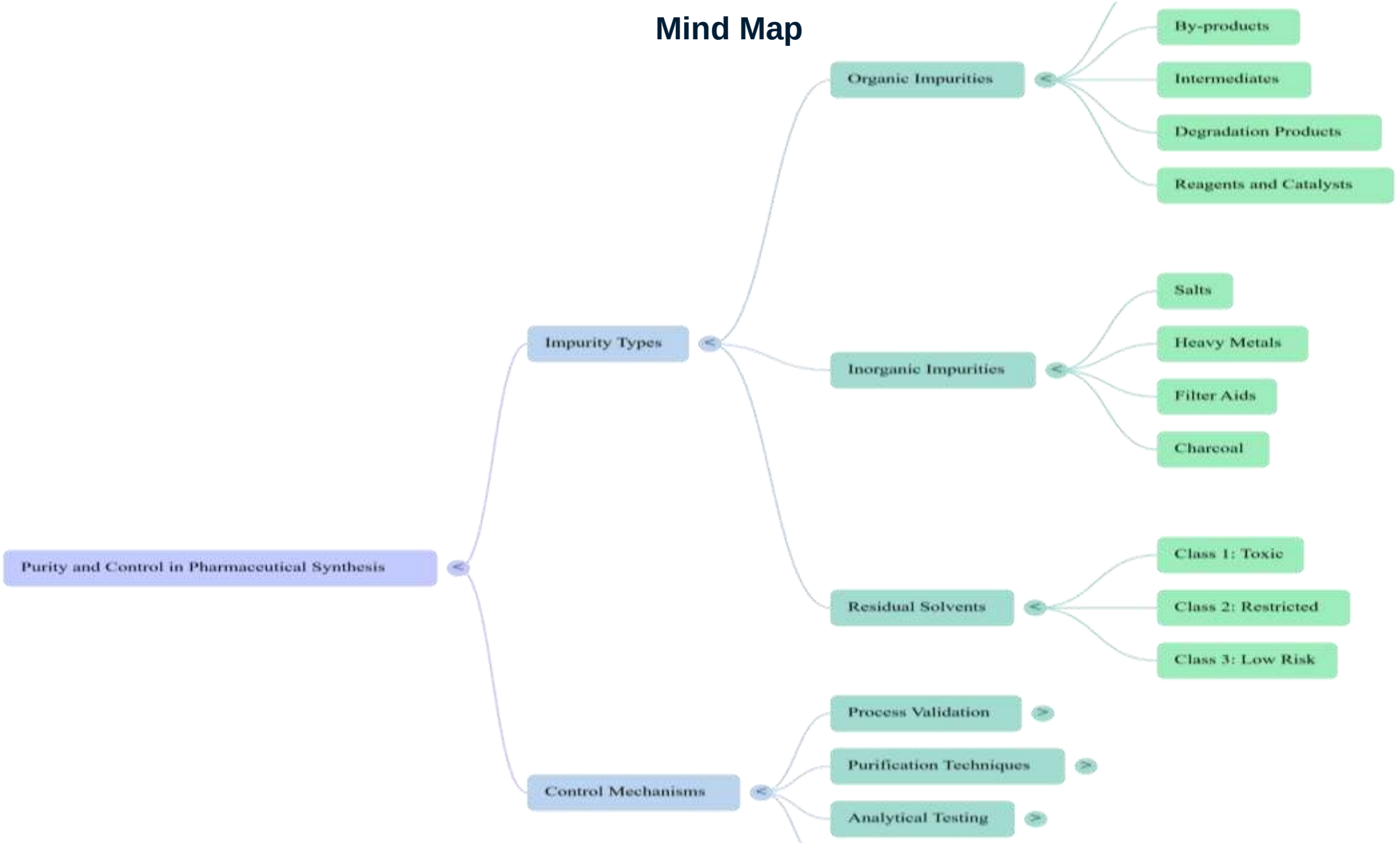
Coimbatore -641035

COURSE NAME: PHARMACEUTICAL CHEMISTRY

I YEAR D PHARM

TOPIC 3:SOURCE AND EFFECT OF IMPURITIES IN PHARMACOPOEIAL SUBSTANCES

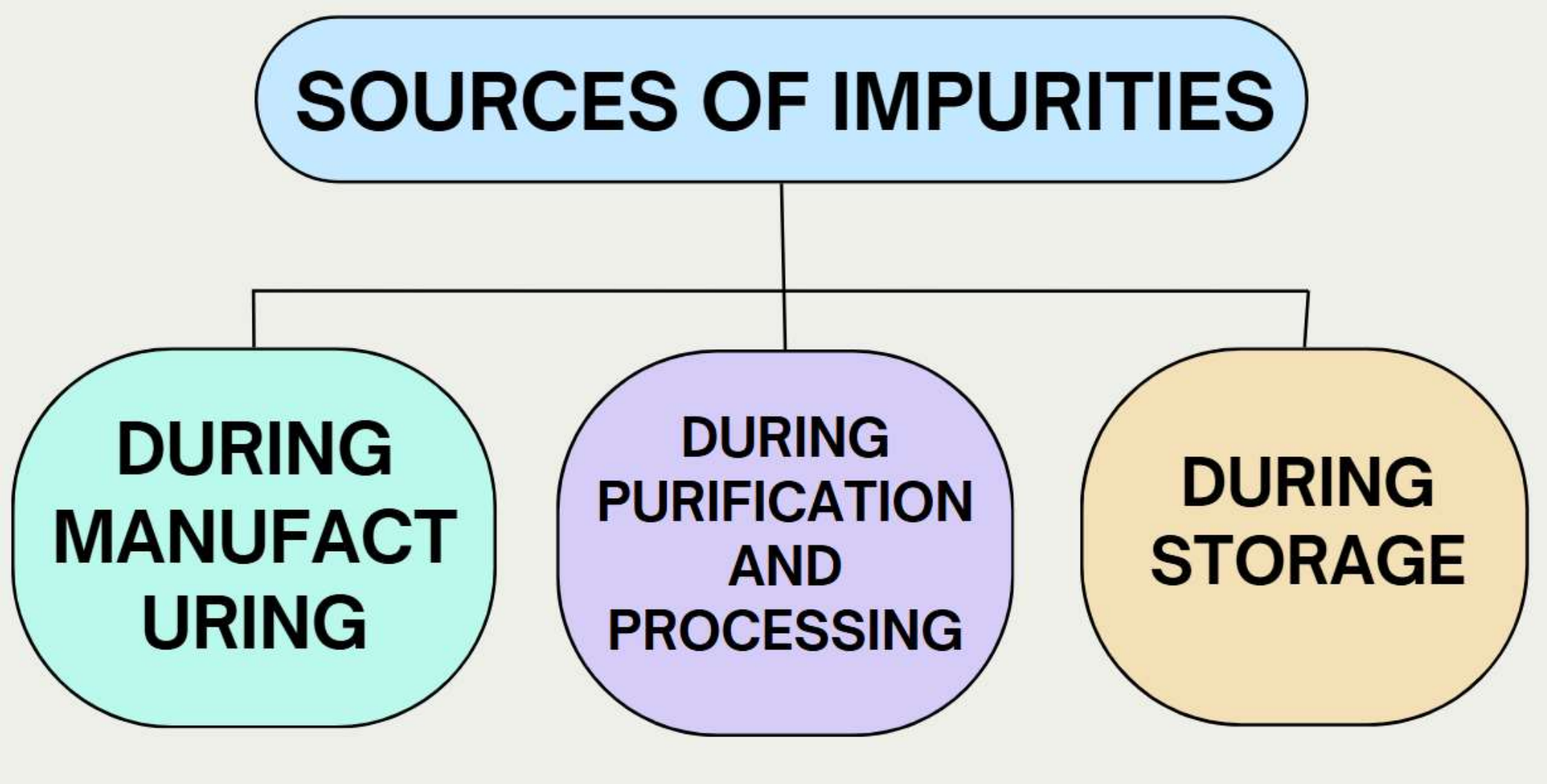
Mind Map


Purity and Control in Pharmaceutical Synthesis
Impurity Types
Organic Impurities
By-products
Intermediates
Degradation Products
Reagents and Catalysts
Inorganic Impurities
Salts
Heavy Metals
Filter Aids
Charcoal
Residual Solvents
Class 1: Toxic
Class 2: Restricted
Class 3: Low Risk
Control Mechanisms
Process Validation
Purification Techniques
Analytical Testing


Impurities in Pharmaceuticals

IMPURITIES

- **Impurity**: Any component of the new drug substance that is not the chemical entity defined as the new drug substance.
- **Impurity Profile**: A description of the identified and unidentified impurities present in a new drug substance.
- **Degradation Product:** An impurity resulting from a chemical change in the drug substance brought about during manufacture and/or storage of the new drug product by the effect of, for example, light, temperature, pH, water, or by reaction with an excipient and/or the immediate container closure system.
- **Degradation Profile:** A description of the degradation products observed in the drug substance or drug product.


SOURCES OF IMPURITIES
DURING MANUFACT URING
DURING PURIFICATION AND PROCESSING
DURING STORAGE


PATENTS
CONFIDENTIAL INFORMATION
TRADE MARKS
LAYOUT DESIGN OF A INTEGRATED CIRCUIT
INTELLECTUAL PROPERTY RIGHTS
INDUSTRIAL DESIGNS
GEOGRAPHICAL INDICATIONS
COPYRIGHTS
PLANT VARIETIES

TYPES OF IMPURITIES

Organic Impurities

- Starting materials
- By-Products
- Intermediates
- Degradation products
- Reagents, ligands, and catalysts

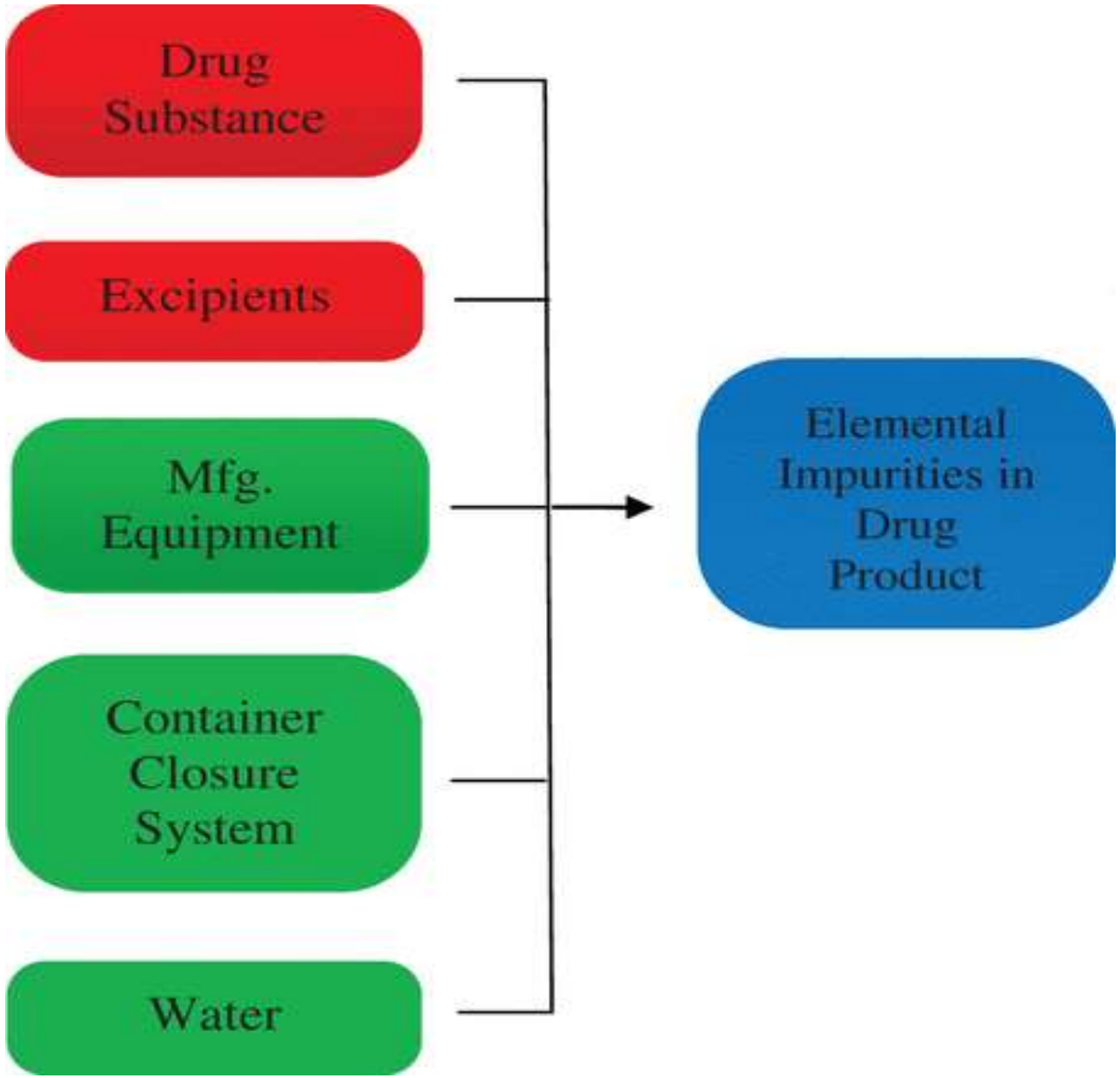
Inorganic Impurities

- Reagents, ligands, and catalysts
- Heavy metals or other residual metals
- Inorganic salts

Residual Solvents

- Class 1- solvents to be avoided
- Class 2 – solvents to be limited
- Class 3 – solvents with low toxic


Elemental Impurities—
Their Impact on Drug Quality


Drug Substance
Excipients
Mfg. Equipment
Container Closure System
Water
Elemental Impurities in Drug Product

Effects of impurities

- Change the efficacy of the FP
- Harmful effect on human health
- Teratogenic, mutagenic and carcinogenic effects
- No therapeutic role and are potentially harmful
- Need to be controlled


Dilution in aqueous and organic medium
Microwave-induced combustion
Microwave-assisted digestion
Wet digestion using conventional heating
APIs Drugs Dietary supplements Tablets
Pills Pharmaceuticals Excipients

Controlling Impurities in Drug Substances & Drug Products

ORGANIC IMPURITIES

- Starting materials
- Byproducts
- Degradation products

INORGANIC IMPURITIES

- Catalysts
- Salts
- Elemental impurities

RESIDUAL SOLVENTS

- Organic solvents from synthesis

ASSESS → DETECT → SET LIMITS → CONTROL

USP ⟨1086⟩

SCIENCE & SAFETY IN EVERY DOSE

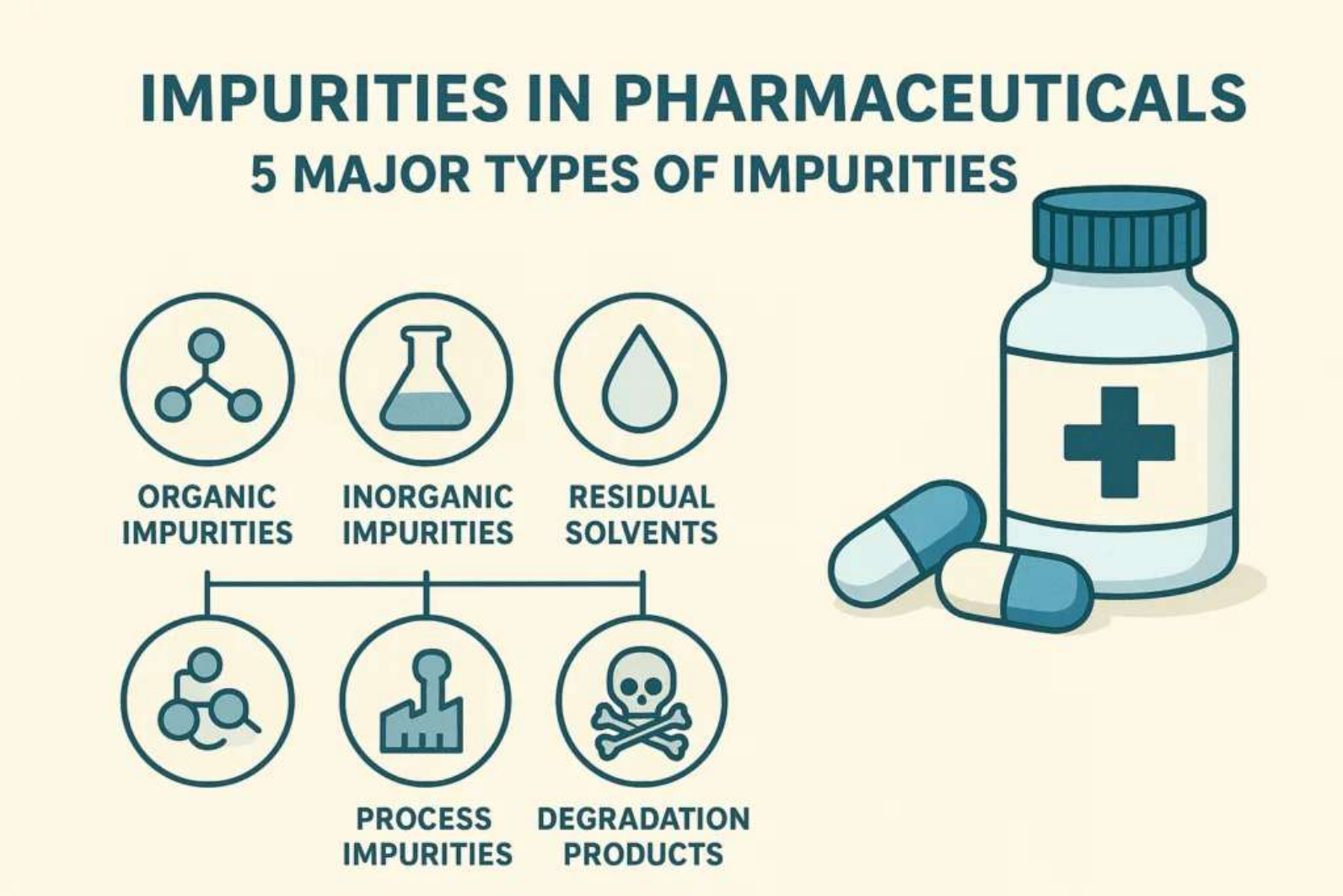

IMPURITIES
GLC

Organic Impurities

Sub type	Process related	Degradants	Chiral impurities	Genotoxic impurities
Common analytical Technique	HPLC , GC , GCMS IC, LCMS ,TLC	HPLC , GC , GCMS IC, LCMS ,TLC	HPLC , GC , CE	HPLC , GC ,LCMS , GCMS ,NMR ,IC [Discussed as separate topic]
API Guidance Reference & limits	ICH Q3 A. [0.05% to 0.15% as per dosage] ,USP	ICH Q3 A. [0.05% to 0.15% as per dosage] , USP	ICH Q3 A, ICH Q6 , FDA guidance. [0.05% to 0.15% as per dosage] ,USP	ICH M7, S9 , FDA guidance. As per TTC limit and duration of treatment.
Drug product Guidance Reference & limits	Usually not monitored in Drug product.	ICH Q3 B. [0.2% to 1% as per dosage] , USP	Usually not monitored in Drug product. Evaluation study done in few cases.	Usually not monitored in Drug product. Evaluation study done in few cases.
		Higher levels are accepted as per literature and or qualification.	Higher levels are specified in pharmacopoeial monographs .	Higher levels are accepted as per literature and or qualification.


PURE
PURE
IMPURE

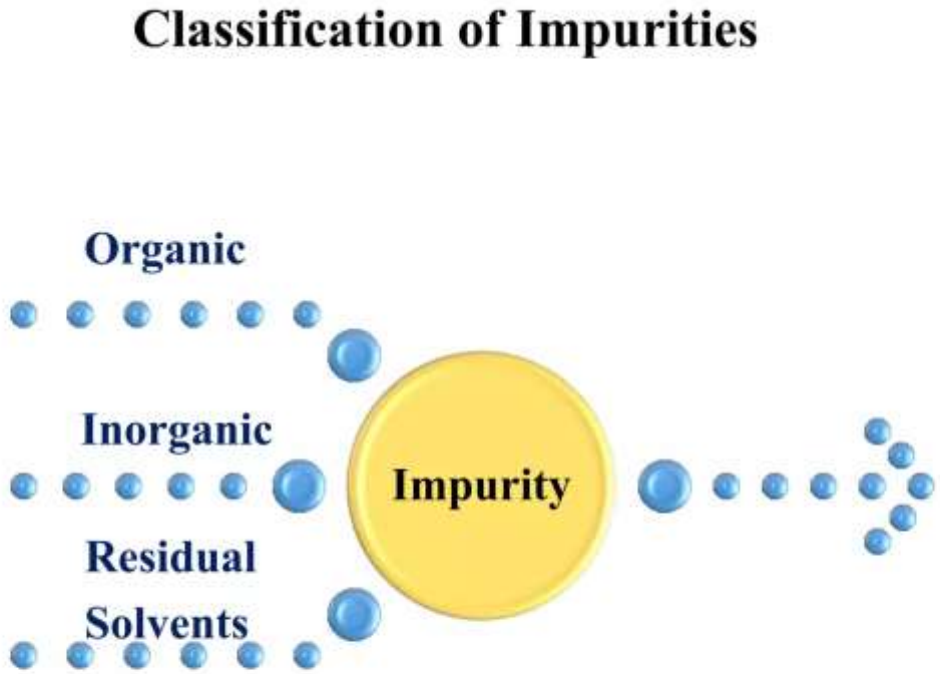
SUMMARY


IMPURITIES IN PHARMACEUTICALS
5 MAJOR TYPES OF IMPURITIES
ORGANIC IMPURITIES
INORGANIC IMPURITIES
RESIDUAL SOLVENTS
PROCESS IMPURITIES
DEGRADATION PRODUCTS

ASSESMENTS

1. Give a note on types on impurities ?

2. Explain the below given picture?



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3. Ways to control impurities?

REFERENCES

•**Pharmaceutical Chemistry (English Edition) for D.Pharm 1st Year** by Dr. Desh Deepak Pandey and Neeraj Kumar, published by Thakur Publication Private Limited.

•**Handbook of Inorganic Impurities in Pharmaceuticals** (eBook) by Parjanya Kumar Shukla and Dr. Amita Verma specifically addresses inorganic impurities and their limit test

•**Pharmaceutical Inorganic Chemistry** by Dr. K. Ilango, published by Nirali Prakashan


Thank You!