IMPURITIES

- Impurity is any material that affect the purity of material of interest
- Presence of impurity may produce toxic effect
- It may lower the strength of pharmaceutical substance
- Common impurities include lead, arsenic, iron, chloride etc.

Types

They are of basically 3 types

- Organic Impurities
- Inorganic Impurities
- Residual Solvents

Organic Impurities

- Organic impurities basically arise during synthesis, purification and storage of drug substances
- They may be identified or Non-identified
- They basically include starting material, by product, synthesis intermediate, reagants, ligand & catalyst.

Inorganic Impurities

- They often derive during manufacturing process
- They are generally identified.
- They basically include reagents, ligands, catalyst, heavy metals, inorganic salts.

Residual Solvents

- They arise during manufacturing process
- These are impurities that are basically present in solvents used in pharmaceutical manufacturing

Sources Of Impurities

- Raw Material
- Reagent
- Method
- Solvents
- Atmospheric contamination
- Reaction with vessel
- Packaging error
- Storage Conditions

Raw Materials :-

Impurities from raw materials may be carried through manufacturing process and contaminate the final product.

Example: Rock Salt ($CaSO_4 + MgCl_2$) = NaCl

Rock salt contains small amount of calcium sulphate & magnesium chloride, Now 'NaCl' prepared from this source may contain calcium and magnesium traces.

Reagent Used :-

If the reagent used in manufacturing are not completely remov
by washing, then it may find entry into the final product

Example : $HgCl_2 + 2NH_4OH \longrightarrow NH_2HgCl + NH_4Cl$

In above reaction ammoniated chloride prepared contains 'ammon
hydroxide', Now if it is not removed by washing with water
then it may contaminate the final product.

Method / Process :-

There are various method / process used for manufacturing of pharmaceutical products. In certain drugs, a multiple step synthesis process is used, which produces 'intermediate compounds'

Now it is very important to purify this intermediate compound otherwise it will contaminate the final product.

Solvents :-

Most of the pharmaceutical products manufactured using water as solvent. Now generally we used distilled or de-mineralised water, but sometime for reducing cost we use softened water that contains 'Na$^+$' & 'Cl$^-$' ions as impurity that can contaminate the final product.

- Tap water :- Contain Ca^{2+}, Mg^{2+}, Na^+ as impurity
- Softened water :- Contain Na^+, Cl^- as impurity
- De-mineralised water :- May contain organic impurity
- Distilled water :- Best but costly

Atmospheric Contamination :-

In industrial area atmosphere is contaminated with dust particles and harmful gases. During manufacturing products can react with them & get contaminated

Example : NaOH reacts with atmospheric CO_2 & get contaminated that's why it should not kept open for long time

That's Why most of the industries build in outer areas (where pollution is very low)

Reaction With Vessel

During manufacturing process some of the vess solvents & reagents may undergo reaction with vessel and contaminate the final product

Example : Iron contain arsenic as impurity, now inorganic compounds that are manufactured in iron vessel may contain Iron and arsenic as impurities.

Packaging Errors

Products of similar appearance such as tablet of same shape, size and colour sometimes packed in similar containers lead to potential source of danger

Improper labelling may also cause major packaging error.

Storage Conditions

After preparation of final product it should be stored in appropriate container depending upon :

- Nature of Material
- Batch Size
- Quantity

Generally materials like plastic, iron, stainless steel & aluminium are used for storage, Improper storage leads to reaction with these materials and contamination of final product.