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Various Aspects in the Impurity Profiling of Pharmaceutical Formulations

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According to the International Conference on Harmonization (ICH), "any component of the drug product that is not the chemical entity defined as the drug substance or an excipient in the drug product" is considered as impurity. Impurities can arise from various steps during synthesis, manufacture, storage or transportation. The great importance of their detection, structure elucidation and quantitation is beyond any doubt, since they may cause various health problems. Their presence even in small quantities may give rise to safety, efficacy, purity, stability as well as quality issues. For this reason, regulatory authorities such as ICH, the United States Food and Drug administration (FDA), different Pharmacopoeias like British Pharmacopoeia, have set guidelines regarding their profiling in pharmaceutical formulations.

To develop a strategy for impurities profiling the following question must be answered: What kind of impurities can be present in Active Pharmaceutical Ingredients (APIs)? These can be organic or inorganic substances originated from different sources. Heavy metals, enantiomers (of different pharmacological and pharmacokinetic profile), catalysts, products of degradation, hydrolysis, photolysis, oxidation, decarboxylation etc, impurities from residuals (organic solvents and unreacted starting materials in bulk drugs and pharmaceutical formulations), intermediate products during synthetic route, by-products formed through a variety of side reactions, products of isomerization, dimerization, unwanted reactions between starting materials or intermediates with chemical reagents or catalysts may be determined as impurities.

Of significant importance is the case of chiral drugs. When for example the race mate is marketed, and only one form is active, half of the dose is effective. On the other hand if the pure enantiomer is administered, the enantiomeric form, the so-called antipode is considered to be an impurity. Their presence is mainly due to the incomplete enantioselectivity during synthesis.

Impurities in the APIs must be identified and quantified. According to ICH guidelines on impurities in new drug products, identification of impurities below the 0.1% level is not considered to be necessary, unless the impurities are potentially toxic. For the determination of impurities in pharmaceuticals different analytical techniques can be applied. The vast majority of analytical methods rely on separation techniques such as high performance liquid chromatography, gas-liquid chromatography, supercritical fluid chromatography, capillary electrophoresis, complied with UV detectors or hyphenated with mass spectroscopy, etc.

Mainly chromatographic, but also non-chromatographic techniques can be used for the isolation of impurities, which are intended to be characterized, by spectroscopic techniques. Nuclear Magnetic Resonance (NMR) spectroscopy, Raman spectroscopy, R-spectroscopy, mass spectroscopy techniques are the most frequently used techniques for the elucidation of the impurities structure.

Various classic extraction methods like Solid Phase Extraction (SPE), Liquid-Liquid Extrcation (LLE) or more sophisticated like Supercritical Fluid Extraction (SFE), Accelerated Solvent Extraction (ASE), and Microwave Assisted Solvent Extraction (MASE) can be used for the isolation of the impurities from the APIs.

A significant number of interesting research articles and reviews are published in the literature describing the recent trends in the impurities profiling of pharmaceutical formulations. And this number will be continuously growing as long as new drugs are synthesized and new synthetic routes are to be explored [1-12].

References

1. Ayre A, Varpe D, Nayak R, Vasa N (2011) Impurity profiling of pharmaceuticals, Adv Res Pharm. Biolog 1: 76-90.
2. Branch SK (2005) Guidelines from the International Conference on Harmonisation (ICH), J Pharm Biomed Anal 38: 798-805.
3. Ermer J (2001) Validation in pharmaceutical analysis. Part I: An integrated approach. J Pharm Biomed Anal 24: 755-767.
4. Specifications: Test Procedures and Acceptance Criteria for New Drug Substances and New Drug Products: Chemical Substances, International Conferences on Harmonization Topic Q6A, July 1997.
5. (1997) Impurities- Guidelines for Residual solvents Q3C FederalRegister. International Conferences on Harmonization.
6. (1999) Specifications: Test Procedures and Acceptance Criteria for Biotechnological/Biological Products. International Conferences on Harmonization Topic Q6B.
7. Draft Revised Guidance on Impurities in New Drug Products.Q3B(R) (2000) International Conferences on Harmonization, Federal Register 65: 44791-44797.
8. (2006) Impurities in new drug substances. International Conference on Harmonisation of Technical Requirements for the Registration of Pharmaceuticals for Human Use (ICH) guideline Q3A(R2).
9. (2011) International Conferences on Harmonization Harmonised Tripartite Guideline Impurities for residual solvnts Q3C(R5).
10. Iwersen J, Melgaard H (2006) Specification Setting for Drugs in the Pharmaceutical Industry, Frontiers in Statistical Quality Control, 249-262.
11. Pilaniya K, Chandrawanshi H, Pilaniya U, Manchandani P, Jain P (2010) Recent trends in the impurity profile of pharmaceuticals, J Adv Pharm Technol Res 1: 302-310.
12. Zhou L, Mao B, Reamer R, Novak T, Ge Z (2007) Impurity profile tracking for active pharmaceutical ingredients: Case reports, J Pharm Biomed Anal 44: 421-429.

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