IDENTIFICATION OF RAW CRUDE DRUGS BY MEANS OF RAMAN SPECTROSCOPY

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Introduction. The development of pharmaceutical enterprises follows the path of active introduction of innovative and science-intensive technologies that ensure the conformity of production to GMP standards. At the present stage, the increased technical equipment of enterprises allows solving complex tasks of ensuring and controlling the quality of medicines. High-tech analytical equipment is equipped with computer systems that allow processing and statistical analysis of a large amount of data.

One of the promising methods used in pharmaceutical enterprises is Raman spectroscopy. Raman spectroscopy is a method for studying the vibrational and rotational states of molecules of an investigated substance in the interval from about 2 to 4000 cm-1, based on the phenomenon of inelastic (Raman) Raman scattering of monochromatic light in the visible, near UV or near IR ranges. The spectra are very sensitive to the nature of chemical bonds – both in organic molecules and polymeric materials, and in inorganic crystal lattices and clusters.

Purpose of the study. To consider the possibilities and advantages of Raman spectroscopy in problems of control and identification of input medicinal raw materials using statistical methods.

Results. Raman spectroscopy is used in:

- Biological and medical diagnostics: allows to detect changes in molecules, analyze cell interactions, investigate microorganisms in cells, detect cancer;
- Pharmaceutical: allows to analyze the composition of tablets, solutions and gels; To control the drying processes of mixing and coating the preparations; Control the purity and quality of medicines; To check raw materials, allowing to identify with high accuracy input materials.

The high resolution and sensitivity of the Raman spectroscopy method allow rapid identification and analysis of the composition of drugs. The Raman effect is highly sensitive to small differences in chemical composition and crystallographic structure, allows the use of non-contact and non-destructive technology, which practically does not require sample preparation.

The method of Raman spectroscopy makes it possible to obtain an individual spectral imprint, unique with respect to the molecule in question or an entire molecular structure. This makes it possible to successfully apply statistical methods of analysis in the identification and quality control of drugs.

The report considers the application of statistical analysis methods when distinguishing closely-spaced spectra of medicinal raw materials.

Conclusions. The Raman spectroscopy method has significant advantages: it can be used for the analysis of aqueous solutions; The intensity of the spectral lines in the solution is directly proportional to the concentration of specific compounds; The Raman spectrum does not depend on changes in the temperature of the solution; The method of Raman spectroscopy practically does not require sample preparation, application of reagents, and is not influenced by the material of the cell, for example, glass.

The advantages associated with the specific nature of the method make the Raman spectrometry a powerful tool for analyzing the quality of the input medicinal raw materials. The main limitation of Raman spectrometry is the fluorescence of impurities. However, fluorescence can be avoided by choosing a source of exciting laser radiation with large wavelengths, for example, the near infrared region of the spectrum.

The use of statistical methods of data analysis in applied problems of quality assurance of medicines makes it possible to:

- to classify and quantify the properties of substances in the test sample;
- to identify and quantify the use of standard samples by statistical approximation of the spectra obtained;
- identify and perform a comparative analysis of data with libraries of spectral characteristics of different samples.