# Pharmacy Section

## Application of the NMR Spectroscopy in the Structural Analysis of Clonidine

**Alexandru Lisnic, Vasile Palii**

Academic adviser: Tamara Cotelea, M.D., Alic Barba, M.D.
State Medical and Pharmaceutical University "Nicolae Testemitanu", Chisinau, Republic of Moldova

NMR spectroscopy is one of the most powerful techniques available for studying the structure of molecules. It involves the absorption of radioawaves by the nuclei of some combined atoms (: 1H, 13C, 15N, 19F, 31P) in a molecule that is located in a magnetic field. Nuclear magnetic resonance spectroscopy is the use of the NMR phenomenon to study physical, chemical, and biological properties of matter. The most important applications are proton NMR and carbon-13 NMR spectroscopy. In principle, NMR is applicable to any nucleus possessing spin. This property of nucleis to have a spin, was used to establish the structure of clonidine using 1H and 13C spectrum. Clonidine-N-(2,6-dichlorophenyl)-4,5-dihydro-1H-imidazol-2-amine- treats high blood pressure by stimulating ?2 receptors in the brain, which decreases cardiac output and peripheral vascular resistance, lowering blood pressure. It has specificity towards thepresynaptic ?2 receptors in the vasomotor center in the brainstem. This binding decreases presynaptic calcium levels, and inhibits the release of norepinephrine (NE). The net effect is a decrease in sympathetic tone. Was determinated : • the number of carbon atoms using 13C spectrum(DMSO), and their shift`s, ppm : 158.5(C7), 134.5(C8), 129.7(C9), 131.5(C10), 129.7(C11), 130.5(C12). • the number of hydrogen atoms using 1H spectrum(DMSO), and thei shift`s, ppm : 7.58(H9), 7.46(H10), 7.58(H11), 10.72(H6), 8.51(H1), 43.2(2H4d, 2H5d). The obtained spectrum gave us the possibility to establish the spatial structure of the analyzed sample. The impact of NMR spectroscopy on the natural sciences has been substantial. It can, among other things, be used to study mixtures of analytes, to understand dynamic effects such as change in temperature and reaction mechanisms, and is an invaluable tool in understanding protein and nucleic acid structure and function. It can be applied to a wide variety of samples, both in the solution and the solid state.

## Application of Physical-Chemical Methods in Chemical-Toxicological Analysis of Pyroxicam

**Vasile Palii, Alexandru Lisnic**

Academic adviser: Tamara Cotelea, M.D.
State Medical and Pharmaceutical University "Nicolae Testemitanu", Chisinau, Republic of Moldova

Pyroxicam (4 hydroxy-2 methyl-N-2 pyrydinil-2H-1,2 benzotiazin-3 carboxamide-1,1 dioxide) is used in medicine to treat the rheumatoid polyarthritis, anchylopoetic spondilitis, gout attack, periarthritis, traumatic pains. It concerns to the group of drugs with antiinflamatory features, analgesic. The action mechanism can be explained by the synthesis inhibition of prostaglandines and the inhibition of the synthesis of cyclooxigenase and the migration of leucocytes to the inflammatory focus inhibiting the phagocytosis and releasing of lysosomal hydrolysis. In certain conditions (overdosage, hepatic diseases) pyroxicam possesses toxic features. In this context the study of pyroxicam is a specific interst in biological fluids. As a result we intended to study the factors (the pH

values of the medium the extragents polarizing acting during the process of isolation of the compound from the blood serum). Pyroxicam has alkaline properties; it can be extracted from an alkali medium. We used chloroform as an extraagent, which carries a specific character for the compounds in unionized form from biological fluids. The pH value is important, which gives us the opportunity to isolate pyroxicam from biological fluids, its passage from ionized form in a molecular one, which encourages the officiency of extraction with lipophilic solvents. The pyroxicam was isolated from blood serum after acidulation with oxalic acid (pH2.0-2.5) and the proteins sedimentation with threechloracetic acid, then extracted from alkali medium with chloroform. Alkalic extracts underwent spectrophotometric studies at a wave length 247 nm. We applied silicosis plaques on a thin layer within chromatography in the following system of solvents: Chloroform: Acetone (4:1) Rf=0.51; Ethylacetate: Methanol: Ammoniacal solution 25% (85:10:5) Rf=0.17; Ethylacetate Rf=0.38. These methods can be applied in chemical toxicological analysis practice.Acetone (4:1) Rf=0.51; Ethylacetate: Methanol: Ammoniacal solution 25% (85:10:5) Rf=0.17; Ethylacetate Rf=0.38. These methods can be applied in chemical toxicological analysis practice.

## Nanopharmacology and the 21st Century Revolution

**Sofia Dolghier**

Academic adviser: Sergiu Cerlat, M.D.
State Medical and Pharmaceutical University "Nicolae Testemitanu", Chisinau, Republic of Moldova

The 21st century is dominated from a revolutionary new technology - nanotechnology. The term Nanotechnology was first introduced in 1959, by Richard Feynman that winning Nobel Prize for Physics in 1965. Nanoparticles are the main product of nanotechnologies, and they may have organic and inorganic structures, the size being less than one hundred nanometers (10-9m). These technologies open the new perspectives and new opportunities for all sciences also in medicine. The new direction based on nanotechnology methods - nanopharmacology will obtain significant advances in areas such as diagnostic, regenerative medicine and pharmacological therapeutics. Nanopharmacology can be defined as the application of nanotechnology to develop and discovery of new methods to delivery drugs. In April 2006, the journal Nature Materials estimated that 130 nanotech-based drugs and delivery systems were being developed worldwide. More and more new drugs, which are highly effective against certain diseases, especially cancer are face-off lot problems as bad absorption or severe side effects. With nanotechnology-based drug delivery systems, important improvement on pharmacokinetics and pharmacodynamic parameters of drugs will take place. Clinical used demonstrate a broad variety of useful properties, such as longevity in the body, increased solubility, specific targeting to certain disease sites and increased drug concentration in it, enhanced intracellular penetration, contrast properties allowing for direct carrier visualization in vivo, stimuli-sensitivity, and others. Also the use of nanotechnology will serve for a more accurate control of doses, which will decrease significantly drug toxicity and increase safety. Some of those pharmaceutical carriers have already made their way into clinic, while others are still under preclinical development. The next generation of pharmaceutical nanoparticles combining different properties and allowing for multiple functions. In recent years, nanotechnology has found innumerable applications in the field of medicine - from drug delivery systems, nanorobots and cell repair machines to imaging, nanoparticles and nanonephrology. But the most important future applications of nanotechnology will be with construction of medical nanorobots, for example, there were technical analyzed some types of medical nanorobots: Respirocytes (artificial mechanical red cells), Pharmacytes (ideal drug delivery nanorobot). To conclude we can say that nanotechnology open new possibilities for pharmacology and medicine with preservation and improvement of human health and extension of natural biological structure and function using molecular tools and molecular knowledge of the human body.