

**E.V. WELCHINSKA**

**TOXICOLOGICAL AND FORENSIC  
CHEMISTRY  
(CRIMINAL ANALYSIS)**

**POISONOUS SUBSTANCES  
AND THEIR BIOTRANSFORMATION**



The Text Book contains questions of the chemical and physical-chemical methods of the qualitative and quantitative determination of poisons and their metabolites at the human's organism or material of dead body, regularity of the pharmacodynamics and pharmacokinetics or toxicodynamics and toxicokinetics at the body, biotransformation's peculiarity of toxic substances of organic or non-organic origin, sphere of use of toxic substances, symptomatic of intoxications and measures of immediate aid after poisonings. For students of the higher pharmaceutical educational institutions and pharmaceutical faculties of the higher medical educational institutions.

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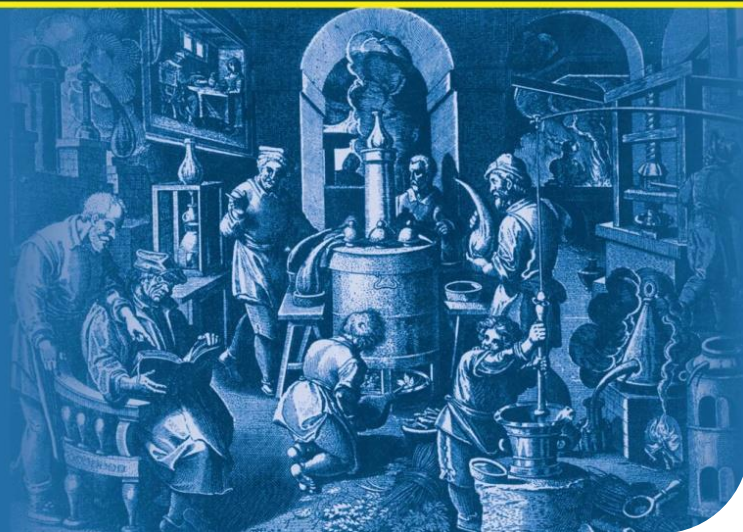
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Welchinska Elena Vasilevna – professor, doctor of pharmaceutical sciences (speciality – pharmaceutical chemistry and pharmacognosy), professor of Pharmaceutical, Biological and Toxicological Department of the National medical university named after A.A. Bohomolets of the Ministry of Health of Ukraine, Kyiv; PhD (Chem.); a lecturer and the head of courses «Toxicological chemistry», «Pharmaceutical chemistry», «Standardisation of medical drugs»; a member of the International Pharmaceutical Federation (FIP), The Netherlands since 1997; a member of organization committee and reduction collegiums of the international scientific-practical conferences of International Centre of Innovational Investigations «Omega Science», Scientific-publish Centre «Aeterna» (Russian Federation); a member of reduction collegiums of the international scientific journals «Innovational science» and «Symbol of science» since 2014. Author of the **more than 500 publications** including 100 full papers in the international journals, 196 patents, 10 personal and collective scientific and pedagogical books, 3 text-books «Toxicological chemistry» for students of the medical and pharmaceutical universities, 2 programmes of discipline «Toxicological chemistry» for universities with Ministry of Health of Ukraine confirmation. She rewarded by Honorary Credential of the Ministry of Health of Ukraine for the high achievements in science and teaching. *Scopus data: Papers – 99, Citations – 47, h-index – 8.*

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TEXT BOOK  
(ON THE BASE OF UKRAINIAN AND RUSSIAN VERSIONS)

CONFIRMED

by the Ministry of Education and Science, Youth and Sport of Ukraine as textbook for students of the higher medical (pharmaceutical) educational institutions

RECOMMENDED

by the Ministry of Health of Ukraine as textbook for students of the higher pharmaceutical educational institutions and pharmaceutical faculties of the higher medical educational institutions

KIEV  
2017



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*On the base of Ukrainian and Russian versions.*

*Recommended by the Ministry of Health of Ukraine as textbook for students of the higher pharmaceutical educational institutions and pharmaceutical faculties of the higher medical educational institutions, State organization «Central methodical office of the higher medical education of the Ministry of Health of Ukraine» (letter № 23-01-25/35 of 09.04.2013).*

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**Welchinska E.V.**

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This Text Book contains questions of the chemical and physical-chemical methods of the qualitative and quantitative determination of poisons and their metabolites at the human's organism or material of dead body, regularity of the pharmacodynamics and pharmacokinetics or toxicodynamics and toxicokinetics at the body, biotransformation's peculiarity of toxic substances of organic or inorganic origin, sphere of use of toxic substances, symptomatic of intoxications and measures of immediate aid after poisonings. For students of the higher pharmaceutical educational institutions and pharmaceutical faculties of the higher medical educational institutions.

This Text Book contains 76 tables; more, than 70 references to literary sources; 11 figures; 181 questions for control; 54 test tasks for control; 283 points at short glossary and abbreviations; described about 200 poisonous compounds. It contains Appendix (49 antidotes and 23 effective drugs).

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## INTRODUCTION

Quantity of pharmaceutical preparations, which are used at the medicine and different areas of economy, increased during the development of chemistry, chemical and pharmaceutical industry. These substances can be a cause of poisonings in certain causes. The sources of poisonings are: sewage of industrial enterprises, which environmental polluted; pesticides (chemical poisonous) for a fight with agricultural pests; soil; vegetables and fruits; social chemical substances for a fight against the rodents and insects or in engineering. Using of chemical substances at economy increases the quantity of poisonous as objects of forensic toxicological analysis.

**Toxicological and Forensic Chemistry** (old name «Judicial Chemistry» or «Forensic Chemistry») — is a science, which studies methods of isolation, purification, qualitative detection and quantitative determination of toxic and poisonous substances and their metabolites in objects of various origin: biological material of animal and herbal origin, industrial waste such as emission of waste water, the air of industrial enterprises, soil and agricultural crops, etc.

Toxicological Chemistry is of vital importance in the diagnostics of poisonings and crime prevention activity. Conclusions of toxicological chemists on the presence and the amount of poison in the investigational material provides a great support for forensic experts (in order to establish the cases of poisoning), helps judicial and investigational bodies in solving crime cases.

Conclusions of toxicological chemists, hygienists, pharmacologists about high toxicity of certain pharmaceutical products and substances used in the national economic enterprise, serve as the basis for raising the issue of removal of these substances from wide use or introduction changes into storage conditions and their over-the-counter dispense to the population. Results obtained from chemical-toxicological and sanitary investigations of the air and industrial waste water containing toxic substances are being used by sanitary protection authorities for the purpose of filing the application for necessity of construction or reconstruction of waste treatment facilities.

Methods of toxicological chemistry helps to define and control the maximum permissible concentration (**MPC**) of toxic substances presents in water and air and develop standards of pesticide residues and other toxic substances in food.

#### **The tasks of toxicological chemistry are:**

- elaboration of new and improvement of already employed isolation methods of toxic substances from objects of chemical-toxicological analysis;
- elaboration of effective purification methods of extracts derived from objects of chemical-toxicological analysis;





quantitative Analyse von Pflanzen und Pflanzentheilen» (Gottingen, 1882), «Die Heilpflanzen der verschie-denen Volker und Zeiten» (Stuttgart, 1898). Professor of Kharkov's university *S.P. Dvornichenko* published his text-book of forensic chemistry for students in 1900.

In 1929 professor of Pharmaceutical institute in Moscow *A.V. Stepanov* published his text-book of forensic chemistry which re-published four times.

In Ukraine the first departments of forensic chemistry opened at Kharkov's pharmaceutical institute in 1921, at Odessa's pharmaceutical institute in 1935.

Necessary to remember about the discoveries in toxicological chemistry by scientists: *S.B. Novikov* (discovery and quantitative determination of methyl alcohol), *A.G. Zaitsev* (method of quicken detection of Phosphorus), *F.V. Zaikovskiy* (quicken removal of nitric acid and nitrites remainders), *A.N. Krylova* (isolation and discovery of Tetraethyl lead, confirmative reactions for Arsenic), *A.A. Novikova* (quantitative determination of Arsenic), *A.F. Rubtsov* (microquantitative determination of Mercury), *N.G. Polezaev* (Mercury isolation by iodoether) and other.

The Text Book «Toxicological chemistry» of Lvov's medical institute professor *V.F. Kramarenko* was printed in 1989.



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