

## REFERENCE CENTRE FOR IDENTIFICATION AND CONTROL OF CHEMICALS: ROLE AND PLACE IN THE NATIONAL SYSTEM OF CHEMICAL SAFETY

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**ABSTRACT.** In 2014 Ukraine accepted the OSCE proposal to develop an Integrated Chemical Safety and Security Program in Ukraine (ICSSP) aiming to develop a collaborative framework between the Ukrainian partners, the OSCE and the international partners for an effective and coordinated actions to ensure chemical safety and security.

The main goal of the ICSSP program is to improve Ukraine's ability to prevent, prepare for and respond to inappropriate handling of chemicals. Effective chemical safety will help to increase the level of protection of chemical materials, associated facilities and vehicles. ICSSP also had to ensure the implementation of modern solutions and coordinated approaches to strengthen the protection of critical infrastructure in Ukraine.

A comprehensive review, conducted as the first step in the implementation of ICSSP, showed that the program should be aimed at introducing national activities in the field of chemical safety by a wide range of national authorities with a focus on the development of legislative and administrative measures for the implementation of United Nations Security Council Resolution 1540 in the chemical industry.

Realization of the program objectives will provide:

- creating a national (regional) Reference Centre for Identification and Control of Chemicals, able to make expert conclusions regarding hazardous chemicals and precursors quickly and reliably;
- expanding opportunities to detect chemicals, conduct toxicological studies, including for the purpose of export control and forensic investigations, and the possibility to clarify the nature and characteristics of "unknown" chemicals;
- improving capabilities of regional network of chemical analytical laboratories to identify toxic chemicals and ability to conduct joint research, as well as to train laboratory personnel and to exchange good laboratory practices.

The National Reference Centre can serve as a model laboratory and national (regional) training platform for the dissemination of knowledge and best practices. It can help to solve regional problems, because the neighbouring countries Moldova, Georgia, Azerbaijan and even some EU countries also need such assistance.

**Key Words:** chemical safety, Reference Centre, preventive toxicology.

**Introduction.** Improving capabilities in the field of identification of hazardous chemicals is an extremely urgent task for Ukraine, which is in a state of military aggression.

In 2014, Ukraine accepted the OSCE's proposal (Organization for Security and Co-operation in Europe OSCE) to develop the Integrated Chemical Safety and Security Program in Ukraine (ICSSP) [1, 2].

The key objective of the ICSSP program is to improve the capabilities of Ukraine in the prevention, preparedness and response to chemically hazardous incidents. The implementation of the ICSSP program should ensure the implementation of modern solutions and coordinated approaches to enhance the protection of critical infrastructure in Ukraine.

The objectives of the ICSSP program are the following:

- support to Ukraine and chemical industry entities (producers and consumers of chemicals) to expand knowledge and improve chemical safety and security means through educational work studying existing national opportunities and achievements of previous experience;
- introduction of best practices and expansion of cooperation between international and national partners, chemical industry and science entities.

To solve these problems, the existing shortcomings of the national chemical safety system were studied, and practical measures were taken to eliminate them. Such approach led OSCE to review the state of chemical safety

and security in Ukraine comprehensively, it was completed in August – December 2015.

A comprehensive review showed that the ICSSP program should focus on the implementation of national chemical safety measures which should be done by a wide range of national authorities, with a focus on the development of legislative and administrative measures to implement the requirements of United Nations Security Council Resolution 1540 in the chemical industry [3].

Improvement of the capabilities for identifying hazardous chemicals was identified by the Comprehensive Review as one of the priority activities. In 2017, Ukraine launched the OSCE project to create a national reference centre for the identification and control of chemicals. Today, analysis of chemicals is the basis for developing standards for the safe and secure handling of chemicals, creating and operating an appropriate licensing system, including the licensing system for export control over dual-use products (Duos material), as well as for developing appropriate technologies for producing and applying throughout the life cycle. Modern analytical instruments in combination with appropriate methods allow specialists to determine the toxicity level of chemicals and mixtures and their hazardous properties accurately.

The national network of chemical analytical and toxicological laboratories has the necessary equipment and qualified personnel to detect and identify chemicals, and to determine level of their danger (toxicity). But most laboratories use outdated equipment and analysis methods, due to old standards (Soviet “GOST” All Union State standard). To improve the situation, it is necessary to modernize equipment and to train personnel to use new analytical instruments and methods that meet modern standards.

Ukraine–European Union Association Agreement provides the introduction of European standards for the compliance of chemicals and mixtures. Therefore, it is necessary to take measures for the accreditation of testing laboratories to assess the compliance of chemical products with international standards. In this context, laboratory staff should be trained in accordance with EU technical regulations on specific chemical products. In addition, in Ukraine until recently there was no specialised and properly equipped control

laboratory (Reference Centre), which was able to offer a quick and reliable expert opinion on the identification and study of the nature and characteristics of “unknown” substances or “unidentified” chemicals which were found during emergencies [4, 5]. Recent emergencies and constant terrorist threats related to the general security situation in the country justify the urgency of creating an identification (reference) centre. It can help all government agencies responsible for chemical safety and security, as well as address the urgent need of law enforcement agencies for judicial inquiries connected with toxic chemicals.

The creation of a national identification centre is an important step in strengthening control over the circulation of dual-use products (Duos material) in accordance with paragraph 3 of United Nations Security Council Resolution 1540 and the country’s readiness to counter chemical threats [6]. It was considered that the State Enterprise “Scientific Centre of Preventive Toxicology, Food and Chemical Safety named after Academician L.I. Medved of the Ministry of Healthcare of Ukraine” (hereinafter referred to as the “Scientific Centre”) is one of the most modern chemical analytical institutions in Ukraine. That is confirmed by the following:

- The Scientific Centre is certified by an authorized European Agency as a preventive toxicological laboratory in accordance with the requirements of Good Laboratory Practice (GLP) [7];
- The Scientific Centre is able to determine the toxic properties of pesticides and agricultural chemicals in accordance with international standards, and its results are recognized by EU supervisory authorities;
- The Scientific Centre has an analytical chemistry laboratory, a toxic waste laboratory and a certified dioxin centre.

Considering the above-mentioned and the conclusions of the Comprehensive Review of chemical safety and security in Ukraine, approved by the Ministry of Healthcare, it was decided to create a “Reference Centre for Identification and Control of Chemicals” (Reference Centre) on the basis of the Scientific Centre.

However, in 2017, the laboratories of the Scientific Centre lacked the appropriate regulatory framework, standard operating procedures (SOPs) for providing services to interest-



**Fig. 1.** Professor Mykola Prodanchuk, Director of the Scientific Center, demonstrates a new device in the laboratory of the Reference Centre.

ed bodies and private sector, as well as lacked some specific high-resolution chemical analytical equipment for accurate, fast and reliable detection and identification of hazardous chemicals, such as precursors, that could be used to produce highly toxic chemicals. These technical inconsistencies were resolved during 2018.

Today, the Scientific Centre has a modern system combining a gas chromatograph with a high-resolution time-flight mass spectrometer (TOF) with the following characteristics:

- resolution 20,000 - 50,000 FWHM;
- mass accuracy—less than 1 permille;
- spectral capture coefficient — 200 spectra/second.

New equipment will allow the Reference Centre laboratory to obtain structural information about highly toxic compounds of chemical weapons and their precursors to carry out an analysis that would allow to search for “unknown substances” and significantly increase the speed of analysis, and as a result, the productivity of the laboratory.



**Fig. 2.** The ceremony of presenting the certificate on the opening of the Reference Centre for Identification and Control of Chemicals (Zoryana Skaletska, Minister of Healthcare of Ukraine; Mykola Prodanchuk, Professor, Director of the Scientific Center; Henryk Villadsen, Ambassador, OSCE Project Coordinator in Ukraine)

It is obvious that today no other laboratory in Ukraine has such opportunities.

The creation of the Reference Centre provides new opportunities in the following areas:

- improving chemical safety and security through the development and implementation of ICSSP provisions in the field of identification of hazardous chemicals;
- enhancing national (regional) analytical ability to detect toxic chemicals or precursors;
- improving the ability to conduct toxicological studies for national government bodies, entities of the chemical sector and international partners.

The main objectives of the Reference Centre are the following:

- identification of toxic chemicals in accordance with national legislation and the

Checklist of dual-use products, as well as with procedures and rules of state export control of Ukraine in accordance with EU norms and standards;

- assistance to central executive bodies in fulfilling the tasks, entrusted to them, in handling toxic substances and maintaining chemical safety and security in Ukraine in accordance with the United Nations Security Council Resolution 1540 (2004);
- development, testing and implementation of modern research methods, identification of toxic chemicals;
- introduction of organizational and methodological assistance in the organization of departmental research laboratories, which are subordinate to the central executive authorities;
- conduct of reference studies;
- provision of advisory and methodological assistance to healthcare institutions of Ukraine regarding toxicological diagnostic methods and identification of chemicals.

Reference Centre for Identification and Control of Chemicals interacts with the following key actors:

Ministry of Defence Ukraine  
Security Service of Ukraine  
Ministry of Internal Affairs of Ukraine:  
National Police of Ukraine  
State Border Guard Service of Ukraine  
State Migration Service of Ukraine  
State Emergency Service of Ukraine  
National Guard of Ukraine  
Ministry of Ecology and Natural Resources of Ukraine

State Environmental Inspection of Ukraine  
Ministry of Economic Development and Trade of Ukraine

State Export Control Service of Ukraine  
Ministry of Healthcare of Ukraine

Other subjects of specialized interactions and international partners.

Based on the results of international cooperation, a Reference Centre for Identification and Control of Chemicals, created in Ukraine, can make expert conclusions regarding hazardous chemicals and precursors quickly and reliably. In a short time, the equipment of the Scientific Centre laboratories was modernized, new high-resolution chemical analytical equipment was purchased, installed and tested. The ability to detect chemicals, conduct toxicological studies, including those for the pur-

pose of export control and forensic investigations, was significantly increased, as well as the possibilities of clarifying the nature and characteristics of “unknown” chemicals were improved. The capability of regional network of chemical analytical laboratories to identify toxic chemicals, the ability to conduct joint research, as well as to train laboratory personnel and to exchange good laboratory practices were improved.

The Reference Centre can serve as a model laboratory and national (regional) training platform for the dissemination of knowledge and best practices, which will contribute to the implementation of regional needs, considering the fact that neighbouring countries, Moldova, Georgia, Azerbaijan and even some EU countries do not have such opportunities.

The Reference Centre for Identification and Control of Chemicals has been declared open.

*The authors declare that there are no conflicts of interest.*

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### РЕФЕРЕНС-ЦЕНТР ІДЕНТИФІКАЦІЇ ТА КОНТРОЛЮ ХІМІЧНИХ РЕЧОВИН: РОЛЬ І МІСЦЕ В НАЦІОНАЛЬНІЙ СИСТЕМІ ХІМІЧНОЇ БЕЗПЕКИ

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**РЕЗЮМЕ.** У 2014 році Україна прийняла пропозицію ОБСЄ розробити Комплексну програму хімічної безпеки та захищеності в Україні (ICSSP) у рамках співпраці між українськими партнерами, ОБСЄ і міжнародними партнерами для ефективних та скоординованих дій у сфері хімічної безпеки.

Основна мета програми ICSSP – покращити можливості України щодо запобігання, готовності та реагування на нелегальне поводження з хімічними речовинами. Ефективна хімічна безпека сприятиме підвищенню рівня захищеності хімічних матеріалів, супутніх споруд та транспорту. ICSSP також мала забезпечити впровадження сучасних рішень та скоординованих підходів для посилення захисту критичної інфраструктури в Україні.

Комплексний огляд, проведений як перший крок реалізації ICSSP, показав, що програма має бути спрямована на впровадження національних заходів у сфері хімічної безпеки широким колом національних органів з акцентом на розробку законодавчих та адміністративних заходів щодо імплементації РБ ООН 1540 р. у хімічній галузі.

Реалізація цілей програми забезпечить:

- створення національного (регіонального) Референс-центру ідентифікації небезпечних хімічних речовин, здатного швидко та надійно робити експертні висновки щодо небезпечних хімічних речовин та прекурсорів;
- розширення співпраці для виявлення хімічних речовин, проведення токсикологічних досліджень, у тому числі з метою контролю експорту, криміналістичних розслідувань і можливості уточнення природи та особливостей «невідомих» хімічних речовин;
- поліпшення можливостей регіональної мережі хіміко-аналітичних лабораторій для виявлення токсичних хімічних речовин та проведення спільних досліджень, навчання персоналу лабораторій та обмін належними лабораторними практиками.

Національний Референс-центр може слугувати зразковою лабораторією та національним (регіональним) навчальним майданчиком для поширення знань та передового досвіду. Це допоможе розв'язати регіональні проблеми, адже сусідні країни – Молдова, Грузія, Азербайджан і навіть деякі країни ЄС також потребують подібної допомоги.

**Ключові слова:** хімічна безпека, референс-центр, превентивна токсикологія.

**РЕФЕРЕНС-ЦЕНТР ИДЕНТИФИКАЦИИ И КОНТРОЛЯ ХИМИЧЕСКИХ ВЕЩЕСТВ:  
РОЛЬ И МЕСТО В НАЦИОНАЛЬНОЙ СИСТЕМЕ ХИМИЧЕСКОЙ БЕЗОПАСНОСТИ**

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**РЕЗЮМЕ.** В 2014 году Украина приняла предложение ОБСЕ разработать комплексную программу химической безопасности и защищенности в Украине (ICSSP) в рамках сотрудничества между украинскими, ОБСЕ и международными партнерами для эффективных и скоординированных действий в сфере химической безопасности.

Основная цель программы ICSSP - расширить возможности Украины по предотвращению особо опасных ситуаций, возникших в результате ненадлежащего обращения с химическими веществами, усовершенствовать готовность и реагирование, на них. Эффективная химическая безопасность предполагает повышение уровня защищенности химических материалов, в частности сооружений и транспорта.

ICSSP также должна была обеспечить внедрение современных решений и скоординированных подходов для усиления защиты критической инфраструктуры в Украине.

Комплексный обзор - первый шаг реализации ICSSP. Он показал, что программа должна быть направлена на проведение национальных мероприятий в сфере химической безопасности широким кругом национальных органов с акцентом на разработку законодательных и административных мер по имплементации СБ ООН 1540 в химической отрасли.

Реализация целей программы обеспечит:

- создание национального (регионального) Референс-центра идентификации опасных химических веществ, способного быстро и надежно подготовить экспертные выводы относительно опасных химических веществ и прекурсоров;
- расширение возможностей для выявления химических веществ, проведения токсикологических исследований, в том числе с целью контроля экспорта, криминалистических расследований и возможности уточнения природы и особенностей «неизвестных» химических веществ;
- улучшение возможностей региональной сети химико-аналитических лабораторий для обнаружения токсичных химических веществ и возможности проведения совместных исследований, обучение персонала лаборатории и обмена соответствующими лабораторными практиками.

Национальный Референс-центр может служить образцовой лабораторией и национальной (региональной) учебной площадкой для распространения знаний и передового опыта. Это может помочь решению региональных проблем, ибо соседние страны, Молдова, Грузия, Азербайджан и даже некоторые страны ЕС, нуждаются в подобной помощи.

**Ключевые слова:** химическая безопасность, референс-центр, превентивная токсикология.

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