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EXPERIENCE OF SCIENTIFIC AND RESEARCH WORK OF HYGIENE AND ECOLOGY INSTITUTE IMPLEMENTATION AT THE COURSE OF DISCIPLINE “HYGIENE AND ECOLOGY” STUDY FOR FOREIGN STUDENTS

Summary. *We have developed and introduced the method of integrated risk assessment for human health during the consumption of pesticide-contaminated water in the course of teaching the discipline “Hygiene and Ecology”. Introducing future physicians with modern approaches of harmful and dangerous environmental factors assessment is an important part of their training, which brings it to the European level.*

Key words: *education, science, implementation, risk, hygiene and ecology.*

In medical science in recent years hygienic methods related to the assessment of the risk of environmental factors affecting human health have been significantly developed. The assessment of environmental risks is prescribed in Ukrainian legislation, and an increasing attention is being paid to the solution of environmental safety problems [1, p. 222–223; 2]. Today in Europe and the world, risk assessment methods are widely used in various fields of environmental monitoring [3, p. 370].

Chemical compounds and pesticides, in particular, are a significant risk factor for the health of professional and non-professional contingents [4]. In Ukraine, unfortunately, only the risk assessment for professional contingents is conducted directly in the application of pesticides for the crops treatment. Risk assessment for the population when consuming contaminated water is not carried out.

That is why it is relevant and important to develop and implement methods for assessing such risks, to develop a set of measures to prevent the negative impact of pesticides on public health. In addition, it is important for future physicians to know a variety of risk assessment methods for the health of professional and non-professional contingents.

The purpose of the work was to share the experience of implementation of the research results of the Hygiene and Ecology Institute into the course of teaching the discipline “Hygiene and Ecology” for foreign students at the hygienic departments of Bogomolets National Medical University.

Materials and methods. Methods of analysis, synthesis and systematization of information, statistical methods were used in this work. As information sources data from the European Food Safety Authority (EFSA), the Environmental Protection Agency (US EPA), the WHO have been used [5, 6].

Results. One of the topics of “Hygiene and Ecology” discipline, which is studied by medical students, including foreigners, is the “Hygienic assessment of the potential risk of environmental factors affecting human’s and population health” at the 6th year. Today’s topic is extremely relevant given the active European integration of our country, as in Europe, the risk-oriented approach is extremely common in assessing any environmental factors, including pesticides [5, 6].

In order to assess the risk to human health when consuming water contaminated with pesticides (so-called “bystanders” or non-professional contingents) abroad, there is such a method (SCI-GROW), which only reflects the maximum possible concentration of substance in water [7, p. 41–43].

Certain indices (LEACH, GUS, LIX) show only the risk of pesticide penetration into ground and surface water, but do not give rise to any risk assessment for human health when using water, contaminated with pesticides. Most other approaches to risk assessment are based mainly on a simple comparison of the amounts of potential pesticide consumption with the product with its admissible daily intake (ADD) [5, 6].

The best, in our opinion, leaching potential index is LEACH. First, this index determines not only the possibility of contamination of groundwater, but also rivers, where pesticides may leach from surface runoff. Second, it takes into account the maximum number of parameters that can influence the transition of pesticides from soil into other mediums.

But it should be noted, that all above calculated indices characterize only the potential of pesticides penetration into groundwater and surface water without reliable estimate of the probability of such penetration. Moreover, they do not allow us to estimate the risk to human health when consuming water contaminated in such a way.

In our country, even such methods were absent. Therefore, we proposed an algorithm for risk assessment for human health when pesticides come in various ways in their body in everyday life (Fig. 1).

We recommend for an integrated assessment of the potential risk of pesticides exposure on human body when contaminated water is consumed to evaluate 3 indices: possible leaching into groundwater and surface waters (LEACH), half-life in water (DT_{50}) and allowable daily dose (ADD) in a four-points scale [8–10].

After adding all the points, the integral index of the risk of contaminated water consumption (IPCWC) is estimated as follows: at the value of IPCWC 3 or 4 points – substances are low hazardous to humans (class 4), 5 and 6 – moderately hazardous (class 3), 7 and 8 – hazardous (class 2), 9 and 10 – highly hazardous (class 1B), 11 and 12 – extremely hazardous (class 1A).

Implementation of this methodology in the educational process was carried out in 2017–2018 and 2018–2019 study years. Around 150 foreign students were informed about the method.

At the practical classes on the topic “Hygienic assessment of potential risk ...”, students have an opportunity to get acquainted with this technique. They solve situational tasks in assessing and predicting the risk of harmful effects on the human body when consuming water contaminated with pesticides, giving recommendations for the prevention of such effects.

For example, at conducting of the post-registration monitoring re-

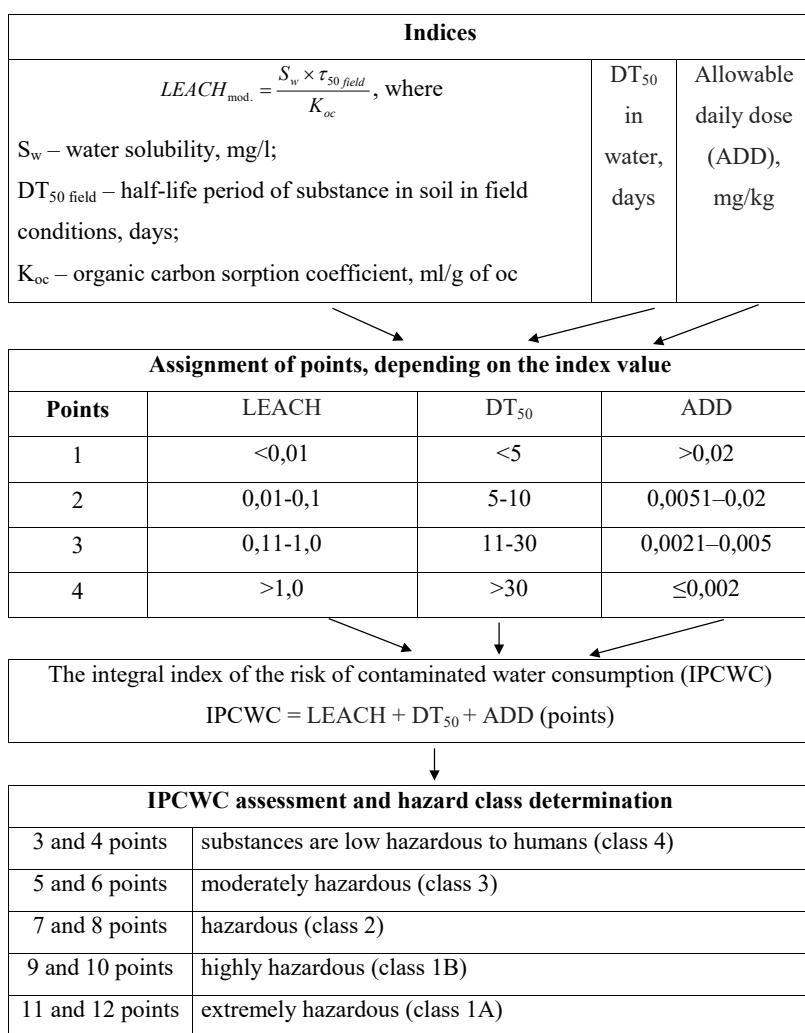


Fig. 1. Scheme for estimating and predicting the risk of pesticides exposure with water to the human body

searches you got the task to estimate the hazard of getting into the human body with water one of the most widely used in Ukraine and the world of fungicide difenoconazole.

Information about physical and chemical properties, stability in the water is given from IUPAC official website: solubility in water – 15 mg/l, K_{oc} – 3760, DT_{50} in water – 3 days. Parameters of studied fungicide stability in soil and climatic conditions of Ukraine are given on the results of own field researches conducted by specialists of Hygiene and Ecology Institute: DT_{50} in soil – 31,3 days. Toxicological properties (allowable daily dose) is given from official Ukrainian document (State Standard 8.8.1.2.3.4-000-2001): ADD – 0,002 mg/kg.

Solution: LEACH = 3 points (0,1249 – calculated by the formula given above), DT_{50} in water = 1 point, ADD = 4 points. IPCWC = 8 points – hazardous compound (class 2).

It was established that according to LEACH index in soil and climatic conditions of Ukraine the risk of contamination of ground and surface water by difenoconazole is moderate. When consuming this compound with water it is hazardous for human health, predominantly due to its high toxicity (low ADD value).

The issues of risk assessment for the population are included in the list of questions for the professional-orientated state exam for students of medical faculties and KROK-2 tests.

Conclusion. Thus, we have developed and introduced the method of integrated risk assessment for human health during the consumption of pesticide-contaminated water in the course of teaching the discipline “Hygiene and Ecology”. Introducing future physicians with modern approaches of harmful and dangerous environmental factors assessment is an important part of their training, which brings it to the European level.

REFERENCE

1. Пляцук Д.Л., Бойко В.В. Економічні аспекти оцінки екологічних ризиків у техногенно-навантажених регіонах. *Механізм регулювання економіки*. 2012. № 4. С. 222–226
2. Закон України «Про Основні засади (стратегію) державної екологічної політики України на період до 2020 року». *Відомості Верховної Ради України (ВВР)*. 2011. № 26. ст. 218.
3. Звягінцева Г.В. Методика з оцінки екологічних ризиків при забрудненні навколишнього природного середовища. *Вісник Донецького Національного університету: Природничі науки*. 2009. Вип. 2. С. 370–379.
4. Корзун В.Н., Воронцова Т.О., Антонюк І.Ю. Екологія і захворювання щитоподібної залози. К.: Міжрегіональний видавничий центр «Медінформ». 2018. 743 с.
5. Guidance of EFSA: Guidance on the assessment of exposure of operators, workers, residents and bystanders in risk assessment for plant protection products. *European Food Safety Authority (EFSA) Journal*. 2014. № 12 (10). P. 3874–3924.
6. Report of the Joint working group on bystander risk assessment (BRAWG). Advisory Committee on Pesticides Committee on Toxicity of Chemicals in Food, Consumer Products and the Environment, US EPA. 2013. 70 p.
7. Cohen, S. Recent examples of pesticide assessment and regulation under FQPA. *Agricultural chemical news*. 2000. P. 41–43.
8. Antonenko A., Vavrinevych O., Korshun M., Omelchuk S. Development of a Method for Prediction of Risk of Surface and Groundwater Contamination with Pesticides and Their Dangerous Aspects for Human Health. IntechOpen, 2019. URL: <https://www.intechopen.com/online-first/development-of-a-method-for-prediction-of-risk-of-surface-and-groundwater-contamination-with-pestici> (date of acceptance 10.04.2019).
9. Спосіб комплексної оцінки ризику негативного впливу на організм людини пестицидів при їх вимиванні у воду. Патент на корисну модель № 105429; заявл. 03.07.2015; опубл. 25.03.2016. 2016. Бюл. № 6. 4 с.
10. Antonenko A.M., Vavrinevych O.P., Omelchuk S.T., Korshun M.M. Prediction of pesticide risks to human health by drinking water extracted from underground sources. *Georgian Medical News*. 2015. № 7-8 (244-245). P. 99–106.
11. Державні санітарні правила та норми «Допустимі дози, концентрації, кількості та рівні вмісту пестицидів у сільськогосподарській сировині, харчових продуктах, повітрі робочої зони, атмосферному повітрі, воді водоймищ, ґрунті» (ДСанПнН 8.8.1.2.3.4-000-2001), Київ-2001

А.М. Антоненко, О.П. Вавріневич, С.Т. Омельчук, В.Г. Бардов. Досвід впровадження результатів науково-дослідної роботи Інституту гігієни та екології в курс викладання дисципліни «Гігієна та екологія» для іноземних студентів. – Стаття.

Анотація. Нами розроблено та впроваджено в курс викладання дисципліни «Гігієна та екологія» методу інтегральної оцінки ризику для здоров'я людини при вживанні контамінованої пестицидами води. Ознайомлення майбутніх лікарів із сучасними підходами до оцінки шкідливих і небезпечних факторів навколишнього середовища є важливою частиною їх навчання, що виводить його на європейський рівень.

Ключові слова: освіта, наука, впровадження, ризик, гігієна та екологія.

А.Н. Антоненко, Е.П. Вавріневич, С.Т. Омельчук, В.Г. Бардов. Опыт внедрения результатов научно-исследовательской работы Института гигиены и экологии в курс преподавания дисциплины «Гигиена и экология» для иностранных студентов. – Статья.

Аннотация. Нами разработана и внедрена в курс преподавания дисциплины «Гигиена и экология» методика интегральной оценки риска для здоровья человека при употреблении контаминированной пестицидами воды. Ознакомление будущих врачей с современными подходами к оценке вредных и опасных факторов окружающей среды является важной частью их обучения, выводит его на европейский уровень.

Ключевые слова: образование, наука, внедрение, риск, гигиена и экология.