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... e minunat să fii sănătos!
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Apă pentru consumul zilnic,
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APĂ IODATĂ

-Apă atent purificată, cu conținut echilibrat de minerale, îmbogățită cu adaos de iod natural din Cehia, fiind potrivită consumului pentru întreaga familie.

-O sticlă de 1,5 litri conține norma zilnică de iod pentru un adult - 150 µgr.

-Iodul natural nu se volatilizează în timpul fierberii, deci această apă poate fi folosită la prepararea băuturilor fierbinți și a bucatelor.

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Materials of the National Scientific Conference with International participation "Water and health: achievements and challenges"

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Water and Health in the care of scientists

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Currently, the population of the world, and especially of the Republic of Moldova, is facing the major problems in terms of the access to safe water and namely to its quantity and quality. Obviously, these important features greatly influence the health of the adult population and children. These are specific determinants of these problems, which unresolved issues may amplify the consequences that currently exist.

That is why, the problem of supplying the population with the qualitative drinking water had been given a high priority worldwide. The United Nations Conference on the Environment in Rio de Janeiro on December 22, 1992, adopted the decision to make **March 22 the World Water Day**. In 2022, this day would focus on the theme of water recovery. The possibilities were highlighted, but also the tasks to implement measures to improve the supply system and water quality were put in front of all leaders, the general public, non-governmental organizations, the media. In this context, the national conference with international participation **"Water and health: achievements and challenges"**, which had been held under the auspices of the Ministry of Health of the Republic of Moldova, was quite eloquent. Papers were presented and scientific reports were presented by the scientists and practical specialists from the Republic of Moldova and also from the scientists from Romania and the Ukraine. The producers of bottled water were also successfully included.

În prezent populația din întreaga lume, în special cea din Republica Moldova, se confruntă cu probleme majore vizând accesul la surse de apă sigură din punct de vedere cantitativ și calitativ. Evident, acest fapt influențează în mare măsură starea de sănătate a populației adulte și a copiilor. Necombaterea factorilor determinanți, specifici ai acestor probleme poate amplifica gravitatea consecințelor existente acum.

De aceea, pe plan mondial, problema aprovizionării populației cu apă potabilă de calitate prezintă o prioritate deosebită. Conferința Organizației Națiunilor Unite pentru Mediu și Dezvoltare de la Rio de Janeiro a adoptat, la 22 decembrie 1992, hotărârea prin care ziua de **22 martie** a fost proclamată **Ziua mondială a apei**. În anul 2022 manifestațiile dedicate acestei zile se desfășoară sub genericul Valorizarea apei. Se evidențiază posibilitățile, dar se și sarcini în fața tuturor factorilor de decizie, publicului larg, organizațiilor nonguvernamentale, mijloacelor de informare în masă etc., pentru realizarea măsurilor de ameliorare a sistemului de aprovizionare și a calității apei. În acest context, se înscrie destul de elocvent agenda Conferinței naționale cu participare internațională **„Apa și sănătatea: realizări și provocări"**, care se desfășoară sub egida Ministerului Sănătății al R. Moldova. Sunt prezentate lucrări și rapoarte științifice ale savanților și ale specialiștilor din domeniu atât din Republica Moldova, cât și din România și Ucraina. În mod reușit s-au inclus în acest context și producătorii de apă îmbuteliată.

The works were based on the results of scientific research carried out over several years. The peculiarities of the unfavorable quality of water from different sources and the quality of drinking water were discussed. High mineralization of water (especially groundwater), deficiencies related to the deficiency or surplus of some microelements (fluorine, iodine, boron), nitrate pollution, pollution with organic and mineral residues, etc., were some of the many characteristics of drinking water quality.

At the same time, the studies had been carried out according to the principle of environmental medicine, which demonstrated the existence of interrelationship between the mineral components of drinking water and some non-communicable diseases. The data were presented on the retrospective characteristic of the population morbidity, highlighted health indicators based on the existing statistical data, the results of medical examinations, addressability to health care, self-assessment questionnaires of individual health, etc. Through these investigations, the premorbid and morbid conditions were possibly conditioned by the water factors, which were highlighted.

The authors, who participated in the conference, developed prophylactic measures, which were partly reflected in the approved and edited guidelines and regulations, and partly were presented for evaluation and approval. Thus, based on the conference materials, concrete, effective premises, it was formed for the argumentation and elaboration a complex of prophylactic measures in order to prevent the unfavorable impact of water risk factors on the population's health indices.

In conclusion, I would like to thank all the participants of the conference for the important materials included in this edition, the people who provided us with financial and spiritual support, with the hope for the effective conduct of the forum, for health and peace.

Sincerely!

Gr. Friptuleac

Lucrările sunt bazate pe rezultatele investigațiilor științifice, efectuate pe parcursul mai multor ani. Se pun în discuție particularitățile calității nefavorabile a apei din diferite surse și a calității apei potabile. Nivelul înalt de mineralizare a apelor (îndeosebi a celei subterane), deficiențele legate de carența sau de surplusul unor microelemente (fluor, iod, bor), poluarea cu nitrați, cu reziduuri organice și minerale etc. constituie unii dintre multiplii factori care pot afecta calitatea apei potabile.

Concomitent, s-au făcut cercetări după principiul medicinii mediului, prin care s-a demonstrat existența interrelațiilor dintre componentele minerale ale apei potabile și unele boli netransmisibile. Sunt furnizate date vizând tabloul retrospectiv al morbidității populației, indicatorii stării de sănătate, relevați pe baza datelor statistice existente, a rezultatelor examenelor medicale, apelării la asistență medicală, a chestionarelor de autoevaluare a stării de sănătate etc. Prin aceste investigații s-au evidențiat stările premorbide și cele morbide, posibil condiționate de factorul hidric.

Autorii, participanți la conferință, au întocmit măsuri profilactice, unele dintre care au fost incluse în ghidurile și în regulamentele respective, fiind în prealabil aprobate și editate, iar altele urmând a fi prezentate pentru evaluare și aprobare. Astfel, în baza materialelor conferinței, se vor crea premise concrete, eficiente de argumentare și de elaborare a unui complex de măsuri profilactice, în scopul prevenirii impactului nefavorabil al factorilor de risc prezenți în apă asupra indicilor de sănătate a populației.

La final, țin să mulțumesc tuturor participanților la conferință pentru elaborarea materialelor valoroase, incluse în această ediție, persoanelor care ne-au oferit suport financiar și spiritual, asigurând desfășurarea eficientă a forului preconizat și să le adresez sincere urări de sănătate și pace.

Cu mult drag!

Gr. Friptuleac

WATER AND HEALTH: PRODUCTS, MATERIALS, CHEMICALS/MIXTURES AND EQUIPMENT USED IN CONTACT WITH DRINKING WATER AND PROTECTION OF HUMAN HEALTH – IN ACCORDANCE WITH ORDER NO 275/2012

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Introduction

In Romania, the Ministry of Health, as a central authority and in accordance with the requirements of Law no. 458/2002, regarding the quality of drinking water, Art.10, paragraphs (1) and (2), decided – in 2012 – to regulate the procedures for the sanitary approval of products, materials, chemicals/mixtures and equipment used in the production, transport, storage and distribution of drinking water, including for installations within the residential buildings. The aim was to protect human health from any contamination of drinking water. Protecting public health is done primarily by reducing short-term or long-term exposure to risk factors posed by chemicals in materials that come into contact with drinking water, the values of which may exceed the CMA (maximum allowable concentration) set by law. These substances can migrate rapidly in water and thus be absorbed by being ingested, which can cause acute effects in the body, or they can be released from the structure of the product over time, into water, which can cause cumulative toxic effects.

Material and methods

The purpose of the study was aimed to describe the evaluation of the products, materials, chemicals/mixtures and equipment from Romania used in contact with drinking water, as well as to analyze the possible risks on the quality of drinking water determined by the products/components of the products, as well was by the substances released during their use.

The evaluation of products, materials, chemicals/mixtures and equipment used in contact with drinking water was performed by the Commissions of materials in contact with drinking water of the Regional Centers of Public Health from Bucharest, Cluj Napoca, Iasi, Targu Mures and Timisoara within the National Institute of Public Health, Romania. Each commission included a doctor, a biologist and a chemist.

The Health Approval Form and the Notification Form are the official documents issued by the Commission at the level of each Regional Centers of Public Health, based on the product file and technical evaluation report carried out by the experts appointed by the director of the National Institute of Public Health, which were ultimately signed by the Coordinator of each commission and by the Medical Chief of the Regional Center of Public Health.

The materials and chemicals used in the production, transport, storage and distribution of drinking water, including that used for residential installations, have been assessed for the nature of the substances from which they are made and for determining the amounts of substances that migrate or dissolve in water. The scope refers to fixed public or private drinking water supply installations.

Products and their components are made of the following types of materials: organic materials (e.g. plastics, polymers, rubbers, resins, etc.), metallic materials (e.g. pure metals or alloys), cements (e.g. concrete, mortar, etc.), glass materials, other materials (e.g. bituminous, lubricants). Products can be made of a single material (e.g. plastic pipes) or they can be made of several components of different materials (e.g. the water meter has organic and metal components).

Although the components of a product can be tested individually, the product is evaluated and certified as a whole, in accordance with the provisions of the harmonized product standard.

According to the Ministry of Health Order no. 275/2012, on the approval of the Sanitary Regulation Procedure for the placing on the market of products, materials, chemicals/mixtures and equipment used in contact with drinking water, for issuing a Health Approval Form or a Notification Form it is necessary, as a first step, to complete an applications which is registered together with the complete file at the National Institute of Public Health. For the evaluation of this file, it is mandatory – in Romania - that the applicant be registered at the Trade Register!

Sanitary approval is the registration process for products, materials, chemicals/ mixtures and equipment used in contact with drinking water, placed for the first time on the Romanian market, produced for the first time in Romania or imported from third countries. Notification is the registration process for products, materials, chemicals/mixtures and equipment used in contact with drinking water, placed for the first time on the Romanian market and approved in Member States of the European Union.

To receive a Health Approval Form or a Notification Form it is mandatory to submit copies of documents in the product file according to the Ministry of Health Order no. 275/2012 (certificates, approvals, toxicological tests, etc.) with the mention "according to the original", signed and stamped, as well as the original analysis bulletins. The product file must be presented in Romanian or, as the case may be, with a certified translation. In order for a product /equipment/material/substance to receive a Health Approval Form or a Notification Form, the file must contain all the documents required in the order. The presence of a document does not exclude the presence of another document, even if certain information is partially or totally found in that document.

A presentation sheet will include: the field of use of drinking water, a brief description of the product(s), including the components that come into contact with drinking water, the working pressure at which it will be used, the nominal diameters, the temperature as is used the product and the product was tested, the substance of the raw material found in the composition of the product that comes into contact with drinking water.

The producer shall declare the quantitative and qualitative chemical composition of the material (s) in which the product comes into contact with drinking water, written on a separate, signed and stamped document. It is not enough if the applicant submits the data sheet/safety data sheet for the material. Test reports/notifications/approvals obtained in the European Union do not replace the document with the quantitative and qualitative chemical composition with the CAS numbers.

Can be requested from the manufacturer: for plastics (e.g. EPDM, polypropylene, polyethylene, etc.) - the quantitative and qualitative chemical composition for the basic chemicals; for metallic materials (e.g. steel, brass, cast iron) - the quantitative and qualitative chemical composition will be found in the material test certificate, which must be issued to the manufacturer of the material declared by the applicant; for cement products - quantitative and qualitative chemical composition for basic chemicals; for fiberglass in the composition of some products - must be checked to see if it is the type used in contact with drinking water; for filter membranes - quantitative and qualitative chemical composition for basic chemicals; for coating (epoxy paint) - quantitative and qualitative chemical composition for basic chemicals.

The analysis forms/tests performed by laboratories accredited in the field, in accordance with the provisions of Regulation (EC) No 765/2008 of the European Parliament and of the Council of 9 July 2008 laying down the requirements for accreditation and market surveillance relating to the marketing of products and repealing Regulation (EEC) No. 339/93, are presented in the original.

The analysis form on migration tests or approvals obtained in European Union countries for material in contact with drinking water (obtained by the producer), the safety data sheet of the raw material manufacturer (for the material that comes into contact with drinking water) and the declaration of conformity (the producer given this declaration) in according with the terms of health effects and not in terms of technical tests performed shall be submitted to the file.

The defining indicators for different groups of products and materials, which come into contact with drinking water and which need to be investigated, include cast iron (Cr, Ni, Mn, Fe, Pb, As, Cd, pH, color, turbidity); galvanized steel (zinc coated): Pb, Cr, Cd, Ni, Zn, pH, color, odor; galvanized steel (Pb, Cr, Cd, Ni, Mn, pH); copper based materials (Pb, As, Cu, Cr, pH, flavor, TOC for copper pipes); brass (Pb, Zn, Cd, Sb, Cu, Ni, Sn, pH); bronze (Pb, Zn, Cu, Cr, Cd, Ni, Sn, pH, Al for aluminum-based bronze); rubber (OCD, oxidizability, Cd, Pb, Zn, Ba, phenols, pH, aromatic primary amines, PAU, odor, color, turbidity). It is recommended to check the presence of other organic substances by GC/MS qualitative investigation; polyethylene: OCD, oxidizability, pH, Pb, Cd, Ni, V, phenols, odor, color, other indicators in accordance with the additives used (for colored materials, the metals will be investigated according to the pigments used); polyurethane (OCD, primary amines aromatics, oxidability, pH, odor, color, Cr, Pb, Cd, Ni, phenols), other indicators depending on the additives used (for colored materials, metals are determined according to the pigments used); color, styrene, Pb, Cd, pH, other indicators according to the additives used; polypropylene (OCD, oxidizability, pH, Pb, Cd, odor, color, other indicators according to the additives used); polyvinyl chloride (TOC, oxidizability, pH, Pb, Cd, vinyl chloride), phthalates (for PVC plastic), odor, color, other indicators according to the additives used; polyamides (TOC, oxidizability, Pb, Cd, primary aromatic amines, pH, odor, color, other indicators according to the additives used; epoxy resins: OCD, oxidizability, primary aromatic amines, Cd, Pb, Ba, Hg, phenols, pH, epichlorohydrin, color, turbidity, volatile organic substances (especially benzene, toluene, styrene, ethyl benzene, xylene); painted materials: TOC, oxidizability, Cd, Pb, phenols, pH, color, turbidity, odor, volatile organic substances (especially benzene, toluene, styrene, ethyl benzene, xylene); cements (Cr, Pb, pH, Cd, Al, As, TOC, oxidizability, nitrites, ammonium ions, conductivity, turbidity, color, odor); ceramic and silicate materials (pH, color, odor, turbidity, Pb, Cd, As, Ni, Cr, Al, TOC); ion exchangers (pH, conductivity, oxidability, TOC, Pb, Cd, Cr, odor, color, epichlorohydrin, styrene).

These rules do not apply to the substances used in water disinfection processes, which fall under the scope of Government Decision no. 956/2005 on the placing on the market of biocidal products.

Results

From 2012 to 2021, the Commission on materials in contact with drinking water from the Regional Center of Public Health Bucharest issued the following: 2012 – 26 Health Approval Form, 2013 – 27 Health Approval Forms, 2014 – 32 Health Approval Forms, 2015 – 12 Health Approval Forms, 2016 – 16 Health Approval Forms, 2017 – 23 Health Approval Forms, 2018 – 23 Health Approval Forms, 2019 – 17 Health Approval Forms, 2020 – 2 Health Approval Forms, 2021 – 23 Health Approval Form and 2012 – 34 Notification Forms, 2013 – 63 Notification Forms, 2014 – 63 Notification Forms, 2015 – 29 Notification Forms, 2016 – 29 Notification Forms, 2017 – 11 Notification Forms, 2018 – 26 Notification Forms, 2019 – 21 Notification Forms, 2020 – 8 Notification Forms, 2021 – 27 Notification Forms.

The files were evaluated taking into account that chemicals dissolved in water can be grouped into 3 (three) categories depending on the impact on human health: threshold toxic substances, genotoxic substances, essential elements.

Contaminants that may have originated in construction materials include metals (e.g. copper, lead and cadmium - released from pipes and welds), asbestos fibers (can be released from the inner walls of asbestos-cement pipes); polycyclic aromatic hydrocarbons (HPA) (from pipe and tank coatings); traces of non-reactive vinyl chloride monomer from PVC pipes; radionuclides from sand and activated carbon used as filter media. Contamination of drinking water with these substances must not occur during water treatment or distribution.

The main types of metal products, which interfered in the water supply networks, for which files were submitted within the Regional Center of Public Health Bucharest were grouped into 2 (two) categories: a) pipes and connecting products (e.g. pipes, tubes, fittings, couplings, etc.) b) mechanical devices (e.g. chemical feeders, vacuum pumps, disinfectors, valves, transmission/distribution systems, devices for treatment processes, etc.). When evaluating a metallic material, the relationship

between the chemical characteristics of the water and its corrosion potential on the metallic ele

ments, as well as the area of the water contact surface will be taken into account.

The main categories of devices and equipment used in water treatment processes for drinking water, used for industrial or residential applications, for which files were submitted to the Regional Center of Public Health Bucharest included: (i) filters: automatic filter equipped with various filter cartridges, portable filter for microbiological water purification, filter cup, etc .; (ii) water purifiers: equipped with filtration systems; (iii) reverse osmosis system; (iv) stations for automatic water softening; (v) equipment for ultraviolet water disinfection; (vi) treatment plant - bottled table water.

In Romania, the Health Approval Form or the Notification Form are valid as long as no change is made in the qualitative and quantitative composition or in the field/conditions of use of the respective product. If during the period of validity of a Health Approval/Notification for a product, material, chemical/mixture or equipment that comes into contact with drinking water it is proved, based on the new European regulations, that it has components that are harmful to public health, the commission will withdraw the issued health opinion/notification.

The evaluation of the products was based on a risk analysis of the quality of the drinking water determined by the products/components of the products by the substances released during their use. In our country, in the Commissions of materials in contact with drinking water, it is practiced to verify the conformity of the substances used for drinking water and then tested in accredited laboratories in accordance with the Positive Lists in the European Union countries where they exist.

A "positive list" is a list of raw materials and excipients (including water migration limits) that are toxicologically permitted for manufacturing the products that come into contact with drinking water. There are 3 categories of "positive lists" adapted to the specificity of each family of materials used: positive lists for organic materials (LP); positive lists for metallic materials - approved compositions (LC); positive lists for materials in the cement category - approved constituents (LCA).

The development of positive lists of substances used for the manufacture of materials under a toxicological evaluation must take into account their ability to transform during manufacture, to fix in the finished material or to migrate on contact with water. The basic materials and components used in the manufacture of products that come into contact with drinking water, and which are not found in the Positive Lists, will be evaluated toxicologically. The necessary toxicological information will be provided by the applicant. The toxicology studies that the applicant submits to the dossier will have to be carried out by a qualified laboratory in accordance with the principle of good laboratory practice, in order to authenticate the results by the legal persons (responsible).

The minimum information needed to evaluate a new substance encompasses acute and chronic toxicity studies and mutagenicity tests. Depending on the results of the studies and/or the chemical structure of the substance, the following may be required: long-term toxicity or carcinogenicity studies; sensitivity effects studies; teratogenic studies; studies on the effect on reproduction. In some cases (suspicious structure, large contact area, clear migration of the substance into the water), information on the toxicity of decomposition products may be required. The sanitary approval of the chemicals used for water treatment is determined by the period of exposure (long-term) and the impurities contained in them. Toxicological risk assessment requires a program similar to that used for food additives. Temperatures were assessed for cold water at 23±2ºC, and for hot water at 60±2ºC, 70±2ºC, 80±2ºC, and 90±2ºC (depending on the product class).

Some European Union Member States have both Positive Lists and a National Institute for managing Positive Lists. Registration of new substances requires a request from the manufacturer accompanied by documentation including studies on the substance concerned and testing (e.g. global migration, OCD, impurities, etc.). In our country, as in most European Union Member States, there are no methodologies for testing starting substances and no national body is authorized to manage positive lists or to accept starting substances, compositions or constituents that can be included on a European positive list of starting substances. To date, we do not have a National Positive List, nor can we list initial substances on the existing European List.

Conclusions

To ensure the safe hygiene of drinking water, four Member States of the European Union (France, Germany, the Netherlands and the United Kingdom) – known as 4MS - made arrangements in 2011 to work together on this important aspect of the regulatory framework.

Currently, about twenty copper alloys are used in the safe transportation of clean drinking water to our homes and businesses. The copper industry has continuously tested different alloys for compatibility with new EU requirements and adapted the chemical composition of existing alloys. New alloys are currently being tested (after years of research) and submitted for approval and submitted by 4MS, they have committed to publish the documents, after their full agreement.

Authorization of substances that are not on the positive list can lead to their rapid migration into the water and thus causing acute effects within the body (these may be irritating to the respiratory system , hence triggering asthma attacks; irritating to the skin , resulting in itchy skin, and rash such as dermatitis and papules) or may be released from the structure of the product over time, causing cumulative toxic effects (being ingested , these may cause gastrointestinal disorders; in kidneys, these may be associated with an increased risk of developing renal carcinomas).

Toxic substances with a threshold effect are substances that become toxic only above a certain concentration (threshold) - cyanides or nitrates or various metals that are toxic above the threshold concentration, which can be reached gradually by the phenomenon of bioaccumulation. Genotoxic substances (arsenic, some synthetic organic substances, many halogenated organic compounds, some pesticides, etc.) are substances that produce harmful effects: carcinogenic (produce cancer), mutagenic (produce genetic mutations), or teratogenic (produce malformations), possibly in any concentration and for which it has not been possible to establish a threshold below which they are not harmful. The higher the risk, the higher the genotoxic substance, the more likely it is to attack more genes. The essential elements (selenium, fluoride, iodine, etc.) are the substances that must be part of the human diet. Some of them reach the body predominantly or exclusively through water and their lack or deficiency affect the health of the living organisms. At high concentrations, these elements can be harmful, such as toxic substances with a threshold effect.

Drinking water quality is a key factor in health, according to the World Health Organization (WHO). High quality, clean and sufficient drinking water is essential for our daily life, drinking and food preparation. European Union policy ensures that water intended for human intake is consumed safely throughout lifetime and this represents a high level of health protection. The protection of human health against any type of contamination of drinking water and the protection of public health is done primarily by reducing short-term or long-term exposure to risk factors posed by chemicals found in materials that come into contact with drinking water, whose values may exceed the CMA (maximum allowable concentration) set by the law. The contribution of the Commissions for materials in contact with drinking water by assessing the files is a very important endeavor. Improving the quality of life of the population and access to the safe drinking water is a priority for us. The new European Drinking Water Directive have set out standards for drinking water quality, including in terms of materials, chemicals/mixtures and equipment used in contact with drinking water. The main objective still refers to the hygienic safety of drinking water.

Keywords: *drinking water, materials, chemicals/mixtures and equipment, positive list, health approval forms, notification forms.*

APA ŞI PROBLEMELE DE SĂNĂTATE

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INTRODUCERE

Apa în general, şi apa potabilă în special, este factorul mediului de viaţă cu cel mai mare impact asupra sănătăţii omului. De asemenea, apa potabilă are o importanţă semnificativă igienică, deoarece alimentarea cu apă a unei colectivităţi umane este un factor de menţinere a unui nivel ridicat al gradului de educaţie igienică a populaţiei, creşterea nivelului de salubritate, confortul al locuinţelor şi de civilizaţie al populaţiei, şi contribuie la progresul tehnico-social al colectivităţilor, prin dezvoltarea infrastructurii.

Organizaţia Mondială a Sănătăţii consideră că 80% dintre toate maladiile de pe Terra sunt cauzate de apa poluată sau de lipsa condiţiilor elementare de existenţă (1).

Problemei alimentării cu apă potabilă a populaţiei i se acordă o prioritate deosebită în plan mondial. Conferinţa Naţiunilor Unite asupra mediului înconjurător de la Rio de Janeiro a adoptat, la 22 decembrie 1992, hotărârea prin care ziua de 22 martie devenea Ziua mondială a apei. Ulterior, de către Organizaţia Naţiunilor Unite, perioada 22 martie 2005 – 22 martie 2015 a fost declarată decada de acţiune „Apă pentru Viaţă”. Pentru Ziua mondială a apei din 2016, UN-Water a identificat provocările viitoare şi a stabilit teme pentru anii următori. Tema Zilei mondiale a apei în 2017 este „Apa menajeră” , în 2018 a fost "Soluţii naturale pentru apă''. În 2020 Genericul acesteia a fost „Apa şi schimbările climatice” , în 2021 sloganul a fost *Valorizarea apei*. Ziua Mondială a Apei în anul 2022 se va concentra pe tema *Apele subterane. Să facem invizibilul vizibil*. Această zi prezintă unele posibilităţi, dar şi pune sarcini în faţa tuturor conducătorilor, a publicului larg, a organizaţiilor neguvernamentale şi a mijloacelor de informare în masă etc., pentru realizarea măsurilor de îmbunătăţire a sistemului de aprovozionare şi a calităţii apei (2).

În Planul European de Acţiune pentru Sănătatea Copiilor în relaţie cu Mediul, aprobat la Conferinţa a IV-a interministerială în problemele Sănătăţii şi Mediului, s-a stabilit ca prioritatea regională nr. 1 constă în prevenirea şi reducerea maladiilor infecţioase şi a altor maladii digestive, cauzate de calitatea apei de băut (3).

Îmbunătăţirea accesului la surse sigure de apă de băut este unul din obiectivele principale ale Protocolului privind Apa şi Sănătatea. Republica Moldova a semnat acest Protocol la 10 martie 2000 şi la ratificat prin Legea nr. 207-XVI din 29 iulie 2005. Conform acestei Legi, Ministerul Sănătăţii, în comun cu Ministerul Mediului au fost desemnate ca autorităţi naţionale pentru punerea în aplicare a Protocolului privind Apa şi Sănătatea (4).

MATERIAL SI METODE

Această lucrare este o sinteză a realizărilor ştiinţifice şi practice în domeniul apei şi sănătăţii, de către savanţii şi medicii practicieni în Republica Moldova. Sunt prezentate datele activităţii specialiştiilor Institutului Moldovenesc de Cercetări Ştiinţifice în Igienă şi Epidemiologie (anii 1945-1995), a Centrului Naţional de Sănătate Publică (anii 1995-2018), a Agenţiei Naţionale pentru Sănătate Publică şi a catedrelor de Igienă a Universităţii de Stat de Medicină şi Farmacie “Nicolae Testemiţanu”.

Cuvintele cheie utilizate pentru căutarea au fost apa potabilă, gradul de mineralizare, stare de sănătate, cercetări ştiinţifice, măsuri profilactice.

Criteriile de selectare a publicaţiilor a constat în lucrări ştiinţifice, care au descris starea de sănătate a populaţiei din Republica Moldova în relaţie cu calitatea apei potabile, date despre gradul de

mineralizare a apei, măsuri de prevenţie elaborate şi implementate. Criteriile de respingere a lucrărilor fiind rezumatele, noutăţi din ştiri şi opinii neargumentate ştiinţific.

REZULTATE

Conform datelor publicate de Organizaţia Mondială a Sănătăţii, consumul apei contaminate microbian cauzează în unele regiuni din Africa şi America Centrală până la 40-80% din bolile diareice acute (BDA). În ţările Uniunii Europene apa potabilă este factorul care cauzează până la 6% dintre maladii, iar în Republica Moldova, apa folosită în scopuri potabile este un factor care determină până la 20-25% din cazurile de BDA şi hepatită virală A (HVA) şi circa 25-30% din bolile somatice, preponderent în zonele rurale. Problema alimentării cu apă potabilă sigură a populaţiei este una dintre cele mai acute probleme sociale şi de sănătate publică din Republica Moldova.

În Republica Moldova aprovizionarea cu apă constituie o problemă stringentă, deoarece sursele de apă sunt distribuite neuniform în teritoriu, iar calitatea apei, în cazuri extrem de frecvente, nu corespunde standardelor naţionale existente. Totodată, perspectiva de dezvoltare a economiei naţionale şi de sănătate a populaţiei în ţara noastră, în mare măsură, depinde de deficitul resurselor acvatice, care în permanenţă creşte.

Circa 50% din populaţia R. Moldova nu are acces la apa potabilă de calitate. Aproape 60% din populaţie este aprovizionată cu apă din sistemul decentralizat (fântâni, izvoare). De regulă, acestea sunt apele freatice.

Investigaţiile ştiinţifice şi practice ale calităţii apei s-au început după anul 1945, odată cu fondarea Institutului Moldovenesc de Cercetări Ştiinţifice în Igienă şi Epidemiologie, cât şi a catedrei de Igienă în cadrul Institutului de Stat de Medicină din Chişinău.

În perioada primelor două decenii cercetările s-au axat preponderent pe principiul igienei mediului, adică se refereau doar la calitatea apelor şi foarte puţin la starea sănătăţii. Un loc important în aceste cercetări l-au ocupat lucrările lui A. P. Zorin, A. P. Discalenco, O. N. Gronic, Iu. I. Viscovatov, V. I. Strocataia, E. A. Cebanu, B. S. Rusnac, N. I. Opopol, E. V. Dobreanski, Iu. N. Trofimenco şi alţii. În special, V. I. Strocataia (1967) s-a referit la conţinutul de iod în apă şi răspândirea guşei endemice (5). Au fost evaluate din punct de vedere igienic apele de profunzime pentru folosirea lor în aprovizionarea centralizată a populaţiei cu apă (6). Autorul a caracterizat compoziţia hidrocarbonat-sodiu a apei.

Importante studii s-au efectuat în privinţa conţinutului nitraţilor în apa potabilă (7). Problema nitraţilor a fost reflectată în monografia publicată de N. I. Opopol şi E. V. Dobreanski (8) "Нитраты" (1986).

Concomitent s-au făcut studii după principiul medicinei mediului, prin care s-au demonstrat interelaţiile între componentele minerale ale apei potabile şi unele boli netransmisibile. Aici se înscriu excelent investigaţiile efectuate de B. S. Rusnac şi coaut. (1965, 1968) în cadrul tezei de doctorat „Fluorul în sursele de apă potabilă din RSSM în relaţie cu morbiditatea prin carie şi fluoroză dentară" şi monografiei (9, 10). De asemenea s-a demonstrat existenţa relaţiei dintre morbiditatea populaţiei prin guşa endemică şi conţinutul de iod în sursele de apă (V. I. Strocataia, 1967) (5). A. P. Discalenco şi E. V. Dobreanski, 1972 au studiat modificările proceselor de oxidare şi de reducere, în ficat şi creier, sub influenţa nitraţilor din apa potabilă (11).

Mai târziu, după anul 1993, s-au reluat cercetările în laboratorul ştiinţific Igiena Mediului (şef. prof. Gr. Friptuleac), realizate după principiul medicinei mediului, când prioritar s-a studiat morbiditatea generală şi prin unele maladii, determinată de calitatea apei potabile. Astfel, a fost analizată morbiditatea populaţiei Republicii Moldova prin litiază urinară, în relaţie cu calitatea apei potabile (12), rezultatele fiind publicate în teza de doctor habilitat a lui Gr. Friptuleac (2001). Sub conducerea lui Gr.Friptuleac au fost realizate mai multe proiecte instituţionale şi în cadrul programului de stat. În baza acestor materiale au fost realizate 3 teze de doctor în ştiinţe medicale cu temele: „Aspecte igienice ale impactului gradului de mineralizare a apei potabile asupra stării de sănătate a populaţiei" (E. Tcaci, 2003) (13); „Estimarea igienică a stării de sănătate a copiilor în relaţie cu calitatea apei potabile" (V. Bernic, 2012) (14); „Estimarea stării de sănătate a populaţiei din

localităţile riverane râului Prut în relaţie cu calitatea apei potabile" (I. Miron, 2022) (15). Prin aceste cercetări s-a stabilit că este foarte variată compoziţia chimică a apelor. În majoritatea cazurilor apele subterane au o mineralizare înaltă, o alcalinitate ridicată şi un surplus considerabil de azotaţi, fluor, stronţiu, selen etc., ceea ce constituie factori de risc pentru sănătatea populaţiei. Studiul dinamicii litiazei urinare a demonstrat existenţa tendinţei de creştere a incidenţei şi prevalenţei pe parcursul anilor. Aceşti indicatori sunt mai înalţi în sudul republicii.

Conform datelor obţinute de E. Tcaci, în regiunea de sud apa din fântâni este supramineralizată în proporţie mai mare decât în centru, constituind respectiv 2,27-3,34 şi 1,58-1,86 g/dm^3, cuantificându-se un conţinut înalt în apă de cloruri, sulfaţi, hidrocarbonaţi, suma de Na+K etc. În structura morbidităţii prevalau bolile aparatului digestiv, bolile sistemului osteo-articular, ale muşchilor şi ţesutului conjunctiv, ale sistemelor circulator şi genito-urinar etc.

Influenţa calităţii apei potabile a fost stabilită de asemenea şi asupra stării de sănătate a copiilor (14, 15). S-a cuantificat existenţa dependenţelor corelative dintre unele patologii diagnosticate la copii în cadrul examenelor medicale organizate şi indicii calităţii apei. În special, bolile aparatului digestiv corelează cu gradul de mineralizare a apei potabile (r=0,72) şi conţinutul de sulfaţi în apă (r=0,55). Bolile sângelui sunt dependente de gradul de mineralizare a apei (r=0,71), conţinutul de sulfaţi (r=0,64), azotaţi (r=0,79). Cu unii compuşi chimici ai apei corelează direct şi bolile endocrine, ale aparatului circulator, genito-urinar, sistemului osteo-articular.

Analiza stării de sănătate a populaţiei în dependenţă de sursa utilizată în scopuri potabile, evidenţiază, că morbiditatea generală constituie cele mai mici valori în cazul utilizării apei din apeductul alimentat din r. Prut, iar cele mai mari valori la persoanele ce utilizează apa în scopuri potabile din apeductul alimentat din sondele arteziene (16). Calitatea apei din reţelele de apeduct alimentate din r. Prut este în limitele admisibile, pe când apa din sonde şi din sursele locale (fântâni) adiacente r. Prut se caracterizează printr-o mineralizare sumară egală cu 1,15-1,36 g/dm^3, condiţionată de conţinutul înalt de sulfaţi, hidrocarbonaţi, cloruri. În fântânile investigate se atestă concentraţii sporite de azotaţi. De asemenea s-a efectuat evaluarea igienică a calităţii apei potabile din fântânile utilizate pentru băut, de populaţia din mun. Chişinău. S-a studiat corelaţia dintre indicii calităţii apei şi morbiditatea populaţiei şi sa calculat riscul chimic (17) .

Unul din studii s-a referit la cercetarea acţiunii apei iodate asupra indicatorilor deficitului de iod la copii (18). Unui grup de copii, pe parcursul unui an de studii, zilnic, li s-a administrat câte 150 ml apă iodată cu conţinutul de 100 mkg de iod, grupului de control în aceeaşi perioadă li s-a administrat câte 150 ml apă neiodată (concentraţia iodului fiind în mediu de 0,02-0,04 mg/dm^3). În rezultat s-a evidenţiat tendinţa de micşorare a ponderii copiilor cu hiperplazie a glandei tiroide şi ameliorarea considerabilă a stării sănătăţii copiilor cu afecţiunea în cauză. La finele studiului s-a mărit ponderea copiilor cu concentraţia iodului în urină de peste 100 mkg/l, micşorînduse pînă la zero ponderea copiilor cu concentraţia iodului în urină mai mică de 50 mkg/l. În lotul de control practic nu s-au depistat schimbări esenţiale a concentraţiei iodului în urină, la începutul şi sfârşitul studiului. A devenit evidentă, necesitatea eradicării acestor stări patologice prin lichidarea deficitului de iod prin mai multe metode, dar şi prin utilizarea apei potabile îmbuteliate fortificate cu iod.

Unul din proiectele importante realizate este „Estimarea igienică a factorilor de risc în etiologia accidentelor vasculare cerebrale", în cadrul căruia s-a cuantificat şi rolul calităţii apei potabile.

Ministerul Sănătăţii, Ministerul Educaţiei şi Centrul Naţional de Sănătate Publică, cu susţinerea UNICEF, au realizat un studiu destinat evaluării situaţiei privind accesul elevilor din şcoli la apa destinată consumului în scop potabil şi pentru condiţii igienice îmbunătăţite. S-a estimat calitatea apei potabile şi condiţiile igienice din toate instituţiile preuniversitare ale Republicii Moldova: 1526 de şcoli, gimnazii şi licee. Circa în aproape jumătate din unităţile administrativ-teritoriale, asigurarea instituţiilor preuniversitare cu sisteme de apeducte este de sub 60%. Aceasta înseamnă că 4 elevi din 10 au acces doar la apa provenită din fântâni. Important din punct de vedere igienic este că, practic fiecare a 6-a probă de apă potabilă, colectată din instituţiile preuniversitare, nu corespunde normelor sanitare după parametrii chimici şi microbiologici. Cea mai înaltă pondere de necorespundere a normelor s-a înregistrat pentru nitraţi, fiecare a 3-a probă fiind neconformă; după care urmează poluarea microbiană, pentru care practic fiecare a 4-a probă nu a corespuns standardelor. Conţinutul

de fluor şi bor în apă au fost neconforme în fiecare a 8-a şi, respectiv, a 15-a probă de apă.

În cadrul catedrei de Igienă generală E. Ciobanu a realizat un studiu (19) privind dependenţa morbidităţii populaţiei rurale prin osteoartroză, de calitatea apei potabile. S-a evidenţiat existenţa unor corelaţii înalte între morbiditate şi frecvenţa utilizării apei din sursele decentralizate (r=0,94), cât şi cu durata folosirii apei din aceste surse (r=0,94).

Conform datelor lui N. Bivol (20) pe teritoriul Republicii Moldova există zone cu conţinut sporit (>1,5 mg/l) de fluor în apa potabilă. Investigaţiile efectuate la Centrul Naţional de Sănătate Publică, în perioada 2008-2015, au stabilit că, concentraţia fluorului depăşeşte voloarea normativă în mai mult dintre jumătate din probele analizate în raioanele Anenii-Noi, Călăraşi, Căuşeni, Făleşti, Glodeni, Rîşcani, Ştefan-Vodă, Taraclia, Ceadâr-Lunga. La mulţi locuitori din zonele afectate sunt înregistrate modificări manifestate de culoare şi de textură a dinţilor.

Obiectivele principale ale Ministerului Sănătăţii, în special a Agenţiei Naţionale pentru Sănătate Publică, pentru protecţia sănătăţii populaţiei, constă în supravegherea igienică continuuă, preventivă şi curentă a tuturor surselor de apă, monitorizarea permanentă a calităţii apei, evaluarea riscurilor şi a impactului calităţii apei asupra sănătăţii populaţiei, cu monitorizarea şi controlul implementării planurilor de siguranţă a apei potabile; informatizarea şi promovarea deprinderilor sănătoase de viaţă a populaţiei la nivel local şi naţional privind calitatea apei potabile, promovarea la toate nivelurile corespunzatoare nationale, precum şi în context transfrontier şi internaţional, a îmbunătăţirii gospodăririi apelor, incluzand protecţia ecosistemelor acvatice, precum şi prevenirea, controlul şi reducerea bolilor asociate apei. Sunt necesare activităţi intersectoriale cu implicarea Ministerului Mediului, Agenţiei ”Apele Moldovei”, întreprinderilor „Apă-Canal”, administraţiei publice locale, mass-media şi a societăţii civile.

În ultimii ani, în baza cercetărilor ştiinţifico-practice, au fost elaborate o serie de regulamente sanitare, ghiduri, recomandări metodice, hotărâri de Guvern, ordine ale Ministerului Sănătăţii, manuale, compendii, etc.

CONCLUZII

1. Problema alimentării cu apă potabilă de calitate sigură a populaţiei este una dintre cele mai acute probleme sociale şi de sănătate publică din Republica Moldova.
2. În Republica Moldova sunt realizate importante cercetări ştiinţifice şi practice în domeniul apei şi sănătăţii, suficiente într-o anumită măsură de a elabora şi de a implementa recomandări profilactice şi acte normative respective.
3. Este elaborat suportul legislativ, fiiind, totodată implementat şi programul de instruire postuniversitară a rezidenţilor în Sănătatea Publică.
4. Cu toate acestea, sunt necesare activităţi de dezvoltare şi implementare a tuturor hotărârilor de Guvern şi a programelor în domeniul apei şi sănătăţii.
5. Este necesară mobilizarea tuturor actorilor interesaţi în activităţi privind asigurarea accesului populaţiei la apă de calitate sigură.

Keywords: drinking water, health status, scientific research, prophylactic measures.

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THE IMPACT OF DRINKING WATER QUALITY FROM DIFFERENT SOURCES ON POPULATION HEALTH

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Keywords: *population morbidity, Prut River aqueduct, artesian wells, wells.*

Introduction. The data literature analysis shows that water quality plays an important role in the health of the population. In the Republic of Moldova, water supply is a pressing problem, since the water sources are unevenly distributed on the territory and the quality of the water, in many cases, does not correspond to the existing national standards. In this sense, the relationship "water - quality of life" is characterized not only from a socio-economic point of view, but also by both objective and subjective indicators, with population health being the foreground issue.

Material and methods. In order to highlight certain morbid and premorbid forms conditioned by the quality of the drinking water, the population morbidity through the most frequently diagnosed nosologies was studied and evaluated by using a modern research organization methodology. For this purpose, the morbidity rate among people that use water from the following 3 different sources was investigated and analyzed: the aqueduct fed from the Prut river, artesian wells, and wells. At the same time, both the age and gender of the consumers were taken into account.

Results. According to the survey, the general morbidity rate is the lowest among subjects who use water from the aqueduct supplied from the Prut river, and the highest numbers were found among subjects who use water from the aqueduct supplied from artesian wells. The majority of the population suffers from several simultaneous chronic diseases. Among the population who consumes water from the aqueduct fed by the Prut River prevails hypertension – 14.2%, pancreatitis – 10.3%, cholecystitis – 12.3%, hepatitis – 3.7% and osteohondrosis – 8.8%. Cases of anemia were found only in people who consume water from wells (12.2%), and nephrolithiasis was found in about 1.5% of cases in the same population. In cases of water consumption from the aqueduct supplied from the wells, most cases revealed an ischemic heart disease – 7.3%, gastritis and duodenitis – 8,8%, radiculitis – 4.5%, arthropathy – 3.8% and pyelonephritis – 7.1%. The analysis of the morbidity through the mentioned nosologies shows that the frequency of diseases increases directly proportional to age and that they are diagnosed more frequently among women who consume water from the aqueduct fed from the river and from comparative wells. On the other hand, the morbidity of people who drink water from wells is higher among men than women.

Conclusions. The analysis of the population's health status emphasizes the impact of the water source used for drinking and sex- and age-dependent characteristics. It was found that the drinking water from the aqueduct fed from the river is much more harmless for the population's health since it is much less mineralized (0.46–0.66 g/dm^3).

WATER SUPPLY TO HOUSING OWNED BY FAMILIES OF SOME PUPILS FROM TWO TOWNS IN BOTOSANI COUNTY

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Keywords: *drinking water, wells, sewer.*

Introduction. Water quality is essential for maintaining the population health, especially in young people. It ensures the hygienic condition necessary to maintain a normal growth/development of the pupils. Unfortunately, in Romania there are still many problems related to the supply of drinking water to homes, especially due to its high price. There are many families in urban and rural areas, who meet their water needs by using water wells and who do not have an adequate sewerage system. Under these conditions, a possible intoxication might occur, as well as trigger several infections due to the consumption of contaminated water.

Material and methods. The study was conducted on a group of 213 families of pupils from M. Ciuca high school in Saveni city (105 families) and pupils from the high school with Sports program in Botosani city (108 families). A questionnaire was applied including questions on the type of home (block, house), water supply (central, own installation, wells) and presence of a sewerage system (yes/no). The results were processed using the Pearson test.

Results. Among the pupils in the study group, the house-type residence predominates (69.01%), the highest percentage being in the city of Saveni. The calculated differences are statistically significant ($p<0.05$). The house-type residence is rarely connected to both the central water supply system and to the sewer system. In Botosani city, the situation is a bit better, especially in the central area. The water supply of the houses is provided mainly by water from wells (46.47%) even in those from Botosani city, which is the county capital. The calculated differences are statistically significant ($p<0.05$) and draw attention to the houses in Savani city where the use of well water is dominant. The water supplied by a centralized system is present only in 36.15% of families, an aspect that is not an encouraging one. The central water supply system is used by 27.6% of families in Saveni and by 44.44% of families in Botosani. There are also 17.37% of families that use their own water supply system, however the water source is uncertain, thus the issue of population health is still concerning.

The presence of drinking water at homes is associated with the appearance of liquid residues that require an adequate drainage system. Unfortunately, only 51.17% of the assessed dwellings were connected to the sewer system. The calculated differences are statistically significant ($p<0.01$) and also draw attention to the housing in the city of Saveni. The percentage of the houses connected to the sewerage system in the city of Saveni makes up 40.0% compared to 62.03% in the city of Botosani.

Conclusions. There are still many problems related to the quality of water supplied to the population of the two studied cities. The solution of this issue is still challenging, since it requires major investments associated with convincing the population to connect to the central drinking water supply systems.

ASSESSMENT OF THE FUNCTIONALITY OF AQUATIC ECOSYSTEMS FROM THE REPUBLIC OF MOLDOVA

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Keywords: *Dniester, aquatic ecosystems, drinking water, hydropower.*

Introduction. Currently, the quantity and quality of inland waters have been already recognized as a major global and direct threat to human health, being one of the most pressing human problems, including the human right to safe drinking water. **Material and methods.** In the process of investigation, expeditions were made in order to conduct complex assessment of aquatic ecosystems in the hydrographical basins of the Dniester and Prut rivers, including expeditions, investigations *în situ and* and laboratory modelling were performed. Determination of the quality of water was carried out in accordance with ISO standards adapted to national ones and summarized in recently developed and published 4 guides (http://zoology.md) The multi-annual materials of the Institute of Zoology have also been systematized. **Results**. The European directives developed several environmental issues, but the majority of population and authorities at different levels focus, primarily, on that of pollution. According to WHO (Programmer on Chemical Safety, 1992), out of over 6 million known chemical compounds, up to 500 thousand compounds are practically used; about 40 thousand of them are harmful to humans, and 12 thousand are toxic. This is a problem of global importance that requires ecotoxicological investigations about migration of heavy metals, POPs, and other toxic and hazardous substances in aquatic ecosystems. But, less attention is paid in Community regulations to the assessment of the functionality of aquatic ecosystems. This means that the monitoring program of the functionality of River ecosystems, such as the running water bodies, refers, particularly, to the assessment of the volume and level or water discharge, the speed of water flow, the amount of suspended substances and alluvium. Since these data are important for evaluation of the ecological and chemical state of the rivers, these parameters determine the balance in the “water-suspensions-silts” system and the ecological potential of the rivers. In some cases, like the Dniester River, the impact of DHPC is marked by sudden daily fluctuations and lowering of the water level to the bottom of the river, as well as by the imbalance of thermal and gas regime. The water flow volume has an obvious tendency to decrease downstream of Naslavcea. The decrease in the content of suspensions of mountain origin resulted in the intensification of the swamp process, the modification of the chemicals migration processes, the decrease of the buffer capacity and the increase of the secondary pollution of the Dniester River. **Conclusion.** Multi-annual investigations have allowed proposing the exclusion of hydropower complexes from the list of so-called "green enterprises", because they destroy the functioning of the river ecosystems. Construction of pumped storage hydroelectric power plants (PSHPP) on large rivers, which are the main source of drinking water an used in fish farming, should be banned, as they destroy all water organisms and damage the functioning of lotic aquatic ecosystems.

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HYGIENIC ASSESSMENT OF DRINKING WATER POLLUTION WITH ORGANIC SUBSTANCES

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Keywords: *drinking water, pollution, organic substance, ammonia, nitrites, nitrates.*

Introduction. The safety of drinking water is an actual issue that bothers all of those who advocate for access to qualitative drinking water. The civil society is particularly alarmed, since, despite of every effort made in order to reduce inequalities in this area, 1 million and a half people lack access to safe drinking water worldwide. According to the World Health Organization, 34.000 people including nearly 5.000 children die daily from poor quality drinking water. Moldovan population, especially in rural areas, are facing this problem without being aware of its impact on health, environment and in particular on the future. The rural population in Moldova is in a critical situation regarding the right to drinking water. Water quality is affected by different pollutants - nitrates, fluoride, and microbial pollution. Surface water pollution is caused in most cases by communal household sector (wastewater treatment plants, wastewater discharges of untreated water from the municipal system, inadequate solid waste management), agriculture (accumulated animal manure, deposits of pesticides etc.) and the energy sector, such as petrol deposits and petrol stations. In rural areas a major source of pollution of surface waters are latrines, this archaic form of sanitation, which is largely responsible for excessive amounts of nitrates in wells. **Material and methods.** The study involved the collection of water samples from decentralized sources of Moldova (wells, springs) from different geographical zones: in the North, the Central, and in the South of the country. Investigation period: 2015-2019. Sanitary and chemical methods were used to investigate and assess water pollution by organic substances like ammonia, nitrites, and nitrates. **Results.** Indicators of organic pollution in water sources were the biogenic indices as ammonia, nitrites and nitrates. The average concentrations of ammonia (NH_3) of water aqueducts supplied from surface sources and water wells had almost equal values (0.16±0.01 and 0.22±0.03 mg/L, respectively), however the index in artesian water was 5.8 and 4.2 times higher. The same principle was characteristic for the nitrogen content (NO_2), which concentration in the artesian well water (0.05±0.002 mg/L) was higher than in water taken from surface aqueducts (0.02±0.001) and wells (0.03±0.005). The origin of these nitrogen substances in artesian water is natural. Both ammonia and nitrites have similar regularities all over the country. Thereby, water from surface aqueducts and wells showed higher concentrations of the analyzed elements in the South (ammonia – 0.21±0.01 and 0.36±0.01 mg/L, nitrites, 0.02±0.001 and 0.06±0.002 mg/L respectively), compared to the North (ammonia – 0.17±0.02 and 0.18±0.02 mg/L, nitrites 0.003±0.0001 and 0.03±0.003 mg/L respectively). The nitrates concentration (NO_3) in aqueduct waters supplied from surface water sources and wells did not range essentially (i.e., 5.1±0.5 and 1.8±0.17 mg/L), however the water investigated from the wells showed a 10.1 and 28.6 times higher concentration of the estimated index than the above-mentioned sources. In the investigated wells, the highest nitrate concentrations were recorded in the North of the republic (88.6±10.0 mg/L) and the lowest was found in the South (32.8±4.3 mg/L). **Conclusions.** The results of the study attest the increased values of organic substances in drinking water. Therefore, the devastating effects of water pollution with organic substances can seriously endanger human health, thus preventive measures must be a priority for any individual or economic society.

THE RELATIONSHIP BETWEEN CLIMATE CHANGE - AQUATIC RESOURCES - HUMAN HEALTH

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Keywords: *climate change; aquatic resources; human health; heavy rainfall; epidemics.*

Introduction. In the Republic of Moldova, the population's access to drinking water sources is a major problem. Access to safely managed aqueduct systems in urban areas is 98%, while in rural areas it hardly reaches half that figure. Access to safe water sources is limited as global warming progresses. The localities near the Dniester and Prut rivers are exposed to an increased risk of floods, conditioned by climate change, as a result of which the sources of drinking water used by the population are frequently polluted. The purpose of the study is to prove the impact of climate change on drinking water conditions affecting the health of the population.

Material and methods. The present research includes a descriptive and analytical study. A bibliographic review was conducted by retrieving the essential data, using full-text articles from the social networking site ResearchGate. The articles on the characteristics of water sources, influenced by climate change and the impact on the health of the population were analyzed.

Results. Climate change can cause changes in water quality, thus increasing the risks of public health. As a result of changes in water temperature, pathogenic bacteria, viruses, and parasites, vibrions will develop in the water at different times of the year and in places where they have not been detected before.

Increasing rainfall events and rising temperatures caused by climate change may upsurge the frequency of waterborne diseases. In most people, diseases of this type do not usually have serious consequences; however, the young children, the elderly and people with weakened immune systems may be susceptible to these. Heavy rains and floods can carry bacteria, wastewater, fertilizers and other organic waste into rivers and lakes. Without proper treatment, these episodes can lead to direct contamination of drinking water sources.

It is increasingly accepted that waterborne disease outbreaks are linked, at least partially, to climatic conditions. These circumstances are indeed conducive to the outbreak of the disease epidemic. Researchers have determined that more than half of waterborne disease epidemics are preceded by episodes of heavy rainfall. It is also possible that rising temperatures will worsen the problems of their decomposition, thus giving the water an unpleasant odor and taste. In addition, high temperatures and increased rainwater runoff, combined with increased beach use, have been shown to be associated with an increase in infectious disease among people who carry out aquatic and nautical recreational activities.

Conclusions. Extreme weather events (especially floods) increase the risk of drinking water supply infrastructure failure due to blockage or overcapacity. This requires rigorous management of water supply conditions throughout the climate changing and its consequences.

DENTAL HEALTH RELATED TO FLUORIDE DEFICIENCY IN DRINKING WATER

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Keywords: *tooth decay, fluoride, drinking water.*

Introduction. Water is the major medium of fluoride intake by humans. Fluoride in drinking water can be either beneficial or detrimental to health, depending on its concentration. At present, it is considered that certain fluoride deficiency in drinking water and in the body is accompanied by an increase in the incidence of dental caries, which is one of the most widespread pathological processes in modern humanity. Previous studies in this compartment have shown that in areas with very low concentrations of fluoride in water, lower than 0.5 mg/L, the incidence of tooth decay is increased, which is 3-4 times higher compared to areas where the fluoride concentration is optimal.

Material and methods. Hygienic, sanitary-chemical and statistical investigation methods were used. The results of the laboratory investigations, carried out during the audit monitoring of the drinking water quality from the underground sources, from all the territorial administrative units of Republic of Moldova, for the period 2015-2019 were evaluated.

The dynamics of the incidence and prevalence of dental caries in the population of students in the schools of Republic of Moldova was studied over a period of 15 years (2005-2020), based on the results of medical examinations (f-12 A) retrieved from the Department of Nutritional Health and youth of the National Agency for Public Health.

Results. The population that uses water from surface sources is usually exposed to low concentrations of fluoride. However, the results of the current study indicate that very low levels of fluoride are also found in some groundwater sources. It was found that in all the investigated artesian wells, investigated in the republic, an average fluoride concentration below 0.5 mg/L was registered in Chisinau municipality- 58.4% and Soldanesti district – 66.7%. The results of the estimated fluoride deficiency concentrations in water from the public wells of the republic, showed an average of under 0.5 mg/L found in Leova districts – 84.0%, Nisporeni – 91.9%, Călăraşi – 84.5%, Soldanesti – 62, 5%, and Straseni district –64%.

Moreover, the spread of dental caries among students living territorially and geographically in Republic of Moldova was studied. The average level of morbidity due to dental caries during the years 2005-2020 is $162.11 \pm 3.98^{0}/_{000}$ incidence and $89.4 \pm 4{,}34^{0}/_{000}$ prevalence. Dental caries in the period under observation ranges from 4.1% to 4.6% incidence and from 4.3% to 5.1% prevalence in the general morbidity structure included in that category.

Conclusions. The greatest preventive effect of dental diseases (from 40 to 70%) is provided by the fluoride intake found in drinking water. It is obvious that the population in the above-mentioned districts with fluoride-deficient groundwater sources is exposed to a major risk of tooth decay, which, according to some authors, is estimated to 90%. It should be mentioned that a level above the average in incidence and prevalence rate of dental caries is characteristic for students within 43.8% of administrative-territorial units from the Republic of Moldova. Dental caries prevention measures are easier to implement by using fluoride-containing toothpastes, eating fluoride-rich foods, and maintaining dental hygiene.

HYGIENIC ASSESSMENT AND WAYS TO IMPROVE THE DRINKING WATER QUALITY IN MODERN CONDITIONS OF DONBASS

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Keywords: *drinking water, water-supply, reservoirs, local military conflict.*

Introduction.The population of the ecocrisis region, as a rule, uses poor-quality drinking water (Yu.N. Talakin et al., 2007, D.O. Lastkov, 2011). In recent years, the situation has not changed, and it should be expected that such water consumption will steadily increase due to anthropogenic pressure and adverse climate change (D.O. Lastkov, A.G. Kozakov, 2016, 2017, D.O. Lastkov, O.V. Sokolova, 2018).

The purpose of the study was to assess the hygienic conditions and forecast changes in domestic and drinking water supply and water bodies in an ecocrisis region throughout a local military conflict, as well as to develop recommendations for its quality provision.

Material and methods. A hygienic assessment of changes in domestic and drinking water supply and water bodies was carried out during 2 time periods: pre-war (2010-2013) and military (2014-2020). Statistical processing was carried out by conventional parametric methods using the MedStat licensed software package. Differences between the indicators of the pre-war and war periods were estimated by the Scheffe method of multiple comparisons.

Results. During the war period, there was a deterioration in water quality in most water supply sources and water bodies, viz. in terms of sanitary and chemical indicators, the water supply network ($p<0.05$), the municipal water pipes ($p<0.01$), and water from open reservoirs were assessed ($p<0.05$); according to microbiological indicators ($p<0.05$), including rural water supply systems ($p<0.01$). During the war period, there was a trend towards an increase in the number of samples that did not correspond to sanitary norms in terms of the content of nitrates (by 2 times) and coliforms (by 2.1 times). The proportion of samples that did not meet the sanitary norms in terms of microbiological parameters in the pre-war years almost did not change, however there was an increase during the war period in 2015-2016. During the war period, water samples were assessed significantly more often that actually did not meet the sanitary norms: according to sanitary and chemical indicators - in public water supply systems, including open reservoirs; according to microbiological indicators – in rural water supply systems. The decrease in water quality during the war period was observed in most water sources. The amount of samples that did not meet sanitary standards in terms of sanitary and chemical indicators in the pre-war years practically did not change; during the war period there was an increase in 2015-2016 and in 2020; in terms of organoleptic indicators, there was a significant increase with a 2-fold drop in 2016 and 2019.

Conclusions. It is shown that drinking water is not one of the main sources of heavy metals in the human organism. It has been established that interfacial tensiometry used to study the surface tension of water is an informative express method for assessing the biological value of water. The present study has substantiated the negative forecast of the subsequent dynamics of the drinking water quality lacking additional treatment and under the conditions of anthropogenic pressure and adverse climate change.

DRINKING WATER QUALITY AS A HEALTH FACTOR OF MEAT PROCESSING WORKERS

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Keywords: *drinking water, meat processing enterprises, ammonia, iron.*

Introduction. Drinking water quality is a key issue due to the impact of chemical and microbiological parameters on the population health, and, in particular, on the health of employees of meat, poultry and egg safety branch (MPES).
MPEs must be provided with a sufficient amount of water of a guaranteed quality for technological, hygienic and drinking water needs and comply with the Law no. 182 of 19.12.2019 *on drinking water quality.*
The adverse effects of chemical or microbiological indicators of the water quite vary and depend not only on the biological characteristics of the human body, but also on the values and the period of action.
Material and methods. The purpose of the study was to assess the laboratory test findings of drinking water quality from the MPEs during 2018-2021.
Results. Currently, the drinking water for the four studied MPEs (Anenii Noi district – no. 1 and 4, Soroca – no. 2, and Bălți – no. 3) is provided from their own wells, thus not supplying drinking water to the population of the above-mentioned localities.
The evaluation of the laboratory results of the water quality from the MPEs showed that the underground sources under study revealed various values of the chemical indicators. The average concentrations of iron content found in the sample from MPE no.4 ranged betwee 0.3±0.2 mg/L, compared to 0.2±0.03 mg/L in the sample from MPE n r.1. At the same time, while comparing the mean iron content in water from MPE no. 1, it was 2 times higher compared to MPE no. 2 (95%, CI – 0.1-0.05; p=0.0008). At the same time, there was an excess of iron concentration at MPE no.4, viz. about 3 times higher compared to MPE no.2 or (95%, CI – 0.4-0.008; p=0.05). The ammonium content in water exceeded the maximum permissible limits in MPE no. 2 and MPE no.4, being of 0.46±0.04 mg/L and 1.6±1.5 mg/L, respectively. While comparing the mean values of the ammonium concentration between these MPEs, MPE no. 4 exceeded the average ammonium concentration by 3.5 times compared to MPE no. 2 (95%, CI – 2.6-0.4; p=0.12). The values of hydrogen sulfide were as following: at MPE no. 1 – 146.4±106.6 mg/L, MPE no. 2 – 97.6±2.1 mg/L, MPE no. 3 – 96.6±2.7 mg/L and MPE no. 4 – 96.4±3.4 mg/L. While comparing the mean values of hydrogen sulfide concentration, a 1.5-time fold increase was found at MPE no. 1 compared to the enterprise no. 4 (95%, CI – 159.9-59.9; p=0.3). Higher values of iron, ammonium and hydrogen sulphide content in the water from the wells of the studied meat processing enterprises did not affect the health status of the workers, thus no health manifestations were attested and hence the employees did not seek medical care.
Conclusions. The results of the study of the water quality from the wells of the meat processing enterprises showed that the average values of the iron content were 3 times higher at the MPE no.4 compared to MPE no. 2, while the ammonium content was 3.5 times higher compared to the same MPE no. 2, and the concentration of hydrogen sulfide at MPE no. 1 was 1.5 times higher compared to MPE no. 4. Multi-sectoral coordination, including the involvement of economic operators, are needed to ensure the meat processing enterprises with drinking quality water.

EVALUATION OF THE INTENSITY AND PREVALENCE OF DENTAL CARIES IN PATIENTS WITH DENTAL FLUOROSIS

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Keywords: *dental fluorosis, dental caries, fluoride.*

Introduction. Dental fluorosis is an endemic condition of hard dental tissue, caused by excessive exposure of the child's body to the action of fluoride during toot formation and mineralization. Dental caries is a condition of the dental hard tissues, caused by the following four major risk factors: the cariogenic diet, the susceptibility of the enamel, the cariogenic microorganisms of the bacterial plaque and time. The susceptibility of the enamel to the acidic action is largely determined by various factors, such as the extent of structural and chemical changes in fluorotic enamel, eating habits, fluoride levels in drinking water and food as well as in the oral cavity, saliva amount and quality changes, as well as oral hygiene. Despite its relationship with fluoride, which is recognized as the main reason for the reduction in the prevalence and intensity of tooth decay in recent decades, the susceptibility of fluorotic enamel to caries remains ambiguous. There are regions in the Republic of Moldova where the concentration of fluoride in drinking water exceeds the normal range, amounting for 14 mg/L, especially in deep water. Epidemiological literature data indicate a high frequency of dental fluorosis in the Republic of Moldova. The frequency of fluorosis in 6-year-old children from regions with high fluoride content in drinking water makes up 62.5%, in 12-year-old children – 79.8% and in 15-year-old children – 80.5%. The prevalence rate of caries also shows high values, thus the frequency in the 6-year-old age group is 87.4% of dental caries, 77.53% for 12-year-old participants and 86.2% for 15-year-old participants, respectively. The purpose of the study was to estimate the prevalence and intensity of dental caries in children and adolescents from two age groups 12 and 15 years old, from the Republic of Moldova, diagnosed with dental fluorosis. **Material and methods.** This research is a descriptive observational study, in which the data obtained from the examination of 57 children, diagnosed with dental fluorosis during the years 2018-2021 were analyzed. The patients were divided in two age groups. The first group included children aged 12 (24 patients) and the second group – those aged 15 (33 patients). The following indices were analyzed: frequency and intensity indices of dental caries per each age group, distribution of cases according to gender, type of dental fluorosis as well as the distribution pattern of dental caries according to teeth group or tooth surface. **Results.** The distribution of patients according to the type of fluorosis was as follows: weak type was diagnosed in 28% of cases, mild types – in 72% of cases. The frequency of dental caries was higher in the 15-year-old age group found in 51.5% of cases compared to 20.8% in the 12 – year-old age group, which is explained by an increased frequency index due to aging. Dental caries was found more frequently in girls, viz. 27.3% compared to boys – 15.3% within the 12- year- old age group, and in – 52% of girls and 50% of boys within 15-year-old age group, which is consistent with international data in this field. The intensity of dental caries (DMF) in the 12-year-old age group was equal to 3 and in the 15-year-old age group = 3.4. The most commonly affected teeth were the first lower molars (98% of cases), and the most commonly affected dental surfaces were the occlusal ones (100%). In all the cases, the teeth with milder type of dental fluorosis were affected. **Conclusions.** Contrary to popular belief that fluorotic teeth are immune to tooth decay, it was found that they are susceptible to acid attacks and therefore may eventually develop tooth decay. However, the carious pattern of fluorotic teeth differs from that of non-fluorotic ones. In our study, only the grooves and cracks in the occlusal surfaces of the molars were affected by tooth decay. Further studies in this area are needed to explain this phenomenon.

DRINKING WATER QUALITY MONITORING IN THE REPUBLIC OF MOLDOVA

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Keywords: *drinking water quality monitoring, sanitary-chemical parameters, drinking water sources.*

Introduction. Monitoring drinking water quality is a primary task of the National Public Health Agency and the country as a whole. The monitoring of drinking water quality is currently carried out in accordance with the provisions of Law 182/19 on drinking water quality and the Sanitary Regulation on small water supply systems, approved by Government Decision of the Republic of Moldova no. 1466/2016. These legal provisions cover all types of drinking water sources: artesian wells, aqueducts and decentralized systems.

Material and methods. In order to achieve the objectives of the current study, hygienic, sanitary-chemical and statistical investigation methods were used. The results of the laboratory investigations, performed during the audit monitoring of the quality of drinking water used for drinking purposes by the population of the Republic of Moldova, for the period 2017-2020 were evaluated.

Results. According to the National Bureau of Statistics, in the Republic of Moldova, about 60.6% of the country's population benefits from centralized water supply services. The largest share of the population provided by water supply systems in this way is registered in Chisinau (88.1%) and ATU Gagauzia (78.4%), followed by the South region – 64.4%, Central part – 49.7% and North – 43.9%. Typically, the urban population has a centralized water supply. In rural conditions, 44.6% of localities are connected to the centralized system, the rest of the population uses drinking water from wells for drinking purposes. The share of water non-conformity in urban aqueducts, fed from the surface and underground sources is on average 8.6 and 40.1%, respectively, in terms of chemical parameters (in microbiological parameters, at 6.3 and 5.6%). The aqueducts from rural areas are mainly fed from the underground sources, the average share of water non-compliance with chemical parameters is 52.0% (microbiological – 21.0%). The population that does not have access to centralized sources of drinking water use water from mine wells, which in 77.2% of cases do not correspond to chemical parameters and in 47.6 percent of cases to microbiological parameters. The water nitrate content of samples retrieved from public wells, during the years under study, showed non-conformity in 56% of cases (2019 – 60.0%, 2018 – 59.0%). As regarding the fluorine and iron content, the water from the investigated wells showed non-conformities in 4.8 and 1.5% of cases. In terms of microbiological parameters, 55% of the researched samples did not correspond to the provisions of the sanitary norms (a. 2019 – 56.6%, a. 2018 – 60.0%). The obtained results showed that the quality of the water from the wells continues to display major non-conformities, the groundwater being compromised on the entire territory of the republic as a result of the anthropic activity.

Conclusions. In order to ensure population with safe quality water, well-coordinated multisectoral interventions and the political will of national decision-makers are required.

COMPARATIVE ASSESSMENT OF WATER QUALITY IN THE DNIESTER AND PRUT RIVERS

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Keywords: *water quality, surface water, drinking water sources.*

Introduction. In the Republic of Moldova, the population is supplied with drinking water from surface sources, which is mainly provided from the basins of the Dniester and Prut rivers, where the water quality varies greatly. Apart from these two cross-border rivers, in accordance with Government Decision no. 890 of 12.11.2013 on the approval of the Regulation on environmental quality requirements for surface water, the National Agency for Public Health also monitors the quality of surface water from sources used for recreation and irrigation.
Material and methods. 379 water samples from fixed points along the Dniester and Prut rivers were investigated for sanitary-hygienic and microbiological indicators. Hygienic, statistical, descriptive and analytical methods were used within the study.
Results. During 2020, in order to monitor the quality of surface water, 379 samples were taken and investigated for chemical and sanitary parameters (Dniester River – 70 samples, Prut River – 50 samples, sources used for recreation – 101 samples, sources used for irrigation – 35 samples and other sources – 123 samples) and 428 samples were assessed for microbiological parameters (Dniester River – 89 samples, Prut River – 47 samples, sources used for recreation – 143 samples, sources used for irrigation – 56 samples and other sources – 56 samples). The results of the laboratory investigations of the monitored surface sources show that, depending on the sanitary-chemical indicators, the largest share of samples was related to quality class I and II (very good and good) to which the Prut water was attached (66.0%), water from irrigation sources (53.0%) and water from the Dniester River (50.0%). Furthermore, it is worth mentioning that 40.0% of samples from the Prut district were classified as being quality class IV and V (polluted and highly polluted). This share was 5.7 times higher compared to the water quality in the Dniester River, the estimated index being of 7.0%. The main indicators according to which the water was classified as polluted and highly polluted were the turbidity and the parameters of the oxygen regime, which are largely influenced by the hydrometeriological conditions. Thus, it should be concluded that the Prut River water is much more vulnerable to climatic changes compared to the Dniester River water, which has a higher self-purification capacity. Microbiological investigations of surface water quality were performed using the following parameters: total coliform bacteria, *E. coli*, intestinal enterococci, pathogenic microorganisms (*Salmonella, Shigella, Vibrioholera*), Colifagi. The results of the investigation showed a permanent pollution of the water basins with wastewater and other organic pollutants. Stable pathogenic microflora was detected in the water basins. In 2020, out of the total number of samples investigated for microbiological parameters, 9.0% of the pathogenic microflora was detected in the Dniester River, 8.4% - in water basins used for recreation and 3.2% in other water basins.
Conclusions. There has been a sharp decline in the quality of surface water in these two rivers due to anthropogenic pollution with untreated or partially treated wastewater.

COMPARATIVE STUDY OF THE DRINKING WATER QUALITY ASSESSED FROM SEVERAL WATER SOURCES OF THE REPUBLIC OF MOLDOVA

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Keywords: *drinking water quality, the Prut river aqueduct, aqueduct fed from artesian wells, wells.*

Introduction. Drinking water quality is a major public health issue. In the Republic of Moldova only 35% of the population uses water for drinking purposes from surface water sources, the others use water for this purpose from underground sources, having the highest share of non-compliance with sanitary-chemical and microbiological parameters.

Material and methods. The present study evaluated and analyzed the water quality service of the Prut river aqueduct, the artesian wells aqueduct and the wells, via 11 sanitary-chemical indices. The research was based on hygienic, descriptive, analytical, sanitary-chemical and statistical methods. This study was conducted under the State Program on "Estimating the risk to human health attributed to exposure to priority chemicals in the Republic of Moldova", cipher 20.8000.8007.35.

Results. The analysis of the obtained data showed that the highest values of the summary water mineralization are characteristic for the samples taken from wells constituting 1.36±0.2 g/dm^3, as well as for those from the aqueduct fed from the artesian well – 1.15±0.18 g/dm^3. Lower values were found in water from Prut River aqueducts, accounting for 0.71±0.08 g/dm^3. The concentration of Fe ions was higher in the water from the Prut River aqueduct, showing values of 0.028±0.026 mg/dm^3, followed by water from the aqueducts fed from the artesian wells – 0.023±0.018 mg/dm^3 and water from the wells – 0.02±0.01 mg/dm^3. The maximum values of copper concentrations were recorded in water from wells, which amounted to 0.04±0.03 mg/dm^3, followed by water from artesian well-fed aqueducts – 0.034±0.05 mg/dm^3 and water from the Prut River aqueducts – 0.027±0.002 mg/dm^3. The fluoride content in the investigated sources varied within very small limits from 0.05±0.04 to 0.95±0.6 mg/dm^3. The average concentrations of ammonia in the water of the Prut River aqueducts and in the water from the wells showed equal values – 0.14±0.1 mg/dm^3, whereas the content of the estimated index was correspondingly 10 times higher in the water from the artesian wells (II 0.06-1.5; $p<0.0001$). The same legitimacy is characteristic for the nitrogen content, the concentration in the artesian well water being of 0.004±0.006 mg/dm^3, corresponding to 13.3 (CI 0.02-0.07; $p=0.0003$) and 5 (CI 0.02-0.07; $p=0.0009$) times higher compared to the water content of the Prut River aqueducts and water assessed from the wells. The content of nitrates in the water of the Prut River the aqueducts and in the investigated artesian wells did not differ significantly, being 4.8±2.4 and 4.09±3.1 mg/dm^3, respectively and showing low values, while the concentration of this index investigated in the wells corresponded to 13.9 (CI 59.03-75.1; $p<0.0001$) and 17.2 (CI 59.03-75.1; $p<0.0001$) or showing higher values compared to the aforementioned sources, thus exceeding the CMA of 50 mg/L.

Conclusions. The water from the river aqueduct is considered the safest source of drinking water supply for the population in terms of its sanitary and chemical parameters.

WATER-RELATED PROBLEMS OF THE RURAL POPULATION FROM IAŞI COUNTY

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Keywords: *drinking water, intoxication, diarrheal disease.*

Introduction. Water is an essential environmental factor for maintaining good health. Unfortunately, the rural areas face many problems related to water supply. These problems are due to the lack of central water supply systems and sewerage systems. Improvised water supply systems (wells) and the absence of sewerage systems (latrine type toilet) are a major public health problem. There is an increased risk of water pollution and contamination that needs to be known and considered.

Material and Methods. The evaluation was carried out on a number of 60 public wells/springs in Iaşi County in 2020. The number of consumers per water source varies from 4 to 400 people. The water was analyzed chemically and microbiologically. Chemical analyzes included the determination of oxidability, ammonium, nitrites and nitrates levels. The values obtained were compared with the reference values found in the national legislation. The microbiological examination included the determination of coliform bacteria, *Escherichia coli* and enterococci. The values obtained were compared to those stated in the current legislation.

Results. The oxidability values did not show any major problems, there were only 4 wells (6.66%), the level being between 5.88 and 9.32 mg O_2/L (normal value 5 mgO_2/L). Ammonium showed high values in 7 wells (11.66%), which ranged from 0.660 mg/L to 3.04 mg/L (normal value max. 0.5 mg/L). Nitrites were within normal limits in all wells as they decompose very quickly. Unfortunately, nitrate accumulation has occurred, which means that a large amount of organic matter has decomposed. There are 39 wells (65%) in which the nitrate concentration ranged between 56.18 and 882.0 mg/L (compared to a maximum acceptable level of 50 mg/L). However, there was a low number of intoxication, viz. only 3 cases reported per year. The challenging problem is related to the microbial contamination that has often far exceeded the allowed values. Coliform bacteria were within normal limits (0 germs/100 ml water) in only 4 wells (6.66%). The values ranged from 20 to 90 germs/100 ml of water, which is a risk to the health of the population. *Escherichia coli* was absent in 19 samples (31.66%). In most wells the values ranged from 10 to 80 germs/100 ml of water, compared to the recommended level of 0 germs/100 ml of water. Enterococci were within normal limits (0/100 ml water) in only 9 samples (15%). Samples from the other wells reported values from 10 to 90 germs/100 ml of water. In this context, the risk of acute diarrheal disease is very high. In 2020, 4225 people were diagnosed with acute diarrheal disease, which is an alarming signal. Unfortunately, local authorities have little interest in these aspects of public health.

Conclusions. It is necessary to carefully monitor the water sources and the water supply of the population since there is a high risk of waterborne disease outbreaks.

„PHAGE TREATMENT AND WETLAND TECHNOLOGY AS INTERVENTION STRATEGY TO PREVENT DISSEMINATION OF ANTIBIOTIC RESISTANCE IN SURFACE WATERS"- A PROJECT LAUNCH IN LOW-MIDDLE INCOME COUNTRIES OF EASTERN EUROPE

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Keywords:
wastewaters, antibiotic resistance, constructed wetlands, low-middle income countries, multidrug-resistant bacteria.

Introduction. Antimicrobial resistance is a widespread and tough challenge, if not impossible, to limit by biological, physical or geographical barriers. This is the reason behind the "One Health" approach, which guides all rules and research plans on antimicrobial resistance worldwide. The abusive and excessive use of antimicrobials in human medicine, veterinary practices, agriculture and aquaculture has traditionally been considered the main reason for the global spread of antimicrobial resistance. The purpose was to assess the epidemiological risk of wastewater as a source of antimicrobial-resistant bacteria concerning public health, focusing on low- and middle-income Eastern European countries.

Material and methods. To achieve this goal, the development of a secure, cost-effective and sustainable technology has been planned, which could easily be introduced in low- and middle-income countries. There have been outlined the following steps: mapping the consumption of antimicrobial emulsions at the national level (primary, cross-sectional study, complete sampling, based on imported data and centralized public acquirement of medicines); research regarding the knowledge, attitudes and practices of the population on antimicrobial resistance (primary, cross-sectional, descriptive study); qualitative and descriptive evaluation of barriers to reduce the phenomenon of antimicrobial resistance by the healthcare services; research regarding the knowledge, attitudes and practices in human and veterinary healthcare on antimicrobial resistance (primary, cross-sectional, descriptive study); screening and investigation of the microbial resistance mechanisms to the strains isolated from patients with infectious pathological processes (preclinical study); analysis of the specific features and sampling of the Constructed Wetlands in Orhei (preclinical study). The Ethics Committee of Ministry of Health of RM positively approved the *Research PhageLand*.

Results. The obtained results of this research will contribute to a better understanding of the involved factors that are generating the broadening of antimicrobial resistance and how they influence the transmission among different hosts (bacteria, animals and humans). Moreover, it can also have a major impact to the engineering field and wastewater management companies by expanding the range of tools with sophisticated technologies, designed to reduce the risk of transmitting antimicrobial resistance in wastewater and improve sewerage practices.

Conclusions. The effective use of knowledge and practices in the worldwide fight against antimicrobial resistance, providing useful data, applicable knowledge, efficient, environmentally friendly and cost-effective protocols and technologies, which can be scaled, implemented and used at the European and international levels with no economic or geographical obstacles.

Acknowledgment. *The research was conducted in the Republic of Moldova within the JPIAMR projects (PhageLand), project number – 22.80013.8007.1.*

UNDERGROUNTD WATER POTABILIZATION USING PHYSICAL, PHYSICO-CHEMICAL AND CHEMICAL PROCESES

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Keywords: *underground waters quality, potabilization processes.*

Introduction. In the last 70 years, as a result of the intensive development of industry, agriculture and the living standards of the population on Earth, the water quality has deteriorated catastrophically. This endangers the health of the population, causing the spread of infections and the appearance of chronic diseases. The study carried out by researchers from the Water Chemistry Laboratory of the Institute of Chemistry over the last 25 years, aimed at the establishing of the chemical indices of natural water quality showed that in most cases, water from underground wells does not comply with the required sanitary norms of the "Drinkable Water" STAS. Scientific research has been carried out using physical, chemical and physico-chemical processes such as aeration, oxidation, ion exchange, adsorption on activated carbon, and reverse osmosis.

Material and methods. The water samples of the underground wells from different geographical areas of the Republic of Moldova were taken in plastic bottles, of which three 1-litre bottles were completely filled and transported to the laboratory in refrigerated boxes for a maximum of 5 hours for being analyzed.

The concentration of hydrogen sulfide and soluble sulfides, ammonia and ammonium ions, nitrite ions, nitrates, chlorine, fluorine, sulphates, iron, manganese, calcium, magnesium, and permanganate oxidability was determined using the analytical methods and standardized spectrometry. The removal of chemical components that exceeded the maximum allowable concentration (MAC) in drinkable water was performed using the unique pilot plant developed and built at the Laboratory of Ecological Chemistry of the Institute of Chemistry. The research leading to these results has received funding from Innovation Staff Exchange Programme and institutional project DISTOX, no. 20.80009.7007.21

Results. The analysis of chemical water quality indices retrieved from 115 artesian wells from different geographical areas of the Republic of Moldova revealed that the most frequent MAC values exceeding these indices are the values of ammonia concentrations and ammonium ions, hydrogen sulfide and soluble sulfur, sodium ions, iron, manganese nitrites, nitrates, as well as the oxidability of the permanganate. It has been established that out of the 115 artisanal wells under study, 96% do not fully comply with the quality indices required for drinkable water. Water taken from underground wells, showing chemical quality standards exceeding MAC has been treated under dynamic conditions using the following consecutive processes: mechanical filtration, aeration, oxidation, ion exchange, adsorption on activated carbons.

Conclusions. The underground waters from the Republic of Moldova are of poor quality. Using consecutive processes of filtration, aeration, oxidation, ion exchange, adsorption on activated carbons, reverse osmosis, water with drinkable qualities can be obtained.

QUALITY OF GROUNDWATER USED FOR HUMAN CONSUMPTION

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Keywords: *drinking water, quality, health, groundwater sources.*

Introduction. Water is the environment in which all the vital processes of the human body occur, as well as the water element is one of the environmental factors with multiple effects, both positive and negative for the health of the population. Therefore, its physico-chemical and biological state determines the existence and security of human society. Providing the population with good quality water in sufficient quantities is an effective measure for the prevention and prophylaxis of communicable and non-communicable diseases. The purpose of the study was to analyze the current situation regarding the causes and factors that determine the water quality for human consumption.

Material and methods. A descriptive bibliographic study was conducted on the water quality for human consumption. The study focused on the analysis of scientific articles, reports and guides published online. Databases and open access platforms were used to collect the information.

Results. From a qualitative point of view, groundwater is considered as clean and complying with drinking water standards. The chemical composition of groundwater varies. In most cases, it reveals high mineralization and a surplus. Groundwater across the territory of the Republic of Moldova is protected from surface pollution in different ways. Its content is influenced by agricultural activities, particularly, by the rational use of mineral fertilizers and large livestock complexes. The chemical composition of groundwater in different regions of the Republic of Moldova is as follows: in ordinary wells and springs, the total mineralization is 66.8 mg/L, nitrates – 52.4 mg/L, fluorine – 9.2 mg/L, sulphates – 13.5 mg/L; in artesian wells, the total mineralization is 39.7 mg/L, nitrates – 3.2 mg/L, fluorine-23.2 mg/L, sulphates – 2.7 mg/L. About 40% of these sources belong to the category of waters with high mineralization and 23.2% with increased amount of fluoride. High mineralization is characteristic of the southern part of the Republic of Moldova. Almost the same situation has been recorded in the southwestern region of Romania, where the quality of groundwater, intended for human consumption, far exceeds the normative values, especially the water mineralization indices. The situation in Romania is characterized by the existence of territories with frequent and important pollution of well water with nitrogenous substances. This situation varies depending on the demographic, socio-economic peculiarities, especially in the rural area. A major problem is the microbial contamination of the water, being a source of infections that can cause many deaths. There are actually two worldwide trends, viz. there are frequent water epidemics with *Salmonella*, *Shigella*, *Escherichia coli* within the developing countries, while whole regions are affected by *Vibrio cholerae*, whereas the industrialized countries do not have these problems, however, other agents have appeared such as *Giardiasis* and *Cryptosporidiosis*.

Conclusions. Thus, to sum it up, water quality presents an important public health problem induced by the wide territorial and spatially dependent variations, from the point of view of the natural chemical composition or due to the population activity.

TECHNOLOGICAL FEATURES OF IODIZED WATER PRODUCTION

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Keywords: *iodized water, production technology.*

Introduction. The drinking water and mineral water market shows that the consumer is often interested in the use of waters for prophylactic purposes, fortified with microelements, vitamins, etc. Over the years of experience, the population has been interested in iodized water.

Material and methods. In collaboration with the National Center for Public Health, a study was achieved about iodine deficiency in a group of children and its reduction due to the consumption of iodized fortified water. The water production technology fortified with this microelement was developed and implemented.

Results. The following technological process is used to produce iodized fortified water. The water extracted from the artesian well is divided into two streams: (1) the first stream is filtered at 20 µm, softened by the ion exchange plant or dosed antiscalant in the stream, filtered at 5 µm, demineralized by the reverse osmosis plant and collected in tanks E3, E4 and E5 with total volume V150m3; (2) the second stream is filtered at 20 µm, passed through the zeolite filter, filtered at 5 µm, then mixed with the first stream in the collection tanks E3, E4 and E5. The ratio of water flows is established in such a way that the mineralization of the obtained water is equal to 0.45-0.65 g/L, in a ratio of approximately 60/40%. In sections, the water undergoes final filtration through a 1-µm filter, then disinfected by bactericidal plant and sent to the bottling lines. The iodine concentrate is dosed with the dosing pump into the water stream immediately before bottling. The production capacity of the dosing pumps is calculated based on the amount of water in the flow, which drains in a unit of time and the concentration of iodine. The iodine concentrate is calculated using the following formula:

$$A = (Q \cdot K2)/K1 \quad (1),$$ whereas:

A - the amount of iodine concentrate, dm^3;
Q - the amount of water in flow, dm^3/h;
K2 - iodine concentration in the finished product, $\mu g/dm^3$;
K1 - iodine concentration in iodine concentrate, $\mu g/dm^3$.

The production capacity of the dosing pumps is calculated by the formula:

$$D = 100 \times A/Qm, \quad (2),$$ in which:

D - production capacity of the dosing pump, %;
A - the required amount of iodine concentrate (from formula 1), dm^3;
Qm - maximum production capacity of the dosing pump, dm^3/h.

From the collection tanks the water is transmitted to the bottling department. Prior to bottling, the organoleptic characteristics (clarity, color, taste, odor, presence of foreign inclusions) of the water are determined, as well as the iodine content, which must be within the range of 80-125 $\mu g/dm^3$. If the water meets both the requirements of SF 06817943-002 and the recipes, it is sent to bottling and in the sales packaging. In case of deviations from the iodine content, the production capacity of the dosing pump is corrected.

Conclusions. The implemented technology allows the production of iodized water, which is beneficial for the prophylaxis of goiter edema in the population.

ANTIBIOTICS AND ANTIBIOTIC RESISTANT GENES IN WATER - ENVIRONMENTAL AND HUMAN HEALTH RISKS

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Keywords: *antibiotic resistance genes, antibiotic, environmental risk, groundwater, human health.*

Introduction. Antimicrobial resistance is a worldwide problem that is both pressing and challenging due to the rate at which it is spreading, and the lack of understanding of the mechanisms that link humans, animals and environmental sources contributing to its proliferation. Antibiotic pollution is becoming an increasingly serious threat across different countries. Potential risks associated with release of human antibiotics into the environment have become an increasingly important issue of the environmental health. This concern has been driven by the widespread detection of antibiotics in all aquatic compartments. Antibiotics are ubiquitous in the environment and significant concentrations have been detected in water sources. The prevalence of antibiotics and antibiotic resistant genes in water has drawn attention in recent years, due to their potential public health risks.

Material and methods. The purpose of the study was to carry out an analysis of the literature related to antibiotics and antibiotic resistant genes in groundwater, based on 61 bibliographic scientific research across the country and abroad using Academic Google and PubMed databases for articles published between 2016-2021.

Results. Antibiotics play a significant role in the induction and dissemination of antibiotic resistance genes in water that has recently become the primary environmental concern. Over the recent decades, antibiotics and antibiotic resistance genes have been regarded as emerging pollutants. The abuse of antibiotics can increase their residual amount in the water environment, which causes the enhancement of antibiotic resistance, being recognized as a new type of pollutant. Various types of normal bacterial genes that become activated under severe antibiotic stress, produces resistant enzymes even under normal conditions. Therefore, the resistance genes are being transferred horizontally from one bacterial cell to another, thus, increasing resistance to antibiotics. The distribution of antibiotics in water sources varies significantly in time and space, corresponding to the amount of antibiotics used locally. The main source of this contamination in the aquatic environment is the wastewater from antibiotic manufacturers, large scale animal farming, and hospitals. Environmental antibiotics pose a range of risks and have significant effects on human health.

Conclusion. Antibiotics have greatly polluted the environment globally. The anti-infectives in environmental waters is of interest because of their potential role in the dissemination of anti-infective resistance in bacteria. Finally, scientific guidance on drug use is still required to discourage and prevent antibiotic abuse. A careful literature review was conducted in order to understand the sources, fate and occurrence of antimicrobials in the aquatic environment. In this context, a broad and specialized background was obtained, enabling a complete overview of the state-of-the-art in these subjects.

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THE ROLE OF BORON FOR HUMAN BODY

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Keywords: *boron, drinking water, human body.*

Introduction. Boron is a little known trace element from the metalloids class that is supposed to be essential for the human body. The main source of boron for humans is drinking water. To date, there is evidence that boron can be beneficial for bone and joint health, brain activity, hormonal health and can help the body to metabolize minerals like calcium, copper, and magnesium. The purpose of this study was to research the literature data to determine the role of boron for the human body.

Material and methods. A study analysis of 150 bibliographic sources was carried out that highlighted the boron functions and its role for the human body.

Results. Boron can be easily found in the form of compounds as borax, boric acid and boron oxide in the environment, particularly in sea water, drinking water, rocks and soil. Its concentration in water can vary from 0.001 to 150 mg/L depending on geographic location. Along with the consumed food and the region of provenience drinking water can provide a dose of 0.75-1.35 mg of boron per day. Following available researches that extrapolate results from animal experiments, for optimal health effects of boron a minimum dose of 0, 5 mg per day is needed. World Health Organization suggests that an acceptable safe range for population means 1-13 mg of boron per day for adults. This indicates that usual intakes of boron above 1 mg day may promote human health. Most ingested boron is converted into boric acid in the gastrointestinal tract, then rapidly absorbed in the proportion of 85-90%, used in the body processes and excreted in that form mostly in the urine. That means that boron is not toxic, and its deficiency is more dangerous than the excess. Available human studies suggest that boron is beneficial for bone maintenance and can reduce the risk for osteoporosis. More than that, daily boron supplementation with 6-12 mg of calcium fructoborate can decrease joint rigidity and increase mobility, the symptoms being associated with osteoarthritis and rheumatoid arthritis. Boron has positive effects on vitamin D metabolism or utilization, circulating homocysteine levels, and S-adenosylmethionine, compounds which affect brain function, thus, it seems reasonable to suggest that nutritional intakes of boron have a positive effect on the central nervous system. Some biochemical findings suggest that boron might be beneficial for reducing the risk of the metabolic syndrome and diabetes through facilitation of the action or releasing of insulin. Both animal and human findings indicate that nutritional intakes of boron can reduce chronic inflammation determined by high serum C-reactive protein, which is a risk factor for heart diseases. Following this findings, boron is supposed to alleviate this risk factor and have a positive effect on heart health.

Conclusions. Substantial evidence indicates that boron is a trace mineral that can be easily found in drinking water and has health effects that may prevent or reduce the risk for bone diseases such as osteoporosis, osteoarthritis and rheumatoid arthritis, brain impairment, cardiovascular diseases and metabolic syndrome.

WATER QUALITY REFLECTS HEALTH

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Keywords:
Health, chemicals, drinking water, endocrine disruptors.

Introduction. A clean environment is essential for human health and well-being. The most well-known health issues are related to the pollution of the surrounding air and poor water quality. Much less is known about the impact of hazardous chemicals on population health and especially on the endocrine system. In everyday life, people are exposed to a wide range of chemicals through polluted air and water. In addition, the amount and variety of chemicals currently used and the steady increase in chemical production suggest that human and water exposure will continue to increase.
As a result, there are health effects of exposure to chemicals, pesticides during life, especially in vulnerable periods, such as early childhood, pregnancy and old age.
Material and methods. The evaluation of the pesticide amount was carried out by analyzing the statistical data on "Report on health and epidemiological status" F-18, of the Ministry of Health of the Republic of Moldova, "Report on the stock and use of plant protection products" f-2/e and f-10/e of the Ministry of Agriculture and Food Industry.
Results. The National Public Health Agency monitors the amount of pesticides and other chemicals in surface water supply sources, especially water intakes for centralized drinking water supply in order to reduce public health risks. Hygienically estimating the variety and intensity of pesticide use, it was recorded that in 2020, 1907.2 tons of phytosanitary products were used in the country, their number being 1240. Of these, 179 are products that can affect the endocrine system. These products get into the water as a result of use. The monitoring results of the drinking water quality from the artesian wells for public use, which accounted for 2908, showed a high level of non-compliance with chemical parameters. The results of the laboratory tests reported that the share of samples that do not comply with the sanitary norms in terms of chemical parameters, taken and examined from the artesian wells in 2020, was on average 71%, compared to 65.9% found in 2019. Poor drinking water quality and unfair access to water are the risk factors that can be prevented and influenced. Improving the quality of the environment in key areas, such as air and water, can prevent diseases and improve human health.
Conclusions. The phenomenon of chemicals impact on public health, as well as the quality of drinking water are the major global challenges and sources of concern for the public health service. Thus, to sum it up, chemicals including endocrine disruptors can be identified as substances of very high concern along with those known to cause mutations, cancer and reproductive toxicity. The aim is to reduce the use and, finally, to replace these substances with safer alternatives. The effects of chemicals, including those involved in disrupting the endocrine system, can be observed long after their exposure.

USING WATER FASTING TO REDUCE BMI IN PEOPLE WITH OBESITY AND TYPE 2 DIABETES

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Keywords: *water diet, BMI, obesity, type 2 diabetes.*

Introduction. Currently, obesity as the 21st century's major disease has affected almost every country worldwide, so it can be called a pandemic. Most studies show that it is a consequence of modern lifestyle (S. Moossavi 2018, Wolfgang Kopp 2019, Irina V. Leskova *2019).* Obesity influences morbidity in many diseases, including type 2 diabetes. According to some scientists, one of the remedies used in fighting against obesity and its complications is the water diet, which is quite effective (Elizabeth A. Dennis 2012, Jodi D. Stookey 2012, John C. Peters 2015).

Material and methods. The study was performed at the University Clinic of Primary Health Care of Nicolae Testemitanu State University of Medicine and Pharmacy, based on the addressability of patients diagnosed with obesity and diabetes mellitus, during 2020. The research is a cross-sectional descriptive study, which included the interviewing method based on the questionnaire regarding the water diet and publications retrieved from specialized sources. This present study used bibliographical, observational, description, statistical, nutritional methods etc. Based on the patient's informed consent, 104 females were included within the study, who were diagnosed with obesity associated with type 2 diabetes, aged between 50 and 59 years, which served as criteria for study inclusion.

Results. The body mass index (BMI) was initially evaluated, the values showing that out of 104 participants, 76 (73.08%) cases had BMI ≥30 kg/m^2, 20 (19,23%) BMI ≥35 kg/m^2 and BMI ≥40 kg/m^2 was determined in 8 (7.69%) people. The subjects selected in the study followed the water diet for 16 weeks. It consists of 4 types of water used between the main meals, according to a certain scheme, but with a 25% reduction in the calories used before starting the water diet. While following the diet, 24 (23.07%) persons did not lose body weight, however, in the post-experimental questionnaire, it was determined that they did not comply to the water and the low-calorie diet. 80 (76.93%) people who followed the water and diet regimen after a prior training decreased their body weight from 3 kg to 12 kg over 16 weeks. People who lost between 2-7.9 kg did not strictly follow the diet but had a hereditary predisposition to obesity and type 2 diabetes and according to the questionnaire, suffered from sleep disorders, as well. In other people where such disorders were not registered, the success rate of the water diet, accompanied by the low-calorie diet, reduced the body weight of the respondents from 8 kg to 16 kg. In 24 (23.07%) persons no changes in BMI were confirmed, since they did not accept the water drinking regimens and hypocaoric diet, which was actually the reason why a person had the same BMI ≥ 40. Other study participants lowered BMI over 16 weeks, in total 80 (76.93%) people.

Conclusions. Based on the positive evolution of the subjects participating in the study, it was found that water diet may reduce the body mass index (BMI) and obesity associated with type 2 diabetes, respectively, as well as decrease the calories by 25% over 16 weeks.

SURVEILLING THE SARS-CoV-2 IN SEWAGE: THE CATALAN CASE

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Keywords: *wastewater-Based Epidemiology, SARS-CoV-2, sewage, COVID-19, Public Health.*

Introduction. Shortly after the outbreak of the COVID-19 pandemic, scientists renewed their interest on the application of wastewater-based epidemiology (WBE) to track the communal circulation of SARS-CoV-2 through the quantification of its genetic traces in sewage. At national scale, such strategy was firstly implemented in The Netherlands in February 2020 and, following the Dutch example, similar sewage surveillance programs were later put into action by other countries at different scales and coverages. At the time of writing, 58 countries are currently monitoring the circulation of SARS-CoV-2 in wastewater as reported at the COVID-Poops19 website. The purpose of this work is to describe the roadmap for the implementation of a wastewater surveillance network at a national scale and to discuss the main challenges faced during its functioning.

Material and methods. It should be noted that all data generated are free for scientific use, and it can be downloaded from a public repository at the Zenodo website. The database is weekly updated and contains all molecular data obtained from the samples analyzed.

Results. In Catalonia, a Spanish region of 7,5 million inhabitants, the Public Health Agency of the Catalan government and the Catalan Water Agency promoted and funded the implementation of the Catalan Surveillance Network of SARS-CoV-2 in Sewage (SARSAIGUA) to provide information on the circulation of SARS-CoV-2 at community level that complement epidemiological & clinical data. SARSAIGUA started in 2020 by monitoring 56 WWTPs that assist 193 municipalities, representing 80% of the Catalan population. Within less than 72 hours, weekly samples are collected, analyzed, and results reported to Health authorities and finally published in an on-line dashboard. After 19 months of monitoring, the normalized daily loads of SARS-CoV-2 genes in the 56 WWTPs monitored, fairly matched the sum of COVID-19 cases along the successive pandemic waves. Moreover, a good fit was obtained between the aggregated viral load (gen copies/day/100.000 inhabitants) and the epidemiological evolution of diagnosed cases in the municipalities, served by the monitored WWTPs (r_{xy}=0.59). In 2021, SARSAIGUA started the monitoring of SARS-CoV-2 variants by sequencing sewage samples every two weeks using Oxford nanopore technology and ARCTIC primers targeting the S gene. The deployment of this sequencing approach has allowed to track the introduction and spread of the Omicron variant and the concomitant wane of the Delta variant across the territory.

Conclusions. Overall, and despite the difficulties and limitations associated to the inherent complexity of wastewater, the usefulness of WBE to rapidly detect viral transmission at community level is very helpful to Health authorities to better manage the pandemic situation. This is particularly relevant under the current scenario, where new emerging SARS-CoV-2 variants with higher fitness and transmission potential outcompete old ones in a weekly time scale.

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COMMUNICATION AND RAISING PUBLIC AWARENESS IN PROMOTING DRINKING WATER SAFETY, HYGIENE AND HEALTH

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Keywords: *drinking water, hygiene, effective communication, raising awareness campaigns.*

Introduction. Access to safe water and hygiene is a precondition for a healthy life. In the Republic of Moldova, it has been estimated that the incidence of acute diarrhea and hepatitis A is about 15-20%, gastrointestinal diseases account for 22-25% and 100% of dental fluorosis are caused by the drinking water quality. Effective communication with the population in order to prevent diseases related to water quality and poor hygiene, protection and management of water resources, and rational use of water are essential elements in the development and implementation of national environmental and health policies. One of the objectives of the National Program for the Implementation of the Protocol on Water and Health is to increase the level of relevant knowledge on drinking water safety, hygiene and health among population up to 80% by 2025 and up to 85% by 2030.

Material and methods. The purpose of this research was to evaluate the effectiveness of communication and awareness-raising activities on drinking water, hygiene and health. The communication and information interventions carried out in the Republic of Moldova over the last 10 years were evaluated, as well as the review of the specialized literature in the field of health communication in relation to the environment.

Results. Communication and information dissemination to the public on water and health issues is carried out in the following ways, including: (i) *Publication of regular official reports*. These reports are prepared and published annually on the official websites of the authorities (National Agency for Public Health, Ministry of Environment, State Ecological Inspectorate, etc.) and contain data on water quality from various sources, access to improved water systems and disease incidence, water protection measures, pollution prevention and impact prevention. It should be noted that these reports are written in an academic, technical style that is often difficult to understand for most of population. (ii) *World Days Awareness Campaigns*. World Water Day (March 22) and International Handwashing Day (October 15) are marked annually. The actions carried out during these events usually focus on information through the media, training of specialists, policy dialogues at different levels, media coverage through social networks, distribution of information materials, interpersonal communication, etc. Such actions are usually not financially supported and with a less impact on the authorities and the population. (iii) *Communication and awareness campaigns on raising the level of knowledge, attitudes and practices*. These actions aim to change knowledge, attitudes and/or behaviors regarding a certain issue related to water quality, sanitation or hygiene, and are carried out in a certain period of time, with planned objectives and achievable results.

Conclusions. Effective communication with the public and active dissemination of information are the key elements in the development and implementation of environmental and health policies. Communication mechanisms, in terms of educational activities and public awareness and information campaigns, are regularly used tools to increase understanding the relationship between water and health at the Community level.

THE RELATIONSHIP BETWEEN THE WASTEWATER TREATMENT PROCESS RESULTING FROM THE ACTIVITY OF MEDICAL INSTITUTIONS AND THE MAINTENANCE OF A HEALTHY AND SAFE ENVIRONMENT

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Keywords: *medical waste, liquid waste, wastewater, hospital*

Introduction. The Monitoring of the quality of drinking water, wastewater, freshwater and seawater is of great importance for the safety and well-being of people, fauna and flora. The medical staff involved in the medical waste management system must know the definitions, categories and waste amount within the unit; risks to the environment and human health at each stage of the waste management (waste removal; the plan for the management of the waste resulting from medical activities), as well as the internal regulations and the codes of procedures applied to the collection, storage, transport and neutralization of the hazardous waste**. Material and methods.** A structured literature review was conducted, by analysing 21 sources, using the PubMed database. The word combinations used were as following: "impact" AND "medical waste"; "Liquid waste" AND "hospitals"; "Wastewater" AND "hospitals". **Results.** Hospitals are important sources of pollutants resulting from diagnostic activities: chemical reagents, radioactive markers, iodinated contrast agents, including pharmaceutical residues, constituting liquid waste, including those without proper treatment, which may end up into the wastewater and cause serious damage to public health and the environment. Liquid wastes from hospitals include various biological fluids from the human body, including blood. It is estimated that about 75% of hospital waste is generated by medical care, while about 25% is classified as hazardous infectious waste. In the context of the COVID-19 pandemic, this risk is constantly increasing. The anatomo-pathological wastes, including biopsy materials collected in operating rooms (amputated tissues and organs) and maternity (fetuses, placentas), anatomical parts resulting from autopsy laboratories, animal carcasses resulting from research and experimentation activities are often infectious delusions. These comes into direct contact with the water, which then reaches the sewer system. In general, wastes resulting from medical activities are improperly collected, transported and stored, thus causing pollution of water basins near localities or downstream areas, which are the main sources of water supply for both humans and animals. In order to prevent the liquid waste leakage, medical wastes must be stored properly. Storage spaces must be provided with an automatic temperature monitoring and recording system, which will be systematically evaluated. The temporary storage conditions should comply with the hygiene regulations in force. The duration for transportation and final disposal of infectious medical waste shall not exceed 24 hours. Medical waste generated on site will be handed over to an authorized operator for the collection and transport of hazardous waste for safe final disposal. **Conclusions.** The minimization of the negative effect of liquid waste resulting from medical activity can be achieved by disinfection and proper disposal of liquid wastes. Medical waste producers must avoid mixing different types of hazardous waste, including hazardous waste with non-hazardous one, whereas the medical units should be responsible for the ongoing training and education of employees.

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IMPLEMENTATING THE WATER SAFETY PLANNING IN THE REPUBLIC OF MOLDOVA

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Keywords: *drinking water, water safety plans, risk assessment, risk management.*

Introduction. Water safety planning is a comprehensive risk assessment and risk management approach that includes all steps in a drinking-water supply chain, from catchment to consumer. A Water Safety Plan (WSP) is a plan to ensure the safety of drinking water through this approach. The World Health Organization (WHO) recognizes WSP as the most reliable and effective way to manage drinking-water supplies to safeguard public health. WSPs provide a proactive approach to ensure water safety through good management of the complete water supply system. This involves understanding the complete system, identifying where and how problems could arise, setting up barriers and control systems to prevent problems before they occur and ensure that all parts of the system continue to function properly. The successful development and implementation of WSPs can help improve the understanding of the water supply system, improve stakeholder collaboration, improve operational efficiencies of the utility and provide a strong framework to better target more sustainable long-term capital investments.
Material and methods. This research was aimed to evaluate the existing tools for developing WSPs and identify gaps in the process, as well as to identify ways to support water operators and local authorities in developing WSPs based on a risk assessment of their water supply systems.
Results. To support water supply operators and local authorities in the development of WSPs, two UNECE-supported training workshops were organized in 2015 and 2016 for 50 water supply systems, mostly urban, but also including 10 small rural operators. In 2017, by the joint order no. 609/65/2017 of Ministry of Health and Ministry of Environment, the National Guidelines for the Development of a Water Safety Plan were adopted and entered into force. To ensure the participation of territorial Public Health Centers in the process, a training was organized for public health professionals on the presentation of the provisions of the Guidelines and the role of public health in coordination. This Guidance provides necessary support and describes all the 9 steps to be followed in this process: (i) Assemble a local team involving all relevant stakeholders (water operator, municipality, local community, school, NGO, public health, local entrepreneurs; (ii)evaluation and description of water supply system; (iii) identification of hazards and assessing risks; (iv) risk prioritization, establishing and validation of control measures; (v)monitoring of control measures; (vi) preparation of management procedures; (vii) validation and verification of monitoring; (viii) developing supporting programs; (ix) documentation and registration. Taking into account that water operators have different levels of understanding and skills, it was decided to develop different models of Water Safety Plans in order to support them in practice. As a result, we have developed WSP in 2 locations: Carpineni, Hincesti, which is the largest rural settlement in Republic of Moldova, having a complex water supply system (artesian wells and springs) and Serpeni, Anenii-Noi, which operates a water treatment plant. This makes possible to disseminate better practices in WSP development and implementation.
Conclusions. Benefits of implementation of WSP results in better protection of public health, maximizing existing resources, improving water supply practices, providing a decision-making framework for all stakeholders, as well as encouraging investments in water supply system based on risk assessment.