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THE SUSTAINABLE DEVELOPMENT DOCTRINE: WHAT DOES TRUE LEADERSHIP MEAN FOR BUSINESS?

In the forefront of genetics

Worldwide known Ukrainian scientists

Farmak

3 / 2020

SCIENCE INSIDE

Edem®

ENJOY YOUR LIFE WITH NO ALLERGY!

Farmak

SHORT PRESCRIBING INFORMATION FOR EDEM RINO:

1. EDEM. Dosage form: tablets, syrup. Active substance: desloratadine. 1 tablet contains desloratadine 5 mg, 1 ml of syrup contains desloratadine 0.5 mg; ATC code R06A X27. **Indications.** Elimination of symptoms associated with allergic rhinitis, urticaria. **Route of administration**. For adults and children over 12 years, the product is prescribed at a dosage of 5 mg (1 tablet) once a day regardless of food intake. For children 6-11 years: 2 ml of syrup once a day, for 6-11 years: 5 ml of syrup once a day. **Contraindications.** Hypersensitivity to the active substance or to any product component or loratadine. **Side effects.** Gastrointestinal: dry mouth, diarrhea, abdominal pain, nausea, vomiting, dyspepsia.

2 EDEM RINO. Active substances: 1 ml of the product contains phenylephrine 2.5 mg. Dimethyndene maleate 0.25 mg. ATC code: R01A. Indications. Symptomatic treatment of colds, nasal congestion, acute and chronic rhinitis, seasonal (hay fever) and non-seasonal allergic rhinitis, acute and chronic sinusites, vasomotor rhinitis. **Posology and method of administration.** For adults and children over 6 years: 1 spraying into each nostril 3-4 times a day. Duration of treatment should not exceed 7 days and depends on the course of the disease. **Contraindications.** Hypersensitivity to any product component. Due to the content of phenylephrine, this product like other vasoconstrictive agents is contraindicated in atrophic rhinitis, as well as for patients who are taking monoamine oxidase (MAO) inhibitors or have taken them during the previous 14 years. **Side effects**. Transient mild local reactions from the nasal mucosa (sensation of burning or dryness) may occur. No. UA/8360/01/01 of 02.04.2015; No. UA/T46/01/011 of 21.10.2013; Marketing Authorization No. UA/14054/01/01 of 01.12.2014

FOR ADULTS AND CHILDREN OVER 12 YEARS:[1]

1 tablet/day

FOR ADULTS AND CHILDREN OVER 6 YEARS:

1 sprayingin each nostril 3-4 times a day

PEDIATRIC POPULATION:[2]

6-11 months - 2 ml once a day
1-5 years - 2.5 ml once a day
6-11 years - 5 ml once a day
For adults and children over 12 years: 10 ml once a day

1. Prescribing Information for Edem tablets 2. Prescribing Information for Edem syrup 3. Prescribing Information for Edem Rino spray

NATIONAL MANUFACTURER OF MEDICINAL PRODUCTS OF THE EUROPEAN LEVEL

Advertising of medicinal products. Before using the medicinal product, be sure to consult your doctor and read the Prescribing Information before administration.
Marketing Authorization No. UA/14054/01/01, of 30.05.2019 [Order of the Ministry of Health of Ukraine of 30.05.2019 No. 1212.].
Marketing Authorization No. UA/8360/01/01, of 19.03.2018 [Order of the Ministry of Health of Ukraine of 19.03.2018 No. 506.].
Marketing Authorization No. UA/7746/01/01, of 12.09.2018 [Order of the Ministry of Health of Ukraine of 12.09.2018 No. 1664.]
УКР/ПРОМО/11/2019/ЕДЕ/ДМ/002
Manufacturer: JSC Farmak, 63, Kyrylivska str., Kyiv, 04080 Кирилівська, 63.
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SELF-TREATMENT MAY BE HARMFUL FOR YOUR HEALTH

Responsible leadership of Farmak

In Ukraine, as in any other country, pharmaceutical industry is strategic. Everyone needs medicinal products, and their own manufacture is critical for the state. The mission of Farmak is to make effective and quality medicinal products available. Accordingly, the technology, processes, equipment, quality and innovation are top-of-the-mind for the Company. Our products are almost in all therapeutic groups; annually an average of 20 medicinal products are released and about 110 medicinal products are in development. Today Farmak releases medicinal products in various dosage forms and packs.

Our investments in manufacture amounting to UAH 3.4 billion over last 5 years allow increasing of the manufacturing capacities by 35%. All lines are certified by the European GMP, which enables entering the new markets. Today Farmak is present in more than 25 countries: the export share amounts to 22.6% of the total sales of the Company.

This is consistent with not only the mission, goals and values of the Company, but also the values of the UN Global Compact, where the third paragraph stresses the need to ensure healthy lifestyle and promote well-being for the people of all ages. In 2019 Farmak joined the Network of the United Nations Global Compact and was the first Ukrainian pharmaceutical company to join the Global Compact.

The leadership in the Ukrainian market is a big responsibility, which motivates us to keep pace with international practices and be an example in implementing the principles of sustainable development. Our most important contribution is the provision of our people and citizens of many other countries with qualitative and affordable medicinal products. When it comes to health, we do our best to multiply other dimensions of human well-being. This includes providing decent working conditions, conducting transparent business and investing in scientific and practical research. Each of the universal principles of the Global Compact, from ensuring human rights to combating all forms of corruption, is integrated into the activities of our Company.

Taking care of people, we keep in mind that we all live in one House, on one Planet. Therefore, by increasing the capacity of our manufacture, at the same time we minimize the negative impact on the environment. And this is not the end of our environmental activities, because numerous educational projects, initiated by Farmak, form a new eco-consciousness of Ukrainians.

This issue of our magazine will tell you about the enormous role that socially responsible business can take on in solving global problems. We are happy to find like-minded people and together be the drivers of positive change!

Volodymyr KOSTIUK,
Executive Director of JSC Farmak

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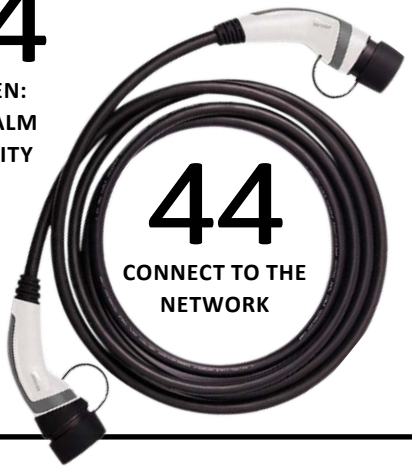

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SCIENCE INSIDE
"Farmak JSC" CORPORATE MAGAZINE

Founder: "Farmak JSC"
Project Manager: Olena ZUBARIEVA
Project Curator: Yana CHERNIUK
Prepared by: AMEDIA GROUP

Edermik

Dimetindene
oral drops

ANTIHISTAMINIC AGENT ‘

1. for babies over 1 month[1]
2. begins to act within 30 minutes after administration’
3. БЕЗ СПИРТУ
   no alcohol and colouring agents
4. optimal volume - 25 ml[1]

Food allergy,[1,2]

Itching in atopic dermatitis [1,2]

Non-allergic itching,л (insect stings, chickenpox etc.)

Drug allergy[1,2]

Seasonal and perennial allergic rhinitis[1,2]

NATIONAL MANUFACTURER OF EUROPEAN MEDICINAL PRODUCTS

Prescribing Information for Edermik
2 E.F. Glushkova, T.N. Surovenko, M.D., Professor “Specifics of prescribing antihistamines in paediatric practice”/ Medical Council No. 9, 2017

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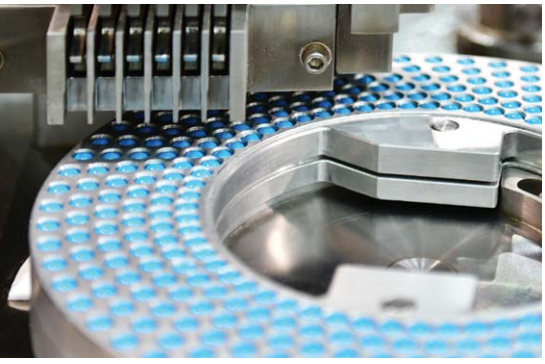
SELF-TREATMENT MAY BE HARMFUL FOR YOUR HEALTH

USA and Ukraine. What a leader can teach you

Today, Ukraine needs new rules for pharmaceutical market players. In search of solutions, it would be helpful to mention the history of the pharma development in the United States. High standards in market regulation, in protecting the interests of the population, in resolving intellectual property issues – a number of points can be a role model for countries seeking sustainable development.



The US pharmaceutical market continues to be the largest in the world, covering more than 40% of the global market. This is where the world's largest number of new medicinal products emerge. This is where health care spending is a record of more than 17% of GDP (compared to 7% to 11% for developed countries).

In fact, no matter which indicators we use to compare the American and Ukrainian pharmaceutical markets – either in terms of turnover or profit, or the number of manufactured and sold packages of medicinal products, or the innovative contribution to the development of medicine and the pharmaceuticals industry in particular – in fact, it would be like comparing a giant to an ordinary person. But this does not mean that in the future Ukraine cannot expect fantastic results and rapid growth.

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the experience of

HISTORICAL GAP

It is impossible to take and apply the mechanisms that provide the advantages of the large American pharma to our domestic realities. After all, we are talking about incredible, tremendous funds. Unfortunately, there is no magic wand that will instantly improve the well-being of our citizens and allow them to invest more in their own health. Thus, according to the World Health Organization study, the funds spent on drugs in developed and developing countries, differ in absolute terms by tens of times; at the same time, they are comparable in relative shares, and these indicators depend on GDP. It will also impossible to immediately establish a state system to support the pharmaceutical industry, similar to the American one. In the United States, this function is performed primarily by national health institutes, independent research institutions that cooperate with universities, large corporations, small and medium-sized businesses. Because in order for such institutions to work, state funding is still needed.

That is, to be a leader in the global pharma, you need to be a leader in the world economy. And now, in order to reveal the secrets of American success, we will have to delve into the analysis of the passionate potential of the first immigrants, and then, step by step, review the whole history of the United States economic development. Looking for reasons of the differences between the markets of the United States and Ukraine, we should consider the matter of the fundamental difference in the efficiency of the market economy, which developed in the United States, and the planned economy, on the ruins of which modern Ukrainian business was rebuilt.

FREEDOM VS CONTROL: HOW THE FDA WAS BORN

Undoubtedly, the basis of the current American pharmacists success is free entrepreneurship. But "freedom" does not mean "a game with no rules." On the one hand, US pharmaceutical companies operate under the principles of free market competition. On the other hand, they depend on the decisions of industry regulators – first of all, Food and Drug Administration, as well as WTO and WHO.

FDA – one of the strictest regulatory bodies in the world – was established and cultivated by the system of government, where citizens can freely defend their rights and have freedom of speech among other things. The whole story began with "The Jungle" novel, in which the publicist Upton Sinclair described the horrors of the Chicago slaughterhouses. The socialist pathos of the work was not successful – instead of sympathizing with the inhumane working conditions of slaughterhouse workers, readers began to panic over the quality of the meat they ate. The scandal became so public that the Senate was to set up an investigation committee and President Theodore Roosevelt was to issue the Pure Food and Drug Act in 1906, which regulated the circulation of food and drugs. This legal basis was the foundation for the FDA, which became more and more powerful and toughened control over pharmaceutical production over time. It came to the point that this institution,

In 2018, the Ukrainian pharmaceutical pharmacy market has been ten times worse since 2014 than in the case of the dollar exchange rate – by 11%.

$8–10 BILLION

annually (in 1994 prices) – so much consumers can save from the expansion of the generics market, which became possible after the adoption of the Hatch Waxman Act.

which fought for the quality of drugs, was accused of... people's deaths. Because the drugs have been undergoing various trials for too long due to strict requirements. In response, the FDA allowed to speed up the approval of medicinal products in exceptional cases. Who knows, maybe this is why the United States will be the first to create a vaccine against today`s threat – the coronavirus?

ADHERE TO STRICT REQUIREMENTS

There is no institution in Ukraine that is similar to the FDA in terms of powers and efficiency and, in particular, that would just as carefully protect our fellow citizens from low-quality medicinal products. However, the system of rules proposed by the FDA is not kept under lock and key. So far, domestic legislation has more lenient requirements for pharmacists than the United States. But the companies that live not only in the present, but also make big plans for the future, want more. Yes, FDA certification requires significant improvements and investment. However, it will mean joining the "club of big players" – confirmation of FDA compliance gives a chance to enter the US market and at the same time provides "visa-free" access to other regulated markets, as a guarantee of unquestionable quality.

BRAND OR GENERIC?

The United States is a leader not only in monitoring the safety and efficacy of drugs. The country also cares about the availability of the necessary medicines. It was the States that pioneered the market use of generics.

This issue became especially relevant in the 1960s after Congress analysed the cost-effectiveness of medicinal products and began strongly advocating the use of generics in federal health and welfare programs to protect against inflated prices due to lack of competition. During the same period, manufacturers of generics were allowed to market medicinal products, based on published data on the safety and efficacy of the brand product.

Prices fell – and, of course, this caused dissatisfaction of well-known brands and caused a wave of objections to the admission of generics to the market by abbreviated application. Some evidence of bioinequivalence of some medicinal products also added fuel to the fire. The opposition of supporters of brand products and fans of generics intensified: some claimed that "all generics are bad," others that "all of them are good." The conflict was resolved through the introduction of stricter requirements for proving bioequivalence and the publication of the Orange Book that assesses the equivalence of generics put on the market. The Hatch Waxman amendments, adopted in 1984, also played an important role. On the one hand, the Act extended the term of patent protection of brands; on the other hand, legalized the registration of generics at the legislative level under an abbreviated application. Later, in 1992, the Generic Drug Enforcement Act was passed, which began to regulate the generic industry even more clearly: Illegal actions aimed at accelerating market entry led to fines, and generic manufacturers were required to provide more scientific data on quality and bioequivalence. This law restored confidence in the generic drug industry. Today, according to various estimates, American doctors prescribe generics in 60-85% of cases. However, most generics sold in the United States are made overseas. However, local manufacturers also work on the development of generics. In some places, in order not to lose their position, generic medications are offered even by originator companies.

GOLDEN STANDARD

From America, the confrontation between originators and manufacturers of generics has spread to all continents. In Europe, the American approach to the regulation of the generic industry has been applied: in the territory of the European Union it is necessary

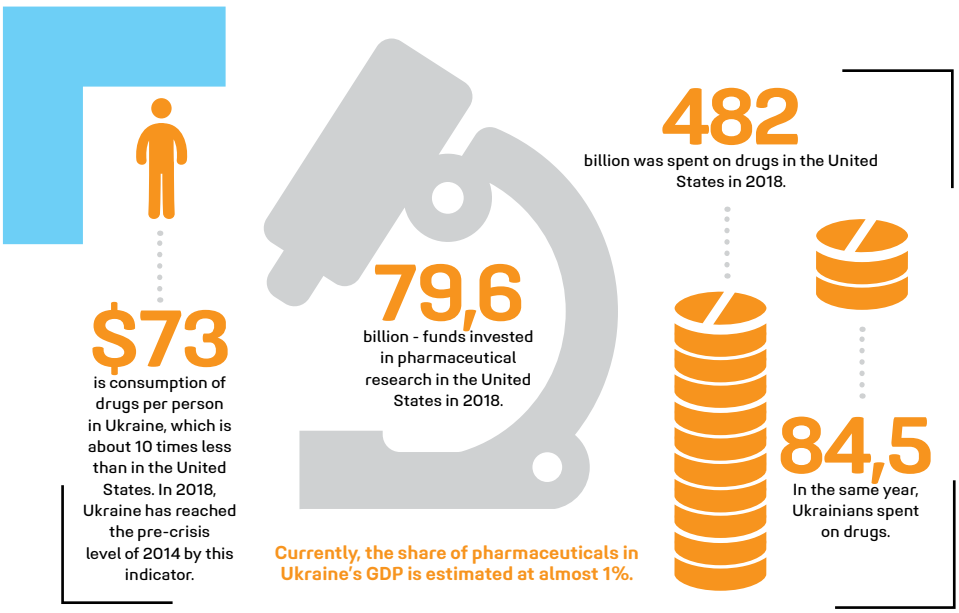


Photo istock.com

to prove bioequivalence of a generic to a reference medicinal product at the stage of its approval. Today, these requirements have become relevant for Ukraine, where the vast majority of drugs produced are generics. Undoubtedly, the winners were those who had previously switched to the development and manufacture of medicinal products according to the "golden standard" of world pharmaceuticals.

PROTECTION OF RIGHTS AND INTERESTS

The United States has also proposed a model for resolving intellectual property disputes, which is now being implemented in the legislation of many countries, and similar processes have begun in Ukraine. This is the so-called "Bolar Provision", according to which generic manufacturers can speed up the launch of a new medicinal product on the market, without violating the rights of patent owners. That becomes possible when research on the reproduction of a drug begins before the patent expires.

In the 1980s, generic manufacturer Bolar began experiments to prove bioequivalence of the original Roche-owned Valium before patent protection expired. In 1984, a federal court deliver a judgement in favour of the patent owner. However, the amendments to the said Hatch-Waxman Act clearly state that the manufacture, use or sale of patented medicinal products exclusively for purposes objectively related to the development and provision of information in accordance with federal law, is not a violation. Thus, the use of a brand product before the expiration of the patent, carried out in order to accelerate the release of a generic, was enshrined in the law. In the US, due to this, the term of entry of generics to the market was reduced from 3-4 years to 1-2 months.

The Bolar Provision was consolidated at the regulatory level in the European Union in 2004. Currently, the process of modernization of laws governing property rights continues in Ukraine. Generic companies will be allowed to develop and research until the expiration of the patent for invention for a formula or molecule of a medicinal product: to import laboratory samples of substances, study them, prepare registration documentation and submit it for state registration of a medicinal product. Given that our country, as well as the countries to which it supplies its pharmaceutical products, need high-quality and inexpensive drugs, this is a very favourable outcome.

Approximately 70% of the world drug market are brand drugs, and only 30% are generics. That is, generics, given their availability, could have a powerful impact on improving health care.

DIRECTIONS FOR GROWTH OF THE UKRAINIAN MARKET

In the 1990s, the Ukrainian market was satisfied with imported medicinal products by 80%, the share of local manufacture, respectively, was 20%. Over 20 years, the share of local manufacture was estimated at about 25%, and foreign manufacturers continued to be the leaders in the pharmaceutical market. At the same time, trends began to change: Due to the devaluation of the hryvnia, the position of Ukrainian pharmacists strengthened, and domestic manufacturers became the market leaders. Currently, a retail share of medicines from Ukrainian manufacturers (and it accounts for 87% of the market) is more than 70%. In addition to the local market, export potential continues to open up significant potential for domestic manufacturers.

More than 90% of locally manufactured drugs are generics, which is natural, given the insane cost of the latest developments. For example, in the United States, the cost of developing a new drug is more than $ 2.6 billion (compared to less than $ 200 million in the 1970s)! And even if, due to historical and economic preconditions, we are not able to make a radical breakthrough in medicine, the mission of Ukrainian pharmacists may be to make large pharma innovations available to those who need it. Among the external factors that will contribute to this, is the expected "patent cliff", a sharp decrease in patents for well-known drugs. Among the domestic ones, which depend on market and state players, are modernization of manufacturing facilities, transition to world standards, investments in scientific intelligence and legal support of the state. All this will allow, if not to catch up with with the giants "in terms of growth", then at least start talking to them in one language and look for possible models of cooperation.

THE SUSTAINABLE DEVELOPMENT DOCTRINE: what does true leadership mean for business?

FARMAK WAS ONE OF THE FIRST PHARMACEUTICAL COMPANIES TO ACCEDE TO THE UN GLOBAL COMPACT. Tetiana SAKHARUK, Chairman of the Management Board, talks about how Ukrainian businesses can contribute to the implementation of the Global Principles and Sustainable Development Goals.

■ ***Ms. Tetiana, how long have you been in charge of the UN Global Compact in Ukraine?***

I joined the Global Compact in 2016, when the initiative almost died because of the crisis in Ukraine in 2013 and the conflict in the East. It was clear that the principles of the UN Global Compact are important for Ukrainian business like never before. Over the past three and a half years, our team has grown significantly. We implement several international projects and have our own initiatives, which involve participants from other countries. This year, we have selected a new Supervisory Board of the organization, which includes nine leaders of the most active corporate parties to the UN Global Compact in Ukraine.

IN UKRAINE, THE UN GLOBAL COMPACT AT LEAST 60 PARTICIPANTS.

■ ***Which of the principles of the UN Global Compact do you consider most relevant to Ukraine?***

Each of the ten principles plays a crucial role. Any business seeking to join the global movement of socially responsible companies should comply with them. And as soon as there is such foundation, which demonstrates the transparency of the company and its sustainability, it can be said that the business is involved in the implementation of the Sustainable Development Goals, which the international community aims to achieve by 2030. For Ukraine, such program items as No. 8 "Decent Work and Economic Growth", No. 4 "Quality Education", No. 3 "Good Health and Well-being", No. 13 "Climate Action", etc. are of utmost importance. However, the company itself must choose for themselves one or more of the seventeen that are the most relevant to it, based on its business areas, regions in which it operates, people's needs.

Tetiana SAKHARUK, Chairman of the UN Global Compact Local Network in Ukraine

Since 2000, more than 10,500 companies from 163 countries have agreed that human rights, decent job relationships, a responsible attitude to the environment and combating corruption are all very important indicators that should be fought for and constantly implemented in their own activities. All of these companies have joined the United Nations Global Compact, a separate initiative within the United Nations system that aims to bring the full force of business, public or private, to global tasks.

■ ***How many local companies have already joined the Network? What industries do they represent? Name the biggest ones.***

In Ukraine, the UN Global Compact is currently supported by more than 60 participants and their number is growing. Communities are also beginning to join the Compact. The largest participants are Farmak, Ukrgazvydobuvannya, DTEK, Astarta, Alfa-Bank, Carlsberg and others.

■ ***What is the algorithm for joining the Network of such socially responsible companies? What are the obligations imposed by participation in the Global Compact?***

A company that adheres to the principles of the UN Global Compact has the right to write a letter to the Secretary-General of the United Nations requesting becoming a member of the international network of socially responsible companies. After verification, such a company will be asked to sign a membership agreement. The company displays its open profile on the international website of the UN Global Compact, where it annually reports on its progress in the social and environmental spheres. Reporting is mandatory. Through the reports we can evaluate how the company's business affect positive change around the world.

Our corporate parties are leaders and role models for their competitors. We noticed a trend: when company in a particular industry joins the UN Global Compact and starts reporting on their

achievements, everyone else start asking themselves why they are not doing anything in this area. The more industries join the network the more positive changes we can expect in society – because business is the drive of progress.

■ ***One of the key components of sustainable development is ecology. Why is this aspect extremely important today?***

The UN estimates that over 2 billion people are currently suffering from a lack of clean water, and by 2050 more than half of the world's population will face this problem. By 2050, coral reefs may be completely gone; in the ocean may be more plastic than fish. The species of animals and plants disappear. Carbon emissions into the atmosphere increase. In 2015 alone, 9 million people died from environmental contamination. According to statistics, 9 out of 10 city residents suffer from environmental pollution. And the list of dangers goes on.

Unfortunately, the educational environment is still dominated by economic theory, which was developed in the 1960s, when profit was called the main purpose of business, and people and the environment were called the resource for profit. However, this approach is very short-sighted. The experience of developed countries proves that businesses that invest in the Sustainable Development Goals are more competitive. This is possible when the main stakeholders combine their efforts:

The Global Compact contains 10 Principles and 17 Sustainable Development Goals. It's a business agenda, a full-scale program to transform our world and change for the better by 2030.

Photo from the archive of Tetiana SAKHARUK

- ***the state encourages businesses to implement the Sustainable Development Goals;***
- ***investors give preference to those companies that affect the achievement of the 2030 Global Agenda;***
- ***society helps find solutions to global challenges and implement such solutions in partnership;***
- ***the education system educates both the younger generation and current business leaders about the new value system and how to profit from it;***
- ***the media are promoting the business in a sustainable way.***

In your opinion, what are the advantages of companies that support the sustainable development doctrine in their activities?

Participation in the UN Global Compact is a "pass" to the civilized business world for any company. It is access to partners from all over the world, it is a dialogue platform for all stakeholders – public and private sectors, it is an opportunity to exchange experience between local and foreign companies. Today, the Global Compact operates in more than 160 countries.

Joining the Global Compact emphasizes the company's commitment to transparent business and meets the employee and community needs. It is also very important for companies going international. Many foreign companies are required by law to report on the entire supply chain which they work with, so it is crucial for them to have a partner company that shares the principles of the Global Compact and adheres to the Sustainable Development Goals. In this case, the participation of Ukrainian business structures in the Global Compact is a guarantee for a foreign partner.

Once a year, the company should report on its progress in implementation of the ten principles of the UN Global Compact in the areas of human rights, labour relations, environment and anti-corruption management. In addition, at the company's discretion, it can also report on the achievement of the Sustainable Development Goals, which the company has identified as a priority in its work. The Progress Report is publicly available on the UN Global Compact website and can be accessed by anyone. This is the main document which western investors use to evaluate companies by ESG (environmental, social and corporate governance) and determine how risky it is to invest in or lend to a particular company.

Statistics show that the members of the UN Global Compact have better ESGs, which means better conditions for obtaining loans and investments, access to global capital and more.

But economic bonuses aren't the only benefits, are they?

Sure. We must not forget that we have one planet for all of us! We can continue to deplete natural resources or tolerate exploitation of people for miserable salaries. But we live here, and there is no possibility to change the planet yet. Not everyone will be able to fly to Mars with Elon Musk.

EXPERIENCE OF DEVELOPED COUNTRIES SHOWS THAT BUSINESSES, WHICH INVEST IN SUSTAINABLE DEVELOPMENT, ARE MORE COMPETITIVE.

Therefore, the time has come for everyone to recognize the need to respect human and environmental resources. And if possible, to implement additional social and environmental measures aimed at improving the situation in the area of the company's presence.

In fact, a business structure that works in this way has many benefits. Its employees enjoy the work, and the community provides a so-called "operating license" in their region, allowing to keep the people and to reduce the outflow of human capital.

So I wish all companies to be true leaders!

LIUDMYLA SAICHENKO

Head of Occupational Health and Safety and Environment Department

Taking Care of the Environment

Modern business is changing its philosophy: Increasing the capital ceases to be the sole purpose – responsible companies are committed to protect the interests of society, in particular, the preservation of the environment. **AND ALTHOUGH IT IS CURRENTLY IMPOSSIBLE FOR PHARMACEUTICAL INDUSTRY TO COMPLETELY EXCLUDE ITS IMPACT ON THE ENVIRONMENT, HOWEVER, ONE MUST MINIMIZE THESE IMPACTS, IMPLEMENTING MEASURES TO IMPROVE THE ENVIRONMENTAL SITUATION.**

FIRST STEPS

Farmak believes that achieving best results requires a coordinated system: knowing how the Company impacts the environment is not enough – it is important to learn how to manage these impacts. It all started when in 2002 an external audit of the enterprise was conducted, which resulted in Farmak's being among those first Ukrainian enterprises that developed and implemented the Environmental Management System in accordance with international standard ISO 14001 of 1997. In 2005 the System was certified, and in 2017 – recertified under the international standard ISO 14001 of 2015.

For the System to really operate effectively, the Company annually sets environmental objectives and develops environmental program, which stipulates the tasks and actions for the units to reduce emissions of pollutants into the atmosphere, reduce waste and

Traditional communal work

wastewater pollution. In addition, there is constant analysing of the current situation and the monitoring of the environmental indicators through internal and external audits, as well as through the work of the sanitary-industrial laboratory. Systematic training of employees in proper waste management, prevention of violations of environmental requirements and the like are also of great importance.

CLEAN ENVIRONMENT

All steps of Farmak taken to protect the environment are focused on several areas.

■ ***Air.*** The manufacturing sites in Shostka and Kyiv operate modern and effective filtration systems. This approach showed good results: 90% of the emissions released into the atmosphere are the pollutants from the boiler facilities, not the manufacturing shops. All the emissions meet allowable standards, as evidenced by the conclusion of sanitary-industrial laboratory, which monitors system performance.

■ ***Wastewater.*** For more than a year, the Company holds a positive trend in the quality of wastewater treatment – the indicators are much lower than those allowed in accordance with the regulations. Achieving such results was made possible due to the construction of the innovative wastewater treatment line in Shostka; careful monitoring of all indicators and timely application of effective measures in case of deviations. Moreover, the modernization of treatment facilities at the Farmak's manufacturing sites in Kyiv are in progress.

■ ***Wastes.*** The company has set itself the task not only to properly dispose of and recycle wastes, but also to minimize their number. The Company has conducted waste inventory, created the registry card of the waste in each manufacturing unit, developed the procedure for handling with them. The first step is thorough sorting. Construction wastes are brought to a special landfill for burial. A significant part of household waste is taken by Obukhovgorvtorresursy, where they sort and further forward it for disposal. Polyethylene, wood and paper wastes collected separately are sent to Obukhovgorvtorresursy for recycling. The company installed press containers. Secondary raw materials are taken from them only when the containers are full. This enables efficient use of transport, reducing fuel costs and greenhouse gases, which are released into the environment during transportation.

GMP, the quality system and the environment are closely linked and only a comprehensive approach allows to achieve the desired results.

In addition, Farmak invented the way of effective use of polyethylene. So, bottlepack sites produce 260-270 tons of polyethylene waste per year. Currently, it is not disposed of but processed for capping bottles.

The Company manages to achieve maximum reduction of technological waste during the manufacture of medicinal products through the use of quality raw materials, introduction of advanced technologies and installation of modern equipment.

LEGISLATIVE INNOVATIONS

Regulatory requirements for the protection of the environment change from time to time. Currently Ukraine is developing the draft law "On the prevention, reduction and control of industrial pollution". This refers to the reforming of the permission system in the sphere of environmental protection, in particular, to the introduction of the integrated permit. In order to get the permit, enterprises which will be subject to the act, among other things, have to provide automatic monitoring of all emissions and prepare an annual public report on environmental impact. The main emphasis will be made on the transparency of the companies. Although this law does not apply to the pharmaceutical industry, Farmak is always ready for innovations, which is normal for European countries. Transparency, openness to the public and preservation of the environment are consistent Company standards.

TO THE TOPIC

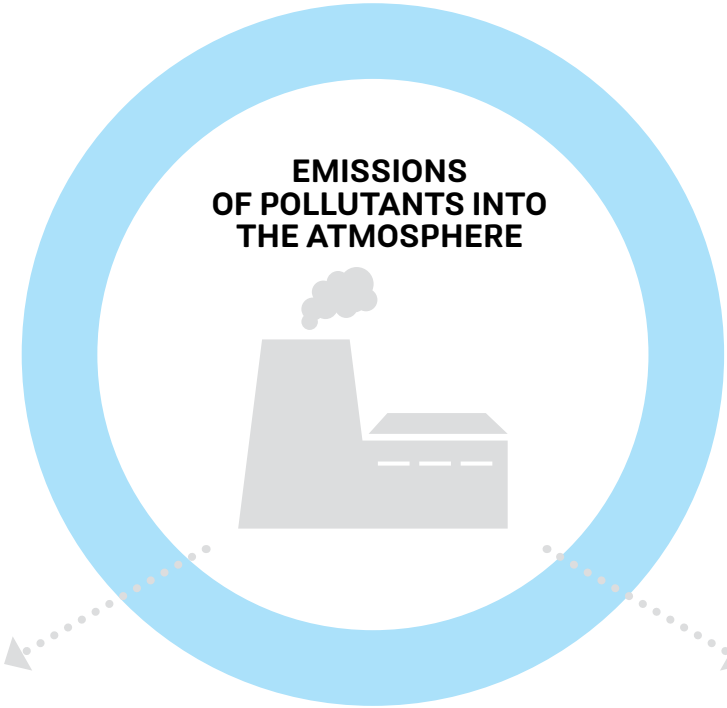
Over the past 5 years Farmak has spent more than 55 million UAH for environmental projects, namely: reconstruction of boiler facilities, modernisation of treatment facilities in Kyiv and Shostka, implementation of energy efficiency program. For 9 months of 2019, electricity consumption decreased by 9.32%; gas by 19.49% per hryvnia of output compared to the same period of 2018.

Farmak`s contribution to protection of environment

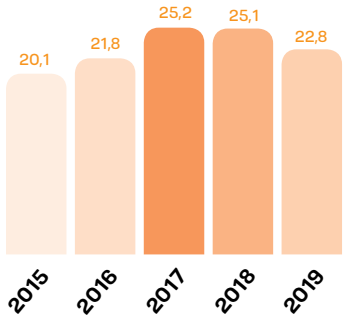
The emissions from the boiler facilities are

99%

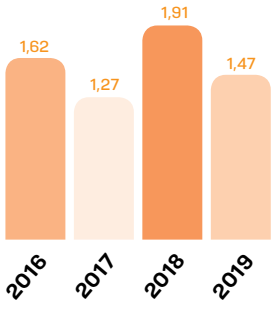
of the total emissions of pollutants.



EMISSIONS OF POLLUTANTS INTO THE ATMOSPHERE, T/YEAR (KYIV)

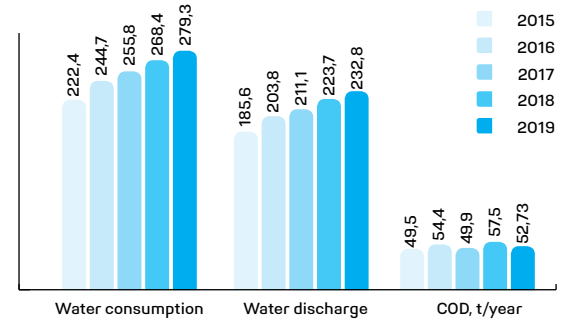


EMISSIONS OF POLLUTANTS INTO THE ATMOSPHERE, T/YEAR (SHOSTKA)

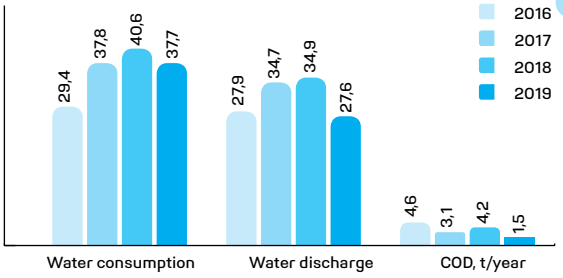


WATER SUPPLY AND DISCHARGE

WATER CONSUMPTION AND DISCHARGE, THOUSAND CUBIC METERS (KYIV)



WATER CONSUMPTION AND DISCHARGE, THOUSAND CUBIC METERS (SHOSTKA)



ENERGY CONSUMPTION PER UAH OF MANUFACTURED PRODUCTS

	ELECTRICITY	WATER	GAS
KYIV	2015 – 0,008 2016 – 0,006 2017 – 0,0047 2018 – 0,0046 2019 – 0,0042	2015 – 0,00007 2016 – 0,00005 2017 – 0,00004 2018 – 0,00004 2019 – 0,000036	2015 – 0,001 2016 – 0,0008 2017 – 0,0006 2018 – 0,0005 2019 – 0,00045
SHOSTKA	2016 – 0,177 2017 – 0,057 2018 – 0, 036 2019 – 0,036	2016 – 0,0012 2017 – 0,0004 2018 – 0,00028 2019 – 0,00027	2016 – 0,029 2017 – 0,009 2018 – 0,006 2019 – 0,006

WASTE MANAGEMENT

WAST RECYCLING

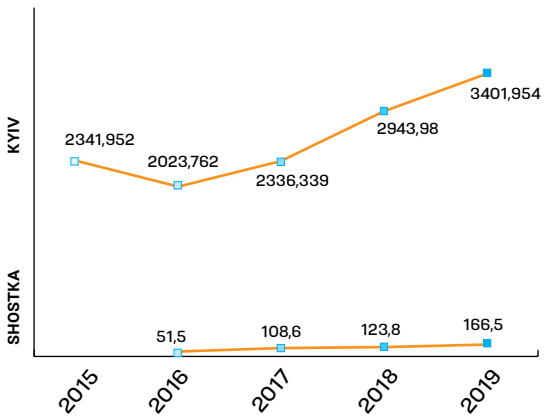
IN 2019, THE FOLLOWING WERE COLLECTED AND SENT FOR RECYCLING:

323,7 T polymer waste and plastic

159,3 T scrap metal

280,9 T waste paper

WASTE, T/YEAR



WASTE, 2019

KYIV	SHOSTKA
61% burial	41% burial
37% recycling	4% recycling
2% disposal	55% disposal

Energy efficient solutions: time for a change

Mankind meets their needs using natural resources which are eventually being depleted. Therefore, developed countries are paying increasing attention to alternative energy sources and developing effective methods of energy conservation. **FARMAK POLICY IS ALSO AIMED AT THE ECONOMICAL USE OF NATURAL RESOURCES.**

COUNTDOWN

Statistics show that over the past 100 years a large part of the minerals accumulated in the Earth over millions of years have been used. According to experts, the deposits of natural gas run out until 2052 and oil – until 2060. The share of energy consumption from natural sources will be only 10%. These disappointing data raise the question over how to prevent the collapse.

SOLUTIONS

Alternative energy – promising ways of obtaining and using energy – is divided into conventional and unconventional.

Conventional methods

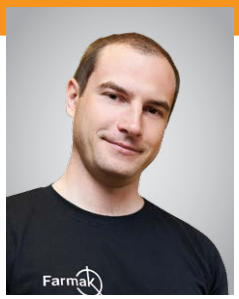
It is the energy of the sun, wind, and bioenergy. They are widely used in different countries of the world, including in Ukraine. A considerable role here is played by the geographical location of the country.

Unconventional methods

1 ***Tidal energy.*** The countries with outlets to the sea actively use the energy of waves. One of the most practical ways of using this method is closing the mouth of a river or tidal basin with the construction of the plant in the gateway. During tide sweeps the water level changes causing the differential pressure between the pool level and the sea that drives the turbines of generators of hydroelectric power stations.

2 ***Cryogenic energy*** is the generation of liquefied atmospheric air into electricity. As a result of cooling air to -196°C, gases, nitrogen and oxygen liquefy, which gives the possibility to pump the liquid into a special storage. From there liquefied air enters the evaporator where it expands 700 times, and thereby drives the turbine of the power station.

3 ***Water temperature gradient energy.*** One of the most powerful renewable



OLEH SUPRUNOVYCH

Chief Power Engineer

Today in Ukraine there are already some positive developments for the use of alternative energy sources: biofuels, solar energy, wind and hydropower. The most developed at present is bioenergy: Statistics show, in 2014 in Ukraine almost 3 billion m^3 of natural gas was replaced with biofuels. Besides, a good way of conservancy is solar energy which helps to save up to 6 million tons of conventional fuel per year. In terms of the economy prospects at world scale, the best alternative energy source is radioactive thorium. In addition, there is another option – to find a way to maximally extract energy from natural gas and oil, because the mankind uses only about 2% of the energy potential of fossil fuels.

energy source exploits the difference of the water in the World ocean at different depths. Hydrothermal energy is at the forefront among other types of alternative energy generation. So, the amount of energy from a temperature gradient on a square meter of the World ocean is around 300 kW, while from wind farms it is about 1.7 kW, and from the sun – 1.4 kW.

WORLD EXPERIENCE

A significant decrease in the proportion of mineral resources and environmental degradation will force the mankind to look for other ways to meet their energy needs. Modern researchers are constantly working on new methods of conservation.

- ***Radioactive thorium*** is a mineral, which is 90% more efficient than uranium. Today it is the most promising source that will help to reduce the amount of the consumption of gas and oil.
- ***Bacteriophage M13.*** American researchers have created virus-bacteriophage M13, the molecules of which transform kinetic energy into electrical energy.
- ***"Speed bumps" are capable of generating electricity.*** This know-how is already used in the United States. The speed "regulators" are made using piezoelectric crystals, which produce electric charge when they are compressed.
- ***Power paper.*** Sony has developed a biogenerator that produces electricity from paper. One A4 sheet can generate up to 18 W, which is enough for 3 LED lamps. This know-how is already used in offices in Japan.
- ***Lightning energy.*** Even Tesla wanted to catch lightning in order to use its powerful energy in everyday life. Researchers think that a single bolt of lightning can be compared to 145 litres of fuel! The only question is how to capture lightning and turn it into energy. Leading U.S. companies are already working on it.

ENERGY EFFICIENCY AT FARMAK

Farmak's manufacturing is constantly expanding: it increases its capacity and volumes. At that, the Company has managed to significantly reduce the use of natural resources. For instance, gas consumption has been reduced by 30% in comparison with 2014. In general, since that time, the quantity of energy spent per hryvnia of output continues to decrease. The company has successfully implemented many energy efficiency measures:

- The wasteheat exchanger is installed in the boiler facilities.
- For heating industrial water, the energy of the condensate is used.
- Fluorescent lamps in the enterprise are replaced with led lamps.
- Disabling or limitation of the operation of air conditioning systems and refrigeration units is used; temperature mode of heating systems is regulated and the like.

The first steps are also made to use solar energy: at the end of 2019 at corporate recreation "Smuglianka" solar panels were installed through which hot water would be supplied for the dining and residential housing.

TO BE DEVELOPED

- The aim is to install solar panels on the roof of the project engineering building to cover the square is 650 square meters. Estimated total of electricity that this power plant can produce is up to 50,000 kWh per year.
- The possibility to create an ice-storage is being considered aimed at directing the energy of cold for the needs of the ventilation system at the enterprise (Farmak specialists work over the issue together with the researchers from KPI). Cold will act as a byproduct of ventilation systems operation. It is important to conform to strict pharmaceutical standards that apply to these systems.

At the boiler facilities

Farmak strives to achieve maximum energy efficiency in the operation of all its units – **IN PARTICULAR, IN THE OPERATION OF THE BOILER FACILITIES, WHICH ARE AN IMPORTANT COMPONENT OF MANUFACTURE.**

Eco-modernization: new Farmak boiler facilities

At the boiler facilities

THE HEART OF THE PLANT

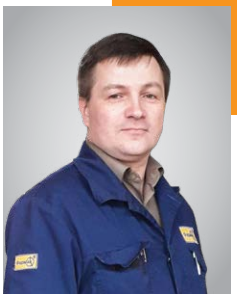
The boiler facilities are essential at a pharmaceutical enterprise. The exhaust steam produced here is used at the plant. First, it is about getting the "clean" steam that is used in the manufacturing of injectable drugs, as well as for moistening the air in ventilation and conditioning systems. Second, it is used to create proper climatic conditions in the main manufacturing facilities, as required by GMP, or to prepare hot water. Besides, the boiler facilities provide thermal energy, which heats manufacturing and administrative rooms in winter. So that, if the boiler facilities are stopped, then the plant will no longer be in operation. Therefore, it operates throughout the year and stops only for service or maintenance.

INNOVATIVE SOLUTIONS

In 2015–2018, the boiler facilities were upgraded and equipped with modern steam boilers manufactured by Viessmann, Germany. Initially, the VITOMAX boiler with a capacity of 5.5 tons of steam/hour was put into operation for the summer mode of the plant, and later two more VITOMAX boilers with a capacity of 12 tons of steam/hour each were added. They are all equipped with water economizers, having a high degree of automation and quite a simple design. Owing to the microprocessor-controlled Weishaupt burner efficiency, thermal energy from fuel combustion is used as efficiently as possible. In addition, they are frequency and oxygen adjusted, which additionally saves electricity and natural gas, and also reduces CO_2 emissions. The basic efficiency of new boilers is 95.5%. The personnel monitors the operation of electronics and controls the levels of emission weekly. Therefore, white, almost transparent pipe smoke is always the symbol of innovative, energy- and cost-efficient manufacturing.

To maximize the usefulness of natural gas which is burnt, steam boilers are additionally equipped with condensing economizers that allow the use of latent heat from flue gases to heat water in the plant's heating system. This new solution has increased fuel efficiency to ~ 99%.

The new boiler facilities have been built according to the modern principles of energy saving: maximum utilization of waste heat from boiler purging, use of heat of evaporation from atmospheric deaerators with simultaneous returning heating steam condensate to the cycle, use of physical heat from the housing of steam boilers for heating boiler facilities, use of a closed loop on oxygen, etc.



OLEKSII CHYZH

manager of the boiler facilities

The investment in energy saving is always on time. The investments are quickly repaid, and the new boiler facilities are a great proof of this. Thus, the condensing economizer, which was installed in 2018, fully paid the investments back for the 2018-2019 heating season

Safe Manufacturing in Shostka

Among the main principles of sustainable development are environmental protection and natural resource conservation. These principles are the most important key points for JSC Farmak. To effectively implement them in the manufacturing of medicinal products, **THE COMPANY APPLIES ADVANCED INNOVATIVE TECHNOLOGIES THAT ALLOW TO MINIMIZE HARMFUL EMISSIONS.**

REGULATORY REQUIREMENTS

API Manufacturing Department located in Shostka (Sumska region, Ukraine) specializes in the manufacturing of active pharmaceutical ingredients (which are the main active substances of medicinal products). The manufacturing is based on organic synthesis, therefore, the latest modern systems are essential for protecting the environment from the harmful effects of chemicals. The main benchmark for the API Manufacturing Department is the Environmental Management System (EMS), which covers the following areas: atmospheric air protection; protection of water resources and subsoil; land protection and waste management; manufacture; energy and resource conservation.

CLEAN AIR

Modern equipment, used by JSC Farmak, allows to purify the air by 95-99%. In particular, the filtration systems of the well-known European brands MVB and GEA were installed at the API Manufacturing Department in Shostka. The purification of air in filtration (gas cleaning) units is carried out in three stages: at the first stage, pocket filters of filter class F7 capture solid particles with an efficiency not less than 90%. At the second and third stages, activated charcoal absorbs gaseous emissions on its surface with efficiency of 70-90%. GEA and DencoHappel (Germany), and Klima-Service (Czech Republic) filtration units are integrated into the ventilation systems. And to clean the vapour from workshop No. 6, systems of gas scrubbers of Czech manufacturer MVB OPAVA CZ s.r.o. are used.

Industrial wastewater cleaning department

Purification systems

The air and water purification systems used at JSC Farmak in Shostka provide the purification level of 85-99%.

SAFE WATER

In the course of the manufacturing of active pharmaceutical ingredients, as the result of flushing of technological lines and equipment, washing of overalls, preparation of purified water and other processes, industrial wastewater is released. Since the case is the manufacture of APIs, the waters are highly contaminated with organic compounds and are classified as aggressive. Thus, proper purification is an extremely important requirement. In order to ensure that no harmful compounds should be released into the environment, 5 years ago a new production line of Slovakian manufacturer AQUAFLOT for industrial wastewater treatment was installed, and now water undergoes several stages of purification: flow equalization, accumulation and neutralization (the water pH is equalised within the range of 6-9); mechanical cleaning (taking out mechanical impurities); biological purification (wastewater treatment through anaerobic and aerobic digestion processes of microorganisms) and ultrafiltration.

Eco-School: let's save the planet together

The unique educational program Eco-School, initiated by Farmak, was among top 20 best social projects of Ukraine in 2018, **AND IT BECAME A FINALIST IN PLANET CATEGORY AT THE INTERNATIONAL COMPETITION PARTNERSHIP FOR SUSTAINABILITY AWARD IN 2019.**

Participants of educational program Eko-School

Participants of educational program Eko-School

STRATEGIC MISSION

Eco-School is the projection of sustainable development of the Company that is consistent with the objectives of the UN Global compact, which Farmak joined in 2019 (incidentally, the first among Ukrainian companies!). The Company's management has clear understanding of the fact that socially responsible business cannot stand aloof from the solution of important environmental problems but should become a driving force in the implementation of such initiatives. The Company believes that current school students should be environmentally educated, aware of the threats facing humanity, and be able to find effective solutions to them.

Participants of Eko-School

START OF ECO-SCHOOL

The project was presented in 2018 in Shostka, where the API Manufacturing Unit is located. 7-11th form students from all town schools joined the project. From the first days, students have shown an incredible interest. The teachers, who accompanied the children in lectures and projects, also actively participated. A year later, students of Kyiv schools were able to join Eco-School.

In several months, the boys and girls have mastered an interesting program, consisting of four thematic blocks: "I and Nature", "Nature and I", "I and Energy", "Project management". They got a lot of relevant information on environmental issues: deforestation, reduction of drinking water reserves, increase of greenhouse gases. The students were shocked by the facts about the real environmental situation in Ukraine and the world, as well as by the likely prognosis for next 10 years. The audience was very concerned with the issues of energy efficiency and energy saving in educational institutions. Special attention in Eco-School is paid to project management, since modern students should not only to see the problem, but to be able to find solutions on their own.

The final stage of Eco-School is the contest of projects, each of which was assessed by Expert Panel of Farmak representatives, leaders of environmental NGOs and teachers. So, among all of the projects the Panel selected three winners who received grants for their project's implementation in schools: they are the installation of contact-free taps to minimize the consumption of water, the fountains for drinking water, and the bicycle to charge mobile phones. The successful implementation of the projects persuaded the students that they had worked for a purpose, and their ideas would turn useful.

While teaching in Eco-School, we use non-standard methods: eco-games, interactive lessons, and more. After all, the main slogan of the project holds "No" to boring lectures!"

WE ARE ONLINE

According to the results of the project in Shostka and Kyiv, the organizers came to positive conclusions about the change in the consciousness of young people, their willingness to make small steps, which in the future would have significant consequences, such as using energy saving light bulbs and the rejection of plastic bags in favour of stylish canvas shopping bags. Therefore, Farmak decided to expand the project boundaries.

Upon the initiative of the Company, the Eco-School educational online platform was created for the students in any corner of Ukraine to have the opportunity to join the environmental initiative, to acquire new knowledge, to unite with like-minded people to create their own eco-projects in their schools and to win grants for their implementation. Now almost 1000 students have already registered for the online courses to gain ecological knowledge remotely.

The children are looking forward to continuing learning in Eco-School because the most interesting part – creating their own projects – is ahead. The participants can join the fourth stage immediately after the completion of the quarantine. And in autumn, the first Eco-Festival will take place, where the teams of the participating schools will present their best projects to the Panel. The organizers prepare gifts and certificates for all eco-students, and the winners will receive mini-grants from Farmak to implement their eco-ideas.

Participants of Eko-School

Eko-School in Shostka

OUR PARTNERS

In order to successfully implement the Eco-School project, it was important to involve the team of professionals in the field of environmental protection – the like-minded people who could share their energy with all the participants from the very first days of the project in order to move together in the direction of an ecological society. For example, in Shostka we cooperated with the International Environmental Organization "Let's do it" in Ukraine, and in Kyiv – with the NGO "Ukrainian Ecological Club "Green Wave". Eco-activists are truly inspired by their business, engage in theoretical and practical issues in the field of ecology, and communicate much with foreign environmental colleagues. Together with NGOs, we created the textbook that at the end of 2018 was approved by the Ministry of Education and Science as a study guide for 11th form teachers.

Nowadays, in most countries, there is the issue of waste processing due to its excessive quantity. The Swedes' experience in this area is impressive – 99% of all trash in the country is recycled. In addition, 700,000 tons of waste is imported from other countries. **WE FIND OUT HOW SWEDEN MANAGED TO ACHIEVE ITS ECO-REVOLUTION.**

SWEDEN: THE REALM OF PURITY

AN IMPORTANT DECISION

It all began in the 1970s, when Sweden set out to become an energy-independent and environmentally friendly territory. At that time the country was literally drowning in piles of garbage. And the scientists have calculated: one person disposes of up to 1.5 kg of waste per day, and 4 tons of recycled domestic waste is equivalent to 1 ton of oil – which is very relevant for a country dependent on conventional fuel import.

The dexterous Swedes have come to the conclusion that waste is an inexhaustible source of free energy, and its recycling will help improve the environmental situation not only in their country but in the whole world. Today, due to modern technologies, Sweden processes 99% of its own waste, converting it into energy.

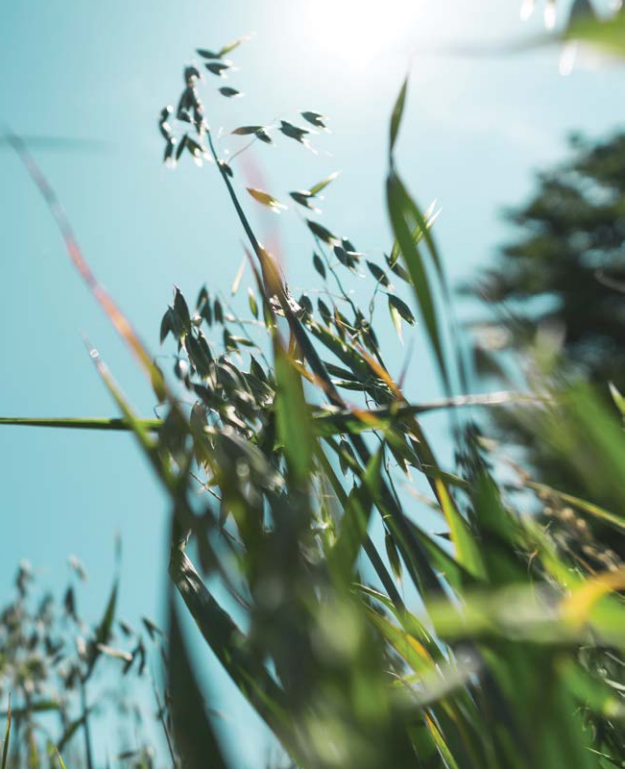
SEAMLESS ALGORITHM

The eco-strategy is spelled out at all levels, from nationwide regulation to personal commitment.

In order to reduce the amount of junk being thrown away, the government is encouraging Swedish manufacturers to produce as high-quality as possible, durable goods. In addition, the manufacturer is responsible for all costs for the collection, recycling and disposal of waste from own production. Companies, therefore, encourage their customers for the responsible consumption. For example, the H&M brand accepts worn clothing from consumers in exchange for discount coupons.

Most Swedes sort their waste at home into special containers. Usually, they deliver sorted waste to recycling centres by themselves. The authorities

Photo istock.com



There are almost

500

recyclable material collection points in Ukraine.

additionally install special containers in supermarkets, government offices, public transport stops, and even in the subway. Also, trucks that collect electronic and chemical waste are running in cities.

The waste is then recycled: scrap paper goes to paper production, plastic packaging to plastic production, and organic residues are used as biofuel. A certain amount of waste is disposed at incineration plants using state-of-the-art technologies, thus minimizing the percent of harmful emissions into the atmosphere (less than 1%). Thus Stockholm has become one of the cleanest capitals in Europe, even though a waste incineration plant operates there. Combustion residues make up only 15% of the weight of all incinerated waste. Incredibly, even the ashes are sent for recycling, and the final residues are sifted, sorting out the gravel used in road construction.

As a result of these effective disposal and recycling measures, only 1% of Swedish waste is landfilled. Sweden's main goal for the coming years is zero waste, clean air and water, and improved environmental performance.

ALTERNATIVE ENERGY

For about 20 years, the Swedes have been providing energy, almost abandoning imported oil and gas. Each year, 7 million tons of waste is disposed in the country, some of which is brought from Germany, Romania, Bulgaria, Italy and other European countries. In Sweden "waste" energy runs 30 power plants that burn 5.5 million tons of waste per year. Thanks to this, almost 900,000 Swedish households have electricity and 1.25 million apartments are heated. In some cities, biofuel (gas produced from organic waste) runs public and municipal transport: for example, this is how all garbage trucks and every fourth bus operate in Stockholm. To minimize urban air pollution, the government plans to convert all motor transport to biofuel made from domestic waste.

THE SWEDES ARE RELYING NOT ON WASTE INCINERATION BUT ON WASTE RECYCLING.

All these effective methods of recycling enable Sweden to significantly reduce waste amounts, compensate for oil and gas shortages and be energy independent.

LOCAL SITUATION

Officially, as of January 1, 2018, landfill is prohibited in Ukraine. But, unfortunately, the landfills cannot be abandoned. There is currently a problem with waste sorting: Ukrainians are not too enthusiastic at adopting the European experience. To help Ukrainians, local developers have created an application called "Sortuj" which provides clear sorting instructions. In addition, 500 recyclable material collection points have already been set up in Ukraine. And these are only the first important steps.

As for recycling, today only two incineration plants are operating in Ukraine, which destroy only 3% of waste, while over 95% of waste is dumped into landfills, number of which is increasing every year. According to statistics, up to 4% of the whole territory of Ukraine is landfill. The construction of new incinerator plants will cost the state a lot of money: the cost of building such factory, depending on the capacity, ranges from 130 to 270 million euros. Thus the prime cost of recycling 1 ton of garbage will be 90-130 euros. Fortunately, a National Waste Management Strategy has been developed in Ukraine, according to which a minimum of 15% of waste in our country should be recycled in four years and 50% in 10 years.

Under this year's motto World Economic Forum was held in Davos, Switzerland, that since 1971 gathers leading businessmen, owners of the largest companies, philanthropists and politicians and celebrities **STRIVING TO JOIN EFFORTS TO IMPROVE THE WORLD.**

"Stakeholders for a cohesive and sustainable world"

Almost 3,000 representatives from 117 countries, including leaders of 53 states and governments, participated in the 50th Anniversary Forum. Among the guests are also key figures of the United Nations and European Union, leaders of international organizations, leaders of prosperous companies: Secretary-General of the UN Antonio Guterres, President of the European Commission Ursula von der Leyen, Managing Director of the International Monetary Fund Kristalina Georgieva, Director-General of the World Trade Organization Roberto Azevedo, President of the International Committee of the Red Cross Peter Maurer, as well as billionaire financier George Soros, CEO of Facebook Mark Zuckerberg, Israeli historian Yuval Noah Harari, U2 band vocalist Bono and others.

KEY TOPICS

The main theme of this year's WEF is the implementation of the Paris Climate Arrangements, which have joined the efforts of countries across the world to curb climate change. One of the priorities of the Forum is the Global Sustainable Development Goals, including: healthy lifestyle, quality education, smart consumption, joint achievement of goals and more. The Davos meeting participants discussed a number of key issues that need to be addressed urgently: the development of new technologies and potential threats of their implementation; climate change and biodiversity protection; business development in the conditions of modern technological and social changes; health care; professional development and future of the labour market; settlement of armed conflicts.

Photo depositphotos.com

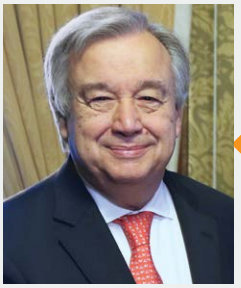
A few days before the Forum's starts, the organizers traditionally publish a Global Risk Report, which identifies the greatest threats to humanity according to various polls. For the first time in the last fifteen years, the top five in this list are climate change threats that put global fears of global recession and economic inequality behind.

MANIFESTO

Davos 2020 proposed that businesses adopt the Manifesto, which fundamentally changes the approach to the tasks that manufacturers and their beneficiaries set themselves. Increasing economic profits cannot be the company's sole purpose. Responsible business should take on the social and public commitment. Resources, both natural and human, cannot be utilized recklessly. An enterprise operating in a particular region should take care of maintaining its infrastructure and social life. "Companies that are part of a large social system also contribute to the aspirations of the people and society. The performance of the company should be measured not only by the shareholders' income, but also by how it achieves the goals of environmental protection, social responsibility and corporate governance", – the Manifesto states.

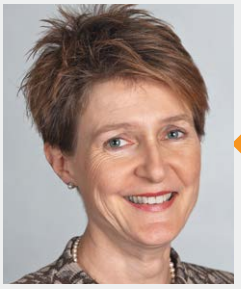
THE SUCCESSES OF FORUM-2020

One of the key positive aspects of this year's Forum is that over 180 countries have concluded a Global pact in the fight against plastic waste. For example, the EU plans to start recycling all types of plastic waste by 2030. And the world's largest manufacturer and supplier of concentrates, syrups and soft drinks, Coca-Cola has announced its intention to build its business by 2030 so as to collect and recycle every bottle or jar sold. In addition, most global companies are going to soon completely reorient their production processes so as to minimize use of energy and other natural resources. In fact, with each day new success formula works more efficiently: consumers' attitude to the brand is determined by how responsive the manufacturer is to the environment and how it takes care of improving the environmental situation.



Secretary-General of the UN **Antonio Guterres**: "Humankind has declared a war on nature and nature is striking back in a very violent way. Climate change running faster than us and we are not winning this war yet. We must win this war. It's not the climate change that will destroy this planet, but we who will destroy our ability to live on this planet".

German Chancellor **Angela Merkel** has spoken about climate change and Germany's plans: "Over the past year we have taken the decision to first exit from nuclear energy because we feel the waste management is simply not sustainable in the long run ... and we decided that at the very latest by 2038 we will exit from coal ... Electricity generation supply also has to be changed to being CO2-free... We intend by 2030 to have 65% generated by renewables. For a country where the sun is not always shining and the wind is not always blowing, that is a considerable amount".



Simonetta Sommaruga, who has been acting as President of Swiss Confederation since January 1, 2020, also addressed the topic of environmental protection: "Biodiversity is like the Eiffel Tower. Take away one screw a day, and nothing happens at first. But then you take away one too many... and everything collapses". She supplemented her emotional speech with a documentary about how pesticide use leads to the disappearance of bees.

President of the European Commission **Ursula von der Leyen**: "For too long, humanity took away resources from the environment and in exchange produced waste and pollution". It is time for a "new capitalism", she said. "It is the stakeholder capitalism that serves the well-being of people – workers and the whole of society".

FARMAK: A hundred-

FARMAK, ONE OF THE OLDEST AND LARGEST PHARMACEUTICAL COMPANIES IN UKRAINE, HAS THE GLORIOUS 95-YEAR HISTORY OF ESTABLISHMENT, heroic restoration, glorious victories and excellent achievements where its creators, ordinary Ukrainians, for whom this work has become a lifelong business, have played a major role.

Podil

Photo wikipedia.org

It is well-known: without knowing the past, one cannot understand the true meaning of the present and the purpose of the future. Nowadays, Farmak is the acclaimed leader of the pharmaceutical industry of Ukraine, the driver of modernization and innovation. That is because it has a reliable foundation: not only its own history and traditions, but also the background of the place where the enterprise is located. Here you can find so many different cultural layers of the past that this area can be easily called a landmark of our city's history and culture.

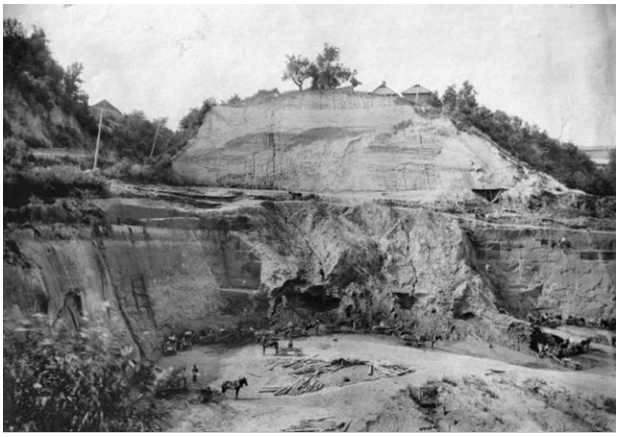
20,000-YEAR OLD ARCHAEOLOGICAL SITE

Sometime at the end of 1893, Vikentiy Khvoyka, an emigrant from Austria-Hungary, who was engaged in growing new varieties of hops and millet, was inspecting a land plot in Podil, which he wanted to buy for commercial purposes. Suddenly, at the bottom

year-long story

of the pit at 59 Kyrylivska street, he saw an unusual white bone that turned out to be a real mammoth's tusk. He agreed with Zival, the owner of the mansion, a well-known in Kyiv manufacturer of boots, about the possibility to continue excavations. Subsequently, 67 mammoth skeletons, more than 100 tusks, the skull of a rhino and the bones of other animals, as well as a large number of flint tools, remains of ancient fires and other unique archaeological items were found here.

Later, Khvoyka expanded his excavations to a nearby site (61-63 Kyrylivska street), which belonged to merchant Kseniia Terekhova-Bahrieieva at that time. Over next 7 years, he discovered another cultural layer at a depth of almost 20 meters: There were fragments of mammoth tusks with geometric ornaments, which are now considered the oldest monuments of fine art in Ukraine. By the way, they were stored in the Kyiv City Museum of Antiquities and Arts (today the National Art Museum of Ukraine), created on the initiative of the archaeologist. These and many other findings have transformed the Kyrylivska archaeological site in Kyiv into a world-wide sensation. However, it still retains its status as an archaeology monument.



During the excavation

The artifacts found during the excavations of Vikentiy Khvoyka turned the Kyryliv parking lot in Kyiv into a world-class sensation.

Photo kyivpastfuture.com.ua

CAVES, FINDINGS AND GOOD DEEDS

Khvoyka's excavations were still going on, when in 1896 both sites at Kyrylivska street were bought by entrepreneur Ion Zaitsev to build a brick factory. At the site of the excavation a clay mine, a quarry for the production of blue clay, from which a heat-resistant brick was made, has appeared. Further east, at the expense of a well-known philanthropist, the construction of a state-owned surgical clinic, designed for 25 beds for poor Jews from Kyiv and suburbs, could be built without special permission from the governor.

Already after the death of Ion Zaitsev, in 1913, his son Markus erected a new, two-storey, modern-style building to the right of the old building, which was designed by Eduard Bradtman. There was a shelter for the elderly and a maternity ward. After the Revolution and the Civil War, the philanthropic medical complex of Father and Son Zaitsevs changed many owners: there were the surgical and gynaecological departments, the infectious hospital, the blood transfusion institute. But its most striking role is maternity hospital No. 2, where thousands of Podil settlers were born. And, probably, it is symbolic that after the 2015 reconstruction the offices of the pharmaceutical company Farmak were located here. Perhaps that is why this room helps to create and implement the boldest ideas and innovations so easily!

Manufacturing process in Farmak

FARMAK. THE START OF THE JOURNEY

In the mid-1920s, during the period of extreme challenges for the entire Ukrainian people, present-day Farmak was actually founded. These were difficult post-war years: the people were exhausted with epidemics and famine. Almost all hospitals were destroyed and almost no medication was imported. There was no own pharmaceutical manufacture that would meet the needs of the population for modern medicines at that time. Hard reality helped to realize simple truths: it is strategically important for the country to be confident that it has the strength and capabilities to ensure the health of its people. The comprehension of these root causes was the beginning of the pharmaceutical history of Ukraine. In summer of 1925 in the historic district of Kyiv, Podil, at 74, Kyrylivska Street, by the Decree of the USSR Council of People's Commissars "On Local Trusts", the first synthetic drug manufacturing plant in Ukraine, the Kyiv Chemical-Pharmaceutical Plant named after M. V. Lomonosov who is considered to be the historical father of JSC "Farmak", was opened.

THE FIRST PRODUCTS

It was necessary to create a new chemical-pharmaceutical enterprise from scratch, besides not only rebuilding new manufacture facilities, but also literally creating a unique team. So, it was a real breakthrough when on December 23, 1925, a team of 12 engineers and 42 workers manufactured their first product. The team of researchers and engineers of the plant under the direction of Professor I.V. Yehorov developed the new technology for the synthesis of the most important drugs of the time, chloroform and salicylic acid. This day is actually considered the birthday of the plant.

In summer of 1925 the first synthetic drug manufacturing plant in Ukraine, the Kyiv Chemical-Pharmaceutical Plant named after M. V. Lomonosow who is considered to be historical father of JSC "Farmak", was opened.

THE COURSE TO IMPORT SUBSTITUTION

Starting from the next year, the range of products, quality and manufacture volume have grown significantly due to the release of new salol- and methyl salicylate-based medicines, and a year later – of the popular analgesic and antipyretic, sodium salicylate. In 1928, as a result of the development of new manufacturing technologies, the antiseptic resorcinol, chlorhydrate and lanolin appeared in the product portfolio of the plant to manufacture many ointments and creams. In addition, the plant at that time was the only Soviet manufacturer of menthol: only in 1931, 3.3 tons of menthol, 600 kilograms of pure chloroform for anaesthesia, and 2 tons of chlorhydrate were manufactured. This was a significant contribution to the development of the new pharmaceutical industry, which by the end of the 1930s was able to increase the manufacturing of medicines by 6 times compared to the pre-revolutionary period. The nomenclature also expanded significantly: the uninterrupted production of 15 medicines was established, including trichloroacetic acid, urotropin, chloride and calcium carbonate, amidochloric mercury, ether for anaesthesia and others.

AND TOMORROW CAME THE WAR...

The confident path to new achievements was interrupted on June 22, 1941. Although no enemy bombs fell on the plant's premises that day, its life changed forever. The fighters of the Kyiv fortified area heroically held the enemy off, but on June 26, 1941, the Republican Evacuation Commission was established. Mass evacuation of enterprises of the capital began, the number of which reached 197 by the beginning of September. Among nearly 350,000 people who left the capital, together with their enterprises, were the employees of Lomonosov KCPP. At first they with the equipment were in Luhansk, but due to the rapid advance of the front line they were sent to deep rear, to Kazan. Here, implementing a secret program aimed at the creation of strategically important enterprise alternates in the eastern regions of the country, in December 1942, the people of Kyiv were able to release the first batch of

Photo apteka.ua

x-ray machines, chloretyl, streptocide and trypaflavin. Within a year, the plant was fully operational, manufacturing white streptocide, ampoules with invert sugar, dental cements, chloroethyl in ampoules, x-ray screens and barium sulphide for surgical radiographs. In order to quickly increase the volume of release of these products, Lomonosov KCPP merged with Kazan CPP.

HOME GROUND

On November 6, 1943, the troops of the First Ukrainian Front liberated Kyiv, so a small plant staff began preparing to leave for their homeland. During 778 days of German Nazi occupation of the capital, the plant walls were virtually intact, but all equipment, property and raw materials were destroyed or looted. In order to breathe new life into the company, the works were carried out around the clock; the changes often lasted for two or three days, but as early as in 1944 it was made possible to ensure the release of streptocide in the amount of 30 kg per month, disulfan – of 10 kg, isafenine – of 20 kg and 2 tons of electrolyte, which was manufactured from sulfuric acid waste. The plant staff also gradually began to resume the manufacture of drugs that had had to be abandoned in the war years.

By 1950, the plant had completely resumed its manufacture of urotropin, anesthetized chloral hydrate, calcium chloride, sodium chloride, and had launched new manufacture lines for menthol, resorcinol and validol. In addition, the partial modernization of manufacture made it possible to provide consumers with new drugs, including chiniofon, quinosol, zinc valerate, flavacridine hydrochloride, sinestrol, bromizoval, carbromal etc. In 1958, the production of validol increased almost 14-fold, and anaesthesia chloroform – 11-fold. The start of manufacturing of syntomycin and the synthesis of new medicines were significant achievements of this period. The manufacture of X-ray contrast agents, namely bilimine, triombrast and iodomine, which the plant provided to all republics of the USSR, was established.

Photo farmak.ua

Archive photo of plant

KEEPING UP WITH THE TIMES

In the next decade, due to the need for the manufacture of cardiovascular drug, an analogue of Valokordin, the staff of the Kyiv Chemical-Pharmaceutical Plant drafted the necessary documentation, and after obtaining the relevant permit in 1960, the company began the release of domestic Corvalol, which quickly became known not only in Ukraine but well beyond.

At that time, all manufacturing processes were carried out manually (pouring solutions into vials, packaging), so the management decided to install automatic lines. Successful technical retrofitting was made possible owing to the plant director V.V. Tsutsarin and young engineer V.T. Zhylieiev, who later became the company's technical director. Thus, Lomonosov plant marked its 40th anniversary by manufacturing 27 products and introducing 1500 innovative proposals and inventions.

The 1970s were considered the period of sustainable development for the pharmaceutical industry. It was possible not only to supply medicines to the USSR republics, but also to establish export to more than 20 countries: Angola, Germany, France, Italy, Egypt, Greece and others. Lomonosov Kyiv Chemical-Pharmaceutical Plant also achieved records in manufacture volumes: M. V. Lomonosov in 1975 alone it produced 165 tonnes of the antibiotic Levomycetin, four times exceeding its planned capacity.

Since the mid-1980s, the Kyiv Chemical and Pharmaceutical Plant has been actively reforming its economic activity. The transition of the enterprise to the principle of complete economic accounting and self-management was an important and difficult decision, which led to the creation of the Board of directors, headed by director I.I. Prybutchenko.

ESTABLISHMENT OF INDEPENDENCE

During the 1990s, the company experienced a period of major changes and complete restructuring. In 1991, the first plant in the chemical and pharmaceutical industry named after M. V. Lomonosov became a joint-stock company and was named JSC "Farmak". During this period, the manufacturing facilities that provided raw materials to factories throughout the USSR became unprofitable because of excessively high cost of substances. Therefore, during the first years of Ukraine's independence, Farmak was on the verge of ceasing to exist. However, in 1995, a significant event took place in the history of the Company – Filya Zhebrovska became CEO and Chairman of the Executive Board. This eminent woman managed to modernize the enterprise, using the global experience of successful pharmaceutical companies, and to set Farmak on a new strategic course for modern European manufacture.

RUSLANA.
Clean energy as a lifestyle

The use of green energy, conservation of ecosystems and responsible consumption are among the current trends today. Ukrainian singer Ruslana LYZHYCHKO, who is the Global Ambassador for Renewable Energy, demonstrates the benefits of energy independence by her own example: **HER ECO-HOUSE OF THE FUTURE IS FULLY SELF-SUFFICIENT IN HEAT AND ELECTRICITY OWING TO NATURAL SOURCES – SUN, WIND AND SOIL.**

Ruslana, you are not only a successful singer, but also a public figure who promotes the ideas of sustainable development. Tell us, what made you think about the need to switch to renewable energy sources?

Green energy is currently being rapidly introduced in most developed countries. The world of the 21st century must be ecological, so even those countries whose geographical location does not allow them to use, for example, solar or wave energy, find their alternative. I am concerned that Ukraine is still dependent on imported oil and gas. And I want to change this somehow, that is why I urge Ukrainians to switch to clean energy.

Since 2018, I have been the Global Ambassador for Renewable Energy, and what could be a better argument in favour of the alternative use of clean energy than my own example? Our eco-house very successfully demonstrates that such switching is potentially available to everyone in the modern world.

■ ***Therefore, you prove your title of Ambassador not only in word but in deed. Tell us more about your home!***

My husband and I had long dreamed of a suburban house: nature inspires us, fills us with strength and harmony. We managed to realize our cherished dream and we built two houses next to each other: four-storey, where we now work, and two-storey, where, in fact, we live. We have everything we need in out house, and not only for leisure but also for professional activities. Our house is completely energy independent: almost 2,000 sq m site is powered purely by the energy from the sun and wind. 10 wind turbines installed let us completely stop using gas. There are also solar panels and collectors. We produce enough electricity – even neighbouring houses use it. Heat pumps, which operate on the energy of the soil, cool the house in summer and heat it in winter and off-season. Automated boiler, which operates on woodchips, warms us in the bitter cold.

Eco-house of Ruslana Lyzhychko

OUR HOUSE IS COMPLETELY ENERGY INDEPENDENT: ALMOST 2.000 SQ M SITE IS POWERED PURELY BY THE ENERGY FROM THE SUN AND WIND.

■ ***To your mind, what discourages the Ukrainians most of all from active switching to energy independence? What advice could you give about this?***

The first steps towards energy independence seem too complex and unprofitable for the majority of Ukrainians. However, I am convinced: this idea arises basically because of the lack of awareness. Therefore, I consider it my mission to convey to Ukrainians that energy independence is easier than it seems. Yes, of course, switching will require considerable investment. But later, saving a lot of money, the owners of eco-houses will understand that their decision is not only environmental-friendly, but also economic.

Having switched to renewable energy, we forgot about regular payments for electricity and gas. In our home we have a recording studio, a video studio, a gym, rehearsal rooms... And, despite the considerable volume of consumption, there is still much more energy generated than we need. We sell the excess to the electricity provider, so the "smart" house not only saves, but also monthly "earns" for us extra UAH 10-15 thous.

■ ***As a famous singer, you have the opportunity to convey a message of renewable energy through your work as well. How do you use this opportunity?***

This year, my team and I have released a new mini-album in the pop-ethno style "We are wind". It includes four songs that are dedicated to wind energy and they were recorded owing to the clean energy produced in our eco-house. The music-futuristic video of social and ecological theme for the song "We are wind" was shot on a giant 3.5 MW windmill of the Novotroitsk station in the Kherson Region. It was an extreme musical performance: I sang and danced at the height of 120 meters to call on Ukraine and the whole world to switch to renewable energy. I plan to continue to create music on green energy and shoot unique spectacular videos that will draw attention to environmental issues and inspire people to find solutions.

■ ***Do you think that Ukrainians will manage to change their mind-sets on environmental issues and switch to clean energy?***

I am convinced that we will not only switch to the use of renewable energy, but also will be able to produce it and export it to other countries. We have everything we need for the development of "green hydrogen" technologies, the creation of clusters, etc. Ukraine can charge the whole world with clean energy. I definitely believe in that. And these are not mere words: recently, our state has been rapidly moving forward in this direction. In 2019, we climbed 55 positions (from 63rd to 8th place) in the Rating of the attractiveness of developing countries for investment in renewable energy. Keep it up!

A NEW ERA OF RESPONSIBILITY

Now the consequences of a human's negligent attitude to the planet are shocking. Fortunately, more and more developed countries support the idea of sustainable development and encourage representatives of various business sectors to be socially responsible. **KLAVDIIA SHEVELIUK, SUSTAINABLE DEVELOPMENT CONSULTANT AND RESPONSIBLE FUTURE AGENCY OF CHANGES FOUNDER, TELLS US WHAT STEPS ARE BEING TAKEN IN UKRAINE IN THIS AREA.**

■ ***Ms Klavdiia, what do you think, why the issue of sustainable development has become so urgent recently?***

Global megatrends: climate change, technological progress, planet overpopulation, urbanization, and the extinction of biodiversity cannot be overlooked nowadays. The main problem that humanity will face in 10 years is how to ensure the comfortable living of 9 billion people on the planet: Will clean drinking water, enough food and clean air be available? All these challenges are reflected in the 17 major Sustainable Development Goals (SDGs) sought by 193 countries, including Ukraine.

■ ***Which of the goals are currently a priority for Ukraine?***

Two years ago, the Ministry of Economic Development and Trade of Ukraine, in partnership with the United Nations agency in Ukraine, presented the National Report: called "Sustainable Development Goals: Ukraine", outlining the ways of the SDGs adaptation to national development. More than 800 leading experts have formulated this document. They have formulated 86 major development goals for Ukraine and established 172 indicators to monitor their implementation. Therefore, the priority goals for Ukraine were:

During "BE SUSTAINABLE!" Summit

- *Figbting poverty (Goal №1).*
- *Ensuring well-being and healthy lifestyle for all segments of the people (Goal №3).*
- *Providing quality education and lifelong learning opportunities for Ukrainians (Goal №4).*
- *Promoting incremental, inclusive and sustainable economic growth, full and productive employment and decent work (Goal №8).*
- *Creating sustainable infrastructure, promoting sustainable industrialization and innovation (Goal №9).*
- *Ensuring transparency, security, viability and environmental sustainability of cities and other settlements (Goal №11).*
- *Building a peaceful and open society for sustainable development, providing access to justice for all and creating effective, accountable and participatory institutions at all levels (Goal №16).*

■ ***In your opinion, how important is it for Ukrainian companies to invest in sustainable development?***

It was necessary to start a dialogue on investments with entrepreneurs much earlier. And it's not just about reputation capital, but primarily about financial sustainability. The Law "On Accounting and Financial Reporting in Ukraine" states that since 2018, enterprises employing more than 250 employees should report on the environmental impact and the effectiveness of corporate governance. This EU directive, adapted to Ukrainian law, tells the owners of businesses of any industry that a new era of responsibility has arrived. Reporting helps to identify problems and risks of the company, as well as opportunities for its development. Potential investors, first of all, pay attention to these indicators. For example, according to recent Morgan Stanley surveys, 85% of US private investors are interested in investing in companies that have a sustainable development strategy, and 84% want to see how the investment is related to the impact goal.

The final of BE SUSTAINABLE! Fashion Summit was the show of Ukrainian designers on the head podium of Ukrainian Fashion Week.

■ ***As a Sustainable Development Consultant, you have delivered educational lectures at Ukrainian Fashion Week. Tell us how this topic is relevant for the fashion industry today?***

Unfortunately, textile production has a negative effect due to emissions into the atmosphere. According to various indicators, the fashion industry today ranks second worldwide in terms of environmental damage – 20% of polluted wastewater and 8-10% of greenhouse gas emission. In addition, the result of the activity of textile enterprises – waste worth $ 500 billion. And this is a problem not only for the manufacturer, but for everyone of us. Fortunately, there are socially responsible companies in Ukraine that are guided by the major sustainable development goals, using eco-friendly materials in fabrication process. For example: nettle, hemp or flax. It is reassuring that there are more such examples of responsible manufacturers.

Ukrainian designers are inspired by the idea of eco-fashion: most of them try to use natural fabrics when creating collections. UFW is actively promoting the theme of Sustainability fashion, which translates to "sustainable fashion" or "eco-fashion". This year, the BE SUSTAINABLE! Summit was held at Fashion Week, where I, as a Sustainable Development Consultant, told participants – manufacturers and consumers – about the principles of the circular economy, about examples of sustainable products and services that inspire Ukrainian manufacturers to tackle environmental and social problems.

■ ***You are a UNDP Consultant on Online Education for Sustainable Development. Please tell us which educational programs operate in Ukraine?***

This year, an educational project called "Online education for sustainable development". which is implemented by the UNDP in Ukraine with the financial support of the German Government, will be launched in Ukraine. As part of the project, three online courses for employees, business leaders and community activists have been developed. The project will help students understand what sustainability is, how to properly perceive the environmental crisis of today, and what the right conclusions to make in order to continue to develop effectively.

With the thought of present and future

ABOUT HOW MODERN MEDICAL BUSINESS IMPLEMENTS THE PRINCIPLES OF SUSTAINABLE DEVELOPMENT IN PRACTICE, SAYS DMITRY GAVRYCHENKO, MEDICAL DIRECTOR OF ODREX CLINIC, Candidate of Medical Sciences, Anesthesiologist-Reanimator, Head of the Department of Anesthesiology, Intensive Care and Pain Medicine, Odessa Medical Institute.

Living with the thought of future generations – how does Odrex see its mission in this?

One of our core values is a systematic approach to health. We take care of patients from birth. Yes, collective immunity suffers in Ukraine, and our family doctors and pediatricians have accepted this challenge. We set out to develop a culture of not only calendar but also other preventive vaccinations – and we are already seeing the benefits of an annual flu vaccination.

The next component of the system approach is the check-ups we promote. Strictly ordered programs assess the condition of the body and reduce the risk of dangerous diseases in the future. Such preventative measures are extremely effective, for example, in oncology.

Educational activities are also important in the context of concern for the future. We hold many lectures, conduct public awareness work on live broadcasts, social networks, our own media and other media.

The fact that Odrex is a multidisciplinary complex gives patients confidence and at the same time saves resources - everything can be solved in one place. What are the benefits of multidisciplinarity?

Our goal is to create a system of medicine that addresses all the needs of patients: from elementary diagnostics to solving difficult situations. And most importantly, we can handle very difficult cases. At any time, it is possible to convene a consultation, in particular, to assemble a Tumor Board for oncopatients, where clinical oncologists, oncology surgeons, radiation therapists, radiologists jointly draw up a treatment plan; or the Heart Team to decide on a patient with cardiovascular disease.

An example of multidisciplinarity in action is the ability to carry out hemodialysis to severe patients with multiple organ failure without being transported to another hospital. By the way, for special cases in our arsenal there is a mobile equipment that moves from office to office and from floor to floor – while observing aseptic and antiseptic.

The Odrex Building itself - was it designed to be a medical facility? Were the special requirements for the algorithm of patient movement, for sterility, for environmental friendliness taken into account?

In fact, the building was erected long before Odrex was born. The more interesting challenge we faced was to design the Medical House so that patient flows were divi-

Odrex Medical House

ded into urgent and planned ones, and a separate route for patients with VRI (such as COVID-19) was recently created.

The number of elevators and stairs is very important: there are four outpatient and two emergency lifts, an entrance and an elevator for patients with disabilities, and four stairs for convenience. By the way, in promoting a healthy lifestyle, we recommend that you use the stairs – for this purpose, the calorie burning dynamics are indicated at each step.

As for energy savings, well-insulated walls keep warm in the winter and keep cool in the summer, which saves on heating and air conditioning. Another point that is important for the safe and effective treatment of patients is the modern specialized building materials. For example, seamless medical linoleum is used everywhere in the operating units to allow the surfaces to be carefully treated.

Separate ventilation on all floors is essential to prevent the spread of nosocomial infections and the infectious safety of medical personnel. Intensive care units and isolators have their own ventilation. For operations requiring extra-sterile conditions (such as cardiac surgery), laminar airflow is used.

How energy efficient are the Odrex solutions?

The sophisticated technological solutions and innovative equipment that modern healthcare requires are significant energy costs for healthcare facilities worldwide. Energy efficient solutions are a rarity for medicine, but there is something you can do!

The very idea of a short stay in the clinic, minimally invasive rapid recovery operations, compliance with modern ERAS (Enhanced Recovery After Surgery) protocols significantly reduce the cost of electricity, water and other resources.

We are as autonomous as possible and this also helps the principles of energy efficiency: reserves of water, electricity, own oxygen station. Also, regular medical technicians monitor the equipment and regularly carry out its maintenance without waiting for breakage.

Modern medicine is impossible without disposable supplies.

In another way, we don't even see our work, especially in surgery. Of course, this is reflected in pricing, but the key is our patients' safety. For example, in coronary angiography, all materials used during the procedure are disposable: conductors, guides, catheters.

Proper classification and disposal of waste is one of the key ways to reduce the environmental impact. So we are working with a dedicated service that disposes of all types of waste.

That is, concern for the environment is present everywhere?

We remember that the impact of medicine on the environment is significant, and we are looking for new ways to reduce it while continuing to help people. Many aspects need to carry in focus. There are global issues, such as the environmental and medical problem of antibiotic resistance – and we are trying to influence the situation by strictly controlling the use of antibiotics.

And there are times that are much easier to control. Yes, business transportation that delivers our family doctors to patients is purely electric vehicles. In the context of environmental concerns, we can even consider the fact that providing food (separately for staff and guests of the Medical House) we rely on seasonal products, which again reduces fuel consumption. And of course, when preparing meals, we take into account the dietary requirements, tastes and wishes of the guests.

Odrex Medical House is a multidisciplinary center of 18,000 m² in Odessa and two clinics for the whole family: in the district Rayduzhnyi and in Chernomorsk.

The medical home provides more than 1900 services: ambulance, full range of medical research, consultation of doctors of more than 50 specialties, minimally invasive surgery and traumatology 24/7, rehabilitation and physiotherapy, Heart Clinic, established in partnership with Medtronic, the Center for Obesity and Metabolic Disorders, Pediatric and Acute Departments.

OXYGEN AGAINST CANCER: the key to the mystery of the century

IN 2019, AMERICAN SCIENTISTS GREGG SEMENZA AND WILLIAM KAELIN JR., AS WELL AS THEIR UK COUNTERPART PETER RATCLIFFE, received the Nobel Prize in Medicine and Physiology "for discovering how cells feel and adapt to oxygen availability."

WHEN THERE IS NO AIR

The human body constantly needs energy – it must maintain its complex organization, stable temperature, ability to actively move. What drives a complex multicellular organism? First of all, a highly efficient process of metabolism, the leading role in which oxygen plays. It is O^2 that supports the functioning of all human organs and is directly involved in the accumulation of energy from nutrients that enter the body in the process of food consumption. Oxygen depends on normal blood supply to cells and proper metabolism; and when oxygen is lacking, the body faces serious challenges that it must give advice at the level of cells, organs and systems. It is clear that various mechanisms are put in place to cope with the lack of oxygen with the least

THE PERFECT SOLUTION

HIF is a kind of demonstration of creativity of the human body. The traditional algorithm for solving such a problem as hypoxia could look like this. As oxygen levels decrease, protein sensors would trigger gene expression, thereby gradually increasing the level, which would activate the "target" HIF-dependent genes. However, this algorithm would have a big disadvantage: it would take a lot of time, whereas with hypoxia the body needs to respond to the crisis very quickly. And the constant production of HIF perfectly solves this problem.

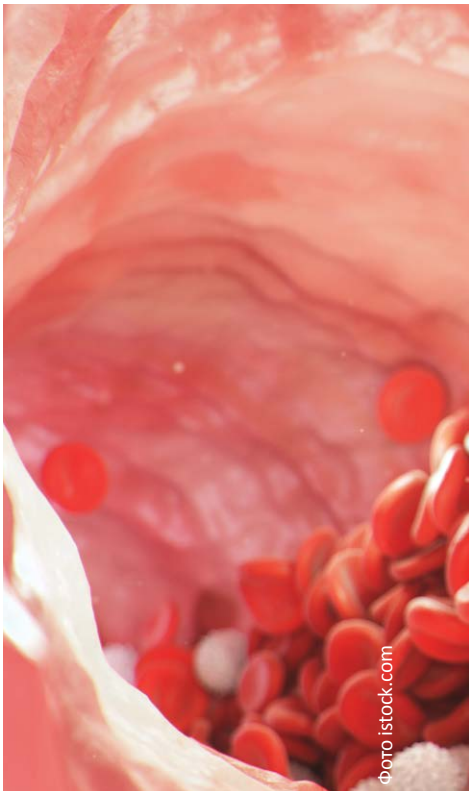


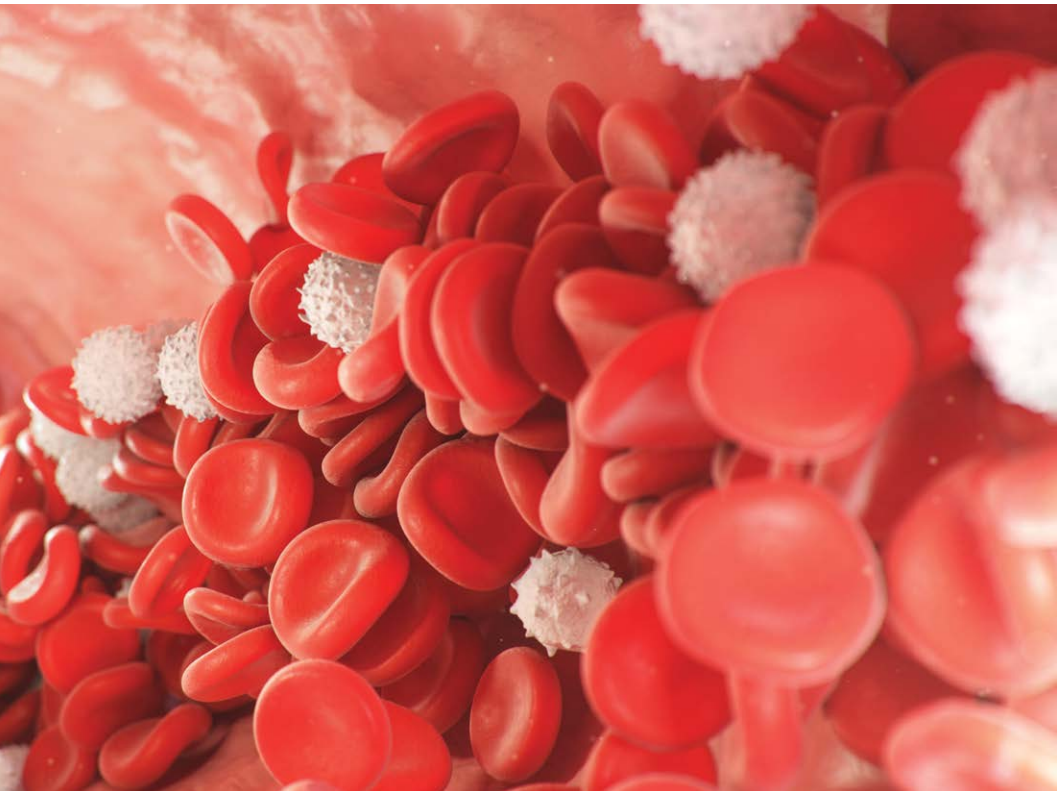
Фото istock.com

GREGG SEMENZA,
USA (1956)

American pediatrician and geneticist, Johns Hopkins University professor, Fellow of the US National Academy of Sciences and US National Academy of Medicine.
Since 1986, Semenza has been a Postdoctoral Fellow in Medical Genetics at Johns Hopkins University. Works at the University's School of Medicine at the following departments: medicine, pediatrics, oncology, radiation oncology, biochemistry. He is also Professor C. Michael Armstrong Professor, Editor-in-Chief of the Journal of Molecular Medicine, a member of the editorial boards of many other well-known industry publications and a recipient of several honorary awards. Semenza believes that the research that led to the Nobel Prize was in some ways a "puzzle" that could potentially affect the health of people, which is the most important part of the process.

"That's what makes science so exciting – you never know for sure where the research will lead."

"I think the really important people who work" at the intersection "between research and {practical} medicine are making it easier to discover knowledge, which will ultimately help improve clinical practice."



losses. For example, the increase in respiratory rate is perhaps the simplest physiological response of the body to hypoxia.

By the way, "jump" of oxygen level can be caused by some illnesses, intensity of breathing, air quality – for example, its pollution level and so on. All these factors have been well known to scientists for over a century, as well as the fact that hypoxia impedes the proper functioning of all systems. However, another important question has long been a concern for scientists: how do cells manage to adapt to oxygen "fluctuations" and continue to function normally?

THE QUESTION IN RETROSPECT

Scientists have been interested in aspects of the breathing process for a long time. An important time lapse on the timeline is the 1880s, related to the research of the famous French scientist Paul Behr, who studied the body's response to the jump in oxygen levels ascending the mountain. He found that as he rises to the height in the blood of a person, the number of red blood cells increases, which helps the body to adapt. This phenomenon is related to the stimulation of the formation in the kidneys of erythropoietin, the hormone responsible for the production of erythrocytes by the bone marrow.

Already in the early twentieth century, it became clear that during hypoxia the number of red blood cells increased. Breath research has

What is the significance of Semenza, Ratcliffe and Kaelin's research in the context of cancer treatment? Revolutionary, given the important fact that oxygen contributes to the rapid growth of tissue, including the aggressive increase in malignancies. It is necessary to "block" the tumor oxygen and its growth will be slowed or stopped altogether.

continued and its authors have been repeatedly noted by the Nobel Committee. In 1931, the Nobel Prize was awarded to German physiologist Otto Warburg, who investigated cytochrome oxidase (an enzyme involved in the process of breathing at the cellular level), and in 1938, his Belgian counterpart, Corneille Heymans, who found out the importance of carotid bodies in the regulation of respiration. In the 1970s and 1980s, scientists identified the erythropoietin gene. However, the exact mechanism by which the body begins to produce red blood cells remains unclear.

AT THE CELLULAR LEVEL

Faced with oxygen deficiency, the body is forced to immediately switch on the compensation mode, receiving the appropriate signal from the cells. How exactly does a cell react? Studying this question, last year's Nobel Prize winners – Semenza, Ratcliffe and Kaelin Jr. – revealed very significant genetic aspects.

Experiments on mices, conducted by Gregg Semenza, showed that oxygen deficiency has an effect on those areas of DNA that control the formation of erythropoietin. Along with an American scientist, Sir Peter Ratcliffe in the United Kingdom studied the subject. Since 1989, he has studied the process of regulating the production of erythropoietin by kidney cells. Ratcliffe and his colleagues realized that increased hormone production is not the only possible response of the body to hypoxia: the work of dozens of cell types in one way or another changes with oxygen deficiency. In the end, the scientist concluded that not only the kidneys, but almost all tissues, there is a mechanism that helps the cells to feel the lack of oxygen and to react.

AN UNSTABLE FACTOR

Given that different types of cells seem to respond to hypoxia, Semenza sought the answer to the question: what gives rise to the work of genes of different cells in the absence of oxygen? And in 1995, he discovered HIF (Hipoxia-inducible factor), a "hypoxia-inducing factor" encoded by the HIF-1A gene, as well as the HIF1A protein (HIF-1α). In the subsequent studies of Semenza and his colleagues, this finding was important.

In an effort to reconstruct the processes occurring in the body at the molecular level, Semenza and Ratcliffe first of all thoroughly investigated the composition of the molecule of the complex HIF1. They found that with the onset of hypoxia, the amount of HIF1 in the body immediately increases. The molecules of this protein begin to bind to the gene that controls the production of erythropoietin – which in turn stimulates the formation of new erythrocytes. Next, it was to find out how the amount of HIF1 in the cell is regulated.

ON THE ROAD TO SOLVING

A study by William Kaelin Jr., a scientist working on hereditary Hippel-Lindau Disease (VHL), has brought this issue to light. The scientist meticulously studied the family

PETER RATCLIFFE,
United Kingdom (1954)

Molecular Biologist, Fellow of the Francis Creek Institute in the United Kingdom. Specialist in hypoxia and oxygen sensing (how cells sense oxygen). In 1990 he founded the Hypoxia Laboratory in Oxford, which he has headed for over 20 years. Ratcliffe is a laureate of many awards, a Fellow of the Royal Society of London, an Honorary Foreign Member of the American Academy of Arts and Sciences.

"We solved the problem of regulating erythropoietin (EPO), which might seem - and to some, it seemed – a mystery, but I believed that this aspect could be traced, and therefore solved. It is very important that the task has the potential to be solved. And, of course, as in almost any science related to discoveries, the value becomes apparent later, and we did not foresee how wide the "coverage" of this system might be when it started."

"... I think this is an important question – we create knowledge. I do this as a state funded scientist. This knowledge has only one quality that can really be defined: this is good knowledge, they are true, they are correct. The idea that some knowledge may be more valuable than others is probably a valid one, but evaluating it in the long run is extremely difficult, and this is an example of when we set out on a journey without a clear understanding of the value of that knowledge; and I think they have gained importance ..."

WILLIAM KAELIN JR.,
USA (BORN 1957)

American Oncologist, Professor at Dana-Farber Cancer Institute at Harvard, Member of the National Academy of Sciences of the United States and the National Academy of Medicine of the United States.

Initially, Kaelin did research that, at first glance, had little to do with Semenza and Ratcliffe's discoveries. In particular, he was interested in the genetic aspects of retinoblastoma, as well as Hippel-Lindau disease (VHL), a rare pathology that increases the risk of developing cancer processes in the body. Subsequently, William Kaelin joined Semenza and Ratcliffe's research on the VHL gene and its role in inhibiting tumor growth.

"... As an independent researcher, I focused primarily on the Hippel-Lindau tumor suppressor protein (pVHL), which is defective in the most common form of kidney cancer. We have shown that pVHL is part of the ubiquitin-ligase complex that, in the presence of oxygen, "targets" the HIF transcription factor for proteasomal degradation. Moreover, we have shown that binding of pVHL to HIF requires that HIF be prolyl-hydroxylated O_2-dependent enzymes, thereby providing a mechanism by which cells sense and adapt to oxygen changes."

history of many patients and found that the genome of families where this syndrome occurred, a "missing" copy of one gene. Then the scientist noticed an interesting detail: these diseased cells with a "broken" gene showed signs of hypoxia. Therefore, it became obvious that all pathways lead to oxygen, but it was necessary to understand exactly what its role was.

Years of research have led Kaelin to a weighty discovery of the VHL protein, now known as the pVHL tumor suppressor. In the mid-1990s, scientists in his group, studying kidney cancer, found that the VHL protein, which is encoded by the VHL gene, has the ability to suppress (suppress) tumor growth.

Kaelin Jr., noted that malignant cells activate the production of an extraordinary number of genes regulated by hypoxia. He also noted that the situation is repeated with the introduction of the VHL gene. Thus, Kaelin has come up with the unquestionable argument that the tumor suppressor gene is directly linked to oxygen deficiency.

In the meantime, Ratcliffe, along with his colleagues, continued their research and made many discoveries, in particular, about the membership of VHL in the part of the complex that "marks" proteins that need to be destroyed. Subsequently, Ratcliffe's scientific team confirmed that, under normal oxygen levels, the VHL protein interacts with the HIF-1A complex. Scientists have found out what fragment of the protein molecule HIF-1A is crucial when it comes to its destruction by the VHL protein. Ratcliffe and Kaelin Jr. concluded that this part of the molecule could determine the sensitivity to oxygen. Thus, their research has helped to determine how cells adapt to fluctuations in oxygen levels in the blood.

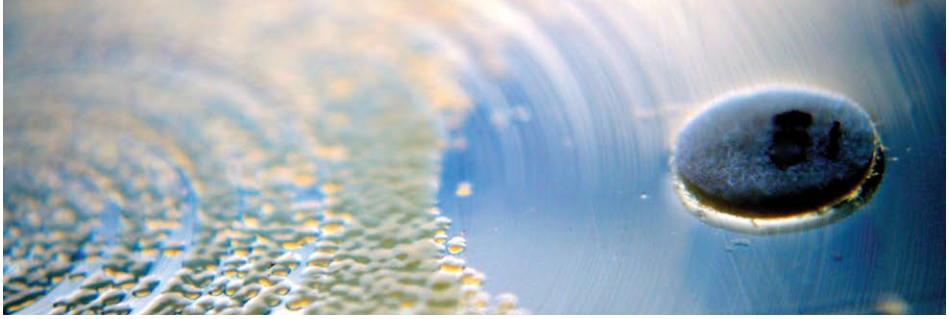
IN SEARCH OF PRACTICAL APPLICATIONS

Oncological diseases remain one of the unsolved problems of humanity, and the idea of finding new, more advanced methods of overcoming cancer is a leitmotif of research by many Nobel laureates. So, in 2018, the award went to James Allison and Tasuku Honjo, who developed a new method of immunotherapy for cancer.

It is likely that the practical achievements in the fight against cancer will lead to the opening of the laureates of 2019. Semenza, Ratcliffe and Kaelin went on to world fame for a long time. Based on a 20-year-old chronicle of their discoveries, it would be possible to create an entire scientific detective with numerous puzzles that have embarked on the path of researchers and which they brilliantly figured out. In the end, they got the most important result: understanding how cells respond to oxygen, which certainly plays a major role in the fight against cancer.

They assume: Being able to influence this mechanism could prevent the formation of new vessels that appear in malignancies and feed them. Being part of a living organism, the malignant formation also feels the need to breathe. Just as the lack of O^2 is felt by the human muscle cells during physical activity or, say, the whole climber's body when climbing high mountains, the tumor also experiences "stress" when faced with a lack of oxygen. The task of scientists is to use this "weakness" in the fight against cancer, that is, to learn to regulate HIF-1A, which is associated with changes in oxygen levels.

HIF-1 controls the expression of more than 300 genes, and virtually all aspects of cancer are involved with it. It has become clear that gene inhibitors are potentially effective anticancer drugs – this suggests that it should be the target of anticancer therapy.



Worldwide known Ukrainian scientists

THE IMPLEMENTATION OF THE GLOBAL SUSTAINABLE DEVELOPMENT GOALS, WHICH IS A LANDMARK FOR FARMAK IN ALL PROJECTS, WOULD BE IMPOSSIBLE WITHOUT NEW SCIENTIFIC BREAKTHROUGHS. Realizing the importance of supporting Ukrainian scientists, the Company has published a book, "There you'll have your science: Ukrainian scientists that are changing the world". These are stories about national physicists and biochemists, neurophysiologists, immunologists, IT developers... For example, geneticist Yurii Hleba, who is one of the famous researchers.

YURII HLEBA

biologist, physiologist roslin, geneticist, academician of NAS of Ukraine. Pioneer at the Galuzia viddalenogo gridridizatsiya and Klitino culture of the Roslin. An associate and science curviline in the genus of genetics and biotechnology roslin.

He was born in a Transcarpathian village and has been living in Germany for many years. The Member of the National Academy of Sciences of Ukraine, a member of several international science academies, Yurii Hleba works in different directions.

PLANT POTENTIAL

One of them is the research in plant genetic engineering. Among his important discoveries – a way to obtain genetic hybrids of plants without the traditional crossbreeding: it is necessary to take plant cells, remove the cell membrane and cross them without traditional pestles and stamens.

WHAT WILL REPLACE ANTIBIOTICS?

The era of antibiotics may be coming to an end, and this is one of the biggest problems today. For the first 15 years of antibiotic production, we have managed to reduce mortality more than all the drugs would be able to do over the next 45 years. However, each period has its start and its end: after all, there is nothing permanent in biology.

People often use antibiotics for no good reason: for example, for viral diseases that have nothing to do with the bacteria, affected by antibiotics. So bacteria gradually develop resistance to them. Because of this, the treatment becomes very fragmented: first, the doctors have to find out what kind of bacteria has settled in the body, and then choose the antibiotics that are effective against it.

According to scientists, pretty soon there will be bacteria resistant to all classes of antibiotics, so researchers are actively seeking ways to resolve the situation. Yurii Hleba himself does research on large proteins that are hundreds of times larger than antibiotics and have a radically different mechanism of action. Scientists are now planning to create a therapeutic molecule in such a way that bacteria will not be able to avoid this action as long as possible. Scientists are developing several areas of direct application: for example, traveller's diarrhea, which often affects travellers in exotic countries. If the idea succeeds, an alternative to the antibiotic may be a tablet that a tourist will receive only once a day.

In addition, bacterial infections are often encountered during visits to healthcare facilities. So this is an additional challenge for further research that the scientist and his colleagues plan to complete over the next few years.

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Estesifin

treatment of nail and skin fungi[1,2,3]

- **Broad spectrum antifungal activity for nails**[1,2,3,4]
- **Easy to apply on and under a nail with a dropper**[1]
- **A large bottle that will provide a long course of nail fungi treatment**[1]

1 - Prescribing Information for Estesifin solution
2 - Prescribing Information for Estesifin spray
3 - Prescribing Information for Estesifin cream
4 - Naftifine: A Review" Aditya K. Gupta, Jennifer E. Ryder, and Elizabeth A. Cooper, 2008

SELF-TREATMENT MAY BE HARMFUL FOR YOUR HEALTH

CONNECT TO THE NETWORK

TODAY, ALMOST EVERY MAJOR CARMAKER IS READY TO OFFER ITS CUSTOMERS ZERO-CO_2 VEHICLES. It has become part of the must-have program for the world's giant companies.

Photo citroen.fr

Remember this date: 2011, the prestigious World Car of the Year competition. "Electric trains" make up a ridiculous percentage of sales, and public opinion about the rationality of buying a car varies between "fashionable thing" and "expensive device". Speakers at the stands of world auto shows on all continents talk about the prospects and innovative developments, designers feel like the happiest in the world, because they can finally draw their futuristic cars that are becoming a reality... And, suddenly, the compact electric car Nissan Leaf wins the title of the best car in the world.

Nobody expected such a turn of events. By the way, this landmark Nissan Leaf victory for the automotive world happened exactly one year before the premiere of Tesla Model S, an ambitious E. Musk project, whose engineers were destined to change the idea of the reliability and autonomy of the drive range of electric cars and even in 8 years to launch Tesla into orbit. In the world of electric cars, everything happened literally at space speeds.

THE GREAT ONES OF THE ELECTRIC WORLD

In general, everything is clear on trends – alternative sources of energy for car engines have shifted from the engineering know-how to the realities of our time. For example, Lexus has officially stated that their strategic course is electrification and hybrid powertrains, and that in a few years, all new Lexus cars will have hybrid engines. And the French concern PSA promises to launch mass production of Citroen Ami microcar – a miniature vehicle that does not require a driver's license to operate in Europe.

What about the actual balance of power? The Renault-Nissan concern may be considered one of the strongest performers in the world

have recently released a new generation of their victorious Leaf, abandoning conservative design, adding maximum technology and assistant systems and increasing drive range on a single charge. However, they have managed to retain their main competitive advantage – it is now the only mid-range electric car designed for a middle-income family buyer.

Renault-Nissan also has relevant to many corporate car fleets model Zoe, which plays the role of the first price offer, as well as a twin-car call a full-fledged car, but it is easy to get to work with it in a congested big city.

Tesla and its best and most popular model (Model S) cannot be overlooked.

Once upon a time, British car journalists from Top Gear compared electric cars to vegetables in a steamer: mom always said that they are useful, but it is impossible to eat them without disgust, so they are devoid of any taste. By taste, the experts meant the dynamics, expression and drive that made the carmakers go all out for it. Therefore, such a definition (not very flattering) may have existed only until the first Tesla electric sports car appeared.

From the very beginning, the Californian brand relied

Photo parkers.co.uk; freepng.es; drive.com.au

not only on environmental friendliness but also on the power, dynamism, extravagance and gadget-like appearance of its car. Tesla offers twice as much margin of autonomy as other electric car manufacturers, and a higher luxury level.

FROM A GLOBAL PERSPECTIVE

Electric car manufacturers are in the right place at the right time – environmental issues are on the agenda like never before: the number of people using cars is increasing, and the demand for polluting emissions is increasing almost every year... And rapid growth in demand adds even more to brand optimism.

The world's largest electric car markets are in China (which has been at the forefront of the automotive world for several years in a row), Europe and the United States, where the automobile culture and the willingness of customers to invest in the purchase of new technological vehicles is very high. The Old World has a solid place in the top three thanks to stringent environmental regulations and the willingness of many governments to join forces to develop the electric car industry.

In the next two to three years, manufacturers promise to significantly expand the range of electric cars, offering models for young people, families and commercial users. According to the market laws, an increased offer will certainly lower the price of a product, and the reality in which a former university graduate will consider buying an electric car on the secondary market no longer seems so futuristic.

MOTORIZED BICYCLE

In today's world, where the majority of the population lives in metropolitan areas, the electric car itself is no longer enough. The concept of a "smart" city that uses its transportation capabilities efficiently and environmentally is becoming more relevant. Private transport came into focus: on the one hand, society is no longer able to give up individual freedom of movement, and on the other, the number of cars, thus, the amount of polluting emissions is growing rapidly. According to analysts, in the next two decades the number of cars will increase by another 1.2 billion.

At the same time, they are confident that part of the "motorized" population of will gladly master the so-called micromobility items and will combine them with public transport (by the way, worldwide, some of it has already been converted to electric motors). Short distances – up to 10 kilometres (most of the daily commutes does not exceed this distance) – residents of metropolitan cities are already ready to cover it on bicycles and small scooters.

Therefore, car manufacturers have turned to history, translated it into a modern way and offer electric bicycles. One hundred percent "eco" and excellent physical shape are guaranteed! An ideal solution not only for congested urban traffic, but also for those users for whom buying their own electric car is still beyond their financial means.

The present situation in Ukraine and in the world

Today, we see that the aforementioned World Car of the Year contest was the beginning of a worldwide trend. Nowadays, no one would even think of making fun of electric cars – the era of big engines is over, so we are waiting for a complete downsizing in the environmental friendliness area. So let us not be surprised that, in just a few years, Nissan Leaf has had many competitors in the World Car of the Year contest. But the first is always the first, and until last year's triumph of Jaguar i-Pace, Leaf was the only genuine electric car winner in contest history.

There are many examples of increasing "electrification". Thus, in Norway today almost half of the cars are equipped with electric motors, and cars with classic ICE have no access to certain cities and regions of Switzerland. The Ukrainian market is developing slowly, gradually and with some delay in the direction of electric cars. There are many reasons for this, but two of them are the most important: lack of charging stations and problems with disposal of batteries. The development of infrastructure for electric cars goes beyond the sole responsibility of the car owner, it is already a state concern. And yet even the most environmentally conscious driver runs the risk of being left alone with no recharge one day. Also, specialized companies that should be directly related to manufacturers, have to deal with spent car batteries. We still have a long way to go, but the task is simple – do not give up, because we have one planet only.

Photo jaguar.ua

+ AND − OF ELECTRIC CARS

ADVANTAGES

- No harmful emissions into the atmosphere.
- Reliability and serviceable life at long operation.
- High efficiency.
- Virtually silent engine work.
- Savings on maintenance and repair due to minimal wear of components (no fuel filter, spark plugs, injectors, etc.).
- Minimal risk of fire or explosion in an accident due to lack of flammable liquids.
- Possibility to charge the battery from a standard power supply.
- The network of charging points is constantly expanding.

DISADVANTAGES

- The problem of manufacture and disposal of batteries.
- Stops for recharging over long distance covering.
- Negative effect of low temperatures on battery charging.

Number of electric cars registered in Ukraine,

2019

7542

Of them:
cars – 7012
commercial – 530

FIRST QUARTER OF 2020

1747

Of them:
new – 159
used – 1588

APRIL 2020

38

TOP-5 POPULAR ELECTRIC CARS AMONG UKRAINIANS, 2019

NISSAN Leaf	3217
TESLA Model S	623
VOLKSWAGEN e-Golf	360
BMW i3	338
FIAT 500e	312

TOP-5 LEADERS, APRIL 2020

AUDI E-Tron	10
BMW i3	7
PORSCHE Taycan	7
HYUNDAI Ioniq Electric	4
JAGUAR I-Pace	4

Source: Ukrainian Automobile Manufacturers (ukrautoprom.com.ua)

In the forefront of genetics

American researcher Nettie Stevens is considered one of the first female geneticists whose scientific achievements were officially acclaimed. **MORE THAN A CENTURY AGO, SHE MADE A BREAKTHROUGH IN WORLD SCIENCE, NOTICING THE DIFFERENCE BETWEEN SETS OF MALE AND FEMALE CHROMOSOMES.**

WUNDERKIND IN NATURAL SCIENCE

Nettie Maria Stevens was born on July 7, 1861 in Cavendish, Vermont, USA. Subsequently, the family moved to Westford (Massachusetts), where the future scientist's childhood passed. Her father worked as an ordinary carpenter, but spared no money for teaching his daughters Nettie and Emmy. Having decent education at the time was mostly a privilege for men, and the Stevens sisters were among only three women who graduated from the Westford Academy during 1872-1883. After completing her studies, the girl moved to Lebanon, New Hampshire, where she taught Physiology, Zoology, Mathematics, English and Latin for three years. During her work as a teacher, Nettie saved enough money to continue her education: she joined Westfield Normal School (now Westfield State University, Massachusetts), where she successfully completed a 4-year course in two years. Subsequently, she earned her bachelor's and master's degrees from Stanford University, and then pursued a postgraduate course in physiology under the supervision of Professor Oliver Peebles Jenkins and his former student, Associate Professor Frank Mace MacFarland.

TRAVELS AND GREAT ACHIEVEMENTS

Already having thorough background in physiology and histology, 39-year-old Nettie Stevens entered Brynn Maritime College (PA) in order to receive her PhD in cytology. She worked under the supervision of prominent scientist Thomas Hunt Morgan, Dean of the Faculty of Biology, the future Nobel Prize winner. It was here that Stevens' eminent research was carried out. She focused on such topics as the structure of unicellular organisms, the regeneration in primitive multicellular organisms, the development of insect germ cells, the division of cells in sea urchins and worms. Her

Photo istock.com

research talent gave Nettie the opportunity to develop well-round outside the US as well. Having become the scholar holder of the presidential program, she went to Naples (Italy), where she studied marine organisms at the Zoological Station, then she went to Germany, where she worked at the Zoological Institute of the University of Wurzburg. Returning to Brynn Maritime College, the researcher earned her doctorate degree.

While earning her master's degree, Nettie Stevens made her first major discovery: she discovered two new species of unicellular organisms, Licnophora macfarlandi and Boveria subcylindrica, and described their life cycles.

At the time, Netty Stevens once again faced the problem of financial support for her research work. It prompted the scientist, having received the recommendations of her supervisor Thomas Hunt Morgan, to apply for research funding. The study of heredity, in particular, of the genetic certainty of sex, was considered a promising area. And in 1905, Nettie received a grant of $1,000 for the best scientific work written by a woman. This was a monograph entitled "Studies in Spermatogenesis", which contained the results of Stevens's most important research on sex and heredity.

THE PIONEER OF GENETICS

In 1902, American zoologist and cytogenetic scientist Clarence McClung expressed the idea, which was later partly developed by Stevens in her research. He found that the so-called accessory chromosome, first described by Hermann Henking, played a major role in determining the sex of the embryo. McClung believed that it was it that had the characteristics inherent in the male sex. This assumption proved to be erroneous, but it provided the basis for further, more successful researches by other scientists, including Nettie Stevens.

Considering this theory as well as Mendel's theory of heredity, she began to study them both. Stevens examined the eggs of five species of Neoptera insects. Working with the California termite, Nettie found a huge number of chromosomes, but did not notice the "accessory" one. Next was Stenopelmatus, a desert locust (Orthoptera) that had been previously studied by McClung. This insect has 46 chromosomes, two of which are longer than the others. Stevens noted one small chromosome present in only half of the spermatozoa, and named it "Element X". She noticed the same strange chromo-

some in half of the spermatozoa of the cockroach Blatella Germanica. Nettie also explored the water worm Sagitta bipunctata, which also had something similar to the "accessory" chromosome. However, since this insect was a hermaphrodite, the researcher had no reason to consider the "element X" to be sex determinant.

REVOLUTION IN SCIENCE

Stevens made her most important discoveries during the genetic and cytological studies of Tenebrio molitor: she noticed the Y-chromosome in it and reached the conclusion that it was its presence or absence that the male and female sex of an embryo depends on.

Nettie Stevens managed to find out that Tenebrio molitor produces two types of spermatozoons: the first type is characterized by a large chromosome, and the second – by a small one. From the large chromosome a female insect was born, and from the small – a male one. Subsequently, these pairs of sex chromosomes became known as X and Y.

In her "Studies in Spermatogenesis", Stevens describes one of her main findings: "Since the somatic cells of a female contain 20 large chromosomes and male cells have 19 large and 1 small cells, this seems to be an obvious case of sex determination, not with the help of an additional chromosome, but with a certain difference in the characteristics of the elements of one pair of chromosomes..."

THOMAS HUNT MORGAN:

"Her single-mindedness and devotion, combined with keen powers of observation; her thoughtfulness and patience, as well as balanced judgement are the explanations of her outstanding achievements."

It is also known that, independently of Nettie Stevens, another scientist, American cytologist Edmund Beecher Wilson, researched the sex chromosomes. Therefore, the works of both scientists had a revolutionary significance in the scientific discourse of the time. After all, first, they put an end to a long discussion about what affects the formation of the sex of an embryo: heredity or the environment the embryo is in. Second, the works by Stevens and Wilson for the first time clearly established an inseparable link between hereditary characteristics and specific chromosomes.

Nettie Maria Stevens (1861–1912) made a number of extremely important genetic discoveries. Along with Edmund Beecher Wilson and independently from him, first ever, she investigated the dependence of sex on the chromosome set, becoming one of the first female geneticists in the United States, whose contribution to science has been formally appreciated.

UNAPPRECIATED GENIUS

Nettie Stevens died at the age of 50 because of cancer. Thomas Morgan wrote a detailed obituary for the authoritative science journal, in which Nettie was presented rather as a wonderful laboratory assistant, not as a great researcher. However, he later disproved his earlier statement and admitted that Nettie was one of his best graduate students, and only few were capable of such "bold and independent" research as she was.

In many biology textbooks, Thomas Morgan is called the first researcher of the Drosophila chromosomes. In fact, the experiments with these insects were started by Nettie Stevens – she was the first to bring them to the laboratory. And for his success in the realm of Drosophila research, Morgan should be grateful to Stevens and Wilson – for their conclusions about the decisive role of chromosomes in the heredity that he used in his research. In addition, it was Nettie Stevens who noticed the presence of XX chromosomes in female germ cells, while Morgan did not make such a discovery; instead, he was involved in the study of chromosomes in male cells, so he later included Stevens in his study.

Nettie Stevens' life was short, but she managed to write almost 40 scientific papers. Her activities aroused great interest in the late twentieth century: In 1994, she was inducted into the National Hall of Fame of the United States, and in 2016 to commemorate her birthday, Google created a Doodle logo depicting Nettie Stevens examining X and Y chromosomes. In 2017, the Science and Innovation Center, opened at this educational institution, was named after her to honour one of the prominent alumni of the State University of Westfield.

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for treatment of anxiety ***2 tablets up to 3 times a day*****

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SELF-TREATMENT MAY BE HARMFUL FOR YOUR HEALTH


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