

Авторским видением данных философских аспектов служит динамический, постоянно изменяющийся и трансформирующийся процесс взаимодействия человека и технологии. От незначительного использования в ранние времена, до объемной интеграции с технологией в наши дни, отношение к данной проблеме будет ставить все новые и новые вопросы к обществу, которое всегда будет иметь разную векторную составляющую. Симбиоз человека, как биологического существа и технологий, как продукта его умственного усилия – возможен и необходим. Главной актуальностью проблемы становится грань между самосохранением и улучшением, с потерей той личностной трансцендентальной идентичности, которая может быть утрачена в том числе безвозвратно в результате техногенных вмешательств, когда существует риск прекращения стремления человека к миру идеальному и духовному, а происходит его «зацикливание» на материальном плане.

ВЫВОДЫ

1. Философский подход к анализу проблем современной медицинской науки является одним из актуальных аспектов в настоящие дни. Динамический и всеобъемлющий подход к выявлению многогранных и неоднозначных проблем, с последующей оценкой стратегий и подходов к их решению, а также потенциальных рисков в области клеточных технологий является неотъемлемой частью успешного развития данного раздела медицины.

2. Исследование проблемы технологизации человека с помощью регенеративной медицины является многоплановым и многоаспектным процессом, включающим в себя медицинские, этические, социологические и философские аспекты. Этот многогранный подход помогает более полно понять и оценить потенциальные выгоды и риски таких технологий для человека и общества в целом.

3. В перспективе выражается огромный потенциал данного направления медицины, как опора и помощь в разрешении проблем болезней человека и всего мира, только с высшей благой целью применения данной силы.

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ВЛИЯНИЕ КИСЛОТНЫХ ДОЖДЕЙ НА ОКРУЖАЮЩУЮ СРЕДУ

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Аннотация

Введение. Кислотные дожди – это глобальная экологическая проблема, которая остаётся актуальной для человечества. Загрязнение воды и почвы приводит к проблемам здоровья. Необходимо проводить работу по экологическому воспитанию населения с целью профилактики заболеваний, вызванных влиянием окружающей

среды. **Цель исследования** – создать в условиях лаборатории модель для наглядной демонстрации вредного влияния кислотных дождей на окружающую среду для повышения экологической грамотности населения. **Материал и методы.** Использовались растворы серной и азотной кислот с уровнем pH = 4. Для этого образцы концентрированной серной и азотной кислот в химическом стакане разбавлялись дистиллированной водой, при этом уровень pH измерялся датчиком цифровой химической лаборатории (СТЕМ). В качестве тест-объектов были выбраны водные рачки, цисты которых имелись в лабораторных наборах по биологии для экологического практикума и демонстрационных опытов. Также были выбраны образцы пшеницы, металлов и сплавов, камня. Исследование проводилось в химической лаборатории средней школы № 9 города Североуральск в форме четырёх экспериментов. Для подтверждения гипотезы и определения уровня экологической грамотности населения было проведено опрос, в котором участвовало 58 человек, в основном учащиеся старших классов школы. Опрос проводился до и после демонстрации результатов экспериментов. **Результаты.** Лабораторные эксперименты наглядно доказали вредное влияние кислотных дождей на окружающие объекты (металлы, камни), почву, растения и живые организмы. **Выводы.** Созданная лабораторная модель наглядно демонстрирует вредное воздействие кислотных дождей на окружающую среду. Данная модель может быть полезной для повышения экологической грамотности населения и проведения мероприятий по экологическому воспитанию. **Ключевые слова:** наглядная модель, кислотные дожди, окружающая среда, экологическая грамотность.

THE IMPACT OF ACID RAIN ON THE ENVIRONMENT

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Abstract

Introduction. Acid rain is a global environmental problem that remains relevant to humans. Pollution of water and soil leads to health problems. It is necessary to carry out work on environmental education of the population in order to prevent diseases caused by the harmful influence of the environment. **The aim of the study** is to create a visual model in the laboratory to demonstrate the impact of acid rain on the environment and improve environmental literacy of the population. **Material and methods.** Solutions of sulfuric and nitric acids with a pH level of 4 were used. For this reason, samples of concentrated sulfuric and nitric acids in a beaker were diluted with distilled water, and the pH level was measured by a digital chemistry laboratory sensor. Aquatic crustaceans (*Artemia salina*) were selected as test objects, the cysts of which were available in laboratory biology kits for environmental workshops and demonstration experiments. Samples of Grasses or Bluegrass wheat (*Poaceae*), samples of metals and alloys in the form of plates for applying acid solutions, and a stone sample were also selected. The study was carried out in the chemical laboratory of secondary school No. 9 in the city of Severouralsk, in the form of four experiments. To confirm the hypothesis and determine the level of environmental awareness of the population regarding the impact of acid rain on the environment, a survey was conducted in which 58 people, mostly high school students, participated. The survey was conducted before and after the demonstration of the experiment results. **Results.** The experiments have proven the harmful impact of acid rain on the soil, plants, metals and stones. **Conclusion.** Based on the results obtained, a laboratory model was created that clearly demonstrates the harmful effects of acid rain on the environment. This model can be useful for increasing environmental literacy of the population and environmental education activities.

Keywords: visual model, acid rain, environment, environmental literacy.

INTRODUCTION

Acid rain is a global environmental problem that remains relevant for everyone and especially for us in particular, and every inhabitant of the planet should think about their contribution to this natural phenomenon. All harmful substances that enter the air during human life do not disappear anywhere, but remain in the atmosphere and sooner or later return to earth in the form of precipitation. At the same time, the consequences of acid rain are so serious that it sometimes takes hundreds of years to eliminate them [1].

Acid rain, as a rule, includes weak solutions of sulfuric and nitric acids, formed as a result of the reaction of atmospheric moisture with oxides of sulfur and nitrogen. Long-term exposure to acid precipitation causes the acidity level of water bodies to increase. At pH < 4.5, all fish, bottom bacteria and plankton, and most frogs and insects die. The life of aquatic organisms is disrupted which leads to death. [2]. Toxic sludge pollutes agricultural areas. Plant integumentary tissues and cellular metabolism are disrupted, which ends in the death of plants. From chemistry course is known that acids interact with certain metals, destroy their structure, making them brittle, and convert metals into soluble and insoluble compounds - salts. Acid rain affects stone, dissolving it, or changing its

structure and gradually destroying it. Acid rain can have a negative impact on human health, causing heart and lung diseases [3, 4].

There are industrial cities in the Sverdlovsk region, such as Asbestos, Nizhny Tagil and Serov. In 2018, the total emissions from enterprises in these cities amounted to 990 thousand tons. The listed cities are the leaders in terms of the number of these emissions. According to a report by the Ministry of Natural Resources, some of the most common toxic substances are sulfur dioxide, carbon monoxide, nitrogen dioxide, nitrogen oxide, dust, hydrogen sulfide and ammonia. Acid precipitation is formed from the listed gases in this list [5].

The following hypothesis was formulated: if the effects of acid rain on living organisms and substances surrounding humans are demonstrated, this will increase the overall level of environmental literacy of the population

The aim of the study is to create a model in the laboratory to demonstrate the impact of acid rain on the environment and improve environmental literacy of the population. The object of the study was acid rain, and the subject was the impact of acid rain on the environment.

MATERIAL AND METHODS

To conduct research and create a demonstration model of the harmful effects of acid rain on the environment, solutions of sulfuric and nitric acids with a pH level of 4 were used. For this reason, samples of concentrated sulfuric and nitric acids in a beaker were diluted with distilled water, and the pH level was measured by a digital chemistry laboratory (STEM) sensor. Aquatic crustaceans (Artemii Salina) were selected as test objects, the cysts of which were available in laboratory biology kits for environmental workshops (ecology, chemistry, biology) and demonstration experiments. Samples of Grasses or Bluegrass wheat (Poaceae), samples of metals and alloys (cast iron, zinc, copper, aluminum, lead, brass, bronze) in the form of plates for applying acid solutions, and a stone sample (natural marble) were also selected. The study was carried out in the chemical laboratory of secondary school No. 9 in the city of Severouralsk, Sverdlovsk region, in 2021 for 6 months in the form of four experiments.

To confirm the hypothesis and determine the level of environmental awareness of the population regarding the impact of acid rain on the environment, a survey was conducted in which 58 people, mostly high school students, participated. The survey was conducted before and after the demonstration of the experiment results.

Research methods: experimentation, modeling, observation.

RESULTS

For the first experiment, Artemii Salina was chosen as test objects. Their cysts were taken in the laboratory. They were placed in salted water and after 2 days they were hatched. In a normal environment, they were active. Then, dividing them into 2 groups, the prepared solutions of nitric and sulfuric acids with pH level 4,1 were added, which corresponds to the composition of acid rain. After a few minutes, Artemi began to slow down their movement, after 7 minutes they showed no signs of life.

For the second experiment, wheat was chosen. Wheat was a genus of herbaceous, mainly annual, plants of the family Grasses, or Bluegrass (Poaceae) and sowed the seeds on February 3. After 3 days it rose, on the 5th day the plants were already 6 cm tall. Three groups were planted: one was a control group, which was watered with ordinary water, the second with a solution of nitric acid, and the third with sulfuric acid. The next day, the control group did not change its appearance and the second and third withered and subsequently died.

The following experiment demonstrated acids effect on metals. To conduct this experiment, a set of metals was taken. Drops of nitric and sulfuric acids were applied to each plate. Visible reactions occurred within 7 minutes. During the interaction of almost all samples of metals and alloys, the formation of precipitation, the release of gases (sulfur dioxide, hydrogen) was observed. After the interaction, a rough spot remained on all surfaces except the cast iron plate, demonstrating the effect of corrosion. There was an assumption that with repeated regular exposure of metals to acidic solutions, the corrosion effect would intensify and lead to complete destruction.

The latest experiment showed effects of acid rain on cultural monuments and buildings. The samples of natural marble were taken, a well-known ornamental stone. It is calcium carbonate CaCO_3 , a salt that is part of chalk and limestone. One sample was placed in a beaker with a solution of sulfuric acid, and the other in a glass with a solution of nitric acid. In a glass with sulfuric acid, the reaction proceeded calmly, bubbles of carbon dioxide were released. In a glass with nitric acid, the reaction was rapid, since nitric acid itself has a high chemical activity. The reaction proceeded until the marble piece was completely dissolved.

In order to confirm the need for environmental education and increasing the level of environmental literacy of people, a survey was conducted in which 58 people, mainly high school students, participated. The questions were aimed at testing the level of knowledge about the harmful effects of acid rain on the environment. The survey was conducted during a school event dedicated to environmental safety, where the results of the experiments were demonstrated in the form of presentation. The survey was conducted before and after the presentation of the experiment results. The questionnaire contained 10 questions and had to be completed in writing.

The results of the survey conducted before demonstrating the results of the experiments are as follows. To the first question: "Have you heard of acid rain?" 62% responded positively; 31% have never heard, 7% found it difficult to answer. Regarding the question "Do you know what acid rain is?" 51% gave a positive answer and 49% negative. When asked about the causes of acid rain, 50% answered that it is due to the work of industrial enterprises, 25% associated this phenomenon with human activity and 20% noted that the cause of acid rain is a sharp change in weather conditions, 5% found it difficult to answer. Awareness of the consequences of acid rain according to the survey results is as follows: 55% of respondents know about the harmful effects of acid rain on the environment and human health, but 15% of them cannot specifically explain what the harm is. 45% of respondents know nothing and cannot explain the harm caused by acid rain. 70% of respondents knew about the danger of acid rains for human health, but could not accurately explain it; 27% could not explain the negative impact on plants and soil; 30% have never thought about the safety of architectural monuments from acid rains and other climatic or chemical factors. The results of the survey before the demonstration of the experimental results showed that approximately half of the respondents did not have specific information about the impact of acid rain on the environment.

The results of the survey conducted after the demonstration of the experiments are as follows. 98% of respondents responded that they received visual information about acid rain and its harm to the environment. The number of respondents who could not explain anything about the consequences of acid rain decreased by 12%. 67% responded that they first thought about environmental safety and the dangers of acid rain for human health after demonstrating the results of experiments.

DISCUSSION

The first experiment was based on the following. It can be seen that an increase in the acidity of the aquatic environment causes the death of aquatic organisms.

The results of the second experiment showed that when exposed to acidic solutions in the soil, the nutrients necessary for plant life dissolve. At the same time, heavy metals are leached from the soil, which are then absorbed by plants, causing them serious damage and death. It can be concluded that acid rain is dangerous for soil and plants and reduces crop yields. As a result of acidification in the soil, nutrients that are vital to plants are dissolved and then die.

During the interaction of almost all samples of metals and alloys, the formation of precipitation, the release of gases (sulfur dioxide, hydrogen) was observed, it should be noted that poisonous ones as well, the formation of roughness on their surface was also observed. This is due to the fact that metals such as iron, which is part of steel, zinc, aluminum, tin are in the "Electrochemical range of metals" before hydrogen, they can react with almost all acids and especially such strong ones as nitric and sulfuric too. And copper, which stands after hydrogen, can react only with nitric acid. The salts formed during the interaction of acids with metals, except lead sulfate, are soluble, therefore, the effect of metal dissolution is created, therefore, ulceration is formed. When steel, zinc, copper, lead, brass, bronze interacted with nitric acid, brown gas was released and the metals were colored: copper and bronze acquired a greenish-blue color, lead - a dark gray color. Acid precipitation is

capable of dissolving many metals and their alloys, destroying their structure due to the formation of soluble salts. When acid solutions simulating acid rain interact with metals and alloys, it is shown that the destruction of the metal structure (erosion) occurs.

Durable, hard marble reacts with solutions of sulfuric and nitric acids and turns into soft gypsum (calcium sulfate) and a highly soluble salt - calcium nitrate. Acidic solutions destroy the structure of the stone until it is completely destroyed, which proves the negative impact of acid rain on marble products, such as architectural monuments.

A survey of respondents confirmed the relevance of environmental education activities in order to increase environmental literacy and the effectiveness in this sense of a demonstration model of the harmful effects of acid rain on the environment.

CONCLUSION

The results of the experiments clearly showed the harmful impact of acid rain on living organisms and substances surrounding humans. On this basis there is confidence that the research hypothesis has been proven. The study can provide ideas for future experiments simulating the harmful impact of chemical and climatic factors on the environment and creating the other visual models demonstrating natural climate phenomena and environmental impact. It is necessary to carry out measures to increase environmental literacy of the population in order to prevent further environmental pollution, improve knowledge in the field of environmental safety and prevention of diseases caused by environmental risks.

Based on the results obtained, a laboratory model was created that clearly demonstrates the harmful effects of acid rain containing chemicals such as ammonia, sulfuric and nitric acids on the environment. This model can become a visual aid and can be useful for environmental education activities.

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ФУНКЦИОНИРОВАНИЕ МЕДИЦИНСКИХ ТЕРМИНОВ В ХУДОЖЕСТВЕННОЙ ЛИТЕРАТУРЕ НА ПРИМЕРЕ ЦИКЛА РАССКАЗОВ М. А. БУЛГАКОВА «ЗАПИСКИ ЮНОГО ВРАЧА»

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