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РОЗДІЛ 4

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ПЕРЕРОБЦІ М'ЯСА, МОЛОКА Й МОРЕПРОДУКТІВ**

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## **WATER FROM THE AIR – AN ADDITIONAL SOURCE OF WATER FOR THE POPULATION**

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The deficit of fresh water exists in many countries. Therefore, the search for additional sources of drinking water is important. This is especially true for areas where there is no centralized water supply and quality of water available for use underground or surface sources is low and requires complex and costly water purification technology. For a number of districts of Odessa region of Ukraine specified conditions are common. The deficit of fresh water experience recreation and health centres located along the Black Sea coast, estuaries and lakes. Water is carried through the packed water (for drinking purposes) and imported in tanks of water (for drinking and household needs). The situation with fresh water is the cause of the rising cost of services for tourists. One possible way to partially solve this problem is to use water obtained from atmospheric air (Osadchyk, Titlov, 2013). In 1 m<sup>3</sup> of air contains from 4 to 25 grams of water vapour. Getting water from the air is possible by cooling to a temperature below the temperature "dew point". In order to get the water from the air, it is necessary that its relative humidity was 40 % and the temperature was higher than 15.5 °C. These requirements correspond to the climatic conditions of the holiday season in Odesa region.

For water with air today use different modifications. There are wind turbines stand-alone type, which generate electricity and water (technology Eole Water "Wind turbine makes 1,000 liters of clean water a day in the desert Megan Treacy" /Technology/ Wind Technology April 16, 2012). There are billboards with a combined surface with hydrophilic and hydrophobic materials (technology Org billboard "Lima billboard is tapped for drinking water"/ 25 February 2013, by Nancy Owano), "bearing tree" (technology Warka Water "Architecture and Vision, Kickstarter"/ Warka water promises to harness safe drinking water from the air / Adam Williams January 23, 2015) or mesh panels hydroscopic materials. The offices to obtain water from the air using air driers (NBD Nano Technology Startup "This self-filling water bottle mimics a desert beetle" / by liat clark, wired uk /wired.co.uk/11.26.12.).

This process occurs in household air conditioners, which are widely used for cooling indoor air sanatoriums and recreation in the holiday season. During their operation formed secondary product – water. It is, in most cases, are not collected and not used in any way, although considerable quantities. Each air conditioners such models "SenSey" FTI-51MR, placed in the environment of 10 to 15 liters of fresh water per day. If, for example, at the recreation center operated 70 such air conditioners, over the holiday season (May to October) they produce about 180 000 liters of water. This water can be used for drinking and household needs (Kovalenko, Kormosh, 2015).

Of course, the use of air conditioner condensate without treatment for drinking purposes is impossible. After all, its quality depends on many factors, including the contamination and humidity, design, work environment and location of the air conditioner, and other

factors. Therefore, the first step in work aimed at the development of water treatment technology derived from the air, was the analysis of samples such as water, depending on the conditions of obtaining (Kormosh, Kovalenko, 2015).

Samples of treated water from the air using air conditioners models "SenSey" FTI-51MR. These air conditioners use at the recreation center, located on the Black Sea near the city Odessa. Studied water quality samples of two types. The first obtained from air conditioners, which are in operation for a long time not subjected sanitized. The latter derived from air conditioners, work surfaces are regularly treated with special Wash Solution. As the detergent solution using a 5 % aqueous solution of citric acid at a temperature (40...50) °C. After sanitizing solution Wash working surfaces rinsed with clean water and obsushuvaly. Next conditioner worked normally.

In water samples determined by sanitary-chemical indicators and indicators of epidemiological safety. For this purpose, standardized methods and modern equipment. The values of water quality parameters obtained from the air, compared with the requirements of state sanitary rules and norms for drinking water from a water pipe (STATE STANDARDS 2.2.4.171.10 Ukraine, 2010).

Analysis of experimental research quality indicators of water samples with air conditioning, long sanitized not subjected to the following conclusions: water quality in terms of epidemiological safety is low. It does not meet regulatory requirements in the following microbiological parameters: total microbial count, general circle shape (Table 1).

**Table 1 – Indicators of epidemic safety of water samples from the air**

The indicator of water quality, unit of measurement	Indicator value	
	Water from Air	Norm
The total microbial count, CFU in cm <sup>3</sup> : — At 22 °C — At 37 °C	> 1000 > 1000	not determined ≤ 100
General koliformy, CFU in 100 cm <sup>3</sup>	present	missing
E.coli, CFU in 100 cm <sup>3</sup>	present	missing

Found that in samples of water present saprophy kind Micrococcus, Staphylococcus, available conditionally pathogenic and pathogenic flora families Enterobacteriaceae (41,7 %), Pseudomonadaceae (36,1 %) and Micrococcaceae (Staphylococcus aureus, 13,9 %). In addition, the presence and proportion of water in samples of fungi: Penicillium (19,4 %), Cladosporium (11,1 %) and Aspergillus (8,4 %), as well as their association (19,4 %). Specifically found that fungi of the genus Cladosporium and Penicillium were dominant in associations. Experimental studies sanitary and chemical indicators of safety and quality of water samples showed a discrepancy of a number of organoleptic characteristics (such as odor, turbidity, coloration), physico-chemical (including pH value, the iron general, dry residue) and sanitary and toxicological indicators (nitrites, ammonia, total organic carbon, boron) current regulatory requirements. Most abnormalities observed in indicators such as coloration, turbidity, total organic carbon content and ammonium. The content of heavy metals and radiation quality water samples did not exceed the norms.

The high content of ammonia in samples of water from the air can be caused by a high content of nitrogen oxides in the air Odessa region. The reasons for this may be the fugitive emissions of pollutants into the atmosphere with powerful enterprise production and transpor-

tation of ammonia, which is located in the region. Also contributing to air pollution nitrogen oxides vehicle exhaust, whose number increases significantly during the holiday season.

Elevated levels of nitrates, probably due to the fact that in the absence sanitizer work surfaces conditioner directly in contact with air and water conditions for biological processes. As a result, under autotrophic organisms is the oxidation of ammonium to nitrite.

About intense biological processes in excess conditioner suggests standards for microbiological parameters. Most likely, the waste products of microorganisms and cause bad odor, much zabarvlenosti and turbidity of water samples of the first type.

Elevated levels of boron in the water with air can be linked to the fact that it is present in seawater. Since getting water from air carried by the sea, it is possible to move it from evaporation from the sea in the air. Analysis of the results of experimental studies of water quality indicators, obtained from air conditioners, sanitizing constantly carried out showed that the quality is better than the sanitary-chemical indicators and in terms of epidemiological safety. However, the ammonium content is significantly higher than normal and is the rejection by some microbiological parameters.

It should also be noted that in both types of water samples is very low contents of calcium, magnesium, sodium and potassium and iodine and fluorine virgins. That is, in terms of physiological full value of the mineral composition of the water it needs additional conditioning before using it as drinking.

Therefore, experimental research carried water quality samples obtained using air conditioners of the air showed that it does not meet the existing requirements for drinking water. To use this water as drinking need to develop technology to improve its quality. This is the next objective of our research.

Scientific Supervisor – PhD Kovalenko O.O.

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