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Palatine Tonsil's Reaction on Drinking Water Quality as A New Method for Estimating People Health

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Abstract

It is well known that monitoring the quality of drinking water is necessary in countries with high and low socio-economic status. There are problems associated with the implementation of methods for studying the state of human health in vivo, depending on the quality of drinking water. The purpose of the article is to propose a new method for assessing the immune response of people to the use of water of different quality and radon waters in vivo. The essence of the method is the analysis of smears from the palatine tonsils (PT) of people taken by harmless and inexpensive scraping from the surface of PT. Scraping is a unique opportunity to obtain samples of lymphoid tissue/immune system (lymphocytes, leukocytes, reticular cells and several erythrocytes), connective tissue and epithelium in healthy and sick people. The obtained PT samples will be studied by various methods: cytological, biochemical, histochemical, immunohistochemical, proteomics, genetic analysis, single cell analysis, mathematical modeling. The analysis of the database of the obtained data will help to draw a conclusion about the degree of changes in the immunity of people who use water of different quality, the risk to their health and suggest appropriate preventive risk measures.

Keywords: Health, Water quality, Immunity, Palatine tonsil

Introduction

It is known that human health is dependent of water security. Monitoring of drinking water quality is important in countries with high and lower socio-economic status.[1-5] Drinking water quality affects immunity system[6,7] and induces changes in gut microbiota.8 PT are an essential part of immunity and they are used as an ex vivo model in different fields of biology and medicine.[9-11] Future studies should include improved impact evaluation and exact characterization of individual factors influencing endogenous nitrosation.[12] A methodology for the interpretation of in vitro monitoring data is required.[13] The article aim is to offer a new method of assessing immunity reaction to drinking different quality water.

Materials and Methods

In the new method, we integrated two important well-known aspects. On the one hand, it was necessary to study man's health with respect to drinking water[6-15] and solve some challenges in this field.[13] On the other hand, we took into account anatomy and cytological features of human PT, spleen and lymph nodes as immunity organs for diagnostics.[16,17]

Researchers emphasize the need to consider the impact of chemical substances, bacterial frequency and abundance in assessments of drinking water quality.[2-24] The published data about the influence of water quality on the immunity and risk of specific cancers and birth defects were taken into consideration[6,7,12] in the process of drafting the method. Earlier researches show certain changes of cytological and protein features of lymphoid tissues/tonsils in oncologic[16,25,26] and infection diseases.[16,17,25,27,28] Besides that, the digestive tract-associated lymphoid tissue is the major immunological organization for the digestive system.[29] PT is compact yet physiologically complex mucosa-associated lymphoid tissues and a part of mucosal immune system.[30]

The method provides for the following steps. Firstly, the patient should be in the sitting or lying position with open mouth. Secondly, the scraping from the surface of PT is performed with tools like a Bunge Evisceration Spoon or Volkmann Bone Curette. The third step is studying the received specimens of PT by proteomics to define the drinking water quality impact on immunity.

Results

A new method of estimating the impact of drinking water quality on human immunity has been created. The essence of the method

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is to analyze people PT smears obtained by scraping from the PT surface. Scraping is an atraumatic manipulation, it is performed with the least waste of time, little pecuniary means and it gives a unique opportunity to obtain specimens of lymphoid tissue (lymphocytes, leucocytes, reticular cells and a few erythrocytes), connective tissue and epithelium. Our experimental light microscopy data show that radon water baths influence immunity cells of rabbit thoracic duct lymph fluid. Dendritic cells of central lymph and bone marrow cells of rabbits were identified according to the form of the cell body, characteristics of formation and branchiness of its processes in health, in atherosclerosis, its correction with radon.[31,32]

Macrophages number also increases after radon balneo-procedures in proportion with radon content in water.[33] There are some earlier not published clinical data about quantitative changes of PT cells of mature male volunteers - practically healthy sobers and drinkers and dehydration in chronic enterocolitis. The researches were carried out at the light microscopic level. PT specimens were stained by Giemsa. The data show that the surface epithelium cells of PT were not found in PT specimens in chronic enterocolitis patients in comparison to practically healthy sobers and drinkers. However, the quantity of the surface epithelium cells of drinkers decreases by two. At the same time, middle and basal layer epithelial cells are observed in PT smears specimens of sober and drinker.

The process of obtaining the studied material in the proposed method by scraping the tonsils is inexpensive and performed without anesthesia. At the same time, the age of patients is practically unlimited. Previously tested methods on 1300 patients (men, women aged 13-85years) showed their safety, were performed without complications.25 Patients willingly agreed to perform this procedure.

Discussion

This approach ensures that a researcher receives a mucosa-associated lymphoid tissue sample of PT for the following studies using cytological analysis and proteomics. There were no any complications after the scraping (1300 male and female) and the age of the patients was virtually unlimited.[25] For the method, the scraping can be considered as a modification of a well-known tonsil tissue collection with tonsil brushes or scraping with swab to collect samples to provide the study of the composition and structure of the tonsil's microbial communities.[28,34]

The published data show the need to develop in vitro bioassays in context of chemical risk factors and clinical diagnostics and some challenges to be overcome in these fields.[13] There are challenges to the study of health with respect to drinking water[14,15] There are major gaps in the knowledge related to health outcomes due to small variations in hydration status, the influence of sex and sex hormones, and age, especially in children and older adults.[35] Some authors revealed that relative to the control day, there were significant increases of IL-6 and IL-10 concentrations in saliva on the post-alcohol day.[36] The considerable change of epithelial cells in PT of drinkers (mentioned above) can be linked to significant increase of IL-6 and IL-10 concentrations in saliva on the post-alcohol day.[36]

It is suggested that radon penetrates through epidermis into body and triggers changes in immunity cells of rabbit thoracic duct lymph fluid in experiment.[31-33] Such mechanism is also possible in case of using drinking radon water. Radon penetrates through epithelial cells of digestive tract and/or directly through PT epithelial cells. Tonsils are linked to skin, CNS and kidneys.[37-39] The digestive tract-associated lymphoid tissue is the major immunological organization for the digestive system.[29]

The lymphoid tissue of the Waldeyer's ring located at the junction of the respiratory and digestive systems is the antigenic collection site. The convenient location of this tissue is important to understand for any doctor operating on this anatomic region. Palatine tonsils are a part of the mucosal immune system; they are compact and physiologically complex lymphoid tissues associated with the mucous membrane and form a part of the Waldeyer's ring. Palatine tonsils are a barrier to antigens and modulate the immune response. The available data and future research can expose the ways to aimed medical treatment.[30]

A rheumatoid arthritis murine model radon treatment showed the morphological reply in arthritic mice to radon and also the pointed changes in cells of the immune system and cytokines in the outlined experimental conditions are probably not cell fatality, but they are sooner immune-mediated. Moreover, mice subjected to radon revealed important amelioration of morphological criterions. With respect to negative influence caused by radon, while by now the experiment cannot give a certain answer, the received data suppose the necessity of further studies. At the same time the immune changes caused by radon are small and consequently do not strongly threaten health in small doses and do not have constant exposure scenario.[40]

The data of modern studies performed on a large number of patients have shown that radon in a certain concentration contained in residential premises is a risk factor for lung cancer and leukemia in children. Therefore, it is necessary to find solutions to reduce the negative impact of radon on human health and the environment.[41]

For better understanding the health effects caused by exposure to radon, it is necessary to conduct more in vitro and in vivo experiments and establish standards for the study of mechanisms involved in the carcinogenesis of radon. To date, the number of studies investigating the effect of radon on human health remains insufficient, and their data are inconclusive.

To uncover the complex mechanisms that underlie the effects of radon on human health, it is necessary to apply appropriate model systems and people exposed to radon. In vivo experiments using appropriate model systems including improved mathematical

models or people exposed to radon are finally necessary to understand the complex mechanisms underlying radon exposure and the resulting effects. There are limitations in conducting in vivo studies on humans.[42]

Expanding in vivo research on humans could provide the necessary answers to pressing questions. The proposed method of assessing the impact of drinking water quality on human immunity allows us to expand in vivo studies on humans and obtain reliable results answering the pressing questions posed in the above-mentioned scientific and practical studies.

We propose to create a database of human PT cytology and proteins/peptide features in healthy users of high-quality drinking water and the data of PT cytology and proteins/peptides features in users/people living in areas with various-quality drinking water. It will be possible to compare the data with the database of PT cytology and proteins/peptide features in healthy users of high-quality drinking water. The result of the comparison will show the impact of various-quality drinking water on human immunity.

Conclusion

The main conclusions we obtained were:

a. The study of the molecular mechanisms of the radon water effect on human health is extremely relevant

b. The method is useful for an individual approach for each patient of both sex and age

c. We propose to create a database of PT cytology and proteins/peptide features in healthy users of high-quality drinking water and the data of PT cytology and proteins/peptides features in users/people living in areas with various-quality drinking water

d. It will be possible to compare the individual data with the database of PT (cytology and proteins/peptide features etc.) in healthy users of high-quality drinking water. The result of the comparison will show the impact of various-quality drinking water on human immunity

e. It is necessary to use computer technologies for data processing and creating recommendations for correcting quality of drinking water and indications for healthy people and sick persons for using certain quality water

f. We are planning to perform histochemical, immunohistochemical and proteomics analyses of PT tissues of patients with different diseases and their correction by radon water impact and, particularly, drinking radon water in Belokurikha resort, Russia

g. It would be useful to use single cell analyses for future research of people immunity reaction on various quality of drinking water. Glass micropipettes can be greatly helpful when performing the single cell analyses. We have been using glass micropipettes sharpened like an injection needle since 1987 (patent No. 1495076 Russia)

h. The obtained PT samples will be studied by various methods: cytological, biochemical, histochemical, immunohistochemical, proteomics, genetic analysis and mathematical modeling. The analysis of the database of the obtained data will help to draw a conclusion about the degree of changes in the immunity of people who use water of different quality, the risk to their health and suggest appropriate preventive risk measures

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Conflicts of Interest

The author declares no conflict of interest.

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