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Genetical Communication

Analysing the Impact of Greenhouse Gases on Genetic and Human Health

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ABSTRACT

The state of the Earth's surrounding atmosphere, especially recently due to Covid-19, worries many people because it affects their health. It is proven that the leading greenhouse gases: carbon dioxide, water vapor, and ozone,influence genetic activity and affect humans. It is also known that because of this effect, water vapor in the Finnish sauna and Russian bath also has a positive impact on a person. In this paper, a comparative analysis of this phenomenon is carried out based on the obtained experimental data. In the first case, the total radiation power (absorption) was calculated in the dipole approximation, taking into account the dipole moment and the resonant frequency of the DNA molecule—the number of all DNA in the cell and all human cells. The emission power of greenhouse gases was determined, taking into account the radiation power in its model spectrum and the coefficient corresponding to the ratio of the integral intensities of the observed spectrum and the spectrum according to the model representations. In the second case, a calculated model of the greenhouse effect was used to estimate the impact on humans of the optical power of radiation in the I.R. region in the band of deformation vibrations of water vapor in the Finnish sauna and Russian bath. This power was calculated using the classical formula for dipole radiation in quantum mechanical analysis. Consequently, the power was determined by the energy of the considered oscillation and the probability of spontaneous transition to the main oscillatory level of water vapor, taking into account humidity and temperature in the Russian bath Finnish sauna. It turned out that the two powers at these given parameters coincide, and they are much larger than the corresponding optical powers for greenhouse (atmospheric) gases falling on a person.

KEY WORDS: GREENHOUSE, GREENHOUSE GASES, GENETIC ACTIVITY, ABSORPTION SPECTRUM, RADIATION POWER.

INTRODUCTION

Most people, especially recently due to Covid-19, are concerned about the state of the Earth's surrounding atmosphere, as it is related to their health. As you know, mitochondrial and nuclear deoxyribonucleic acid (DNA) have different linear dimensions, and therefore different resonance frequencies (Chirkova, 1992), to which the genome reacts. It is important to note that the frequency of 1660 cm^{-1} of the first overtone of nuclear DNA and the fundamental tone of 1061 cm^{-1} of mitochondrial DNA, calculated from model representations and lying in the infrared (I.R.) region, coincide within the error with the frequencies of the corresponding intensity maxima in the DNA absorption spectrum (Tymchenko & Polyanichko, 2017; Sheikhshoaie et al., 2018; Asgari2021). (see table 1, corresponding values are given in parentheses). The same coincidence is observed for the fundamental tone of the frequency 830 cm^{-1} of nuclear DNA. Theoretical and experimental research in this area has long been of great interest, for example, work (Oktyabrskiy and Ryazanceva, 2020).

In this paper, as in the first mentioned above, we are talking about the particle-wave dualism of the genome, which can be beneficially affected in vivo in the IR, visible and ultraviolet regions with the help of external

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optical radiation sources, including lasers. In addition, it is known (Asgari 2021) that, first, the main atmospheric (greenhouse) gases: water vapor, ozone and carbon dioxide; due to the greenhouse effect, affecting the human genetic activity in the IR region, have a beneficial effect on his health. By genetic activity we will understand such a state of the genome when the frequency of incident radiation coincides with the frequency of its absorption, and the power reaches the activation threshold, that is, in the case of resonance: "setting the receiver to the frequency". Secondly, because of this greenhouse effect, water vapor in the Russian bath and Finnish sauna also has a positive effect on humans.Therefore, the question arises of a comparative analysis of the experimental data obtained for these two effects due to the greenhouse effect. This study is devoted to the answer to this question (Asgharzadeh and Manda, 2021).

Since a sufficiently strong absorption of solar radiation by overtones and composite frequencies of water vapor is observed in the visible and near-IR regions, the "greenhouse glass" model, which corresponds to the classical interpretation of the greenhouse effect, does not pass in the case of the atmosphere. Still, using this traditional terminology, we will mean that in our IR range there is radiation from greenhouse gases due to the absorption of thermal radiation from the Earth. In the case of the Finnish sauna and the Russian bath, the role of the Earth is played by the furnace, and the impact on the person is due to the radiation of water vapor, which in turn absorbs the thermal radiation of the furnace, that is, under the influence of the same greenhouse effect (Sajjadi and Moosavi, 2019; Ilina et al., 2020). Overall, in this study, it is attempted to analyze of impact of greenhouse gases on genetic and human health considering the acquired experimental data, especially in the era of COVID-19. Firstly, the total radiation power (absorption) is calculated in the dipole approximation, taking into account the dipole moment and the resonant frequency of the DNA molecule. Secondly, a calculated model of the greenhouse effect is used to estimate the effect on humans of the optical power of radiation in the IR region in the band of deformation vibrations of water vapor in the Finnish sauna and Russian bath.

MATERIAL AND METHODS

To satisfy the aim of the study, a comparative analysis of is conducted based on the obtained experimental data. Initially, the total radiation power (absorption) was calculated in the dipole approximation, considering the dipole moment and the resonant frequency of the DNA molecule, as well as the number of all DNA in the cell and all human cells. Second, a calculated model of the greenhouse effect was applied to estimate the effect on humans of the optical power of radiation in the IR region in the band of deformation vibrations of water vapor in the Finnish sauna and Russian bath. This power was calculated using the classical formula for dipole radiation in quantum mechanical analysis.

RESULTS AND DISCUSSION

Water molecules, like ozone, belong to the point group of symmetry, C_2v, that is, the main operation is rotation by 180° (axis of rotation C_2). Having two components of the dipole moment (relative to two coordinates in the plane of the molecule), which also change during its vibrations, water and ozone molecules have a vibrational-rotational absorption spectrum (radiation). The main tones of vibrations of interest to us (Table 1) these molecules are located in the mid-IR region. Their activity in the radiation (absorption) spectrum is determined based on the theory of point symmetry groups. The oscillation frequency is active only when the amplitude of the matrix element of the dipole moment differs from zero. This means a situation in which the product of the wave functions of the initial and final states, as well as the corresponding component of the dipole moment in the basic symmetry operation of this group (C_2) does not change sign. This is exactly what is observed in our case.

As for carbon dioxide, it is a linear molecule belonging to the symmetry group D∞h. Therefore, it has a center of symmetry (inversion). Although the molecule does not have a dipole moment in the equilibrium position, however, it appears in valence asymmetric and doubly degenerate deformation vibrations. The last frequency (010), which is 667 cm^{-1}, is interesting because within the error range (Table 1) it coincides with the basic tone of nuclear DNA calculated from model representations (Chirkova, 1992). In addition, in one vibrational band there are hundreds of rotational bands, that is, we have a so-called vibrational-rotational band. Depending on the change in the rotational quantum number J (takes the values: -1, 0, +1) during the transition from the lower vibrational level to the upper one, in general, we have, respectively, branches P, Q and R with symmetry E_u, which corresponds to a perpendicular band: the dipole moment is directed perpendicular to the axis of the molecule.

In the first case, the optical power of radiation for the corresponding DNA was calculated per unit area (the effective area of a person is approximately 2 m^2), unit frequency interval (in wave numbers) and unit solid angle. The calculation was performed in the dipole approximation (Elyashevich, 2014), using the classical formula, which includes the dipole moment (second degree) equal to 1015 D (Oktyabrskiy and Ryazanceva, 2020), as well as the resonant frequency of the DNA molecule (fourth degree). Taking into account the number of all DNA in the cell and all human cells (or only the liver), the total radiation power was determined. Optical power emission of greenhouse gases was determined based on the radiation power spectrum and its coefficient corresponding to the ratio of the integral intensities of the observed spectrum and the model spectrum by ideas from (Borisov, 2011; Ilina et al., 2020). Human thermal radiation was also calculated (as for a black body) at the frequency of greenhouse gases and the corresponding DNA.

In the second case (see above) numerical value of the power per unit area (2 m2), a unit frequency interval (for half-width of bands in the spectrum of absorption around 250 cm^{-1}(Borisov, 201) and unit solid angle was calculated from the ratio of the dipole approximation (Elyashevich, 2014), obtained from well-known classical formula for the dipole radiation in the quantum-mechanical consideration. As a result, the power was determined by the product of the probability of spontaneous transition, taking into account its dependence on the frequency and dipole moment of water molecules equal to 1.84 D, the population at the main level of water vapor (010) at a given humidity, respectively, in a Russian bath and a Finnish sauna, the pressure of saturated water vapor in this volume, equal to approximately 1 m^3, temperature and frequency energy (010) (Ilina et al., 2020). The thermal radiation of the furnace was also calculated as the radiation for a completely black body (see above).

As a result, (Table 1), it was found that within the error (Δp) calculated by the formula of indirect measurements (Asgari 2021), the optical power of radiation (P) of water vapor for the Finnish sauna and the Russian bath is the same, although the temperature in both cases differed by 30 K, and the humidity – by 8 times. Large errors, in turn, are associated with a large half-width of the band of non-degenerate deformation vibrations (010) of water vapor (Borisov, 2011). These optical powers were approximately an order of magnitude greater than the corresponding thermal powers calculated for the Finnish sauna and Russian bath furnaces, and three orders of magnitude greater than in the case of the greenhouse effect for water vapor in the Earth's atmosphere (Jlina et al., 2020) and more than three orders of magnitude greater than human thermal radiation at the frequency of greenhouse gases and the corresponding DNA.

Table 1. The frequency of greenhouse gases (GG), DNA radiation and their respective radiation powers, including the Russian bath and the Finnish sauna.

	GG, DNA	F, cm^{-1}	ΔF, cm^{-1}	P, w/ (m^2 cm^{-1}sr)	ΔP, w/(m^{2}cm^{-1}sr)
I	G0 Mitochondrial DNA from liver cell	1042 1061 (1070)	25 53 (27)	0.02 0.16-0.33	0.01 0.03-0.06
II	GDC Nuclear DNA of human cell	667 830 (837)	144 42 (27)	0.30 0.16	0.10 0.03
III	GWV Nuclear DNA of human cell, 1-st overtone	1595 (1678)	250 (87)	0.02 0.03	0.01 0.01
IV	Russian bath (333 K, humidity 40%)	1595	250	37	17
V	Finnish sauna (363 K, humidity 5%)	1595	250	30	14

CONCLUSION

Thus, as a result of the analysis of experimental data obtained in two cases in accordance with the two proposed models, the following conclusions can be drawn:As in the case of greenhouse (atmospheric) gases, water vapor in the Finnish sauna and Russian bath due to the greenhouse effect influence the genetic activity of a person and has a beneficial effect on his health.Due to the significant predominance of the optical power of water vapor falling on a person in both baths over the power emitted by the greenhouse gases of the Earth's atmosphere, the impact on a person in the first case is much greater.Direct human exposure in both cases can be carried out through the membranes of certain skin cells.

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