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Hydrogen Subatoms and Microbial Metabolism

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Abstract

Weak ultraviolet radiation of wavelengths in the region of 206 nm is empirically observed during the fermentation of a yeast culture under standard laboratory conditions. The radiation is observed only during metabolism and stops after the fermentation is over. Such radiation has been predicted and is possible during the passage of wall electrons and protons to the subatomic states of hydrogen. Hydrogen subatoms help explain the results of a number of cold nuclear transmutation experiments for biological systems.

Keywords: hydrogen subatoms, yeast, metabolism, characteristic ultraviolet radiation.

Hydrogen subatoms are special hydrogen atoms in their base state, notable for having a more compact localization that allows them to approach the nuclei of other elements to significantly closer distances, thereby increasing the probability of nuclear reaction by many orders of magnitude [1]. Such states may be predicted in hydrogen atoms by taking into account the intrinsic quantum energy of the movement of an electron as given by de Broglie's equation:

$$E = \hbar\omega = m_0 \cdot c^2 \tag{1}$$

Let us denote by r_{0i} the threshold radius between the subatom and the nucleus, past which the former ionizes in the outer electric field of the ion:

$$r_{0i} = \frac{9Za}{2(1+Z)^2} \tag{2}$$

Here, *Z* denotes the atomic number, as given in the periodic table of elements, and $a = \hbar^2 / m\,e^2$ denotes the Bohr radius. As an example, titanium has $r_{0i} = a/5.34$. In this case, the polarizability of the subatoms will be two orders of magnitude lower than the standard value for hydrogen atoms. Delivering a proton in an electron shell at such distances to nuclei of, let's say, nickel (*Z* = 28) is equivalent in energy to that of a projectile proton of approximately 5 keV, and should increase the probability of nuclear reaction considerably [2], calculable by standard quasi-classical tunneling methods.

In our opinion, the results from the many years of experiments aimed at the realization of controllable isotope transmutation in a number of growing microbiological cultures, from the radiation-resistant to yeasts, deserve close attention and a consistent explanation [3]. A number of such explanations exists. Specifically, the authors of the monograph of [3] have proposed a model based on the particular nature of barrierless nuclear reactions in non-stationary nuclear systems. This model describes the quantum movement of two uncharged particles with discrete quantum spectrums, in a potential well with steep edges that has been formed by the external environment. However, the particles are later assumed to be charged in the Born approximation for Coulomb particles that is used in computing the scattering cross section.

The contradiction of this approach may be removed if we consider the movement of two charged nuclei in a hydrogen-subatom field. In this case, a significant convergence of these nuclei becomes possible, which may increase the probability of nuclear reaction under standard room temperatures [4]. The Coulomb repulsion energy for nuclei at these distances is equivalent to the energy of the colliding nuclei:

$$\Delta E \le \frac{2e^2 Z_1 Z_2 (1 + Z_1 + Z_2)^2}{9a(2Z_1 + 2Z_2 + Z_1 Z_2)} \tag{3}$$

As an example, for the case of the nuclei of magnesium ($_{12}$Mg) and oxygen ($_{8}$O) colliding in the neighborhood of a hydrogen subatom, we have $\Delta E \approx 1.9$ keV, which should increase the probability of nuclear reaction significantly. Such reactions have been observed in biological cultures [3]. In collisions of this nature, the hydrogen subatom may act as an electron shield (a "catalyzer"), stimulating nuclear reactions and frequently taking part in them [4].

We venture to suppose that hydrogen subatoms also play a significant role in the microbial context, as hydrogen ions are always present in the liquid medium inside and outside cellular structures. By colliding with electrons that are weakly attached to the walls of the cellular structures, they transfer a mechanical momentum to the wall, slow down, and may often be "captured" by the electrons, thereby forming hydrogen subatoms with the binding energy [1,2]:

$$\Delta\varepsilon = \frac{2e^2}{9a} = 6.02eV \tag{4}$$

During this process, we expect to observe a recombination radiation of wavelengths of 206 nm or slightly greater. Hydrogen subatoms are rather active particles [4]. For microbes, they serve as a defense that neutralizes toxic elements, while also generating new elements necessary for the growth and development of the microbes. For example, in biological systems it is possible to have "paired" reactions, where one of the nuclei collides directly with the hydrogen subatom, $^{*}H^1$:

$$K^{41} + {}^{*} H^{1} = Ca^{42} + e + \Delta\varepsilon \qquad (5)$$

Here, the energy release due to this reaction would be $\Delta\varepsilon = 9.96*10^{3}$ keV. Reactions of this type have been observed experimentally and are described in [3]. When microcultures in a growth medium reach stationary-phase metabolism, the addition of various chemical compounds leads to controllable nuclear transmutations [3]. In all reported experiments, the outer medium plays a predominant role, with the characteristics of the microbiological cultures – specifically, their radiation resistance – being of secondary importance. In other words, a number of different transmutations may be realized with a single culture. This is very important to understanding the generality of the phenomenon.

The baker's yeast "Lux" (*Saccharomyces cerevisiae*) was chosen for the experiments. To prove the appearance of hydrogen subatoms during the metabolism of the yeast, we observed how its radiation spectrum evolved over time, paying attention to the wavelength range of 200-240 nm between the time when the yeast was placed in the growth medium and the end of the fermentation. The yeast concentration needed to be sufficiently high to achieve an increased radiation intensity. A sugar-and-water solution served as the growth medium. The length of the fermentation life cycle is determined by the quantity of sugar in the growth medium and the medium's temperature. A temperature of 19-20°C was chosen for a moderate rate of fermentation.

The spectrometer employed was an FSD-10 v6.1 model from Optofiber, LLC (Russian: *Nauchno Tekhnicheskiy Tsentr Volokonno-Opticheskikh Ustroystv*). It had a 50-μm fiber optic cable, a wavelength-measurement precision of 2.25 nm, a nominal sensitivity of 160 V/lx.s (for a wavelength of 550 nm), and a possible measurement range of 190-1080 nm. The yeast solution was contained in a Petri dish and, together with a fiber optic sensor, was placed in black plastic boxing, which could be tightly sealed from the incident light. An exposure time of 60 seconds was chosen for each spectrum so as to accumulate a weak signal. The yeast radiation spectrums were recorded seven times in the wavelength range of 190-1080 nm, with signal-amplitude averaging done afterwards. Difference spectrums were considered so as to remove the effects of the different sources of noise, among them the spectral characteristics of the photoreception matrix. The background radiation spectrum for the box was recorded first by covering the Petri dish with an aluminum sheet. The radiation spectrum for the yeast solution in the Petri dish was recorded no more than two minutes later, and the two spectrums were then subtracted. Because the expected signal level was weak, the occurrence of areas with negative amplitudes following the subtraction was possible, owing to the two-minute time lag in the recording of the spectrums.

The difference spectrum for the beginning of the fermentation process is given in Figure 1.

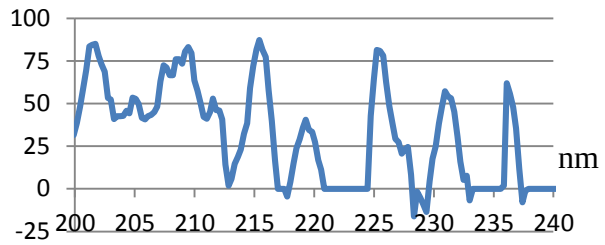

Figure 1. Spectrum for the beginning of the fermentation, following the deduction of the background spectrum for the box.

From the figure, we can see that the spectrum contains several maxima, among them one in the 206-nm region. Figure 2 provides a difference spectrum for 1.5 hours into the fermentation.

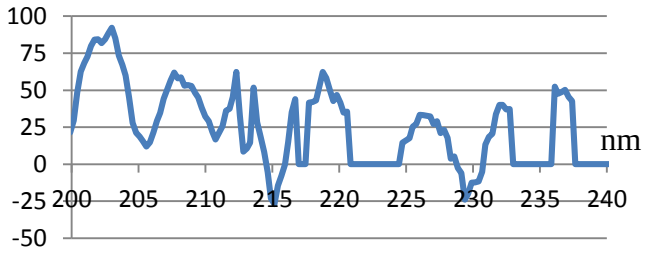

Figure 2. Difference spectrum for 1.5 hours into the fermentation.

We can see from the figure that the expected radiation in the 206-nm region has somewhat diminished after 1.5 hours of fermentation.

Figure 3 provides the radiation difference spectrum for the solution at 72 hours, after the fermentation has ended and the mixture has separated. The top layer consisted of a transparent liquid.

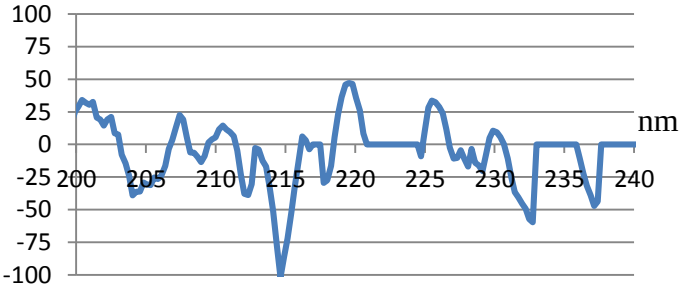

Figure 3. Difference radiation spectrum for the yeast culture after 72 hours.

We can see from the figure that the radiation spectrum has taken a strong fluctuating character. The expected radiation has essentially stopped. In Figure 4, we provide the radiation spectrum for the same solution following stirring, after which

the solution took a homogeneous outer color that was the same as that at the beginning of the experiment.

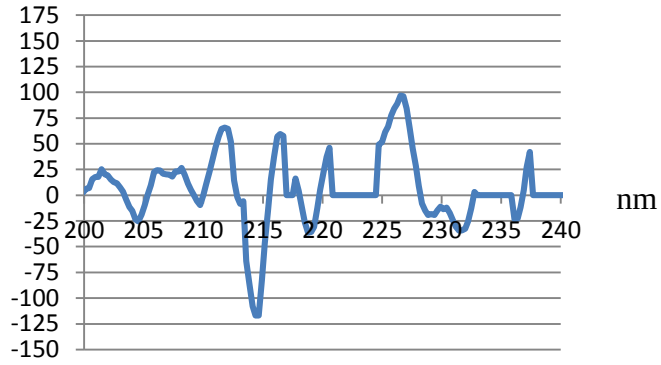

Figure 4. Difference radiation spectrum for the yeast solution after 72 hours and stirring.

From the figure, we can see that even if there is some signal in the 206-nm region, it is three times smaller than the initial as seen in Figure 1.

The series of experiments has thus shown that the yeast microculture exhibits a radiation in the region of 206 nm during metabolism.

For mechanical systems in particular, we have previously shown that the presence of hydrogen in a magnetron discharge can lead to the transmutation of isotopes in metallic targets [2]. Extracting a characteristic ultraviolet radiation with a wavelength of 206 nm is, however, rather difficult. The possibility of controllable nuclear transmutation in microbiological cultures has been reliably demonstrated [3]. Owing to the observed radiation from the generated hydrogen subatoms, we believe that they may contend for the role of the source in cold nuclear reactions.

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