

that are components of these tumors. The presence of EPA in cell lines of fibroblast origin and its absence in a strain of epithelioid cells (HeLa) means that this antigen can be used as a marker of human fibroblast-like cells, and also that these cells can be used as a model for the study of the biological function of EPA.

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DEPENDENCE OF MITOGENETIC RADIATION AND UNBALANCED MOLECULAR ORGANIZATION OF LIVER CELLS ON VAGUS NERVE STIMULATION

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Structural changes in the molecular substrate of the rabbit liver arising in vivo in response to weak (subthreshold) electrical stimulation of one trunk of the vagus nerve in the cervical region are examined. The method of investigation was to study the mitogenetic radiation of the liver. It was shown that the degree of saturation of the liver with unbalanced molecular structures (constellations) increases during subthreshold stimulation. The possible mechanism of this relationship is discussed.

KEY WORDS: mitogenetic degradation radiation; unbalanced molecular constellations; vector biological field.

Previous investigations showed that electrical stimulation of the vagus nerve in rabbits increases the number of unbalanced molecular structures or "constellations" (UMC) in the neuroplasm of the contralateral nerve and in the sarcoplasm of heart muscle. An indicator of UMC is degradation mitogenetic radiation, which arises during structural changes and disturbances of UMC.

The study of this dependence is of definite interest in the liver, an organ innervated by branches of the vagus nerve, and of different structure and function, about whose radiation much is already known.

EXPERIMENTAL METHOD

A short segment of the vagus nerve in the neck and a small area (1.5-2 cm²) of the surface of the liver were exposed in an unanesthetized rabbit. Electrodes were applied to the exposed segment of the nerve and it was stimulated by means of a stimulator. Pulses 1 msec in duration, with a frequency of 40 Hz and an in-

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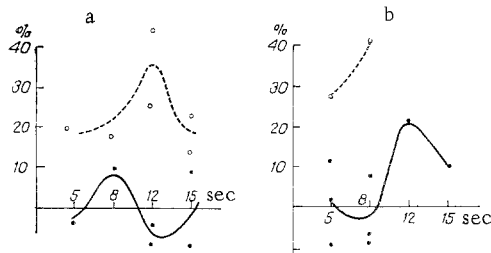


Fig. 1

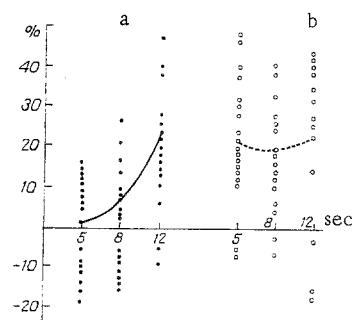


Fig. 2

Fig. 1. Individual characteristics of degradation radiation of rabbit liver (results of three experiments on animals): a) cooling of the liver; b) cooling of the liver during nerve stimulation. Abscissa, exposure (in sec); ordinate, relative intensity of radiation.

Fig. 2. Combined characteristics of degradation radiation of rabbit liver without (a) and with (b) nerve stimulation. Legend as in Fig. 1.

tensity of 40–50% of that evoking slowing of the heart, were used. Simultaneously with stimulation, which lasted not more than 30 sec, and at intervals of 1–2 min, the liver was irrigated with physiological saline cooled to 5–6°C. Cooling, by disturbing UMC, is known to induce degradation radiation. In the intervals between stimulations the liver was irrigated with warm physiological saline. The radiation of the cooled liver without stimulation of the nerve also was determined in the same rabbit. Radiation was recorded on a biodecator (a yeast culture on solid nutrient medium [4]), located 1 cm away from the liver. Because of the high sensitivity of the detector, an exposure of between 5 and 15 sec was sufficient. It must be emphasized that the relative assessment of the intensity of radiation was based (just as in previous investigations) on the reciprocal relationship between intensity and duration of exposure.

EXPERIMENTAL RESULTS

Results obtained on different rabbits, despite individual differences in the emission curve, showed conclusively enough that degradation radiation of the liver was intensified during stimulation of the nerve. This intensification was found when exposures were compared in all experiments, of which only a few (Fig. 1) are reported, and from the statistical distribution of all the data (Fig. 2). Similar stimulations while the normal temperature of the liver was maintained did not induce mitogenetic radiation.*

It can thus be assumed with a high degree of probability that stimulation of an exposed part of the vagus nerve increases the degree of saturation of cells with UMC, some of which are excited up to the ultraviolet level, in the liver just as in other systems [2].

This fact could be explained on the grounds that the effect of electrical stimulation of the nerve increases the disturbance of constellations belonging to the liver, thus increasing their degradation radiation. However, this explanation is opposed by the extent and structural complexity of the whole path of spread of the processes and the deliberately low intensity of stimulation. Considering views regarding the origin of accessory UMC and the frequency parameter of the stimulation, it can be accepted that this contributes to the rhythmic increase in frequency of spontaneous fluctuations of states of the nervous substrate. The more frequent oscillating structural changes in the neuroplasm may reach the innervated organ as a weak signal, including analogous increases of frequency in it, although of course it must be assumed that they change in some way as they spread.

Let us attempt to examine the general relationship thus observed in the light of certain propositions from A. G. Gurvich's theory of the biological field [3]. According to that theory, energy of metabolism, maintaining the molecules composing the constellation in an excited state, and a spatially characterized factor, influencing the arrangement of the excited molecules, i.e., contributing to the formation of UMC as unbalanced systems, are essential for the formation of UMC. Vector cell fields may be such a factor. For our purpose the views of this author on molecular processes, which are regarded as the most probable "dynamic sources" of vectorizing impulses, are important. With an increase in the frequency of oscillations of different molecular processes

*As investigations by Tarusov [8] and our own subsequent studies [6, 7] showed, the liver radiates at body temperature only in the visible region, but not in the ultraviolet region.

during nerve stimulation, spreading as chain processes to extensive biological systems, the interchange of states of the chromatin in the liver cell nuclei also increases in frequency, and in this way, vectorizing impulses arise. The probability of formation of accessory UMC is increased under these circumstances. Specific intermediate stages, linking nerve stimulation with strengthening of degradation radiation of the liver can, in the present writers' view, be represented by this consecutive organization of processes. The more saturated the substrate with UMC, the more effectively the regulation potential of the system must evidently be manifested [1, 2, 5]. Special importance under these circumstances must be attached to the parameter of unbalance, signifying vectorization of the molecular substrate from the aspect of higher biological levels, i.e., linking regulation potentials with the principle of the whole.

The effect of weak nervous stimulation, leading to saturation of the substrate with constellations, can thus be regarded as particularly interesting.

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