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Diagnostic method of absorption characteristics of humoral media

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Abstract

Method and mechanism of anti-Stokes absorption of humoral samples is proposed is based on the theory of crystalline field. We suggest that "negative absorption" is in consequence of iron d-orbital splitting in hemoglobin. As a result of this process hemoglobin molecule changes its state from high-spin to low-spin and becomes diamagnetic. The increase of 2,3-diphosphoglycerate concentration may also cause affect of "negative absorption". This phenomenon is experimentally checked and can be used in medical diagnostics.

Introduction

The analysis of the absorption spectrum of blood and blood components is effective solving the problem of latent disorders. Until recently such objects were examined traditional methods in medicine without taking into account the effects of multiple H_j scattering, because deep and impartial study of mechanisms and causes of deviation from norm was inhibited. To receive the veritable indices (max) and coefficients (a substantial absorption, we have proposed and realized polyfunctional spectrophotometer with primary transformer like integrating sphere [1,2].

Experimental

The computer-measuring system was created on the base of PFSPH (polyfunctional spectrophotometer). It consists of such main consecutively connected units as a monochromator, an integrating resonator, a radiation detector, a registration block

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adaptor and a personal computer. The integrating resonator is performed like sphere a in the center of which there can be placed an object for measurement, a quartz cuvette with an experimental specimen - 1 ml of blood plasma. The walls of internal emptiness of the sphere are covered with as much as possible diffusion reflecting substance i wave length range of 400-1100 nm, that is the MgO film with the thickness of 1 In addition to the registration block there is an adaptor and a radiation detector, the -ti has a meas\mi\% ttaTYsfoimet, a couyxgatm^bVock, foravsi oï coiv&uttmg signal, hi executive element, outlet of which is mechanically bound up with monochromator, and Bc entry of the measuring transformer is bound up with outlet of the radiation detector. ~ j-iiermore, the outlet-entry of the conjugating block is bound up with the outlet-entry of ж registration block and personal computer. Such a principle allows the system to work in ж automatic regime with memorizing of an electric signal X1(X) when the light bundle 3iioes through the empty cuvette and X2(X) - through a specimen with fixed length of wave mc io measure the absorptional coefficient of the specimen:

$$m_{\alpha} = -\frac{1}{l} \ln[1 - \alpha(\lambda)] , \quad (1)$$

It gives the possibility to determine the absorptional index of an elementary volume of a imoraï medium directly for the expression:

$$\alpha(\lambda) = \frac{X_2(\lambda)}{X_1(\lambda)} \quad (2)$$

where / is the layer thickness of an experimental specimen [3].

Thus, we can receive the spectrum of absorptional indices $m_{\alpha} = f(x)$ (Fig. 1,2,3) on Bc monitor screen, changing the value of wave length of incident radiation. The received m:rmation according to the elaborated programme is worked out and dropped to a -iologue, for example, to the United International Oncologic Test (UIOT), what serves as ж base for establishment of diagnosis.

Discussion

Analyzing received experimental results of dependence $m_{\alpha} = f(x)$ and $\alpha = 1 - R_{00} = f(x)$ я donors' blood plasma (healthy persons) and oncologic patients, partly with leucosis ji±ology, it was marked that absorbability of specimens with deviation from norm sLmost for all working spectral fields (400-1100 nm) is lower than those of donors. /:reover, in the majority of specimens was discovered the phenomenon of "negative arsrption" for red and near infrared part (650-900 nm), which is the base of

phoporphyrins' anti-Stokes fluorescence. The quantum go out of phoporphyrins considerably increases, for example, because of the iron deficiency or other reasons (Fig. 1). Similar researches were carried out for tissues of-benign and malignant heoplasms, the latter also showed the red fluorescence in the range of 650- 900 nm, which was gradually disappearing by temperature decreasing of specimen frofn 273K to 193K (Fig.2). It is possible to assume that the vibroenergy decreases and consequently • the thermodynamic balance is settled inside of oncospecimen cell. Similar results have been received 7-8 years ago and donor preparations have practically not shown anti-Stokes absorptional effect. However, our investigations for the period of 1994-1995 discovered "negative absorption" in some donor specimens. It can be caused by the negative aftereffects of Chernobyl catastrophe, intensification of ecological disbalance and other carcinogenic factors. Thus, discovering anti-Stokes "negative absorption" has a great diagnostic significance.

In addition to the above mentioned words paramagnetic haemoglobin property can be used in magnetobiology for studying therapeutic action of the magnetic field on biological process in living tissues, for bioelectrotimulation (BES) of patients, with immunodefi-ciency, for example, by means of redistribution of energy potential in bioactive points .

For corroboration of electromagnetic nature of metaloporphyrines we have carried out a seri^ of investigations on plasmatic specimens of people with thymus pathology, because of Chernobyl catastrophe. These specimens were taken in pre-and post- operative patients for measurements, the former were undergone by narcosis, the latter - by BES. The spectral analysis has shown that peaks in grade of 500-600 nm are inhibited by narcosis and become as forecome or increase by BES-action. It confirmed not only paramagnetic nature of porphyrins, but also high efficacy BES means on point of view of organism strengthening immunological system in pre-and post-operative period, that is biosystem transferring from diamagnetic low spin complex to paramagnetic high spin one due to the influence ofBES (Fig.3).

Humoral specimens of anaemic patients are characterized by considerable anti-Stokes absorpton. Mythohondriais the most intensive fluorescencing component beside porphyrines (max 587-634nm), the composition of the upper albumens consists of tryptophanum, pyridin, nucleotides, flavin (max 520-53 5nm), etc. In this case the most fluorescencing localization strongly depends on environment. In the visible spectral part the carotin and melanin (max 525-540nm) [4] also interact between each other with radiation. The covalent frame structure of globular protein remains undamaged under the influence of such extreme factors as increased or decreased pH, increased temperature, ionize radiation or other pathologies, but polypeptid chain ("spiral") becomes untwist and assumes irregular spatial conformation. In this case the quaternary erythrocyte structure and its biological activity is lost. Erythrocyte destruction causes mutations and hemolysis, that result in anaemia. Then blood plasma turns muddy and enriched by red haemoglobin

rests that were exuded through damaged erythrocyte membranes. The specimen spectrum of such plasma is characterized by hardly noticeable smooth peaks in the range of 500-

600 nm, and as a rule, by "negative absorption" in the part of 650-800nm. The specimen turbidity results in considerable lightscattering and according to the opalescence.

It is clear that the surplus fluorescence of such blood is caused by the presence of emulated phosphorus in DPNG molecule and also in phospholipid membranes. It gives reason to assume the DPHG blood concentration has increased owing to global climatic warming of our planet and a partial pressure CO and CO₂ in comparison with O₂ and other cancerogenic influences, and for the period of ionize radiation rise. It is confirmed at recipients spectrum shows gradual rising of anti-Stokes absorption manifestations low in comparison to the middle of the 80s.

Conclusions

1. There has been elaborated a new method and computer measuring system of different ranges of disorders diagnostics, partly oncopathology. In the base of the upper there is the principle of integrating resonator looking like a sphere with a specimen in the center.

2. Mechanism of anti-Stokes absorption by humoral environments has been proposed, it is correctly submitted to coordinating theory of crystalline field.

3. Discovered anti-Stokes absorption of humoral tissues indicates probable deviations from norm, it allows to prevent and to treat possible different disorders, and that is why it is important for diagnostics in medicine, especially oncology and hematology.

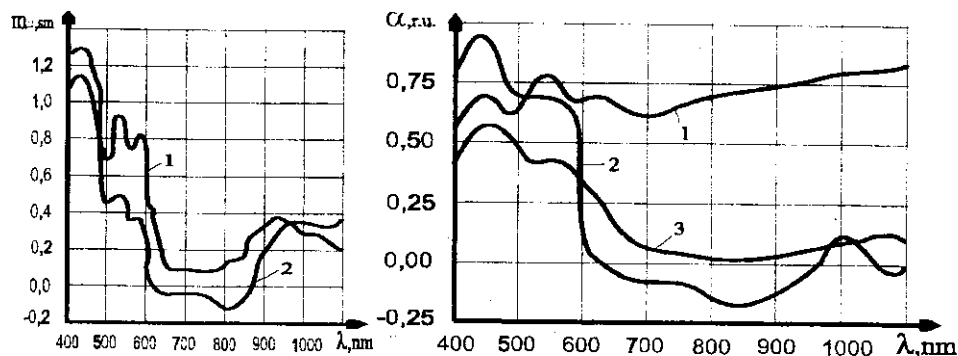


Fig.1. The absorption spectrum of blood - m.u.: 1-of donors; 2-with leucosis pathology. Group of blood-A(II), Rh+.

Fig.2. The absorption spectrum (oc-coef. of absorption): 1-of benign fibroma (fibromyoma), T - 310 K; 2- a malignant tumour of uterus body on the IInd stage, infiltrative form, blood group-A(II), Rh+, T=310 K; 3-the same malign, tumour, T= 193 K

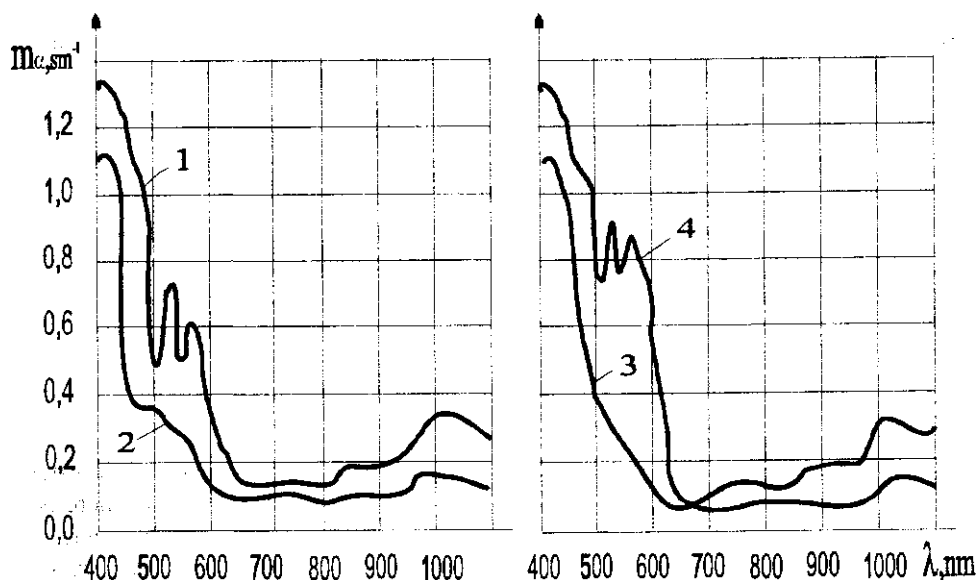


Fig.3. Absorption spectrum of blood plasma of the patients : 1 - before the operation; 2- after the operation with narcosis; 3- before the operation with narcosis; 4- after the operation with bioelectrical stimulation.

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