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## THE ANALYS OF INFLUENCE OF EXTRANEIOUS SMELLS ON A FUNCTIONAL CONDITION OF BIOOBJECT

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**Abstract.** The work is devoted the analysis of structure, classification and influence on a condition of a human body of various smells. It's studied the influence both pleasant aromas, and repellent, type of a smell of the spoiled meat.

As a functional condition, in the given degree work, it is represented in the form of an integrated indicator of work of cardiovascular, central and vegetative nervous systems. During experimental researches theoretic-empirical dependences on influence of tests on an organism on which basis the mathematical model of identification of a functional condition of bioobject is constructed are received. Chronometric adaptable and regenerative possibilities of an organism are studied.

**Keywords:** bioobject, smells, functional systems.

**Анотація.** Робота присвячена аналізу складу, класифікації й впливу на стан організму людини різних запахів. Вивчається вплив як приємних ароматів, так і відразливих, типу запаху зіпсованого м'яса.

Функціональний стан, у даній роботі, представляється у вигляді інтегрального показника роботи серцево-судинної, центральної і вегетативної нервових систем. У ході експериментальних досліджень отримані теоретико-емпіричні залежності по впливі проб на організм, на підставі яких побудована математична модель ідентифікації функціонального стану біооб'єкта. Вивчено хронометричні адаптаційні й відбудовні можливості організму.

За останнє сторіччя було запропоновано близько 30 теорій, автори яких намагалися пояснити природу запаху, його залежність від властивостей пахучої речовини. У цей час удалося встановити,

що в природі запаху, як і в природі світла, двоїстий характер: корпускулярний (залежний від структури пахучої речовини) і хвильовий.

За сучасним даними, молекули пахучих речовин поглинають і випускають хвилі довжиною від 1 до 100 мк, а тіло людини при нормальній температурі поглинає й випускає хвилі довжиною від 4 до 200 мк. Найбільш важливі електромагнітні хвилі, що мають довжину від 8 до 14 мк, що відповідає довжині хвиль інфрачервоної частини спектра. Поглинання дії пахучих речовин досягається ультрафіолетовими променями й поглинанням інфрачервоних променів. Ультрафіолетові промені вбивають багато запахів, і цим користуються для очищення повітря від непотрібних ароматів.

Ці дані, а також вивчення спектра запахів дають підставу вважати, що запахи мають фізичну природу, і навіть приблизно вказати їхнє розташування в інфрачервоній і ультрафіолетовій частинах шкали електромагнітних коливань.

Вдихання пахучих речовин робить на організм людини досить значну фізіологічну дію. Запахи впливають на працездатність, змінюють мускульну силу, змінюють газообмін, змінюють ритми подиху й пульсу, змінюють температуру шкіри, змінюють кров'яний тиск, змінюють внутрічерепний тиск, впливають на слух, змінюють якість зору.

При тривалому впливі певного запаху в людини поступово настає несприйнятливність до нього, і іноді він перестає його відчувати, це явище називається нюховою адаптацією.

**Ключові слова:** біооб'єкт, запахи, функціональні системи.

**Introduction.** Among sensory systems, a special place is given to the sense of smell. In humans, the sense of smell has lost its leading role (with the exception of cases of blindness and deafness, when compensatory development of the existing sensory organs, including the sense of smell, occurs), since highly developed vision and hearing provide most of the information about the environment. However, often without realizing it, a person makes decisions based on information coming from the organs of smell. At present, it was possible to establish that the nature of smell, like the nature of light, is dual in nature: corpuscular (depending on the structure of odorous substance) and wave.

Inhalation of odorous substances has a very significant physiological effect on the human body. The purpose of the work is to study the influence of odors of various nature on the indicators of functional systems of the body. To achieve the goal, must to solve the following tasks:

1. To analyze, in accordance with the classification of fragrances, the chemical composition of samples with the study of their effects on the human body;
2. To study the reaction of the nervous, cardiovascular systems of the organism to the influence of various odors, while assessing the time of adaptation to the appropriate smell;

3. According to experimental data, to construct a model of identification of the functional state on the effect of odors on a person.

**Objective.** The object of the study is the functional changes of the autonomic nervous system (VNS) and brain sections.

The subject of the study is the methods and means of modeling the identification of the functional state under the influence of odors.

**Materials and methods.** Methods of research are based on the methods of computational and analytical mathematics.

When conducting an experiment, it is necessary to establish the concept of the functional state of an object. According to the literature, the Functional State is an integral complex of the present characteristics of those qualities and properties of the organism or its individual systems and organs that directly or indirectly determine human activity. We took the functional state as an integral indicator of the cardiovascular (pulse rate), central (electroencephalogram indicators) and vegetative (indicators of sympathetic and parasympathetic) nervous systems. As shown earlier, the sense of smell is one of the main sensory systems of man. Smells of a different nature surround us constantly and at the same time, in a certain way act on our body. Therefore, it is advisable to analyze the effects of odors on various functional systems, as well as to follow the adaptation and regenerative abilities of the body.

According to the literature, odors have the following classification: 1) essential (for example, fruit and wine smells); 2) aromatic (spices, camphor); 3) balsamic (floral smells; vanilla); 4) ambromusculus (musk, sandalwood); 5) garlic (garlic, chlorine); 6) burnt (roasted coffee, creosote); 7) psiny or caprylic (cheese, fowl fat); 8) repulsive (bugs, belladonna); 9) nauseous (feces, body smell). Also have a classification and perfume: 1. Flower. 2. Ferns (wine glasses). 3. Chypre. 4. Eastern (amber, oriental). 5. Citrus fruits. 6. Woody. 7. Leather. (smoke, burnt wood, tobacco).

The experiment involved 30 volunteers. This population was divided into two samples: men and women. The age of the surveyed was 25-45 years.

Oriental, citrus and woody perfumes, as well as smells of vanilla, belladonna and spoiled meat were used as samples. This paper analyzes the chemical composition of these odors. The duration of each experiment is determined by the extremum points. Those. a certain smell affect the body to the maximum value of the EEG potential. Next, we study the recovery of the body to the initial values. Received three characteristic points - 1 ms, 5 and 15 s. During a series of experiments, the occurrence of  $\alpha$ ,  $\beta$ , and  $\theta$  EEG waves is detected. Below is the monitoring data. (Slide 4) When exposed to surveyed eastern spirits, we have.

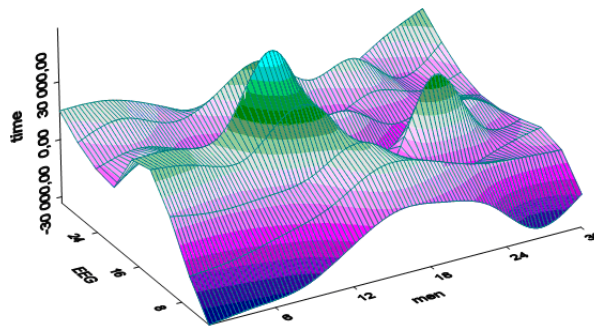


Fig. 1. Changes in  $\beta$ -waves of inspected by inhalation of eastern spirits

In 40% of women and in 60% of men, the  $\theta$  wave appears on the 15th monitoring panel, which indicates pathological changes, while the SIM index increased on average by 33.3%, i.e. it is safe to say that this class of spirits causes an irritating reaction in these people. In 13% of women and 30% of men per 1 ms and then the  $\beta$ -wave parameters remained low, indicating indifferent perception of the brain of these spirits. In 20% of women and in 40% of men, after 5 seconds of the experiment, the state began to approach the “normal” (initial) state. These figures suggest that women are more responsive to this fragrance, while men mostly remain “indifferent.” Pulse during 5 s of the experiment increased by an average 5.5% and 15 s recovered at 96.8%.

The following is a chart on the effects of citrus perfume on the body (slide 5).

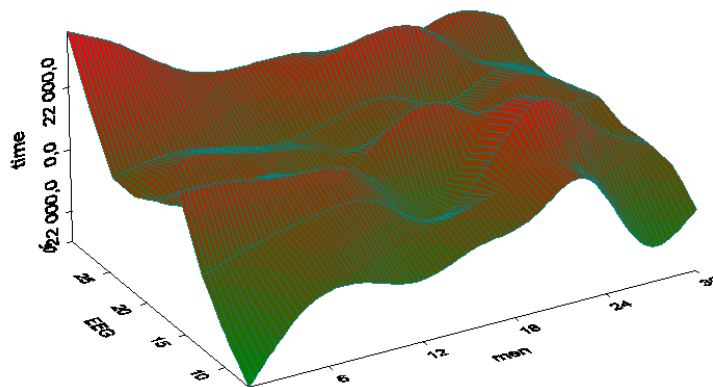


Fig. 2. Change of  $\beta$ -wave of the examined by inhalation of citrus spirits

Only 6.6% of women and 20% of men (compared to the previous fragrance) on 15 of the monitoring appears  $\theta$  wave. 33.3% of women and 40% of males per 1 ms and then remained low  $\beta$  wave rates. In 20% of women and 40% of men after 5 from the experiment the State began to approach the original. 6.6% of men "pulled to sleep". Here we can conclude that this type of perfume does not cause irritating effect. The indicators of the VNZ remain normal. Pulse on average 5 with experience increased by 2.2%, by 15 s was fully restored.

There is only part of our researches. We can make the next conclusions for all our work.

**Conclusions.** 1. An analysis of the influence of odors on organisms of living creatures is conducted. The classification of smells, as well as the classification of perfumes, has been studied. In accordance with this classification, the chemical composition and influence on the functional state of fragrances and odors are studied.

2. The reaction to the influence of different odors of the cardiovascular, central and autonomic nervous systems has been studied. The scatter in the perception of the same smell in the samples of men and women was revealed, as well as a different dynamics in the perception of aromas, sharp and unpleasant odors.

3. The study of the adaptive reaction of the organism on the influence of odors was conducted. As a result of experimental research, a mathematical model for identifying a functional state was constructed, reflecting both "normal" and "pathological" changes in functional systems of the organism.

**Conflict of interest statement:** The authors state that there are no conflicts of interest regarding the publication of this article.

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