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DAS BURNOUT-SYNDROM UND SEINE ENTSTEHUNG

Zusammenfassung. Im Artikel werden die Fragen, die die Entstehung des Begriffs des Burnout-Syndroms betreffen, untersucht. Zu diesem Zweck ist eine Reihe von literarischen Quellen, die sich auf den Gegenstand unserer Untersuchung beziehen, analysiert worden.

Schlüsselwörter: Burnout-Syndrom, Stress, emotionelle Erschöpfung, Depersonalisation, Reduzierung von persönlichen Leistungen.

Problemstellung. Die Fragen, die die Entstehung des Begriffs des Burnout-Syndroms betreffen, sind von großer Bedeutung nicht nur für nationale und ausländische Psychologie, sondern auch insbesondere für die klinische Medizin.

Analyse der letzten Untersuchungen und Publikationen. Dem Problem des Burnout-Syndroms widmeten solche aus- und inländischen Wissenschaftler wie: Aronson E., Buunk B. P., Leiter M. P., Maslach C., Pines A., Jerg-Bretzke L., Novak P., Traue H. C., Schaufeli W. B., Freudenberger H. J., Kumar S., Babanov S. A., Boiko V. V., Vodopianova N. E., Orel V. E., Lavrova M. G., Starchenkova E. S. u.a. bestimmte Aufmerksamkeit.

Das Ziel des Artikels besteht in Aufklärung der Entstehung des Burnout-Syndroms.

Hauptergebnisse der Untersuchung. Der Stress ist das Aroma und der Geschmack des Lebens; weil der Stress mit jeglicher Tätigkeit verbunden ist, kann ihm nur derjenige entgehen, der nichts macht [1, S. 71]. Selye H. behauptete, dass der Stress die unspezifische Antwort des Organismus auf jegliche an ihn gestellte Forderung ist, insbesondere ist es vom Gesichtspunkt der Stresssituation von keiner Bedeutung, ob die Situation, in die wir geraten sind, angenehm oder unangenehm ist, von Bedeutung ist nur die Intensität des Bedürfnisses an Umstellung oder Anpassung [1, S. 27]. 1936 hat Selye H. das allgemeine Anpassungssyndrom als ein Prozess, der in drei Phasen verläuft, die konsequent ineinander übergehen, beschrieben: 1) Alarmreaktion – der Organismus ändert seine Charakteristiken, weil er dem Stress unterworfen worden ist, sein Widerstand ist aber unzureichend, und es kann zum Tod kommen, wenn der Stressor stark ist (schwere Brandverletzungen, äußerst hohe oder niedrige Temperaturen); 2) Widerstandsphase – wenn die Stressor-Einwirkung mit Möglichkeiten der Anpassung vereinbar ist, leistet der Organismus den Widerstand, die Zeichen der Alarmreaktion verschwinden insbesondere fast völlig, der Widerstandslevel erhöht sich deutlich mehr als normal; 3) Erschöpfungsphase – nach einer längeren Stressor-Einwirkung, an die sich der Organismus anpasst, werden die Reserven der Anpassungsenergie allmählich erschöpft und die Zeichen der Alarmreaktion erscheinen wieder, diesmal

sind sie aber irreversibel, und die Person kommt um [1, S. 34–35].

Das Burnout-Syndrom wird oft mit dem Modell des allgemeinen Anpassungssyndroms von Selye H. verglichen [2, S. 144].

In ausländischer Literatur stammt wahrscheinlich das älteste Beispiel mit dem Begriff „to burn out", der mit der Erschöpfung verbunden ist, von Shakespeare W., der 1599 im Sammelband der Gedichte „The Passionate Pilgrim" schrieb: „… She burned with love, as straw with fire flameth; She burned out love, as soon as straw outburneth …" [3, S. 311; 4]. Der Begriff „staff burnout" wurde zum ersten Mal von Bradley H. 1969 in seiner Untersuchung von Beamten, die minderjährige Verbrecher bewachten, verwendet [3, S. 311–312]. Später, im Jahre 1974 erforschte der amerikanische Facharzt für Psychiatrie Freudenberger H.J. dieses Phänomen unter den Freiwilligen, die mit Drogensüchtigen arbeiteten, und er wird für Gründungsvater des Konzepts des Burnout-Syndroms gehalten [3, S. 312; 5, S. 159].

In der Geschichte der Untersuchung der emotionellen Erschöpfung kann man bedingt drei Etappen aussondern: in der ersten Etappe stellten die Wissenschaftler die emotionelle Erschöpfung dem Begriff „Stress" gleich, indem sie diese für ein Ergebnis des Arbeitsstresses hielten; die zweite Etappe ist systemisch, als emotionelle Erschöpfung eine Beschreibung als systemisches Konstrukt in Einheit des statischen und dynamischen Aspekte, Kriterien deren Bestimmung erhielt; die dritte Etappe ist humanistisch, die die emotionelle Erschöpfungen als Komplexe von spezifischen Erlebnissen betrachtet und darin konstruktive Möglichkeiten für Selbstaktualisierung einer Fachkraft vorsieht [6, S. 199].

In der wissenschaftlichen Literatur existieren verschiedene Ansichten über das Wesen des Burnout-Syndroms.

Der sozialen Psychologen Maslach C. Und Leiter M. P. haben das Burnout als ein Syndrom, welches als eine dauerhafte Reaktion auf den chronischen Stress erscheint, der infolge der Arbeit mit den Menschen entstanden ist, beschrieben [7, S. 103]. Drei Schlüsselzeichen des letzteren sind: die enorme Erschöpfung, das Gefühl von Zynismus und Abgeschiedenheit von der Arbeit, das Gefühl der Wirkungslosigkeit und Reduzierung von persönlichen Leistungen [7, S. 103]. Die emotionelle Erschöpfung drückt sich im Gefühl der emotionellen Überanstrengung und im Gefühl der Leere, Ausschöpfung von eigenen emotionellen Ressourcen aus, das Gefühl der „Gedämpftheit", „Abgestumpftheit" von Emotionen entsteht, in besonders schweren Erscheinungen sind emotionelle Ausfälle möglich [8, S. 30]. Die Depersonalisation ist ein Trend, das negative, herzlose, zynische Verhalten zu den Rezipienten zu entwickeln, insbesondere werden die Kontakte entpersönlicht und formell, die entstehenden negativen Einstellungen können am Anfang einen verborgenen Charakter haben und in innerer unterdrückter Reizung, die mit der Zeit in Form von Ausbrüchen der Reizung oder Konfliktsituationen herausreißt, erscheinen [8, S. 30]. Die Reduzierung von persönlichen Leistungen erscheint als die Herabsetzung des Gefühls der Kompetenz in eigener Arbeit, das Mißvergnügen mit sich selbst, die Herabsetzung des Wertes eigener Tätigkeit, die negative Selbstwahrnehmung im beruflichen Konzept; man merkt negative Gefühle oder Erscheinungen in sich und beschuldigt sich, seine sowohl fachliche, als auch persönliche Selbsteinschätzung setzt sich herab, das Gefühl des eigenen Versagens, die Gleichgültigkeit zur Arbeit entstehen [8, S. 30]. Die Bedeutung diese Dreifaktorenmodells besteht darin, dass das Erlebnis des persönlichen Stresses des Menschen deutlich in den sozialen Kontext verschoben ist und das Verständis vom Menschen sich selbst und der Umstehenden einschließt [7, S. 103].

Pines A. und Aronson E. betrachten das Burnout als ein Zustand der physikalischen, emotionellen und geistigen Erschöpfung, die durch eine lange Beteiligung an Situationen, die eine emotionelle Spannung erfordern, ausgelöst ist [9, S. 263].

Interessant ist, dass die Übersetzung und Nutzung des Begriffs „Burnout" in verschiedenen Län-

dern der Welt verschieden ist; außerdem nutzt man den Begriff „Erschöpfung“ anstatt des Begriffs „Burnout“, manchmal in Verbindung mit dem Adjektiv „fachlich“ [10, S. 210]. In einigen Ländern legt man den Begriff „Burnout“ als die Unmöglichkeit der vollständigen Wiederherstellung, d.h. als ein „psychologisches Todesurteil“ aus und wendet man den Begriff „Burnout“ gerade deswegen [10, S. 210]. In literarischen Quellen kommen auch solche Auslegungen wie „emotionelle Erschöpfung“ („Burnout“) (Boiko V. V.) [2, S. 136–156], „psychische Erschöpfung“ („Burnout“) (Orel V. E.) [11, S. 33–38], „fachliche Erschöpfung“ („Burnout“) (Vodopianova N. E.) [12, S. 1, 27–430]. In den Ländern mit einem entwickelten System des sozialen Schutzes der Bevölkerung, solchen wie Schweden und die Niederlande, ist das Burnout-Syndrom eine klinische Diagnose [7, S. 108].

Vodopianova N. E. behauptet, dass das Burnout ein subjektiv-persönliches Desadaptationssyndrom ist, welches in einer Störung des optimalen Funktionierens der Person als eines Tätigkeitssubjekts erscheint, solche Änderungen tragen insbesondere in der Regel einen zerstörerischen Desadaptationscharakter, wirken sich negativ auf geschäftliche zwischenmenschliche Beziehungen und Kommunikationen im Organisationsumfeld negativ aus, erscheinen in einer Minderung der Zufriedenheit und Selbsterfüllung im Beruf, der Selbstaktualisierung in anderen Lebensbereichen und bei einer hohen Ausgeprägtheit in Verschlechterung des psychosomatischen Befindens [12, S. 35].

Der Meinung von Boiko V. V. nach ist das Burnout ein von der Person ausgearbeiteter Mechanismus der psychologischen Verteidigung in Form des vollen oder partiellen Ausschlusses von Emotionen (Verminderung deren Energie) in Antwort auf ausgewählte posttraumatische Einwirkungen, insbesondere ist das Burnout eine Form der fachlichen Deformierung der Person [2, S. 137].

Als der Verlauf von bestimmten Ereignissen im Leben einer Fachkraft gibt der Burnout-Prozess, der Meinung von Lavrova M. G. nach, die Dynamik deren Änderung und die Charakteristiken der entsprechenden Etappen wieder; als ein diagnostizierter Zustand mit entsprechenden Kennwerten ist es ein statisches Bild in gegebenen Zeitraum, dass die Einschätzung des aktuellen Zustands der Versuchsperson auf der bestimmten Etappe der Entwicklung der fachlichen Destruktion ermöglicht [6, S. 199]. Gerade diese Lage wird in Form vom Burnout-Syndrom – einer Reihe von Symptomen diagnostiziert, die Ergebnis eines langen Prozesses der fachlichen Deformierung sind, dessen Zwischenergebnisse entsprechende psychophysiologische Zustände des Subjekts sind, deren Erscheinungen in allen Bereichen (dem emotionellen, Motivations-, axiologischen, Verhaltensbereich usw.) der Person vorhanden sind [6, S. 199]. Die Wissenschaftlerin meint, dass die Anerkennung des Vorhandenseins im Burnout-Syndrom von dessen beider Modalitäten – der Struktur und des Prozesses gleichzeitig, d.h. das Verstehen der psychischen Erscheinung des Burnouts als einer prozesshaften (dynamische Erscheinungen in der Zeit, Anzahl der Phasen) und dabei strukturellen (beständige bestimmte Formen) Erscheinung die Lösung eines solchen Widerspruchs ist [6, S. 199].

Starchenkova E. S. behauptet, dass das Burnout-Syndrom zu den wenig untersuchten Phänomenen der persönlichen Deformierung gehört und ein mehrdimensionales Konstrukt, ein Satz von negativen psychologischen Erlebnissen, die mit langen und intensiven interpersonalen Wechselwirkungen mit einer hohen emotionellen Prägnanz und kognitiven Kompliziertheit verbunden sind, ist; es ist die Antwortreaktion auf lange Stresse von zwischenpersönlichen Kommunikationen [13, S. 19]. Die Wissenschaftlerin sondert drei Gruppen der Risikofaktoren des Burnout-Syndroms aus: 1) persönliche Risikofaktoren – das Erlebnis der Ungerechtigkeit, das chronische Erlebnis der Einsamkeit, das Erlebnis der sozialen Ungeborgenheit, das Erlebnis der sozialwirtschaftlichen Instabilität, das Erlebnis der sozialen

und zwischenpersönlichen Isolierung, destruktive Modelle des Bewältigungsverhaltens, eine hohe Motivation der Gewalt, eine hohe Affiliation, der „Workaholismus", das „Typ A-Benehmen", ein schwaches „Ich-Konzept", eine niedrige Selbsteinschätzung, ein niedriges Einfühlungsvermögen und eine niedrige soziale Intelligenz, eine niedrige fachliche Motivation, die Motivation der Unglücksvermeidung, die emotionelle Unbeständigkeit, nichtrealistische Erwartungen; 2) Situationsrisikofaktoren – der soziale Vergleich und die Einschätzung anderer, die Ungerechtigkeit/Ungleichheit der gegenseitigen Beziehungen, negative oder „kalte"/gefühlslose gegenseitige Beziehungen mit Kollegen und Unterstellten, „schwierige" Schüler/Kunden/Partner, das Fehlen des Korporationszusammenhalts, eine niedrige Organisationskultur, hausinterne und zwischenpersönliche Konflikte, Rollenkonflikte, die Rollenunbestimmtheit, der Mangel an Verwaltungs-/ freundschaftlichen/ sozialen/ fachlichen und anderer Unterstützung, Über- und Unterlastungen; 3) fachliche Anforderungen – kognitiv komplizierte Kommunikationen, die emotionell gesättigte Geschäftskommunikation, die Notwendigkeit der ständigen Selbstentwicklung und Steigerung der fachlichen Kompetenz, die Anpassung an neue Personen, sich ändernde fachliche Situationen, die Suche nach neuen Lösungen, die höchste Verantwortung für das Geschäft und die Anderen, die Selbstkontrolle und Willensentscheidung, die uninteressante oder unbeliebte Arbeit, der Bürokratismus und die „Papierarbeit", das Fehlen von fertigen Lösungen, die Notwendigkeit der schöpferischen Unrast [13, S. 55–56].

Babanov S. A. meint, dass es einen engen Zusammenhang zwischen dem Burnout und der Motivation der Tätigkeit gibt, insbesondere kann das Burnout zur Reduzierung der fachlichen Motivation führen: die anstrengende Arbeit verwandelt sich allmählich in eine inhaltsleere Beschäftigung, es entstehen die Apathie und sogar der Negativismus in Bezug auf eigene Pflichten, die auf ein Minimum reduziert werden [14, S. 45]. Einem psychischen Burnout sind am ehesten die Workaholiker ausgesetzt – diejenigen, die mit einer hohen Selbsthingabe, Verantwortung, Einstellung auf einen ständigen Arbeitsprozess arbeiten, der junge Alter, das Fehlen der Lebenserfahrungen und praktischen Erfahrungen tragen zur Entstehung des Burnout-Syndroms bei [14, S. 45]. Das Burnout entsteht bei vielen, in erster Linie aber bei den Arbeitern, die an etwas mit besonderer Zielstrebigkeit und dem Idealismus herangehen [15].

Das Burnout-Syndrom hielt man lange für eine arbeitsbedingte Erkrankung für die Berufe des Typen „Mensch-Mensch", solcher wie soziale Dienstleistungen, Ausbildung und Gesundheitswesen [7, S. 103]. Therapeutische und geschäftliche Beziehungen, die sich zwischen demjenigen, der soziale Dienstleistungen erbringt, und demjenigen, der diese Leistungen erhält, erfordern einen langen und engen Kontakt und, obwohl solche Beziehungen gespannt und sich lohnend sein können, können sie dabei auch sehr stressauslösend sein [7, S. 103]. Zu solchen Berufen gehören gemäß der Klassifizierung von Klimov E. A.: Ärzte, Psychologen, Pädagogen, Soziologen, Produktionsorganisatoren und andere [16, S. 160]. Innerhalb der oben erwähnten Berufe sind die Uneigennützigkeit und der Altruismus, die Überstundenarbeit und Versuche, alle seine Anstrengungen für die Hilfe einem Kunden, Patienten, Studenten zu nutzen, die Verhaltensnormen [7, S. 103]. Die Ärzte sind für hohe Stresslevel im Laufe ihrer beruflichen Tätigkeit und insbesondere für das Burnout anfällig [17, S. 1].

Die Arbeit der meisten medizinischen Arbeiter wird unter solchen Bedingungen ausgeführt, dass ein Komplex von ungünstigen Produktionsfaktoren unterschiedlicher Natur, der geistig-nervlichen Beanspruchung, hohen Verantwortung auf sie einwirkt, zu den psychologischen Stressfaktoren, deren Wirkung sich auf das medizinische Personal auswirkt, gehören insbesondere: a) eine große Zahl von Kontakten mit kranken Menschen und deren Verwandten, die ständige Berührung mit fremden Problemen und fremdem Schmerz, mit negativen Emotionen,

die negative Energie tragen; b) erhöhte Anforderungen an die fachliche Kompetenz des Arztes und an den Dienst den Anderen, die Selbsthingabe; c) die Verantwortung für das Leben und die Gesundheit der anderen Menschen; d) die Arbeitsumgebung mit neuen Faktoren des sozialen Risikos, solchen wie Kriminalität, Drogensucht, Heimlosigkeit u.a. [8, S. 114].

Man sondert drei Typen von medizinischen Arbeitern, denen die Entwicklung des Burnout-Syndroms droht, aus: 1.– „der pedantische Typ", der sich durch die verabsolutiere Gewissenhaftigkeit, die überschüssige, abnorme Sauberkeit, das Bestreben, die musterhafte Ordnung in jeder Sache zu erreichen (sogar zum Nachteil für sich selbst) gekennzeichnet; 2.– „der demonstrative Typ", der sich danach strebt, der Erste in allen Sachen, sowie immer in Sicht zu sein; diesem Typ ist ein hoher Grad der Erschöpfbarkeit sogar bei der Ausführung der unauffälligen Routinearbeit eigen; 3.– „der emotionelle Typ", der aus eindrucksfähigen und empfindlichen Personen besteht, ihre Aufgeschlossenheit, Geneigtheit zum Empfinden des fremden Schmerzes als seines eigenen grenzt an der Selbstzerstörung [14, S. 45].

Schlussfolgerungen:

Auf Grund der durchgeführten Untersuchung kann man zur Schlussfolgerung kommen, dass die Entstehung des Begriffs „Burnout-Syndrom", der mit der Erschöpfung verbunden ist, in ausländischer Literatur in einem gewissen Maße im Sammelband der Gedichte von Shakespeare W. „The Passionate Pilgrim" von 1599 widerspiegelt ist. Der Begriff „Personal-Burnout" („staff burnout") wurde insbesondere zum ersten Mal von Bradley H. im Jahre 1969 in seinen Untersuchungen verwendet, für den Gründungsvater des Konzepts des Burnout-Syndroms wird aber mit Recht der amerikanische Facharzt für Psychiatrie Freudenberger H. J. gehalten, der 1974 dieses Phänomen unter den Freiwilligen untersuchte.

Es ist auch zu bemerken, dass verschiedene Meinungen über das Wesen des Begriffs „Burnout-Syndrom" in der ausländischen und nationalen Psychologie existieren.

Während der letzten Jahrzehnte untersuchen die Wissenschaftler verschiedener Länder aktiv das Burnout-Syndrom-Phänomen, welches eines der akutesten Probleme unserer Zeit ist.

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APPLICATION OF ELECTROMYOGRAPHY METHOD FOR DIAGNOSIS AND TREATMENT OF STOMATOLOGY DISEASES

Abstract. The analysis of the bioelectric activity of masticatory muscles allows assessment to determine the degree of functional alterations and provides the ability to monitor the functional rehabilitation of the patient. Electromyographic studies of dental defects and dentognathic anomalies demonstrate an increased activity of the masticatory muscles, which can be normalized with an adequate treatment. Significant changes detected in the activity of masticatory muscles and functional changes of the maxillodental system in patients with dental defects, dentognathic anomalies, temporomandibular joint dysfunction, and the pathology of periodontal tissues indicate the expediency and importance of using electromyography to diagnose and control the effectiveness of treatment.

Keywords: electromyographic study, masticatory muscles, stomatological pathology.

Introduction. Despite the development and implementation of numerous treatment methods and prevention measures aimed at reducing the level of dental morbidity rates at the early stage of initial treatment for dental caries, the prevalence and intensity remain at a high level still [30]. This often leads to tooth loss and persistent abnormal morphological and functional changes of the maxillodental system. Results of medical and statistical studies indicate an increased incidence of tooth loss, reaching up to 70% in some regions of Ukraine. Timely unsubstituted dental defects cause the maxillo-dental deformities and violations in occlusal correlations. The loss of a large number of teeth in lateral areas results in reduced occlusal vertical dimension. In addition, at the bilateral defects the lower jaw is displaced distally, at the unilateral– asymmetrically towards the direction of defect; and teeth which have lost antagonists, are moved beyond the occlusal plane. If the dental restoration is not performed in timely manner, the temporomandibular joints become involved in the pathological process [3]. The bioelectric activity of masticatory muscles is associated with a number of stimuli that form a certain functional system, so-called «dynamic stereotype». Therefore, the assessment of the functional state of the biodynamics of the motor apparatus and its active component– the muscular system, represents an importance in theoretical and practical perspectives [5]. The method of electromyography is widely used in masticatory muscle activity evaluation under normal and pathological conditions. Electromyographic studies are based on the evaluation

of muscle fiber biopotentials functioning as a part of the motor units: a functional unit of the arbitrary and reflexive bioelectric activity of the neuromuscular apparatus. The masticatory muscles electromyographic activity during chewing is characterized by a variable activity of examined organs, a coordinated function of antagonists and synergists, and a clear change in the activity and resting phases during one single chewing movement, which is not observed at muscular pathology [18; 19]. The evaluation of indicators of bioelectric activity of masticatory muscles under the pathological conditions of the chewing apparatus allows to determine the degree of functional alterations, as well as to control the functional rehabilitation status of the patient after the appropriate treatment [4; 9; 12; 18; 19]. All of the above suggests the relevance of this problem, expedience and perspectivity of its further study taking into account new technological possibilities and originality of approaches.

The aim was to study scientific works about the role of masticatory muscles physiology in various pathological conditions of the tooth-jaw system, namely: the presence of defects in dentition, dental maxillary anomalies, neuromuscular pathology, pathology of the temporomandibular joints, periodontal disease as well as the dynamics of the rehabilitation period on the basis of the literary data analysis that reflect the results of electromyography.

Material and methods. The review of scientific works is conducted in that the presented results of evaluation of the masticatory muscles functional state was carried out by functional electromyography which consisted in the registration of muscle bioelectic potentials prior to medical and preventive measures as well as after appropriate treatment. The myograph measures and records the electrical activity (biopotential) of eight muscles at the same time at the state of rest and during jaw compression in one record without phase shift, representing a valuable diagnostic information in assessing the position of the mandible and the state of all masticatory muscles. The use of surface electrosensors attached to the skin at the site of the muscles in question projection makes it possible to determine the degree of hypertonic (spasm) of these muscles. The signals of the miograph are displayed on the display with the preservation of the waveform in a given time interval and the display of averages, which give information about the patterns of contraction and relative intensity.

Review and discussion. The study of chewing muscles bioelectric activity indicators allows us to determine the degree of functional disorders in the pathological states of the masticatory apparatus and to further control the degree of functional rehabilitation of patients after treatment. It has been established that the patients with defects in dentition in comparison with the norm have a prolonged chewing period and decrease in chewing efficacy, the ratio of excitatory and inhibitory processes in chewing muscles sharply deteriorates, the term of bioelectric activity increases due to reduction of the relative bioelectric rest period, discoordination of chewing muscles activity progresses [7; 14]. In the case of the defects in dentition timely replacement by orthopedic structures based on dental implants with the number of installed dental implantscorresponding to the number of lost teeth in one month after fixation on abutments of permanent orthopedic structures the bioelectric activity of the masticatory muscles did not have statistically significant differences from the norm, which evidenced about the full functional rehabilitation of persons under research [1; 2]. Using the method of masticatory muscles surface electromyography the control of the prosthesis effectiveness and the degree of adaptation in the prosthetics of patients with end defects in the dentition was carried out using implantable replacement structures with high resistance. The approximation of masticatory muscles bioelectric potentials to norm after 3 months of using these prostheses is shown [24]. A study was conducted to determine the activity of chewing muscles of patients requiring dental implantation in different observation periods (before implantation, after 3, 6 and 12 months), depending on the time after the removal of the teeth, the

time of implantation and the time of functional load presentation on the implant. It has been shown that the functional activity of chewing muscles depends, first of all, on the period after the removal of the teeth and the installation of implants: the more time passed after the removal, the more obvious changes can there be and vice versa. In addition, it was found that the functional activity of chewing muscles also depends on the period of optimal functional load reproduction: activity is more likely to be normalized with early functional loads transmitted through temporary orthopedic constructions [8]. The comparison of chewing muscles electromyography quantitative indices was conducted during adaptation of patients to complete removable dentures without the use of drugs and against the background of therapeutic and prophylactic use of drugs with adaptogenic properties. It is proved that the total absence of teeth typical for elderly and aged people is characterized by changes in the parameters of masticatory muscles electromyography in the course of an arbitrary chewing test consisting in lowering the amplitude, increasing the frequency of biopotentials, increasing the time of activity in the dynamic cycle. The use of completely removable dentures during 30 days leads to improvement of the electromyography but does not lead to completeness in the new stereotype of chewing. The use of Aveit and Piracetam preparations accelerates the development of adaptive changes in electromyographic parameters of chewing muscles [10]. Thus, electromyographic studies of maxillofacial area muscles can serve as an objective criterion for the adequacy of orthopedic treatment and may reveal a neuromuscular imbalance in the manufacture of poor-quality orthopedic structures. Pathological types of bite are characterized not only by the deviation of the teeth position and their occlusive relationships, but also by pronounced decline in function, primarily chewing. It is known that the functional characteristic of masticatory muscles in distal occlusion (class II of dental maxillary anomalies by Engle) is high muscular activity m. tmporales compared with m. masseter, which leads to the development of less physiological temporal chewing type [11]. In addition to the well-known two-way deviations of the second class according to Engle there are cases where the distal ratio is observed only on one side. It was established that in unilateral class II the functional dominance of m. temporales was determined by qualitative and quantitative indicators, which is the functional reason to consider this type of bite as pathological [16]. One of the pathogenetic mechanisms of tooth rows distal ratio development with protrusion of teeth is the violation of the myodynamic equilibrium between the muscles of the external and internal muscular circles of the mouth, which is confirmed by electromyographic examination of 6–9 years old children. The study of the tooth-jaw area functional state before and during orthodontic correction with the use of myotrains showed that in 3 months the patients improved the function of the muscles under study, namely: the amplitude of the biopotentials reductionis growing and approaching the normal values [15]. Electromyographic studies of children aged 8–9 and adolescents aged 16–17 found that at distal occlusion not only increases the length of the masticatory period and the number of chewing movements, but also the total time of bioelectric activity of the chewing and front of the temporal muscles in comparison with the norm. At the same time the maximum amplitude of chewing and temporal muscles is much lower than normal. It has been established that children's difference between temporal and chewing muscular biopotentials and the norm reaches, on average, 30%, whereas adolescents have it at 17 to 47%, which indicates an increase in functional imbalance with age [21]. At the orthodontic treatment reception the proportion of patients with tooth-jaw abnormalities complicated by accumulation of teeth makes 70–80%. It is proved that in the complex diagnosis of such cases it is extremely important to determine the functional state of the temporal, actually the chewing muscles and the coliform muscle of the mouth, which provides the possibility of a systemic objective approach [6; 17].

It is known that the frequency of temporomandibular joint (TMJ) dysfunction of adult population is from 5 to 50%, and among patients who seek dental care it is 70–95%. The key to the development of TMJ dysfunction is the violation of the harmonic occlusion-muscle relationship due to anomalous articulation-occlusal relationship of teeth, tooth rows and jaws, bite, decrease in the height of central occlusion, joint injuries, bruxism, strain and tension of the masticatory muscles, especially of people with a stress-instable type of personality. With an occlusion-muscular dysharmonia to achieve the lower jaw position of the central relationship the tension of the muscular complex increases which isleading to the development of the main dysfunction symptoms [13]. With an occlusion-muscular dysharmonia to achieve the lower jaw position of the central relationship the tension of the muscular complex increases which is leading to the development of the main symptoms of dysfunction [20]. At the same time there is evidence that in 57–81% of cases the pathology of TMJ is found with persons who have intact dental rows and an orthognathic bite [21]. A serious study requires the problem of adolescents TMJ dysfunction due to the considerable prevalence and variety of clinical manifestations that may affect the psychological and social health of adolescents. A compulsory method of modern diagnostics in such cases is functional examination, namely, electromyography of chewing muscles, most often m. temporalism masseter, which are placed superficially [7]. On the other hand, the elderly with defects in the dentition have a violation of adaptation to the changed conditions of their functioning, especially with complete loss of teeth. Since muscles primarily react to the presence of errors in the construction of occlusion, according to electromyographic studies it is possible to indirectly assess the functional value of the prostheses. The inclusion into the diagnostic algorithm of functional methods can be controlled to provide comfortable conditions for accelerating the timing of adaptation to completely removable prostheses [21]. It is known that electromyographic research is one of the leading methods of diagnostics in dentistry, in particular, in periodontology. The problem of qualitative periodontal tissues pathology treatment remains relevant, especially against the background of organism resistance general and local factors reduction as, for example, in the case of herpes virus infection. At the same time the function of the tooth-jaw system including chewing muscles even in the absence of defects in the dentition significantly deteriorates [22]. It is known that in 85% of cases the cause of periodontal disease is occlusive disorders, which makes their early diagnosis of great clinical significance. The study of changes in the bioelectric activity of the muscles in the maxillofacial area of patients with chronic generalized periodontitis revealed a violation in their coordinated work, which led to more frequent exacerbations of the disease. At the same time, the picture of electromyography was characterized by a significant decrease in the amplitude of biopotentials of chewing and temporal muscles, the presence of all muscle groups spontaneous activity, an increase in the amplitude of the biopotentials of the supradiary muscles which take on the compensatory load [25]. One of the widespread types of periodontal tissues pathology which affects between 15 and 85% of respondents aged 16–60 is a recession of gums. This periodontal disease causes not only an aesthetic defect, but also promotes the development of hypersensitivity of the teeth roots due to the exposure to cement, carious process and abfraction. It is important to study the influence of hypertonic chewing muscles on the development of generalized gum recession. The assessment of the gum recession progression with patients having muscular-tonic syndrome has shown a progression of the process in the absence of appropriate treatment. Herewith the group of maximum risk has been patients with a thin alveolar bone and an increased total potential. Understanding the role of myotonic syndrome in the development of generalized gum recession allows for more effective treatment and prevention and reduces the risk of disease recurrence [21].

Conclusion. The performed researches have revealed significant changes in the activity of chewing muscles and functional changes of the tooth-jaw system of patients with defects in dentition, dental ankles, dysfunction of the temporomandibular joint, periodontal tissue pathology which indicates the expediency and necessity of using electromyography for diagnosis and monitoring of the relevant pathological conditions. It is also important to use functional methods to determine the effectiveness of the treatment and control of its stability.

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CLINICAL AND X-RAY CHARACTERISTICS OF THE CONDITION OF PERIODONTAL TISSUES IN PATIENTS WITH GENERALIZED PERIODONTITIS ACCOMPANIED BY DIFFERENT TYPES OF REACTIVITY OF THE ORGANISM IN REMOTE PERIODS OF TIME

Abstract. The reactivity of the organism affects the pathogenesis of generalized periodontitis and the subsequent clinical and radiological stabilization of the pathological process after treatment.

Key words: periodontitis, reactivity of the organism, stabilization, recurrence.

Introduction. Mass prevalence, significant growth of destructive forms in people of young, working age, high recurrence rate of the disease make the problem of generalized periodontitis one of the central in dentistry [1,2,3]. Inflammatory-destructive lesions of the periodontium lead to tooth loss and dysfunction of the dental-maxillary system, have a negative impact on the body in the whole, which causes not only medical but also socio-economic significance [4,5,6]. It is a well-known fact that generalized periodontitis is a pathological process that develops in periodontal tissues because of the combined influence of various general and local exogenous and endogenous factors [7,8,9]. At the same time there are many neuro-regulatory, neurotrophic, biochemical, immunological and functional disorders, microcirculatory and metabolic disorders, disorders of almost all the types of metabolism develop: protein, lipid, carbohydrate, mineral, that eventually leads to irreversible destruction of the periodontium and alveolar bones [10–13].

In connection with the above-mentioned facts, the search for new tools, methods and approaches to comprehensive treatment of generalized periodontitis remains relevant [14,15]. General and local drug therapy has been widely used in the complex treatment of this pathology [16,17]. However, the question of clarifying the key mechanisms of development and course of the disease remains relevant, in particular — depending on the condition of reactivity of the organism, which has a significant impact on the pathogenesis of generalized periodontitis and further clinical and radiological stabilization of the pathological process in the long-term perspective – after the intervention on periodontal tissues [18,19].

Objectives. The aim of this research was to study the clinical and radiological state of periodontal tissues (recurrence, stabilization) after the indications for patch surgery in patients with generalized periodontitis of II, III degrees of severity accompanied by normo-, hyper- and hyporeactivity of the body within the period between 6 months and 2 years.

Materials and methods. 216 patients (82 men and 134 women), at the age between 45 and 55 years with the diagnosis of generalized periodontitis of II, III degree of severity, chronic course were examined. The diagnosis was made on the basis of clinical examination, radiography, determination of periodontal samples in accordance with the International Classification of Diseases ICD-10. Depending on the state

of reactivity of the body, the patients were divided into three groups: the first one included the patients with normoreaction (132 people, 61%); the second group contained the patients with hyperreaction (46 people, 21%); the third one consisted of the patients with hyporeaction (38 people, 18%). The division of patients into groups depending on the state of reactivity of the organism was performed on the basis of the identified clinical and laboratory differences. All the patients underwent patch surgery. Clinical and radiological condition of periodontal tissues was assessed after 6 months, 1 year and 2 years. Special ttention was paid to the color, tightness, relief of the marginal edge of the gums, the presence of edema, the severity of redness, pain. In order to objectively assess the condition of the periodontium, periodontal indices and samples were determined:

- papillary-marginal-alveolar index of PMA (in% — from 0 to 100%);
- intensity of exudation from periodontal pockets (in mm2);
- periodontal index (PI) Russell (in points — from 0 to 8);
- Schiller-Pisarev's test (visual qualitative assessment of the intensity of staining of the oral mucosa).

To assess the degree and nature of the destruction of bone tissue of the alveolar process, radiological examinations were performed (radiography of individual teeth by intraoral contact method; panoramic radiography of the jaws).

Statistical processing of the obtained digital data was performed using the computer program Statistica 8.0 (STA862D175437Q).

Results. The results of remote clinical observations in patients with generalized periodontitis of II, III severity with normoreactivity of the body are presented in 6 months after comprehensive treatment the inflammatory-destructive process in patients of the first group on the background of the achieved clinical and paraclinical indicators did not progress in 94.7% of people. At the same time during the examination there were no clinical signs of inflammation in the periodontal tissues. There was no increase in the index of PMA, Russell, Schiller-Pisarev's test and the amount of exudate from periodontal pockets compared with the data obtained immediately after the treatment. The radiographs confirmed the remission of the process in the interdental alveolar septa: their height was maintained, the cortical layer was dense, osteoporosis of bone tissue and the expansion of the periodontal gap was not determined. During this observation period, 5.7% of patients had a recurrence of the disease with the corresponding dynamics of clinical and paraclinical parameters. The clinical and radiological signs of the disease corresponded to the initial level. Such patients underwent the necessary set of therapeutic measures. After 1 year, 88.6% of patients in the first group remained in remission, which was characterized by positive dynamics of all the studied indicators. After 2 years, the stabilization of the process was registered in 82.9% of cases.

The results of remote clinical observations in patients with generalized periodontitis II, III degree of severity accompanied by hyperreactivity of the body in 6 months after comprehensive treatment of inflammatory-destructive process in patients of this group on the background of clinical and paraclinical indicators did not progress in 86.9% of people. At the same time during the examination there were no clinical signs of inflammation in the periodontal tissues. There was no increase in the index of PMA, Russell, Schiller-Pisarev's test and the amount of exudate from periodontal pockets compared with the data obtained immediately after the treatment. The radiographs confirmed the remission of the process in the interdental alveolar septa: their height was maintained, the cortical layer was dense, osteoporosis of bone tissue and the expansion of the periodontal gap was not determined. During this observation period, recurrence of the disease with corresponding dynamics of clinical and paraclinical parameters was observed in 3 patients. The clinical and radiological signs of the disease corresponded to the initial level.

Such patients underwent the necessary set of therapeutic measures. After 1 year, 78.3% of patients in the second group remained in remission, which was characterized by positive dynamics of all the studied indicators. After 2 years, the stabilization of the process was registered in 69.6% of cases, which was 13.3% more than in patients with normal body reactivity.

The results of remote clinical observations in patients with generalized periodontitis of II, III severity accompanied by hyporeactivity of the body in 6 months after comprehensive treatment of inflammatory-destructive process in patients of this group on the background of clinical and paraclinical indicators did not progress in 89.4% of people. At the same time during the examination there were no clinical signs of inflammation in the periodontal tissues. There was no increase in the index of PMA, Russell, Schiller-Pisarev's test and the amount of exudate from periodontal pockets compared with the data obtained immediately after the treatment. The radiographs confirmed the remission of the process in the interdental alveolar septa: their height was maintained, the cortical layer was dense, osteoporosis of bone tissue and the expansion of the periodontal gap was not determined. During this observation period, recurrence of the disease with corresponding dynamics of clinical and paraclinical parameters was observed in 2 patients. The clinical and radiological signs of the disease corresponded to the initial. Such patients underwent the necessary set of therapeutic measures. After 1 year, 78.9% of patients in the third group remained in remission, which was characterized by positive dynamics of all the studied indicators. After 2 years, the stabilization of the process was registered only in 68.4% of cases, which is 14.5% more than in patients with normoreactivity of the body.

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Section 2. Medbiosciences

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INFLUENCE OF THE ALKALOIDS OF ANABAZIN, ANABAZAMIN AND LUPININ ON THE APOMORPHINIC HYPOTHERMIA IN MICE AND RATS, STUDY OF APOMORPHINIC HYPOTHERMIA IN RATS AS A TEST FOR PSYCHOTROPIC PREPARATIVE

Abstract. The article provides an assessment of the effect of the activity of alkaloids anabasine, anabasamine and lupinine in various doses on apomorphine hypothermia in mice and rats, and also a study of apomorphine hypothermia in rats as a test for psychotropic drugs was carried out.

Keywords: alkaloids, anabasine, anabasamine, lupinine, test for psychotropic drugs.

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ВЛИЯНИЕ АЛКАЛОИДОВ АНАБАЗИНА, АНАБАЗАМИНА И ЛУПИНИНА НА АПОМОРФИНОВУЮ ГИПОТЕРМИЮ У МЫШЕЙ И КРЫС, ИССЛЕДОВАНИЕ АПОМОРФИНОВОЙ ГИПОТЕРМИИ НА КРЫСАХ КАК ТЕСТА ДЛЯ ПСИХОТРОПНЫХ ПРЕПАРАТОВ

Аннотация. В статье приводиться оценка влияния активность алкалоидов анабазина, анабазамина и лупинином в различных дозах на апоморфиновую гипотермию у мышей и крыс а также проводилось исследование апоморфиновой гипотермии на крысах как теста для психотропных препаратов.

Ключевые слова: алкалоиды, анабазин, анабазамин, лупинин, тест для психотропных препаратов.

Актуальность исследований. В настоящее время большое внимание уделяется изучению психотропных препаратов, содержащих природные соединения, для операции и лечения заболеваний в мировом уровне. Одним из основных источников этих растений является вид *Anabasis aphylla* L – Ежовник безлистный. Из 3 алкалоидов, выделенных из этого растения [6, 292], два относятся к пиридиновому (анабазин, анабазамин) и лупинин к хинолизидиновому рядам. Воздействия алкалоидов анабазина, анабазамина и лупинина на разных процессах организма животных изучена [2, 26–33; 3, 20–22; 5, 4–11], однако влияние этих алкалоидов на апоморфиновую гипотермию и апоморфиновой гипотермии подробно неизучена. Апоморфиновую гипотермию на мышах, описанную И. П. Лапиным и М. Л. Самсоновой [4; 563–567], используют как тест для разграничения антидепрессантов, которые уменьшают апоморфиновую гипотермию, и холинолитиков, которые на нее не влияют [3].

Объекты и методы исследования. Опыты выполнены на крысах и мышах самцы. Контрольные и подопытные группы состояли не менее, чем из 7–8 животных каждая. Как и в опытах с резерпином, мышей и крысы помещали группами по 7–8 животных в металические коробки, а другая такая же коробка служила для измерения двигательной активности у каждого животного в отдельности. Мы использовали этот тест при исследовании алкалоидов. Комнатная температура в этих экспериментах колебалась от 18 до 23 °С.

Результаты исследований и их обсуждения. Как видно в таблице 1, алкалоиды в испытанных дозах не оказывают влияния на гипотермию, вызванную апоморфином. Из 4 опытов этого типа исключение составил только один, в котором анабазин (3 и 6 мг/кг), анабазамин (25 и 50 мг/кг) и лупинин (40 и 80 мг/кг) достоверно уменьшали апоморфиновую гипотермию. Взятый для сравнения с алкалоидами трициклический антидепрессант имипрамин не во всех опытах достоверно уменьшал действие апоморфина, поэтому было решено повторить эти опыты на крысах. Как видно из таблицы 2, имипрамин на крысах в 100% случаев противодействовал апоморфиновой гипотермии. Другой антидепрес-

сант деметилимипрамин, подобно имипрамину, снимал апоморфиновую гипотермию у крыс, но не всегда оказывал влияние на нее у мышей. Поэтому можно сделать вывод, что антагонизм антидепрессантов с апоморфином в тесте гипотермии надежнее оценивать на крысах. Это же относится к новым препаратам. На мышах в этом тесте эффект нового препарата можно пропустить.

В дальнейшем мы продолжили исследование апоморфиновой гипотермии на крысах. Однако, алкалоиды в испытанных дозах: анабазин 1 и 2 мг/кг, анабазамин 5 и 12,5 мг/кг и лупинин 10 и 20 мг/кг (при введении за 30 мин. до апоморфина), а также анабазин 3 мг/кг, анабазамин 25 мг/кг и лупинин 40 мг/кг (введение за 1 час до апоморфина в дозе 5 мг/кг) не оказывали влияния на гипотермию.

Таблица 1.– Влияние алкалоидов на апоморфиновую гипотермию у мышей

1-е введение		**Изменение температуры[x]**	**Доза апоморфина в мг/кг**	**Гипотермия (–Δt°)[xx]**
препарат	**доза, мг/кг**			**Кумулятивные индексы за 30+60 мин.**
Через 30 мин. после введения				
H_2O	–	–1,6	–	0,6 ± 0,18
H_2O	–	–1,3	5	9,9 ± 1,50
АНБ	1,5	–1,3	5	9,1 ± 1,73
АБМ	12,5	–1,9	5	7,5 ± 0,45
Луп	20	–0,5	5	10,8 ± 0,72
Им	12,5	–2,0	5	4,5 ± 0,60*
Через 60 мин. после введения				
H_2O	–	–1,0	–	+1,1 ± 0,18
H_2O	–	–1,6	5	4,8 ± 0,56
АНБ	3	–0,4	5	4,3 ± 1,09
АБМ	25	–2,1	5	5,0 ± 0,80
Луп	40	–0,5	5	5,4 ± 0,95
Им	12,5	–0,5	5	1,9 ± 0,65*
H_2O	–	–1,3	–	+1,7 ± 0,27
H_2O	–	–1,4	5	5,7 ± 0,42
АНБ	6	–1,4	5	7,1 ± 0,38
АБМ	50	–5,0	5	3,5 ± 0,82
Луп	80	–1,6	5	7,0 ± 1,11
Им	25	–1,4	5	2,8 ± 0,36**

*Примечание: АНБ – анабазин, АБМ – анабазамин, Луп – лупинин, Им – имипрамин, [x] – от исходной температуры, [xx] – от температуры перед введением апоморфина, * P < 0,05, ** P < 0,01. В каждой группе по 7 мышей – самок. Все препараты вводили внутрибрюшинное*

Наряду с алкалоидами были исследованы 10 антидепрессантов: имипрамин, деметилимипрамин, амитриплитин, нортриптилин, мапротилин, хлоримипрамин, новерил, апонал (все в дозе 5 мг/кг). Все испытанные антидепрессанты, за исключением нового антидепрессанта ипридола, отличающегося от других слабым адренопозитивным действием, достоверно уменьшали апоморфиновую гипотермию у беспородных крыс и крыс линии Вистар. Наименее выражено это действие было у азафена.

Таблица 2.– Воспроизводимость антигипотермического эффекта имипрамина и деметилипрамина на крысах и мышах

Вид	**Достоверный антагонизм с апоморфином(число групп)**	
	имипрамин (5 мг/кг, в/б)	**деметилимипрамин (5 мг/кг, в/б)**
Крысы	8/8	2/2
Мыши	4/15	14/24

В каждой группе по 6–8 животных. Апоморфин вводили в дозе 5 мг/кг внутрибрюшинной или подкожно

Сильным антигипотермическим действием обладали адренопозитивные препараты: AW (5 мг/кг), кокаин (5 мг/кг) и фенамин (0,5 мг/кг).

Противогипотермическим действием обладали также нейролептики в очень малых дозах: галоперидол и мажептил (0,002 мг/кг), хлорпротиксен и трифтазин (0,1 мг/кг), этаперазин (0,01 мг/кг) и аминазин (I мг/кг).

Из 4-х использованных холинолитиков только скополамин в дозе 5 мг/кг достоверно уменьшал апоморфиновую гипотермию, но в этой дозе он сам вызывает достоверно повышение температуры. Атропин, амизил и пентафен не оказывали влияния на апоморфиновую гипотермию.

Таким образом, алкалоиды, подобно антидепрессантам, достоверно противодействовали эффектам резерпина и фенамина, однако действие их было менее выражено, чем действие имипрамина. На эффекты резерпиноподобного препарата Ро-4–1284 и на гипотермическое действие апоморфина алкалоиды не оказывали влияния.

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INFLUENCE OF SOME ALKALOIDS ON PHYSICAL ACTIVITY AND BODY TEMPERATURE OF ANIMALS

Abstract. In the article presented study of the influence of alkaloids anabasine, anabasamine and lupinine in different doses on the physical activity and body temperature of animals. We analyzed that alkaloids reduce physical activity and lower body temperature.

Keywords: alkaloids, anabasine, anabasamine, lupinine, physical activity, temperature, locomotion, getting up.

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ВЛИЯНИЕ НЕКОТОРЫЕ АЛКАЛОИДОВ НА ДВИГАТЕЛЬНУЮ АКТИВНОСТЬ И ТЕМПЕРАТУРУ ТЕЛА ЖИВОТНЫХ

Аннотация. В статье приведены данные по изучению влияния алкалоидов анабазина, анабазамина и лупинином в различных дозах на двигательную активность и температуру тела животных. Мы анализировали что, алкалоиды уменьшают двигательную активность и снижают температуру тела.

Ключевые слова: алкалоиды, анабазин, анабазамин, лупинин, двигательная активность, температура, локомоция, вставания.

Актуальность исследований. В настоящее время непрерывно увеличение количества различных заболеваний и приоритетной задачей для будущего каждого общества является создание для физического здоровья человека. В мировом уровне ведутся научные исследования для подтверждения выделенных из растений алкалоидов в качестве перспективных источников при разработке лекарственных препаратов в целях профилактики и лечения различных заболеваний. Одним из этих растений является вид *Anabasis aphylla* L – Ежовник безлистный, которые рекомендована как сельскохозяйственное сырьё, находящее применение в разных отраслях промышленности [4, 48–56], в том числе в фармакологии. Из 3 алкалоидов, выделенных из этого растения [5, 292], два относятся к пиридиновому (анабазин, анабазамин) и лупинин к хинолизидиновому рядам. Влияния алкалоидов анабазина, анабазамина и лупинина на разных процессах организма животных были освещены в работах некоторых ученых [1, 26–31., 2, 20–22., 3, 40–44]. Однако влияние этих алкалоидов на двигательную активность и температуру тела животных подробно неизучена.

Объекты и методы исследования. К изучению нейрофармакологической активности алкалоидов, мы решили проверить полулетальная доза ($ЛД_{50}$) алкалоидов при внутрибрюшинном введении для мышей, крыс и подкожном для лягушек в условиях Намангане.

На мышах установили, что их $ЛД_{50}$ особенно не отличается от установленных в условиях Ташкента [6, 37–44]: анабазин 18,8 мг/кг, анабазамин 159 мг/кг и лупинин 263 мг/кг. На крысах $ЛД_{50}$: анабазин 20 мг/кг, анабазамин 175 мг/кг и лупинина 250 мг/кг. На лягушках анабазин 24 мг/кг, анабазамин 400 мг/кг и лупинин более 480 мг/кг. В другие работы токсичность этих алкалоидов на крысах и лягушках не исследовали.

Двигательную активность животных оценивали по двум показателям: по локомоции (горизонтальный компонент ориентировочной двигательной активности) и по вставаниям (вертикальный компонент ориентировочной двигательной активности).

Результаты исследований и их обсуждения. Алкалоиды испытывали в дозах: анабазин (1,5; 3 и 6 мг/кг), анабазамин (12,5; 25 и 50 мг/кг) и лупинин (20, 40 и 80 мг/кг) или 1/12, 1/6 и 1/3 $ЛД_{50}$. Через 30 минут после введения алкалоиды только в большой дозе достоверно угнетали оба компонента двигательной активности мышей (таблица 1). Эти дозы алкалоидов не изменяли двигательную активность через 1; 2; 3 и 4 часа после введения в другой серии опытов.

На крысах получены сходные результаты: анабазин (6 мг/кг), анабазамин (50 мг/кг) и лупинин (80 мг/кг) через 1 час после введения достоверно угнетали оба компонента двигательной активности, а через 2; 3 и 4 часа после введения не действовали.

Таблица 1.– Влияние алкалоидов (через 30 мин. после введения) на двигательную активность мышей (по локомоции и вставлениям)

№	Препарат	Доза, мг/кг	Локомоция	Вставания
1.	H_2O	–	17,10 ± 2,00	9,40 ± 1,64
2.	Анабазин	1,5	14,20 ± 1,20	10,40 ± 3,00
3.	Анабазамин	12,5	15,70 ± 2,20	6,90 ± 2,90
4.	Лупинин	20	13,70 ± 3,00	6,60 ± 2,30
5.	H_2O	–	17,10 ± 3,15	11,20 ± 3,34
6.	Анабазин	3	19,60 ± 2,65	10,50 ± 3,24
7.	Анабазамин	25	11,60 ± 3,61	3,40 ± 1,58
8.	Лупинин	40	14,20 ± 1,32	8,90 ± 2,45
9.	H_2O	–	23,75 ± 2,30	18,62 ± 3,02
10.	Анабазин	6	15,90 ± 2,01**	9,00 ± 3,31*
11.	Анабазамин	50	14,12 ± 2,83**	0,90 ± 0,40***
12.	Лупинин	80	15,00±1,77**	7,20±3,81*

*Примечание: * P < 0,05; ** P < 0,02; *** P < 0,001. В каждой группе по 8 мышей. Алкалоиды вводили внутрибрюшинное*

Таким образом, алкалоиды оказывают незначительное и кратковременное действие на двигательную активность. На мышах они (в дозе 1/3 $ЛД_{50}$) только через 30 мин. после введения уменьшали двигательную активность. Поэтому в дальнейших исследованиях взаимодействия алкалоидов с другими препаратами измерения проводились через 1 час и позже после введения алкалоидов, когда уже проходило их седативное действие (за исключением некоторых опытов).

На мышах через 30 мин. после введения анабазин (6 мг/кг), анабазамин (25 и 50 мг/кг) и лупинин (80 мг/кг) достоверно снижали температуру тела. В других испытанных дозах они не действовали (таблица 2).

Таблица 2.– Влияние алкалоидов (через 30 мин. после введения) на температуру тела мышей

№	Препарат	Доза, мг/кг	Температуры (от исходной)
1	*2*	*3*	*4*
1.	H_2O	–	+0,27 ± 0,07
2.	Анабазин	1,5	+0,22 ± 0,10
3.	Анабазамин	12,5	+0,01 ± 0,10
4.	Лупинин	20	+0,91 ± 0,40
5.	H_2O	–	–0,61 ± 0,33
6.	Анабазин	3	–0,40 ± 0,10
7.	Анабазамин	25	–2,20 ± 0,38*
8.	Лупинин	40	–1,26 ± 0,25
9.	H_2O	–	+0,37 ± 0,02
10.	Анабазин	6	–1,40 ± 0,50**

1	*2*	*3*	*4*
11.	Анабазамин	50	–3,75 ± 0,40***
12.	Лупинин	80	–1,52 ± 0,41**

*Примечание: * P < 0,05; ** P < 0,02; *** P < 0,001. В каждой группе по 8 мышей. Алкалоиды вводили внутрибрюшинное*

В таблице 2 приведены результаты одного из 4 опытов этой серии (комнатная температура была 18–22 °С). Достоверное снижение температуры сохранялось только через 1 и 1,5 часа после введения, а через 2; 3 и 4 часа температура восстанавливалась до нормальной величины. На крысах получены аналогичные результаты.

Таким образом, алкалоиды вызывают гипотермию, и это сильнее выражено у анабазамина. Наши результаты хорошо согласуются с данными И. С. Хазбиевич (1973), установившими, что анабазамин в дозах 25 и 50 мг/кг снижает температуру у белых мышей на 1,5–2,0 °С и 4,0–5,0 °С соответственно.

Таким образом, алкалоиды уменьшают двигательную активность и снижают температуру тела. Поскольку они действуют так только в больших дозах (примерно 1/3 $ЛД_{50}$) и в первые 15–30 минут, угнетающее действие можно расценить как слабое и кратковременное.

Правда, антидепрессанты, обладающие транквилизирующим и седативным действием у больных, тоже уменьшают двигательную активность в дозах, близких к дозам алкалоидов, 1/3 $ЛД_{50}$.

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Section 3. Life sciences

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MODERN CONCEPT OF QUALITY OF LIFE RESEARCH IN ONCOLOGY

Abstract. The article deals with the modern concept of studying the quality of life of patients with oncology. Based on the experience of many researchers, the author argues that today it is the well-being of a person, bringing the life of patients closer to the level of practically healthy people is one of the main goals of treatment. Cancer science is no exception in this regard. The question not only of "how long did the patient live", but also "how he lived these years", is increasingly taking place in scientific publications of recent years.

Keywords: quality of life, research concept, health-related quality of life.

As early as the middle of the twentieth century, representatives of humanistic psychology (V. Frankley et al.) Noted the need to develop a humanistic paradigm in medicine and stressed the need to study and treat a person who freely and responsibly decides how to deal with various situations, including illness.

Today it is the well-being of a person, bringing the life of patients to the level of practically healthy people, is one of the main goals of treatment. In this respect, cancer science is no exception. The question not only about "how long the patient lived", but also about "how he lived these years" is increasingly encountered in scientific publications in recent years.

Interest in the problem of the quality of life of people suffering from various diseases was formed in the middle of the twentieth century and required a study of not only the prevalence of diseases but also their impact on professional activity. For a long time, this criterion was considered only in the social aspect and meant the degree of satisfaction with work, leisure, living conditions, the level of satisfaction of needs, communication, etc. the well-being of the population.

Perhaps the first attempt at a medical interpretation of this phenomenon was the work of Professor D. A. Karnovsky, who published the article "Clinical Evaluation of Cancer Chemotherapy" in 1947. Thus, the first patients whose quality of life became the subject of medical research were cancer patients. This publication was the beginning of the development of the science of quality of life in general.

In 1948, WHO formulated a fundamentally new definition of health as a state of complete physical, mental and social well-being, and not just the absence of disease. At this time, the concept of "health-related quality of life" and attempts to assess this important and controversial parameter appeared in medicine.

Today there are many definitions of the quality of life, each of which supplements and concretizes the interpretation of this term, but so far there is no generally accepted definition of this concept.

Quality of life is an essential characteristic that ensures the physical, social, and psychological functioning of the patient. In accordance with the above definition of health, WHO defines QOL as the individual ratio of a person's position in society in the context of his culture and value system with the goals of this person, his plans, opportunities, and the degree of disorder. As you can see, the fundamental properties of the quality of life are multicomponent and subjective in their assessment.

Considering that methodological guidelines for studying the quality of life are given by philosophical anthropology, and specific knowledge is formed by medical sciences, it is advisable to determine the quality of life with the integration of primary sociological and secondary medical approaches into it. It reads: "The quality of life is the correspondence of the psychosomatic state of a person to his social status."

A similar definition of the quality of life was proposed by N. K. Wenger: the quality of life is "satisfaction from psychosocial and other forms of activity in conditions of limitations associated with the disease."

The US Medical Encyclopedia of Quality of Life gives a simpler definition: "Quality of life is the degree to which human needs are met."

The author of the St. George's Hospital Life Quality Questionnaire (SGRQ) P. V. Jones adjusts the definition of quality of life from a physician's point of view. It sounds like "the correspondence of desires to those possibilities that are limited by the disease."

The existing set of definitions of the quality of life is a clear indication of the lack of a unified approach to the formulation of this concept. This is due to the fact that it is very difficult to explain all the components and aspects of such a voluminous concept.

Traditionally, this concept has, as it were, three components. First, it covers different aspects of a person's life: living conditions, professional activity, home environment. Secondly, the medical aspects of the quality of life: the impact of the disease itself and the restrictions resulting from the disease, as well as the impact of treatment on the patient's life. Finally, the quality of life itself: the patient's complaints, his functional capabilities, the perception of life changes associated with the disease, general well-being.

Thus, this term includes physical, psychological, and social well-being as perceived by the patient himself, and allows a qualitative assessment of the impact on the listed components of factors such as illness and treatment methods.

In modern foreign medicine, the term "quality of life-related to health" is widely used, implying that there is another aspect that is not related to health: the impact of the environment, economic, political, and spiritual changes. The concept of "health-related quality of life" allows for a deep and multifaceted analysis of the physiological, psychological, emotional, and social problems of a sick person.

The main tool for studying the quality of life is profiles (assessment of each component of the quality of life separately) and questionnaires (for a comprehensive assessment). Both those and others can be general (to assess health in general) and special (to study specific nosologies). At the same time, according to a number of authors, all of them do not assess the clinical severity of the disease but reflect how the patient transfers his illness.

Today there are about 400 questionnaires of the quality of life. They are widely used in clinical practice, defining those areas that are most affected by the disease, thereby characterizing the condition of patients with various forms of pathology. Not a single study of the effectiveness of a pharmacological drug today can be conducted without studying this parameter.

The study of the quality of life in oncology plays a significant role both in research work and in clinical practice. In oncology, quality of life studies have been regularly used for over 30 years. According to MedLine and CANCERLIT (US National Library), in

2008 alone, more than 5,000 references to the quality of life research could be found.

The methodology for studying the quality of life makes it possible to accurately describe a complex range of multifaceted and multifaceted disorders that occur with a patient with a malignant tumor during the development of the disease and its treatment. According to the FBA guidelines published in the USA in 1985, the assessment of the patient's quality of life should be included in clinical trials related to the introduction of new drugs in oncology.

At a joint conference of the US National Cancer Institute (NCI) and the American Society of Clinical Oncology (ASCO) in 1996, it was postulated that quality of life is the second most important criterion for evaluating the results of anticancer therapy after survival.

As applied to oncological practice, the concept of the study of the quality of life has ample scope for application and allows:

1) Optimize the standardization of treatment methods;

2) Carry out an examination of new methods of treatment, based on international criteria adopted in most developed countries;

3) Improve the quality of examination of new medicinal products;

4) Provide full-fledged individual monitoring of the patient's condition with an assessment of early and long-term results of treatment;

5) Develop predictive models for various forms of cancer;

6) Conduct socio-medical population studies with the allocation of risk groups in malignant tumors;

7) Provide dynamic monitoring of risk groups and evaluate the effectiveness of prevention programs;

8) Study and conduct an economic justification of treatment methods, taking into account pharmaco-economic indicators: "cost-utility", "cost-effectiveness", etc.

To assess the quality of life of cancer patients, both general and special questionnaires are used. The former is designed to assess the quality of life of both healthy and sick, regardless of the type of disease. The latter is designed for patients with various diseases.

In oncology, the following general questionnaires are used:

1) Developed in the 70s – the Quality of Well-Being Index (QWB) and the Sickness Impact Profile (SIP);

2) Developed in the 80s – the Nottingham Health Profile (NHP) and the Quality of Life Index (QLI);

3) Developed in the 90s – the Questionnaire for assessing the quality of life of the European Group for Quality of Life (EuroQoL) and the General Health Questionnaire (SF-36).

The most commonly used general questionnaires to measure the quality of life in patients with malignant disease are SF-36 and EuroQoL. Their advantage is their widespread use, ease of questioning, and high validity. More than 90% of clinical trials in Russia use the SF-36 questionnaire.

Special questionnaires:

1. Questionnaire of the European Organization for Research and Treatment of Cancer (EORTC QLQ-C30).

2. Oncology Function Assessment Questionnaire (FACT-G).

3. Index of functioning in cancer (Functional Living Index Cancer, FLIC).

4. Inventory of assessment of difficulties in cancer (Cancer Inventory of Problem Situations, CIPS).

5. Rehabilitation Evaluation System (CARES).

The most common are EORTC–C30 and FACT-G with additional modules for selected nosological forms of cancer. These questionnaires are widely used in multicenter clinical trials in Europe, the United States, and Canada. A detailed description of general and specific questionnaires used in oncology can be obtained from the Internet on the websites of the relevant research organizations.

In addition, in everyday practice, scales and profiles are widely used to assess individual manifestations of cancer, primarily pain: Brief Pain Inventory (BPI), McGill Pain Questionnaire, Memorial Pain Assessment Card) and weakness: Brief Fatigue Inventory (BFI), Pearson-Byars Fatigue Feeling Checklist, Cancer Fatigue Scale.

Thus, the study of the quality of life is a reliable, informative, and economical method for assessing the patient's health status both at the group and at the individual level. In cancer research, the quality of life is an important criterion for evaluating the effectiveness of treatment and has prognostic value. Quality of life assessment in clinical trials improves the quality of the trial itself.

Conclusion. A change in approaches to the provision of medical care is a modern trend that has embraced many countries of the world. Today, in the developed countries of the world, the medical model, which has as its goal only the elimination of the disease and the restoration of the functioning of the human body, is gradually being replaced by a model focused on the psychosocial approach. Such a concept requires not only the restoration of the biological function of the body but also the normalization of its psychological and social functioning.

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Section 4. General biologists

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SPECIFIC MAMMALIAN IMMUNE RESPONSE TO NEMATODE INFESTATION

Abstract. The article analysis the specific mammalian immune response to nematode infestation. The obtained nematode antigens are described. Titers of antibodies in THA and ELISA in the period of infestation and after deworming are given.

Keywords: nematode antigens, biological properties of antigens, immune reactions, antibody titers, mammals.

Introduction

To understand the mechanisms of antiparasitic immunity development, it is necessary to understand the antigenic composition of parasites of different species, including nematodes. Nematode diseases are associated with the intake of exogenous and endogenous, or somatic, antigens into the body of homoothermic animals. Exogenous antigens are part of the secretions and excretions of nematodes. They are secreted during the growth, development and penetration of larvae into tissue, as well as during the life cycle of the imaginal stages of the nematodes. Somatic antigens are only released to wild ungulates after the nematodes have died. The secretions and excretions of nematodes at different stages of development have different antigenic activity. Immunizing activity increases sharply during larval molting periods, when the host receives large quantities of nematode metabolic products with antigenic properties.

Exogenous and endogenous antigens of nematodes are of protein and polysaccharide nature. They are characterized by polyfractionation and contain up to twenty or more antigen fractions. Different nematode tissues include, in addition to the common antigens of different tissues, specific fractions, i.e. tissue-specific antigens. In some cases, different tissues of the same nematode species contained fewer common antigenic components than the same tissue of different species.

Objective: To determine the biological properties of mammalian nematode antigens and to establish their titers in THA and ELISA during infestation and after deworming.

Materials and methods

Obtaining nematode antigens. Somatic, excretory-secretory antigens were prepared from tegument and metabolites of nematodes. In order to prepare somatic antigens, the collected nematodes were washed with distilled water and mechanically milled using a straight blade mill. The resulting mixture was then disintegrated in a homogenizer with distilled water. The resulting homogenate was ultrasonically

disintegrated at 35 kHz for 15 minutes. Detritus was removed by centrifugation of the mixture at 12,000 g for 15 minutes. Part of the supernatant, containing water-soluble proteins, was frozen at minus 18 °C and the other part was preserved with 0.4% phenol solution and stored at plus 4 °C.

For the production of excretory-secretory antigens, the nematodes were washed with phosphate salt buffer with a hydrogen ion concentration of 7.2 at plus 37 °C, and the volume was brought up to 1 l with distilled water. They were then incubated for 24 hours in 0.1 M phosphate-salt buffer with hydrogen ion concentration of 7.2 at plus 37 °C in a 1:10 ratio with addition of benzylpenicillin sodium salt 100 U/cm^3 and streptomycin sulphate 100 μg/cm^3. Stirred, the nematodes were sedimented and the solution was separated. The resulting supernatant was centrifuged at 12,000 g for 15 min at plus 4 °C. The antigen solution was preserved with 0.4% phenol and stored at plus 4 °C.

Determination of the biological properties of nematode antigens. Protein content in the samples obtained was determined by trichloroacetic acid precipitation and spectrophotometry at 540 nm. The solution was adjusted to protein concentration of 1 mg/cm^3, using distilled water as a diluent. The antigen solution was preserved with 0.4% phenol solution and stored at plus 4 °C.

Harmlessness of mammalian nematode antigens was determined in clinically healthy white mice of both sexes, weighing 19–21 g and not previously tested (10 mice in each group). The animals were kept in a constant temperature room 24 hours before and during the test. Two hours before weighing and selecting the animals for testing, food and water were taken away from them. Animals of the experimental group 1 received somatic antigen 0.5 cm^3 each, animals of the experimental group 2 received excretory-secretory antigen 0.5 cm^3 each, animals of the control group received physiological sodium chloride solution 0.5 cm^3 each. Preparation solutions were preheated to 37 °C. The preparations were injected into the abdominal cavity. Animals of the experimental and control groups were observed for 10 days.

Toxicity of the obtained antigens was determined in a lethal effect test on white mice weighing 16–18 g. The preparations in doses of 0.5; 1; 5; 7 and 10 mg were diluted with 0.5 ml saline. Each dose was tested on 5 white mice, which were premonitored for 3 days. After antigen administration, animals were observed for 10 days.

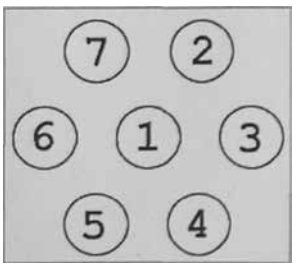
Reactogenicity of excretory-secretory as well as somatic antigens of wild ungulate nematodes was tested in laboratory guinea pigs. To guinea pigs the antigens were injected 0.1 cm^3 at a dilution of 1:20 intradermally. The reaction in animals was recorded after 24 hours by the presence of local redness (erythema) at the injection site.

Species specificity of excretory-secretory as well as somatic antigens of mammalian nematodes was tested in guinea pigs using the anaphylaxis method. Experimental and control groups of 5 animals each were formed for studies by this method. Guinea pigs were sensitized with 0.25 cm^3 antigens. On the 20th day after sensitization, 0.2 cm^3 of homologous and heterologous antigens were injected intrathecally into the animals. Animals were monitored after antigen administration.

Obtaining hyperimmune serum and performing immunodiffusion reactions

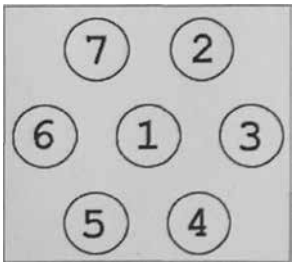
For the immunodiffusion reactions, we previously obtained nematode antigens and hyperimmune serum to them. Blood samples were taken from rabbits in the control group to obtain normal sera. Prior to immunization, the protein concentration of the antigens was measured and the protein level was 1 mg/cm^3. For immunization, rabbits were selected by analogue principle with a live weight of 2.5–3 kg, 4 animals per group. The antigens were administered four times at 14 day intervals. Immunization was carried out subcutaneously at several points. The antigen was mixed with an emulsion obtained from Esso-52 mineral oil in a 1:1 ratio to a volume of 4 cm^3. Blood samples were taken every seven days

from rabbits of experimental and control groups to obtain serum and to establish the feasibility and sensitivity of the immunodiffusion test according to the following diagram:



1) hyperimmune serum of rabbits immunized with excretory-secretory nematode antigen
2) serum from rabbits of the control group (not immunized)
3) capsule antigen of *Pasteurella multocida*
4) tissue proteins of infected animals
5) tissue proteins of intact animals
6) excretory-secretory nematode antigens
7) saline

Figure 1. Diagram of immunodiffusion test with hyperimmune rabbit serum obtained by immunization of experimental animals with excretory-secretory nematode antigen



1) hyperimmune rabbit serum immunized with somatic nematode antigen
2) serum from control rabbits (not immunized)
3) capsule antigens of *Pasteurella multocida*
4) tissue proteins of infected animals
5) tissue proteins of intact animals
6) somatic antigens of nematodes
7) saline

Figure 2. Diagram of immunodiffusion test with hyperimmune rabbit serum immunized with somatic nematode antigens

Obtaining indirect hemagglutination inhibition test (THA) using the antigens

THA was performed using a micromethod in polystyrene round bottom plates. The dilutions of serum from 1:10 to 1:10240 were used. The pattern of erythrocyte sensitisation by antigens was found to depend reliably on a number of factors (temperature, pH, duration of sensitisation, etc.). It should be noted that the phenomenon of limit sensitization of erythrocytes by protein antigens is of a complex nature due to the influence of various conditions modifying this process [2]. We used a 5% solution of acroleinized sheep red blood cells for THA in mammalian nematodes. They were tanninized by adding tannin solution (1:20000) in a 1:1 ratio. Sensitization of ram erythrocytes was carried out with a solution of mammalian nematode somatic antigen. For this purpose, the working solution of somatic antigen was mixed with a solution containing tanninized red blood cells at a 1:1 ratio. We found that the required level of hemosensitization is achieved in 2 hours at a temperature of 37 °C and a hydrogen ion concentration of 7.2.

Determination of antibody titres by immunological methods in animals during infestation

Determination was carried out by THA and ELISA. THA was performed using a micromethod in polystyrene round bottom plates. ELISA was performed using solid-phase indirect modification, the reaction was recorded at a wavelength of 492 nm.

ELISA using dilutions of sera from 1:10 to 1:1600 established the nature of the relationship with observed optical density, which was used later to choose the optimal parameters for recording the results obtained. Diagnostically significant level was defined as an excess of 1.5 or more times the optical density of the serum tested (S/N) over the negative serum. On examination of sera obtained from

healthy animals, the S/N value was 1.00 ± 0.01 and the triple standard deviation was 0.17, allowing the S/N level of 1.5 to be used for diagnostic purposes. Subsequently, different dilutions of serum and antigen for use in immunoassay were selected to investigate the sensitivity in a comparative aspect of their different dilutions.

Results and discussion

Determinations of the harmlessness and toxicity of nematode antigens

Toxic effects of helminths on the host are complex. Helminths undoubtedly have toxic properties, and the degree of their manifestation varies from species to species. Sometimes the toxic effects exhibited by one species are extrapolated to other helminth species without regard to the host response.

In the available literature, there are various points of view related to the discussion of this issue. There is evidence that a few drops of horse parascarid liquid injected into the eye already after 10 minutes caused a violent reaction in a large proportion of animals (severe lacrimation, red eyes, swollen eyelids), and in 10% of horses anxiety, shortness of breath, profuse sweating and diarrhoea were noted. However, in almost all cases, these symptoms disappeared after a few hours. Other researchers have obtained the opposite results in similar experiments. Therefore, non-sensitized animals have been found to tolerate large doses of ascarid products injected intraperitoneally. But if experimental animals were previously sensitized with ascarid antigens, parenteral administration of ascarid products causes a violent response, manifested as anaphylactic shock, sometimes fatal. It has been shown that live ascarids kept in a solution without nutrients for about 10 hours do not release toxins as long as their cell and tissue structure remain unchanged. The liquid then takes on toxic properties as necrobiosis of the ascarid tissues takes place, accompanied by an increase in the release of toxic nitrogenous products (biogenic amines) owing to protein degradation. Thus, the life products of mature ascarids are not considered to have toxic properties. However, these studies do not prove the absence of toxic substances in helminth tissues or larval metabolites [5].

In determining the harmlessness, it was found that during the observation period, no death of animals of the experimental and control groups was observed, no deviations from the physiological norm were detected. Therefore, the somatic and excretory-secretory antigens of nematodes obtained by us are harmless.

Table 1 – Toxicity of nematode antigens

Antigen name	Method of introduction				
	Intravenously				
	Antigen dose, mg	Number of animals	Number of illness cases	Number of fatalities	Number of survivors
1	*2*	*3*	*4*	*5*	*6*
Somatic antigen	0.5	5	0	0	5
	1.0	5	0	0	5
	5.0	5	0	0	5
	7.0	5	5	0	5
	10.0	5	5	1	4
Excretory-secretory antigens	0.5	5	0	0	5
	1.0	5	0	0	5
	5.0	5	0	0	5
	7.0	5	0	0	5
	10.0	5	0	0	5

Toxic properties of somatic and secretory-secretory antigens were studied by injecting these antigens into white mice intravenously at a rate of 0.1 cm^3/s into the caudal vein. The results of these studies are presented in (Table 1).

As shown in (Table 1), somatic antigens are more toxic. Their intravenous administration at a dose of 10.0 mg caused the death of 20% of the animals. When these antigens were administered intravenously at a dose of 7.0 mg the animals showed tremors lasting for a maximum of 30 minutes, with a subsequent extinction of these phenomena.

At intravenous administration of excretory-secretory antigens at doses including 7.0 and 10.0 mg, no visible changes in animal behaviour were observed.

Our results show that the excretory-secretory antigens of nematodes are not toxic, while the somatic antigens are toxic, but the degree of toxicity is weak.

Determination of reactogenicity and species specificity of nematode antigens

The results of our study showed that during the period of observation death of laboratory animals was not noted, the area of local hyperemia did not exceed 3 mm necrosis and tissue swelling at the injection site was not recorded, the remains of the antigen solutions at the injection site were not found.

In the study of species specificity it was found that introduction of permissive doses of homologous antigens in guinea pigs developed typical clinical signs of anaphylactic shock. At introduction of heterologous antigens (pasteurellosis antigen, eimeria antigen) and physiological sodium chloride solution no signs of anaphylaxis were observed (table 2).

Table 2. – Determination of specificity of animal nematode antigens using the anaphylaxis method

Sensitizing antigen	**Permissive antigen or preparation**	**Test result**
1	***2***	***3***
Excretory-secretory antigen	Excretory-secretory antigen	The death of laboratory animals was observed within 5 minutes.
	Somatic antigen	Excitation, tachycardia and hyperthermia have been observed in laboratory animals.
	Pasteurellosis antigen	No changes in animal behaviour were observed.
	Eimeria antigen	No changes in animal behaviour were observed.
Somatic antigen	Excretory-secretory antigen	The death of laboratory animals was observed within 1 hour.
	Somatic antigen	Excitation, tachycardia and hyperthermia have been observed in laboratory animals.
	Pasteurellosis antigen	No changes in animal behaviour were observed.
	Eimeria antigen	No changes in animal behaviour were observed.
Negative control	Excretory-secretory antigen	No changes in animal behaviour were observed.
	Somatic antigen	No changes in animal behaviour were observed.
	Saline sodium chloride solution	No changes in animal behaviour were observed.

Therefore, the excretory-secretory and somatic antigens of mammalian nematodes are areactogenic and specific.

Determination of the completeness of animal nematode antigens

Results showed that sera obtained reacted with homologous (somatic) antigens with the formation

of 4 precipitation lines, with heterologous (secretory-excretory) antigens – 3 precipitation lines.

The sensitivity of immunodiffusion test application of hyperimmune serum obtained using secretory-excretory and somatic antigens of animal nematodes is high and amounts to 4–5 $\log_2$ и 4–6 $\log_2$ respectively (Table 3).

Table 3.– Results of immunodiffusion test sensitivity determination

Tested serum	Antigen used	Antibody titer (mean value $\log_2$)
1	*2*	*3*
Hyperimmune rabbit serum obtained by immunisation with excretory-secretory antigens	Excretory-secretory antigen	5*
	Somatic antigen	4*
	Pasteurellosis antigen	–
	Tissue proteins of an infected animal	–
	Tissue proteins of a healthy animal	–
	Saline solution	–
Hyperimmune rabbit serum obtained by immunisation with somatic antigens	Excretory-secretory antigen	4*
	Somatic antigen	6*
	Pasteurellosis antigen	–
	Tissue proteins of an infected animal	–
	Tissue proteins of a healthy animal	–
	Saline solution	–
Hyperimmune rabbit serum obtained by immunisation with pasteurellosis antigens	Excretory-secretory antigen	–
	Somatic antigen	–
	Pasteurellosis antigen	6*
	Tissue proteins of an infected animal	–
	Tissue proteins of a healthy animal	–
	Saline solution	–
Blood serum of an intact animal (normal rabbit serum)	Excretory-secretory antigen	–
	Somatic antigen	–
	Saline solution	–

*Note: * – $P \leq 0.001$*

Antibody titres in THA

For nematode infestation in ungulate animals, the diagnostic efficacy in THA was 85%, whereas in the same group, 65% of patients were detected by the flotation method. The highest antibody titer was10 $\log_2$, the lowest – 1 $\log_2$. THA and the flotation method was 100%.

THA titres from 1:10 to 1:2560 were obtained for excretory-secretory antigens, and from 1:10 to 1:1280 for somatic antigens (Table 4). Of the 115 ungulates examined, 64 animals (55.6%) were identified using the somatic antigen and 96 animals (83.5%) using the excretory-secretory antigen.

Table 4.– Results of THA performed on animal sera using nematode antigens

Dillution	Number of positive samples using excretory-secretory nematode antigens	Number of positive samples using somatic nematode antigens
1	*2*	*3*
1	2	3

1	*2*	*3*
1	2	3
1:10	1	3
1:20	3	1
1:40	1	4
1:80	7	16
1:160	23	14
1:320	32	16
1:640	18	9
1:1280	9	1
1:2560	2	–
1:5120	–	–

The data obtained are in agreement with the findings of M. E. Onufrienko, who found that the most active and specific are secretory-excretory trematodes. Somatic antigens have sufficient specificity, but show less activity in THA and ELISA with positive sera from mammals infected with trematodes [4].

The dynamics of the level of specific antibodies to nematode exposure in experimentally infected animals were studied in THA. The infection of animals with invasive culture of nematodes leads to increased concentration of specific antibodies in the blood serum, and on the 10th day of infection, their titer was 7.22 ± ± 0.79 $\log_2$. The maximum increase in the concentration of specific antibodies was on day 21 of the study, up to 9.10 ± 0.12 $\log_2$. No nematode-specific antibodies were detected in intact control animals (Table 5).

Table 5 – Dynamics of nematode-specific antibody levels in THA

Antibodies titer, $\log_2$ (M±m)				
Research period, days after infestation				
Before infestation	3	10	21	45
0	6.89±0.90	7.22±0.79	9.10±0.12	6.22±1.02

Determination of antibody titres by immunological methods in infested animals

The best results with the nematode excretory-secretory antigen 1:100 and somatic antigen 1:200 with blood serum diluted 1:100, were shown in blood sera from nematode-infested animals. The optical density was 5.31 for the somatic antigen and 5.49 for the excretory-secretory antigen (Table 6).

Table 6. – Determination of ELISA comparative sensitivity in different dilutions

Antigen dillution		**Blood serum dillution**				
		1:0	**1:25**	**1:50**	**1:100**	**1:200**
		Mean optical density				
1	***2***	***3***	***4***	***5***	***6***	***7***
Somatic antigen	1:0	1.21	1.27	1.34	1.52	1.58
	1:25	1.34	1.62	1.92	2.45	2.34
	1:50	1.42	1.71	2.23	2.45	2.55
	1:100	1.58	3.21	3.85	4.12	4.05
	1:200	1.64	4.33	4.72	**5.31**	4.92
	1:400	1.80	2.01	2.23	2.35	2.30

1	*2*	*3*	*4*	*5*	*6*	*7*
Excretory-secretory antigen	1:0	1.37	1.45	1.71	1.92	1.95
	1:25	1.65	1.90	2.45	2.70	2.65
	1:50	1.75	2.59	2.82	3.21	3.11
	1:100	1.80	3.94	4.92	**5.49**	5.11
	1:200	1.89	2.71	2.92	3.47	3.32
	1:400	1.92	2.25	2.47	2.60	2.50

When 45 animal serum samples were examined by ELISA, 34 out of 38 samples were positive for the presence of nematodes, as confirmed by the helminthological flotation method. The use of somatic antigen in the ELISA found a sensitivity of 89.5% and a specificity of 100% for the detection of nematodes.

The highest antibody titre of 8.34 ± 0.78 $\log_2$ as registered in the THA in the infected animals, on the 28th day of investigation, while in the intact animals this indicator was 0.14 ± 0.12 $\log_2$. After deworming the antibody titre gradually decreased, and from the 70th day its value became lower than a diagnostically significant level and on the 84th day of the investigation was 0.78 ± 0.14 $\log_2$. The gradual decrease of average values of antibody titres in blood serum in the THA in animals after application of antihelminthic preparation is connected with their liberation from nematodes, that is with the termination of antigenic load on animals' organism. Animal recovery is accompanied by a decrease in specific antibodies below the diagnostically significant level after 28 days (Table 7).

Table 7. – Dynamics of specific antibodies in THA in animals under the influence of nematodes and after application of antihelminthic preparation

Day of test	**Antibody titre, $\log_2$ (M±m)**		
	Animal group		
	Infested animals	**Animals treated with the preparation**	**Intact animals**
1	7.24 ± 0.72***	8.14 ± 0.12***	0.62 ± 0.36
14	7.18 ± 0.56***	7.18 ± 0.42***	0.46 ± 0.22
28	8.34 ± 0.78***	5.02 ± 0.52***	0.14 ± 0.12
42	7.32 ± 0.64***	2.06 ± 0.74**	0.16 ± 0.12
56	6.56 ± 0.82***	1.46 ± 0.48*	0.18 ± 0.14
70	6.78 ± 0.74***	0.8 ± 0.36	0.25 ± 0.18
84	6.42 ± 1.12***	0.78 ± 0.14	0.18 ± 0.12

*Note: * – $p < 0.05$; ** – $p < 0.01$; *** – $p < 0.001$. The level of significance (p) is calculated in comparison with the values of intact animals*

The diagnostic efficacy of THA after treatment of animals with an anthelminthic preparation depends on the ability to produce a certain amount of specific antibodies to the nematode antigens in the blood. THA is known to be based on the phenomenon of antibody agglutination of the blood serum of a sick animal with an antigenic erythrocyte diagnosticum [3]. The receptor apparatus of red blood cells and antibody active sites capable of binding antigen epitopes (antigen-binding Fab fragments of immunoglobulins formed by hypervariable H- and L-chain regions) are of key importance in this interaction. IgG antibodies bind the highest weight in the THA (80% of serum antibodies), followed by IgM (10%) and IgA (9%). Negative THA in animals after nematode release is caused by a reduction in the number

of specific antibodies circulating in the blood that can bind nematode antigens.

The results showed that the ELISA of the infected animals had the highest antibody titres registered on days 14 and 28 of the tests, which were 3.22 ± ± 0.32 log_2 and 2.82 ± 0.14 log_2 respectively. In intact animals this indicator was 1.14 ± 0.02 log_2 and 1.16 ± ± 0.04 log_2. After deworming the antibody titre gradually decreased, and from the 70 th day its value became lower than the diagnostically significant level and was 1.34 ± 0.16 log_2 (table 8).

Table 8. – Dynamics of specific antibody levels in ELISA in animals exposed to nematodes and after application of anthelmintic preparation

Day of test	Mean optical density exceedance (M ± m)		
	Animal group		
	Infested animals	Animals treated with the preparation	Intact animals
1	2.72 ± 0.24**	2.54 ± 0.12**	1.12 ± 0.02
14	3.22 ± 0.32***	2.8 ± 0.16***	1.14 ± 0.02
28	2.82 ± 0.14***	2.48 ± 0.14***	1.16 ± 0.04
42	2.74 ± 0.18***	2.24 ± 0.18***	1.09 ± 0.04
56	2.66 ± 0.24***	2.02 ± 0.18***	1.12 ± 0.02
70	2.06 ± 0.32***	1.68 ± 0.12*	1.14 ± 0.03
84	2.28 ± 0.12***	1.34 ± 0.16	1.16 ± 0.04

*Note: * – $p < 0.05$; ** – $p < 0.01$; *** – $p < 0.001$. The level of significance (p) is calculated in comparison with the values of intact animals*

The absence of a diagnostic reaction in the ELISA after anthelmintic treatment is due to the fact that this method is based on the detection of IgG using their corresponding antispecies antibodies conjugated to a tagging enzyme (horseradish peroxidase). The degree of binding of specific IgG determines the intensity of staining after the enzymatic reaction in the detection of peroxidase activity with orthophenylenediamine. The concentration of the end product of the reaction (2,3-diaminophenazine) plays a major role in obtaining optical density values at the measured wavelength [1]. The intensity of the staining and therefore the exceedance of the optical density is directly related to the amount of specific IgG in the tested serum. Therefore, the absence of a positive ELISA result in animals when they are free of nematodes is due to a decrease in circulating specific class G immunoglobulins that can bind nematode antigens in the blood.

Conclusion

1. The biological properties of the nematode antigens have been determined: somatic and excretory-secretory antigens are specific, complete, harmless and weakly reactive.

2. The highest antibody titre of 8.34 ± 0.78 log_2 was registered on the 28 th day of the study in infected animals in THA, in intact animals this index was 0.14 ± ±0.12 log_2. In the ELISA of the infected animals the highest antibody titres were registered on the 14th and 28th days of the investigation, that was 3.22 ± ± 0.32 log_2 and 2.82 ± 0.14 log_2 respectively. In intact animals this indicator was 1.14 ± 0.02 log_2 and 1.16 ± 0.04 log_2.

3. After deworming both in THA and ELISA the gradual decrease of antibody titers was registered, and from the 70 th day their values became lower than diagnostically significant level and on the 84 th day of investigation in THA they were 0.78 ± 0.14 log_2, in ELISA – 1.34 ± 0.16 log_2.

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