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SPIS TREŚCI

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Przekazujemy w ręce Państwa – naszych Czytelników i Autorów – ostatni w tym roku zeszyt Kwartalnika i zarazem ostatni numer pod tytułem „Puls Uczelni – Higher School's Pulse". Nowy rok 2017 rozpoczynamy jako „Medical Science Pulse", a zmiana podyktowana jest profesjonalną koniecznością, ponieważ rozwój merytoryczny Kwartalnika wymaga specjalistycznego tytułu jednoznacznie wskazującego na naukowy i medyczny profil czasopisma. Rok 2016 był szczególnie wytężony w pracy nad doskonaleniem jakości naukowej, redakcyjnej i edytorskiej „Pulsu Uczelni". Pozyskanie nowych członków Rady Naukowej, poszerzenie grona międzynarodowych recenzentów, nowoczesny poziom edytorski, III Międzynarodowa Konferencja, a nade wszystko wartościowe prace badawcze z wielu ośrodków krajowych i zagranicznych, w większości w języku angielskim, to także Państwa zasługa. Wyrazy wdzięczności składamy Autorom za ogromną chęć publikowania i pełne życzliwości oceny! Dziękujemy wszystkim Recenzentom, Członkom Rady Naukowej, Redaktorom i Członkom Komitetu Redakcyjnego za wytężoną pracę i pomoc. Dziękujemy Władzom PMWSZ w Opolu za stałe wsparcie finansowe, przypominamy także, że zadania związane z szeroko pojętym procesem digitalizacji Kwartalnika i umiędzynarodowienia czasopisma wykonujemy w ramach umowy 583/P-DUN/2016 ze środków Ministra Nauki i Szkolnictwa Wyższego przeznaczonych na działalność upowszechniającą naukę.

Nieustannie zapraszamy Państwa do przesyłania wyników projektów badawczych. Najlepsze prace oryginalne tłumaczone będą na język angielski. Równolegle z wersją drukowaną czasopisma ukazuje się w bezpłatnym dostępie wersja elektroniczna o numerze e-ISSN 2449-9021. Wszystkie artykuły publikowane są w systemie Open Access na licencjach Creative Commons, aby Państwa publikacje mogły być czytane przez jak najliczniejsze grono odbiorców. Profesjonalna wersja elektroniczna czasopisma dostępna jest na stronie: http://higherschoolspulse.com/resources/html/cms/MAINPAGE.

W niniejszym zeszycie prezentujemy prace oryginalne na temat: oceny higienicznych warunków pracy lekarzy ginekologów-położników w obwodzie grodzieńskim na Białorusi; znaczenia wysiłku fizycznego w chorobie nowotworowej i jego postrzegania przez pacjentów onkologicznych oraz substancji dodatkowych w produktach żywnościowych dla niemowląt i małych dzieci. Prace poglądowe opisują: doświadczenia dotyczące strategii pisania podań o dotacje badań dla młodych pracowników nauki z perspektywy amerykańskiego uniwersytetu publicznego; metody treningowe wykorzystywane w eliminacji hipoksji treningowej; zagadnienie przyczyn, diagnostyki i leczenia halitozy oraz wybrane teorie starzenia się organizmów.

Zamykając piąty rok wydawania „Pulsu Uczelni" (lista czasopism B – 6 pkt MNiSW), zapraszamy do udziału w IV Międzynarodowej Konferencji Medical Science Pulse pt.: Young Scientists – from MSc to Assoc. Prof. (Młodzi naukowcy – od magistranta do habilitanta), która odbędzie się w dniach 18–19 maja 2017 roku w Państwowej Medycznej Wyższej Szkole Zawodowej w Opolu.

Zachęcamy do dalszej współpracy z Redakcją „Medical Science Pulse" w budowaniu nowej wizji naukowego czasopisma!

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HYGENIC ASSESSMENT OF THE WORKING CONDITIONS OF OBSTETRICS AND GYNECOLOGICAL DOCTORS

OCENA HIGIENICZNYCH WARUNKÓW PRACY LEKARZY GINEKOLOGÓW-POŁOŻNIKÓW

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A – przygotowanie projektu badania | study design, **B –** zbieranie danych | data collection, **C –** analiza statystyczna | statistical analysis, **D –** interpretacja danych | interpretation of data, **E –** przygotowanie maszynopisu | manuscript preparation, **F –** opracowanie piśmiennictwa | literature review, **G –** pozyskanie funduszy | sourcing of funding

SUMMARY

Background: Doctors of obstetrics and gynecology perform their professional duties under the influence of different occupational factors. Some of these factors are harmful and a detailed study of their impact on the health of health care workers is required.

Aim of the study: The study was a hygienic assessment of the working conditions of obstetricians and gynecologists, with the aim of identifying possible professional health risks.

Material and methods: The working conditions of 102 obstetricians and gynecologists working in the Grodno region in 2015 were investigated by using the data from their most recent workplace certification and by analyzing the hygienic parameters measured by the laboratory service of the Grodno regional center of hygiene, epidemiology, and public health.

Results: We have described all the occupational factors which were present in the workplaces of obstetricians and gynecologists and have indicated the possible risks posed by these factors to the health of the professionals. We have established that the presence of extragenital pathologies in female obstetricians and gynecologists, arising as a result of contact with harmful occupational factors, contributes to abnormalities in the functioning of the female reproductive system during preparation for pregnancy, and to the development of complications of pregnancy and delivery.

Conclusions: The working conditions of obstetricians and gynecologists may cause deterioration of the health of these professionals. Therefore, the creation and implementation of new preventive technologies for levelling the adverse impact of occupational factors represents an important scientific and practical problem.

KEYWORDS: obstetricians and gynecologists, working conditions, health

STRESZCZENIE

Wstęp: Lekarze ginekolodzy-położnicy wykonują obowiązki służbowe, na które mają wpływ czynniki zawodowe o różnym charakterze. Niektóre z tych czynników są szkodliwe dla zdrowia, co wymaga szczegółowej analizy ich oddziaływania na organizmy pracowników służby zdrowia.

Cel pracy: Celem pracy było przeprowadzenie oceny higienicznych warunków pracy lekarzy ginekologów-położników i identyfikacji ewentualnych zagrożeń zawodowych, mających wpływ na pogorszenie ich stanu zdrowia.

Materiał i metody: Warunki zatrudnienia 102 ginekologów-położników, którzy pracowali w obwodzie grodzieńskim w 2015 r., badano wykorzystując wyniki ostatniej certyfikacji pracy i analizując parametry higieniczne, które zostały uzyskane z pierwotnej dokumentacji wyników pomiarów wykonanych przez Laboratorium Regionalne Higieny, Epidemiologii i Zdrowia Publicznego Centrum Grodno.

Wyniki: Opisano wszystkie czynniki zawodowe występujące w pracy lekarzy ginekologów-położników, które mówią o możliwości zagrożenia lub pogorszenia stanu zdrowia w wyniku kontaktu z czynnikami środowiska pracy. Stwierdzono, że obecność pozagenitalnych patologii u kobiet ginekologów-położników w wyniku kontaktu ze szkodliwymi czynnikami zawodowymi przyczynia się do zaburzeń w funkcjonowaniu układu rozrodczego kobiety w czasie przygotowań do ciąży, jak również rozwoju potencjalnych powikłań ciąży i porodu.

Wnioski: Warunki pracy lekarzy ginekologów-położników mogą spowodować pogorszenie ich stanu zdrowia. W tym zakresie tworzenie nowych technologii prewencyjnych na rzecz niwelowania niekorzystnego wpływu czynników zawodowych jest ważnym problemem naukowym i praktycznym.

SŁOWA KLUCZOWE: ginekolodzy-położnicy, warunki pracy, zdrowie

Background

According to the World Health Assembly, more half of the world's population works, and this group plays the main role in the economic and social development of society. Workers' health is mainly conditioned by the presence in the workplace of harmful and dangerous occupational factors, and also depends on the efficiency of the protection measures provided by the medical organization.

Currently, about 40,000 doctors work in the health care system of the Republic of Belarus, of whom the vast majority are women of active reproductive age. The multifactorial impact of harmful factors in the workplaces of obstetricians and gynecologists puts them at risk of deterioration in health. The study of the working conditions of this group of medical personnel, and their hygienic assessment, is thus very topical [3].

Aim of the study

The aim of this study was to carry out a hygienic assessment of the working conditions of obstetricians and gynecologists, and to identify any professional health risks faced by them.

Material and methods

We studied the working conditions of 102 obstetricians and gynecologists who provided medical care in outpatient and inpatient conditions at health care organizations in the Grodno region during 2015. Women made up 83.3% of the group and 64.78% of these (55 women) were of reproductive age (23–49 years).

The hygienic assessment of working conditions was carried out by studying the results of the most recent workplace certification; this is the main instrument for receiving objective hygienic assessment about working conditions [6]. We also examined the hygienic parameters obtained from measurements carried out by the laboratory service of the Grodno regional center of hygiene, epidemiology, and public health.

Results

The results show that almost all the workplaces of obstetricians and gynecologists were located in adapted buildings of atypical construction, despite the modernization of the past decade. The offices of this category of doctors, who performed diagnostics and treatment on the premises of health care organizations for outpatients and inpatients, ranged in area from 22 to 47% of the area required by the hygienic standards.

The standards for the permissible ranges of air temperature, relative humidity, and air velocity were complied with in the vast majority of workplaces during the year. Thus, the microclimate parameters in the outpatient and inpatient premises mainly corresponded with the hygienic requirements, and in the final evaluation of working conditions were classified as being 2nd class (permissible) working conditions. The maximum air temperature was 22.3±0.1°C during the cold period of the year and 26.1±0.63°C during the warm period of the year. Due to the use of air conditioning systems in the hospital rooms where medical care was provided, the temperature changed only slightly over the year and was 23.1±0.8°C. The relative humidity did not exceed the normative parameters at any of the premises of the specialized health care organizations, being 50.3%±2.61% in the cold period of the year and 53.4%±2.57% in the warm period of the year. Air velocity was in the range of 0.16±0.02 m/s in the cold period of year, indicating poor mobility. However, the air velocity was higher than the norm during the warm period of the year in the outpatient premises, reaching 0.47±0.12 m/s on account of natural ventilation (open windows).

The illumination at all the evaluated workplaces was classified as permissible working conditions (class 2). Certain indicators of illumination did not comply with regulatory requirements at certain workplaces; however, the natural and artificial illumination was sufficient at all workplaces in the specialized health care organizations [17].

Bactericidal lighting from quartz lamps was used to disinfect air within the premises of the specialized health care organizations. Rules for their usage in the

workplace complied with the requirements for bactericidal lighting.

Aspects of the location of the specialized health care organizations, their adjacent territories, as well as a significant number of patients in the premises pointed to the need for a detailed study of noise levels in the workplaces of the obstetricians and gynecologists [20]. It was found that the main source of nonintense noise was technological equipment, but that the levels of noise corresponded to the hygienic standards throughout the working day. The impact of noise was rated as permissible (class 2). The level of general and local vibrations arising from the operation of medical equipment was normal according to the hygienic standards. Levels of ionizing and nonionizing radiation, as well as of infrasound and ultrasound, also did not exceed the norms. All these factors were thus classified as class 1 (optimal working conditions).

Occupational factors of a biological nature at the workplaces of obstetricians and gynecologists arise due to the need for constant direct contact with patients' biological material while providing medical care. This class of doctors are thus in a group that experiences a high risk of contracting infectious pathologies, given the conclusion of World Health Organization experts regarding the constant circulation of hospital strains of microorganisms which have high virulence and resistance [7, 22]. The influence of biological factors was determined by the significant bacterial air contamination of the working premises, as reported in the workplace certifications. The highest values of common bacterial contamination were found in the workplaces of those obstetricians and gynecologists who worked in outpatient health care organizations (214.7±12.48 microbial bodies per 1 m^3), while the lowest values were found in delivery rooms: 123.1±7.21 microbial bodies per 1 m^3 in physiological departments and 194.1±14.19 microbial bodies per 1 m^3 in observational departments, which exceeds the established parameters. The effects of such biological factors on obstetricians and gynecologists were rated as class 3.2 (harmful working conditions), given the duration of contact with patients, which was over 65% of working time.

During workplace certification, qualitative analysis of the air aimed at identifying chemical toxicants present at the premises of outpatient and inpatient health care organizations showed that the samples did not contain any chemical substances of concern, except where their concentrations were minimal. The working conditions at all the obstetricians' and gynecologists' workplaces were thus classed as permissible (class 2). Nevertheless, it is known that, during the working day, the concentration of chemical toxicants in the air in the working area typically varies, and may exert an intermittent action on the body, which can be more pronounced than continuous action [13]. Given that the female body is more sensitive to the effects of chemical substances than the male body, changes in the reproductive system can occur without any obvious signs of poisoning [19]. Hypoxia of tissues develops following contact with chemical toxicants [8], leading to a two-phase reaction in the endocrine system which, while initially aimed at adapting the body to adverse conditions [12], can lead to cytotoxic, mutagenic, and carcinogenic effects among experienced workers aged 30–40 years [19].

The degree of physical effort of obstetricians and gynecologists was classified as category 1b (140–174 W) for those providing the outpatient medical care and 2b (233–290 W) for those providing the inpatient medical care. These high levels of physical effort were associated with the uncomfortable position required during manipulations for diagnosis and treatment, on which obstetricians and gynecologists spend up to 60% of their working time. The time spent in the sitting position, with the main load on the muscles of the neck, shoulders, and hands (as, for example, when filling out medical documents) amounted around 20% of working time. Standing poses with a slight tilt forward and a bend in the spine towards the patient, or with a strong inclination of the body and spine curvature (as during gynecological examinations, during delivery, and when performing operations) made up around 40% of the working time. Obstetricians and gynecologists performed up to 1000 local movements. Furthermore, as shown by the workplace certificates, doctors performed up to 80 tilts of the body while providing medical care and carried out total movements in the vertical and horizontal directions ranging from 2 to 4 km, not exceeding established hygienic norms. Technical breaks did not exceed 5.6% of the total working time and nonprofessional lost time amounted to no more than 2.5%. In this regard, the severity of the labor process among this group of medical personnel was assessed as permissible (class 2).

We have found that the work process of obstetricians and gynecologists is characterized by high levels of mental tension, mainly due to the considerable intellectual and emotional loads. The occupancy of the working day was very high (around 85.2%), due to the need to perform basic professional operations; this was accompanied by pronounced neuro-emotional tension among the vast majority of doctors. The intellectual and emotional loads were due to the need to solve complex professional problems by choosing appropriate approaches, the significant influence of various kinds of signals on the sense organs, the need to comprehensively evaluate all professional activities, the need to distribute tasks to nurses and to monitor their work, the need to work under time pressure while processing large volumes of information, requiring increased responsibility for the final result of medical care, the high degree of risk to the doctors' own lives, and the large number of patients and information sources that simultaneously require monitoring. In addition, sensory loads played a significant role, including the need for long concentrated observation for up to 68% of the working time and the observation of video terminals

presenting alphanumeric medical information for up to 2.5 hours per working day. Thus, the level of tension was classified as class 3.2 (harmful working conditions).

It should be noted that the regime of work for the vast majority of the doctors was characterized by irregular alternation of the working day, including nighttime, which was also confirmed in the certification of working conditions. This can lead to dysfunction of biorhythms [21] and to the development of burnout syndrome, which the ICD-10-CA (International Statistical Classification of Diseases and Related Health Problems) classifies as a disease associated with the negative influence of the working environment, and which the WHO global action plan for workers' health, 2008–2017, identified as a factor to be prevented [5, 23]. Among obstetricians and gynecologists, the development of different phases of burnout syndrome, with the manifestation of various symptoms, begins to appear in the first years of work among all age groups and specializations [18].

Discussion

The obstetricians and gynecologists at all types of workplace thus work with a complex of occupational factors of various natures, and their working conditions can be characterized as harmful (class 3.3; see Table 1).

Table 1. Summarized results of analysis of obstetricians' and gynecologists' working conditions

Occupational factors	Class of working conditions
Chemical	2 (3.1)*
Biological	3.2
Aerosols with predominantly fibrogenic action	1
Noise	2
Infrasound	1
Ultrasound in the air	1
General vibration	1
Local vibration	1
Nonionizing radiation	1
Ionizing radiation	1
Microclimate	2
Illumination	2
Severity of labor	2
Tension of labor	3.2
Overall degree of harmfulness and hazard of working conditions	3.3

* For obstetricians and gynecologists who work in the operations unit.

Source: Own study.

Our results are compatible with those of other researchers, and show that, under such conditions, obstetricians and gynecologists are unable to avoid disease, even if they follow all the safety rules [4]. These professionals are thus highly at risk of infectious diseases due to contact with occupational factors of a biological nature. Similarly, Selishcheva (2012) has found that respiratory diseases take first place in overall morbidity among doctors of this specialty, and mainly had an infectious etiology [14]. In turn, the presence of extragenital pathology contributes to abnormalities in the functioning of the female reproductive system during preparation for pregnancy, as well as during pregnancy and delivery [1].

Contact with occupational factors clinically manifests in the form of menstrual irregularities, infertility, neoplasms of the genital organs, complications of pregnancy and delivery with the development of intrauterine fetal hypoxia, threat of pregnancy termination and preeclampsia; these diseases are recorded significantly more often than in doctors of other specialties [11], which allows researchers to consider them as professional pathologies [15].

High levels of primary and general morbidity related to the musculoskeletal system have been recorded among obstetricians and gynecologists, although the conditions of physical effort in such work are relatively favorable [10]. In addition, researchers have found that pathological changes in the female reproductive system under the influence of an increased severity of work can manifest as hypermenorrhea, algomenorrhea, female genital prolapse, cervical erosion, and benign tumors of the genitals [9].

Increased mental tension is accompanied at the onset by a reduction in the nonspecific resistance of the body [11], and is followed by the increasing occurrence of general pathologies of the nervous system and mental disorders, increasing frequency of amenorrhea, risk of miscarriage and spontaneous abortion during pregnancy, discoordination during delivery, and obstetric hemorrhages [2, 16].

Conclusions

The working conditions of obstetricians and gynecologists are harmful. Factors of a biological and chemical nature, and the level of mental tension combined with the significant physical effort play a major role in the formation of these working conditions. Performing professional duties under such conditions, especially with increasing workloads, leads to a deterioration in health and the development of common polymorbid pathology, as well as to specific disorders in the functioning of the reproductive system, more severe courses of disease, and more adverse prognoses. Effective preventive measures are thus urgently needed.

References

1. Amirov NCh, Bercheeva ZM, Garipova RV. Očenka professional'nogo riska narušenij zdorov'ja medicinskich rabotnikov po rezul'tatam periodičeskogo medicinskogo osmotra. Vest Sovr Klin Med 2014; 7 (2): 10–14.

2. Babanov SA, Ivkina ON, Agarkova IA. Tabakokurenie i drugie faktory riska, vlijajuščie na zdorov'e medicinskich robotnikov. Vestnik Kostromskogo Gosudarstvennogo Universiteta im. N.A. Nekrasova 2010; 16 (1): 9–12.
3. Gičeva IM, Zejnalova DK, Nikolaev KJu. Ocenka sostojanija zdorov'ja medicinskich rabotnikov i ich kačestvo žizni. Zdarovoochr Ros Feder 2009; 6: 20–24.
4. Glotov YP. On the prevention of occupational infection of health care workers with bloodbarne pathogens. Kazan Med J 2012; 2: 348–351.
5. Izmerov NF. Global'nyj plan dejstvij po ochrane zdorov'ja rabotajuščich na 2008–2017 gg.: puti i perspektivy realizacii. Med Truda i Prom Ekol 2008; 6: 1–9.
6. Instrukcii po ocenke uslovij truda pri attestacii rabočich mest po uslovijam truda i predostavlenija kompensacij po ee rezul'tatam: utv. Postanovleniem M-va truda i soc. zaščity Resp. Belarus' 22.02.2008. Minsk: Izdatel'stvo Belorusskij Dom Pečati; 2008: 13–82.
7. Kosarev VV, Vasjukova GF, Babanov SA. Professional'naja zabolevaemost' medicinskich rabotnikov v Samarskoj oblasti. Med Truda i Prom Ekol 2007; 7: 40–47.
8. Kudaeva IV, Masnavieva LB. Vlijanie chimičeskich veščestv različnoj prirody na pokazateli okislitel'nogo stressa. Med Truda i Prom Ekol 2008; 1: 17–24.
9. Lentikova LI, Sumina AV. Ocenka faktorov riska proizvodstvennoj sredy, vlijajuščich na razvitie reproduktivnoj patologii u ženščin fertil'nogo vozrasta. Vest Nov Med Technol 2011; 2: 302–303.
10. Nedurueva TV. Professional'noe zdorov'e medicinskich rabotnikov: strukturno-kriterial'nyj podchod. Uč Zap Ros Gos Soc Un-ta 2012; 2: 175–180.
11. Ovchinnikova MG. On the state of nonspecific resistance of women-medical personnel. Pacific Medi J 2004; 4: 61–62.
12. Potapenko AA, Sivočalova OV, Denisov EI. Uslovija truda i sostojanie reproduktivnogo zdorov'ja ženščin – medicinskich rabotnikov. Med Truda i Prom Ekol 2008; 4: 12–19.
13. Rakevič AV. Sovremennye trebovanija k reglamentacii vrednich chimičeskich veščestv na proizvodstve. Ochr Truda i Soc Zaščita 2009; 10: 45–48.
14. Seliščeva IN. Kompleksnaja social'no-gigieničeskaja ocenka trudovogo processa i uslovij truda vračej akušerov-ginekologov. Best Vseros Obšč Spec po Med-Soc Ekspert Reabil i Reabil Industr 2011; 4: 39–45.
15. Sivočalova OV, Potapenko AA, Denisov EI. Uslovija truda i sostojanie reproduktivnogo zdorov'ja ženščin – medicinskich rabotnikov. Med Truda i Prom Ekol 2008; 4: 8–12.
16. Chažomija RK, Lučkevič VS, Darmogaj NV. Osobennosti socjal'no-gigieničeskogo i mediko-social'nogo funkcionirovanija ženščin reproduktivnogo vozrasta. Prof i Klin Med 2009; 2: 7–10.
17. Dianat I, Sedghi A, Bagherzade J, Jafarabadi MA, Stedmon AW. Objective and subjective assessments of lighting in a hospital setting: implications for health, safety and performance. Ergonomics 2013; 3: 245–253.
18. Dobiás L, Kůsová J, Gajdos O, Vidová P, Gajdosová D, Havránkova J, et al. Bioassay-directed chemical analysis and detection of mutagenicity in ambient air of the coke oven. Mutat Res 1999; 445 (2): 285–293.
19. Chen KY, Yang CM, Lien CH, Chiou HY, Lin MR, Chang HR, et al. Burnout, job satisfaction, and medical malpractice among physicians. Int J Med Sci 2013; 10 (11): 1471–1478.
20. Kok MC, Dieleman M, Taegtmeyer M, Broerse JE, Kane SS, Ormel H, et. al. Which intervention design factors influence performance of community health workers in low- and middle-income countries? A systematic review. J. Health Policy Plan 2015; 30 (9): 1207–1227.
21. Lerssrimongkol C, Wisetborisut A, Angkurawaranon C, Jiraporncharoen W, Lam KB. Active commuting and cardiovascular risk among health care workers. Occup Med 2016; 66 (6): 483–487.
22. Fitch KM, Pérez Alvarez L, Andrés Medina R, Nájera Morrondo R. Occupational transmission of HIV in health care workers: a review. Eur J Public Health 1995; 5: 175–186.
23. Wisetborisut A, Angkurawaranon C, Jiraporncharoen W, Uaphanthasath R, Wiwatanadate P. Shift work and burnout among health care workers. Occup Med 2014; 64 (4): 279–286.

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THE STATE OF PHYSICAL ACTIVITY AND ITS PERCEPTION IN ONCOLOGICAL PATIENTS

STAN AKTYWNOŚCI FIZYCZNEJ I JEJ POSTRZEGANIE PRZEZ PACJENTÓW ONKOLOGICZNYCH

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A – przygotowanie projektu badania | study design, **B –** zbieranie danych | data collection, **C –** analiza statystyczna | statistical analysis, **D –** interpretacja danych | interpretation of data, **E –** przygotowanie maszynopisu | manuscript preparation, **F –** opracowanie piśmiennictwa | literature review, **G –** pozyskanie funduszy | sourcing of funding

SUMMARY

Background: Malignant neoplasms constitute significant danger to humans on a global scale. However, the effects of oncological therapies continue to be unsatisfactory. In order to improve the treatment results, new or additional therapeutic and preventative methods are being researched. One of such methods is physical activity, carefully chosen and executed in safe conditions. Its values include: low cost, availability, safety and lack of side effects.

Aim of the study: Assessing the current state of physical activity and the knowledge of its effect on health among oncological patients.

Material and methods: The study was conducted on a population of 57 oncological patients using the diagnostic survey method with own questionnaire.

Results: In the study population, 55 patients (96.49%) did different types of physical activity. 43 (75.44%) patients had proper knowledge on the lack of counter indicators for physical activity. 50 (87.72%) patients felt very good and good after completing physical exercise. Doing a physical activity had positive effect on the attitude of oncological patients, strengthening their resolve in achieving goals, improving their quality of life, helping them feel positive emotions and improving their relations with others.

Conclusions: The studied oncological patients did different types of physical activity. They had positive attitude towards exercises, which in turn had positive effect on their social attitudes. Good mood after completing physical exercise stimulated them to continue being physically active.

KEYWORDS: oncological patients, physical activity, prophylaxis and health therapy

STRESZCZENIE

Wstęp: Nowotwory złośliwe stanowią istotne zagrożenie dla człowieka w skali globalnej. Jednak wyniki terapii onkologicznej są nadal niezadowalające. W cele poprawy wyników leczenia poszukuje się nowych lub dodatkowych metod leczenia i prewencji chorób nowotworowych. Należy do nich prawidłowo dobrana i bezpiecznie realizowana

aktywność fizyczna. Jej istotnym walorem jest niski koszt, ogólna dostępność, bezpieczeństwo i brak skutków ubocznych.

Cel pracy: Zbadanie aktualnego stanu aktywności fizycznej pacjentów onkologicznych, jak również stopnia ich wiedzy na temat pozytywnego wpływu tej aktywności na zdrowie.

Materiał i metody: Badania zostały przeprowadzone metodą sondażu diagnostycznego z wykorzystaniem autorskiego kwestionariusza ankiety w grupie 57 osób chorych onkologicznie.

Wyniki: Różne formy aktywności fizycznej uprawiało 55 chorych (96,49%). Właściwą wiedzą o braku przeciwwskazań do uprawiania wysiłku fizycznego dysponowało 43 chorych (75,44%). U 50 (87,72%) badanych samopoczucie po zakończeniu ćwiczeń fizycznych było bardzo dobre i dobre. Aktywność fizyczna korzystnie wpływała na właściwe postawy pacjentów chorych onkologicznie, wzmacniając ich dążenia do osiągania celów, poprawiając jakość życia, wzmacniając odczuwanie pozytywnych emocji i poprawiając relacje międzyludzkie.

Wnioski: Badani pacjenci onkologiczni uprawiali różne formy aktywności fizycznej. Cechowało ich pozytywne nastawienie do ćwiczeń fizycznych, których wykonanie wywierało korzystny wpływ na ich postawy społeczne. Dobre samopoczucie po zakończeniu ćwiczeniach fizycznych stymulowało ich do dalszej aktywności fizycznej.

SŁOWA KLUCZOWE: chorzy onkologicznie, aktywność fizyczna, profilaktyka i terapia zdrowotna

Background

Each year, 14.1 million new cases of malignant neoplasms are diagnosed. According to the estimates, within the next 20 years this number will rise to 22 million [1]. In most cases, malignant neoplasms are caused by noxious exposure to, inter alia, harmful environmental factors, such as: tobacco combustion products, pollution, drugs and infections [2]. The oncogenic factors, which can stimulate carcinogenesis, include unhygienic lifestyle – eating low quality food, excessive consumption of alcohol, overweight and obesity [3-5], insufficient supply of certain microelements [6] and low physical activity or lack thereof [7]. Physical activity for oncological patients is usually a part of oncological physical therapy [8]. Such form of physical therapy usually comprises of: kinesiotherapy, incorporating physical exercises and kinesiotherapeutic methods; physical therapy, employing the therapeutic use of different types of energy; massage based on the use of mechanical energy for restoring physical fitness [9]. Oncological rehabilitation comprised of such components has the following goals: restoring physical fitness, preventing social isolation, maintaining social and family bonds, and enabling oncological patients to return to work. Furthermore, it was shown that many oncological patients during and post treatment consider mental and physical exertion as draining their body and therefore not recommended during the course of neoplastic disease and treatment. According to other sources, regular physical activity can constitute the primary neoplastic disease prevention [10]. However, the oncological rehabilitation programme and prescribed physical exercise should be individually tailored to the patient, taking into consideration: the type of the neoplasm, its placement, progression of the disease, general health of the patient, their age, concomitant diseases and needs and expectations.

Aim of the study

The aim of this paper was to asses and establish the current level of physical activity and the awareness of its effect on health among oncological patients. The main goals were: to establish the views of oncological patients on physical activity and showing the positive and negative effects of physical activity and its lack, as well as assessing the state of the oncological patients' knowledge on the prophylactic and therapeutic effect of physical exercise.

Material and methods

The study population comprised of 62 patients diagnosed with neoplastic disease. The final number qualified for statistical analysis was 57 subjects, 46 women and 11 men. The study was conducted in Opole Oncological Center. The age of the study population was: 10 subjects between 30 and 40 years old, 17 subjects between 41 and 50 years old, 16 subjects between 51 and 60 years old, 13 subjects between 61 and 70 years old, one subject between 71 and 80 years old. The level of education of the study population was: 2 subjects with primary education, 15 subjects with occupational education, 15 subjects with secondary education, 25 subjects with higher education. The structure of residence, based on the size of the town or city, was: 12 subjects living in towns > 15,000 inhabitants, 17 subject living in towns between 15,000 and 50,000 inhabitants, 11 subjects living in cities between 50,000 and 100,000 inhabitants, and 17 subjects living in cities with over 100,000 inhabitants. Out of the study population, 42 subjects were professionally active, 10 were unemployed, 4 were retired and one subject did not provide information. The study was approved by the Research Bioethics Committee of the State Vocational Medical School in Opole.

The study was conducted using a diagnostic survey, with an own anonymous questionnaire containing 21 questions, 5 of which provided socio-demographic characterisation of the respondents. The remaining 16 questions concerned the subject of this paper: 4 concerned the location and character of the diagnosed neoplasm, duration of the condition and the patient's attitude towards it, 3 questions concerned any counter indications which occurred during the course of the disease, 2 concerned the physical activities of the patient and 7 concerned the effect of physical activity on the patient's body. The respondents filled out the questionnaires themselves, in the presence of an interviewer.

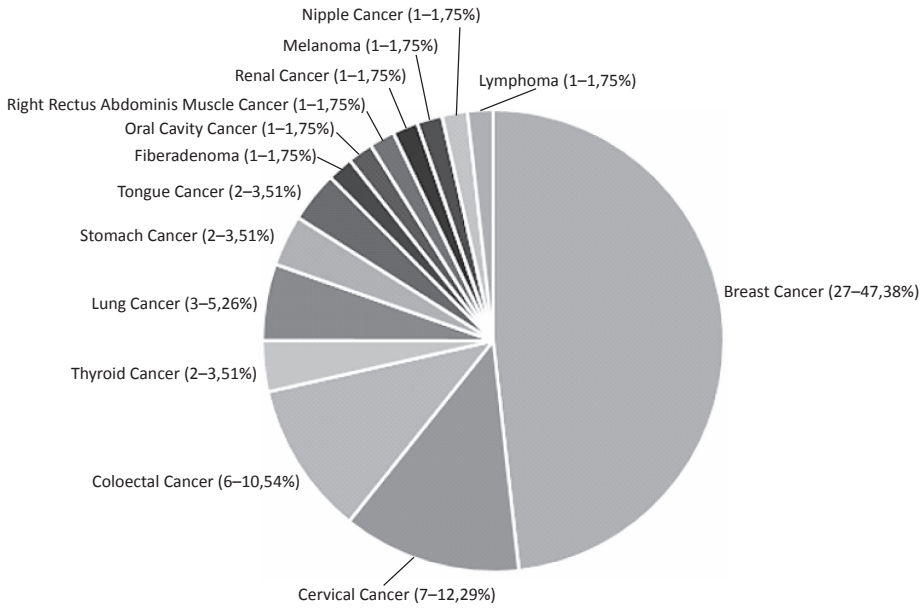
The obtained results were presented in numeric values and percentage points, and in the case of key questions they were also presented in a graphic form for easier analysis.

Results

The obtained results were grouped into 4 sections.

Description of the Disease

An analysis of the percentage values of the 57 study subjects showed that the most common form of neoplastic disease was breast cancer (27 subjects, 47.38%), cervical cancer (7 subjects, 12.29%), and colorectal cancer (6 subjects, 10.54%). Detailed data are presented on Figure 1. The results also showed that the current form of neoplasm was malignant in 48 (84.21%) cases and benign in 9 (15.79%) cases.



Source: Own study.

Figure 1. The types of neoplastic disease diagnosed in the study group

The diagnosed duration of the disease is presented in Table 1. The analysis of the data shows that out of the study population, the duration in the biggest subgroup was between 7 and 12 months.

Table 1. Duration of the disease

Duration [months]	Number of patients [n]	Number of patients [%]
< 3	12	21.05
3–6	13	22.81
7–12	21	36.84
13–24	5	8.77
> 24	6	10.53

Source: Own study.

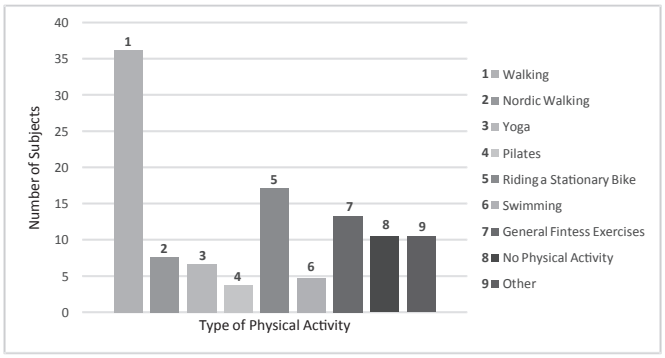
Furthermore, the analysis showed that 19 (33.33%) subjects had positive attitude towards their disease, 14 (24.56%) had negative attitude, 18 (31.58%) had ambivalent attitude and 6 subjects (10.53%) did not answer the question.

Counter Indications which Occurred During the Course of the Disease

The study showed that 8 subjects (14.04%) had counter indications to doing physical activity, 41 subjects (71.93%) did not have any counter indications, and 8 (14.04%) subjects did not answer the question. Among the significant counter indications to physical activity 6 subjects (10.54%) listed general pain, 1 subject (1.75%) listed leg wounds and another one (1.75%) listed a removed muscle. The results of the analysis of the answers to survey question of whether the subjects considered neoplastic disease as a counter indication to physical activity showed that 9 subjects (15.79%) considered neoplastic disease a counter indication, 43 subjects (75.44%) did not and 5 subjects (8.77%) did not have an opinion.

Performed Physical Activity and Its Forms

The majority of subjects (55 patients, 96.49%) was physically active and 2 subjects (3.51%) did not perform any type of physical activity. The 105 answers to a multiple choice question listed such types of physical activity as: walks (38 subjects, 36.19%), nordic walking (8 subjects, 7.62%), yoga (7 subjects, 6.67%), pilates (4 subjects, 3.81%), riding a stationary bike (18 subjects, 17.14%), swimming (5 subjects, 4.76%), general fitness exercises (14 subjects, 13.33%), other (11 subjects, 10.48%) (Figure. 2).

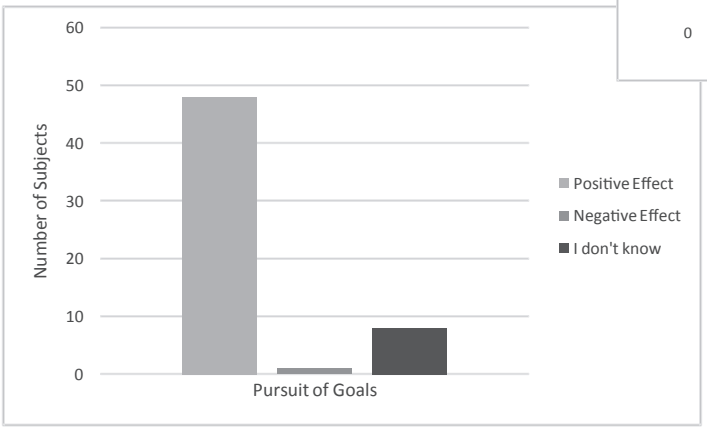


Source: Own study.

Figure 2. Types of performed physical activity

The Effect of Physical Activity on the Patient's Body

The analysis showed that 47 subjects (82.46%) had positive attitude towards starting doing physical exercises, 1 subject (1.75%) had negative attitude and 9 subjects (15.79%) had neutral attitude. On the next question, "How does your attitude towards physical exercise affect pursing your goals?", the patients answered: positively (48 subjects, 84.21%), negatively (1 subject, 1.75%), I don't know (8 subjects, 14.04%) (Figure 3).



Source: Own study.

Figure 3. Subjective assessment of the effect of physical activity on the pursuit of goals

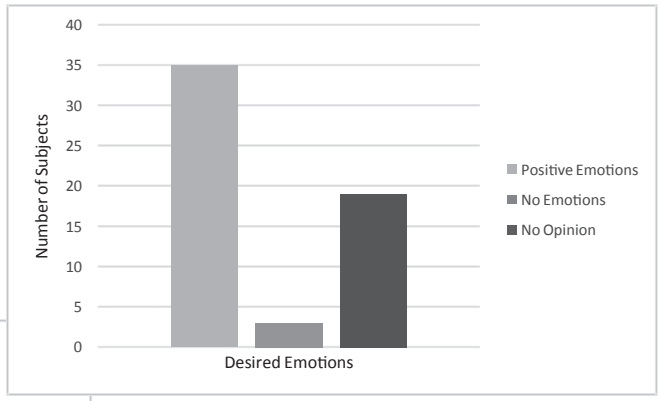
The assessment of the effect of the attitude towards physical activity on the health and life of patients yielded the following results: 40 subjects (70.18%) reported clear improvement, 12 subjects (21.05%) reported negative reaction and 5 subjects (8.77%) reported no effect (neutral) (Table 2).

Table 2. The features of the effect of the type of attitude towards physical activity on health and life

Type of influence	Number of patients [n]	Number of patients [%]
Positive	40	70.18
Negative	12	21.05
Neutral	5	8.77

Source: Own study.

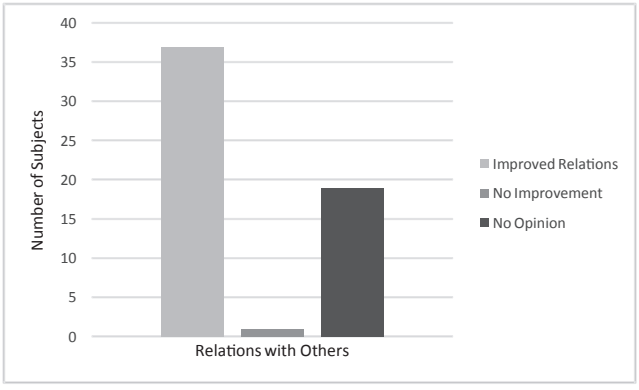
The analysis of the effect of the attitude towards physical activity on the experienced emotions showed that in 35 cases (61.40%) the effect was positive, in 3 cases (5.26%) there was no effect and 19 subjects (33.34%) did not give their opinion (Figure 4).



Source: Own study.

Figure 4. Subjective assessment of the effect of physical activity on the desired emotions

An assessment of the effect of the attitude towards physical exercises on relations with other people showed that 37 subjects (64.91%) reported improvement, one subject (1.75%) reported no improvement and 19 subjects (33.34%) did not give their opinion (Figure 5).



Source: Own study.

Figure 5. Subjective assessment of the effect of physical activity on the relations with others

Furthermore, the results showed that the well-being of the patients was: very good in 18 cases (31.58%), good in 32 cases (56.14%), moderate in 6 cases (10.53%) and the same in one case (1.75%).

Moreover, the results showed that in 55 cases (96.49%) physical exercises had positive effect on motivation to further taking up physical activity, and negative effect in only 2 cases (3.51%).

Discussion

Out of 57 participants of the study, 15.78% were diagnosed with benign tumours and 84.22% with malignant tumours, which constitute 13% of causes of death around the world [1]. Thus, the study population comprised of subjects with serious medical conditions and whose knowledge of pro-health lifestyle should be better than average and oncogenic factors eliminated from their lives as much as possible. Pro-health behaviours should be exhibited daily and as many as possible, as Puchalska et al. reported that a large number of respondents in the study believed their disease limited their activity [11]. Most of the study population in the present study were women, therefore the most common types of neoplasm among the participants were breast cancer and cervical cancer. If we assume physical activity is one of prophylactic and therapeutic factors in neoplastic disease, the study population showed good pro-health behaviours, as 82.46% had positive attitude towards physical activity and 96.49% did some kind of physical exercise. This paper did not analyse why so many patients had such positive attitude towards physical exercise. However, we did establish that the most common type of physical activity was walking (38 subjects, 36.19% of 105 responses). Walking is the easiest and the most available form of physical activity for people whose mobility is not impaired. It is relatively safe in changing and different weather conditions, in different areas and with different intensity, individual for each patient. Other discussed forms of physical activity have limiting factors, especially for the infirm and therefore were not as common. A high percentage of physically active patients constitutes proof of pro-health behaviours and assisting in oncological treatment, especially as only 33.34% of the subjects had positive attitude towards their disease, which could have been motivated by the chronic character of the neoplastic disease. Pro-health behaviours among patients were also recorded by Skinner et al. who showed that properly executed physical activity had positive effect on improving muscle strength, elasticity, function and well-being of oncological patients [12]. Similar results, corroborating the positive effect of physical exercise on health of oncological patients, were reported by Diggins et al. [13] and Zopf et al. [14]. Furthermore, Drageset et al. [15] also corroborated these findings and showed that positive mindset, physical activity, hobbies and work can help oncological patients function day to day and return to health. Moreover, the positive effect of physical activity on well-being, motivation and everyday functioning of oncological patients was observed [8, 16]. Stec, referring to the results of Yoga Biomedical Trust studies, established that in 90% of cases doing yoga had positive effect on the health of oncological patients [17]. In the present study only 6.67% of subjects did yoga, which constitutes a small percentage of the population, however reports from the USA showed that yoga is popular among oncological patients and cancer survivors [18]. No cause was established as to why 3.51% of the study population did not perform any type of physical exercise.

The study population began physical exercises with positive attitude, which was reported by 82.46% of the participants. According to Kaczmarek-Borowska et al., women more frequently than men show positive attitude towards physical exercise during oncological treatment [19]. Due to the small size of the study population, we did not assess the difference between the sexes in relation to the attitude towards physical exercise. However, the obtained results indirectly suggest that that the study group had high awareness of the positive, therapeutic effect of physical exercises on fighting cancer and wanted to actively participate in the process, alongside healthcare professionals. Only 1.75% of the study population reported negative attitude towards physical exercise, which according to Mayer can be attributed to depression arresting the patient's psychomotor activity [20]. According to Mazurkiewicz, as much as 25% of women experience neoplastic disease as a traumatic experience resulting in loss of interest in physical activity, however in the present study adverse behaviours and reaction like that were limited to the minimum [21].

Moreover, it is noteworthy that as much as 21.05% of the study population had significant counter indications for doing physical exercises, however, none of the subjects indicated that it was physical activity, rather 75.44% of the subjects had sufficient knowledge that physical exertion is not a counter indication for oncological patients. Positive attitude towards physical activity and proper content-related knowledge on the lack of counter indications in case of oncological patients affected other volitional features. The obtained data showed that it was positive attitude towards physical exercises and probably doing different types of exercises which had in case of the majority of the study population positive effect on the pursuit of goals (82.46% of the subjects), attempting to improve quality of life and health (70.18% of the subjects), strengthening positive emotions (61.40% of the subjects) and improving relations with other people (64.91% of the subjects). These results can be summed up by a statement by Pietrzyk and Lizińczyk that positive thoughts in patients help soothe a difficult situation, i.e. a neoplastic disease, and constitute a foundation maintaining the meaning of life and pursuit of one's goals [22]. Also Woźniewski stated that physical activity in oncological patients has a positive effect on the somatic and mental aspect of an

ill organism, which would have also been observed in the present study. Moreover, Woźniewski showed that physical activity decreases the risk of relapse of the neoplasm by even 40% [23].

Despite different circumstances and difficulties, mainly personal, the patients participated in different types of activities organised in the hospital. They organized their own physical exercises and performed them in safe conditions [24]. This involvement of oncological patients shows their determination and participation in the process of actively fighting against cancer both in terms of somatic and mental impact.

The results of the present study show that after completing physical exercises, 87.72% of subjects felt very good, which means the exercise was not detrimental to the organism. Moreover, 96.49% of the subjects, regardless of how they felt after exercise, believed that physical exercise stimulated them to further activity, which is a sign of determination in seeking out pro-health behaviours. These data show that thanks to the physical activity and positive attitude towards it, the participants of the study can employ a more positive attitude towards life and the process will intensify once they notice the therapeutic benefits [10]. The results of this study show that the patients' attitude towards motivation, willingness and doing different types of physical exercise during oncological treatment is positive.

Conclusions

1. The positive attitude of the study population towards physical activity translated into actively doing physical exercise in everyday life, despite negative and ambivalent attitude towards the disease.

2. The positive attitude of oncological patients during execution of physical exercise had pro-health effect on their well-being and at the same time stimulated to further exercise.

3. The positive attitude of oncological patients to executing physical exercise helped promote their pro-health life style and helped build positive social attitudes.

References

1. Ferlay J, Soerjomataram I, Dikshit R, Eser S, Mathers C, Rebelo M, et al. Cancer incidence and mortality worldwide: sources, methods and major patterns in GLOBOCAN 2012. Int J Cancer 2015; 136 (5): 359–386.
2. Kułakowski A, Skowrońska-Gardas A, red. Onkologia – podręcznik dla studentów medycyny. Warszawa: Wydawnictwo Lekarskie PZWL; 2003.
3. Uzunlulu M, Telci CO, Oguz A. Association between metabolic syndrome and cancer. Ann Nutr Metab 2016; 68 (3): 173–179.
4. Cowey S, Hardy RW. The metabolic syndrome: a high-risk state for cancer? Am J Pathol 2006; 169 (5): 1505–1522.
5. Polednak AP. Temporal trend in the U.S. black-white disparity in mortality rates from selected alcohol-related chronic diseases. J Ethn Subst Abuse 2008; 7 (2): 154–164.
6. Solomons NW. Plant-based diets are traditional in developing countries: 21st century challenges for better nutrition and health. Asia Pac J Clin Nutr 2000; 9 Suppl.: 41–54.
7. Pierce JP, Stefanick ML, Flatt SW, Natarajan L, Sternfeld B, Madlensky L, et al. Greater survival after breast cancer in physically active women with high vegetable-fruit intake regardless of obesity. J Clin Oncol 2007; 25 (17): 2345–2351.
8. Rogiewicz M, red. Praktyczny podręcznik psychoonkologii dorosłych. Kraków: Medycyna Praktyczna; 2015.
9. Malicka I, Pawłowska K. Aktywność ruchowa w prewencji pierwotnej i wtórnej raka piersi. Reh Med 2008; 1 (12): 32–38.
10. Trzebińska E. Psychologia pozytywna. Warszawa: Wydawnictwa Akademickie i Profesjonalne; 2008.
11. Puchalska M, Sierko E, Sokół M, Wojtukiewicz MZ. Jakość życia chorych na raka piersi poddanych chemioterapii prowadzonej w warunkach szpitalnych. Probl Pielęg 2011; 2: 123–127.
12. Skinner TL, Peeters GG, Croci I, Bell KR, Burton NW, Chambers SK.Impact of a brief exercise program on the physical and psychosocial health of prostate cancer survivors: A pilot study. Clinical Oncology [online] [cit. 20.05.2016]. Available from URL: http://onlinelibrary.wiley.com/enhanced/doi/10.1111/ajco.12474/.
13. Diggins AD, Hearn LE, Lechner SC, Annane D, Antoni MH, Whitehead NE. Physical activity in Black breast cancer survivors: implications for quality of life and mood at baseline and 6-month follow-up. Psychooncology 2016; 10: 1002.
14. Zopf EM, Bloch W, Machtens S, Zumbé J, Rübben H, Marschner S, et al. Effects of a 15-month supervised exercise program on physical and psychological outcomes in prostate cancer patients following prostatectomy: The ProRehab Study. Integ Cancer Ther 2015; 14 (5): 409–418.
15. Drageset S, Lindstrøm TC, Underlid K. "I just have to move on": Women's coping experiences and reflections following their first year after primary breast cancer surgery. Eur J Oncol Nur 2016; 29 (21): 205–211.
16. De Walden-Gałuszko K. Rozpoznanie i leczenie przewlekłego zmęczenia w chorobie nowotworowej. Onkol Dypl 2015; 1 (12): 44–46.
17. Stec K. Dynamic Suyranamaskar. Sun Solution. Bengaluru: Swami Vivekananda Yoga Prakashama (SVYP); 2012.
18. Buffart JM, van Uffelen JG, Riphagen II, Brug J, van Mechelen W, Brown WJ, et al. Physical and psychosocial benefits of yoga in cancer patients and survivors, a systematic review and meta-analysis of randomized controlled trials. BMC Cancer 2012; 12: 559. Doi: 10.1186/1471-2407-12-559.
19. Karczmarek-Borowska B, Niemiec A, Pop T. Wpływ rehabilitacji na poprawę jakości życia chorych w trakcie chemioterapii. Onkol Pol 2012; 4 (15): 143–148.
20. Meyer R. Psychopatologia. Gdańsk: Gdańskie Wydawnictwo Psychologiczne; 2008.
21. Mazurkiewicz A, Otrębski W, Makara-Studzińska M. Potraumatyczny rozwój u kobiet leczonych napromienianiem z powodu choroby nowotworowej. Onkol Radio 2015; 1: 28–31.
22. Pietrzyk A, Lizińczyk S. Nadzieja podstawowa pacjentów z nawrotem choroby nowotworowej oraz ich własna skuteczność kontroli bólu i radzenia sobie z nim. Psychoonkologia 2015; 1 (19): 1–11.
23. Woźniewski M, red. Fizjoterapia w onkologii. Warszawa: Wydawnictwo Lekarskie PZWL; 2012.
24. Mazurkiewicz A, Rutkowska A, Sidor K, Makara-Studzińska M. Psychological problems in cancer patients. Oncol Radio 2015; 3 (33): 23–27.

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FOOD ADDITIVES IN FOOD PRODUCTS FOR INFANTS AND YOUNG CHILDREN – COMPLIANCE WITH THE PREVAILING RULES AND REGULATIONS

SUBSTANCJE DODATKOWE W PRODUKTACH ŻYWNOŚCIOWYCH DLA NIEMOWLĄT I MAŁYCH DZIECI – ZGODNOŚĆ Z OBOWIĄZUJĄCYM PRAWODAWSTWEM

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A – przygotowanie projektu badania | study design, **B –** zbieranie danych | data collection, **C –** analiza statystyczna | statistical analysis, **D –** interpretacja danych | interpretation of data, **E –** przygotowanie maszynopisu | manuscript preparation, **F –** opracowanie piśmiennictwa | literature review, **G –** pozyskanie funduszy | sourcing of funding

SUMMARY

Background: Pursuant to Polish law, products for infants and young children constitute a special purpose food group, which is divided into three categories: infant formulae, follow-on formulae, and cereal-based foods and other baby foods. The ingredients lists for each product from every group are regulated by the regulation of the Minister of Public Health of November 22nd 2010.

Aim of the study: An analysis of the contents of products for infants and young children commercially available in the Opole region.

Material and methods: Food additives in 81 products were analysed, based on the contents provided by the producers. The food additives (categories of preparations) were used in accordance with the regulation on food additives and the regulation on special purpose food groups. However, some banned additives were treated as nutrients and sources of macroelements, in which case they were not listed as food additives.

Results: The most commonly used source of calcium were the phosphate and carbonate salts. The hypoallergenic infant formula Nestle NAN 1 HA, Nestle NAN 2 HA and HUMANA 2 HA contained the fewest additives. Ready-made meals, which constitute complementary foods, did not contain additives. Drinks and desserts contained only L-ascorbic acid.

Conclusions: Regardless of the manufacturer, the analysed products contained only substances which comply with the prevailing Polish and EU law. The least additives were found in modified hypoallergenic milks: Nestle NAN 1 HA and NESTLE NAN 2 HA and Humana 2 HA. Drinks and dessert jars contained only L-ascorbic acid (E300), and oat cookies for children contained potassium bicarbonate (E501).

KEYWORDS: infant and young children foods, Polish law, European regulations

STRESZCZENIE

Wstęp: Produkty dla niemowląt i małych dzieci, zgodnie z polskim prawem, należą do żywności przeznaczenia specjalnego i są podzielone na trzy kategorie preparatów: do żywienia początkowego, dalszego i uzupełniające

środki spożywcze. Skład produktów należących do każdej z kategorii jest regulowany Rozporządzeniem Ministra Zdrowia z dnia 22 listopada 2010 r.

Cel pracy: Przeanalizowanie składów produktów żywnościowych dla niemowląt i małych dzieci, dostępnych w obrocie handlowym na Opolszczyźnie.

Materiał i metody: Na postawie podanych przez producentów składów przeanalizowano substancje dodatkowe w 81 produktach. Dodatki (kategorie preparatów) do żywności zostały użyte zgodnie z rozporządzeniem dotyczącym substancji dodatkowych, jak i rozporządzeniem odnośnie do żywności przeznaczenia specjalnego. Jednak niektóre niedozwolone dodatki potraktowano jako substancje odżywcze lub źródło makroelementów. W takich przypadkach dana substancja nie jest oznaczona w składzie jako dodatek do żywności.

Wyniki: Najczęściej stosowanym przez producentów źródłem wapnia były jego sole fosforanowe i węglanowe. Najmniej substancji dodatkowych zawierało mleko modyfikowane hipoalergiczne NESTLE NAN 1 HA, NESTLE NAN 2 HA i HUMANA 2 HA. Dania gotowe, wchodzące w skład żywności uzupełniającej, nie zawierały substancji dodatkowych, a napoje i deserki w słoiczkach miały w swym składzie jedynie kwas L-askorbinowy.

Wnioski: Poddane analizie produkty, niezależnie od producenta, w swoim składzie zawierały tylko substancje zgodne z prawem obowiązującym na terenie Polski i Unii Europejskiej. Najmniej substancji dodatkowych miało mleko modyfikowane hipoalergiczne NESTLE NAN 1 HA, NESTLE NAN 2 HA i HUMANA 2 HA. Napoje i gotowe desery w słoiczkach w swoim składzie, jako substancję dodatkową, zawierały jedynie kwas L-askorbinowy (E300), a ciasteczka zbożowe dla dzieci wodorowęglan potasu (E501).

SŁOWA KLUCZOWE: żywność dla niemowląt i małych dzieci, prawo polskie, prawo europejskie

Background

Food for infants and young children has to meet the nutritional needs of it consumers based on their age and nutritional requirements [1–2]. The food for infants, included in the three groups: infant formulae, follow-on formulae, and cereal-based foods and other baby foods, its content, placing on the market and labelling is regulated, since July 20th 2016, by the Regulation no 609/2013 of the European Parliament and of the Council [1]. This document contains the rules and regulations on foods for "certain and/or vulnerable population groups", which also includes food for infants and young children. This term replaces the previous term: "special purpose food products". The regulation provides unified rules and regulations and a unified list of nutrients, including those used as additives improving technological characteristics (previously there were three lists), which could be found in infant formulae, follow-on formulae, and cereal-based foods and other baby foods. The producer is now obligated to list the substances improving technological characteristics on the packaging of a product [1]. In Polish Society's of Gastroenterology, Hepatology and Nutrition standards of nutrition for children [3], the recommended mode of feeding an infant is breastfeeding for at least 6 initial months of life, preferably a year. If mother's milk is insufficient or the mother cannot breastfeed the child, modified milk can be introduced [3–5]. The described standards were created based on the guidelines of the European Commission, WHO and UNICEF, and adapted to Polish conditions [4–5].

Introducing food additives to infant formulae, follow-on formulae, and cereal-based foods and other baby foods is regulated by a regulation of the Minister of Health [6]. These substances can act as emulsifiers, anti-oxidants, acidity regulators, raising agents, but it is forbidden to add colouring and sweetening substances [6–8]. There are 15 substances allowed in infant formulae, 20 in follow-on formulae and 65 in cereal-based foods and other baby foods (Table 1). Only substances improving the technological characteristics are marked with an "E" on packaging labels, the rest should be treated as enriching substances which are a source of amino-acids, vitamins and micro- and macroelements [7, 14].

Table 1. Allowed food additives (categories of formulae) in food products for infants and young children, divided by stages of the child's development

Infant Formulae	Follow-on Formulae	Cereal-based Foods and Other Baby Foods
E270 E304 E306 E307 E308 E309 E322 E330 E331 E332 E338 E339 E340 E412 E471 E472c E473	E270 E304 E306 E307 E308 E309 E322 E330 E331 E332 E338 E339 E340 E407 E410 E412 E440 E471 E472c E473	E170 E260 E261 E262 E263 E270 E296 E300 E301 E302 E304 E306 E 307 E308 E309 E322 E325 E326 E327 E330 E331 E332 E333 E334 E335 E336 E338 E339 E340 E341 E354 E400 E401 E402 E404 E410 E412 E414 E415 E440 E450(i) E471 E472a E472b E472c E500 E501 E503 E507 E524 E525 E526 E551 E575 E1404 E1410 E1412 E1413 E1414 E1420 E1422 E1450 E1451

Source: Own study, [6].

Aim of the study

The aim of this study was to show the contents and type of food additives in food products for infants and children up to 3 years old commercially available in the Opole region.

Material and methods

We analysed the contents of 81 selected food products for infants and small children, from 8 producers: HUMANA, HIPP, HOLLE, NESTLE, NUTRICIA, BABY SUN, AGUGU, and BABYDREAM. The products were divided into three categories:

– Infant formulae (12 products, 6 brands from 4 producers) – modified milk and modified hypoallergenic milk.

– Follow-on formulae (12 products, 6 brands from 4 producers) – modified milk and modified hypoallergenic milk.

– Cereal-based foods and other baby foods – rice-milk cereal, wheat-milk cereal, multigrain-milk cereal, gluten-free-milk cereal and semolina-milk cereal (12 products, 5 brands from 4 producers), ready-made meals in jars, with meat, vegetables, meat and vegetables (16 meals and soups, 7 brands from 6 producers), drinks (6 products, 1 brand from 1 producer), desserts, including fruit in jars (18 products, 6 brands from 5 producers), and sponge cookies (5 products, 4 brands from 3 producers).

A substance was classified as an additive, when the producer provided information on its application on the label, e.g. soy lethicin – emulsifier, and/or was marked with an "E" symbol with proper number, pursuant to the regulation of the Minister of Health of November 22nd 2010 on authorised food additives [6]. The nutritional substances were classified based on the Regulation no 609/2013 of the European Parliament and of the Council [3].

Results

Irrespective of the producer, the analysed food products for infants and young children contained only the food additives authorised by the rules and regulations prevailing in Poland and in the European Union, even though some of the substances were treated as nutritional substances or sources of macroelements.

The following food additives were found in milk products for infants and labelled as:

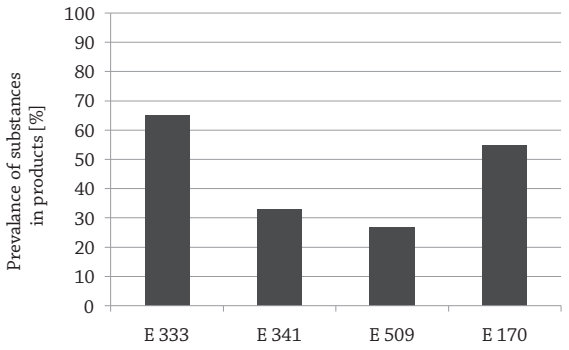
– Emulsifiers – soy lethicin (E322), citric acid esters of mono- and diglycerides of fatty acids (E471).

– Enriching substances (e.g. sources of calcium) – calcium citrate (E333), calcium carbonate (E170), tricalcium phosphate (E341) and calcium chloride (E509).

– Other, improving the technological characteristics and constituting sources of macroelements – potassium citrate (E332), trisodium citrate (E331), trisodium phosphate (E339), potassium phosphate (E340), potassium chloride (E508) and magnesium chloride (E511).

The analysed modified and hypoallergenic milk infant formulae contained emulsifiers, however modified milk contained only soy lethicin (E322) and hypoallergenic modified milk contained mainly citric acid esters of mono- and diglycerides of fatty acids (E471), or both emulsifiers (Bebiko 1 HA, Babilon 1 HA). Only Nestle NAN 1 HA milk was free of these substances. The least food additives were found in modified hypoallergenic milk brands NESTLE NAN 1 HA, NESTLE NAN 2 HA and HUMANA 2 HA.

Calcium is especially significant in infant nutrition. Its absorption depends on the form in which it is contained in food. The producers ususally use tricalcium phosphate (E341) and calcium carbonate (E170), and to a lesser extent calcium citrate (E333) and calcium chloride (E509), as sources of calcium (Figure 1).



Source: Own study.

Figure 1. Sources of calcium in infant and follow-on formulae used by the producers

These substances were found in most of the milk products, although calcium citrate was found only in modified milk and calcium chloride in hypoallergenic modified milk. The occurrence of other food additives introduced as sources of macroelements varied, with the greatest variety noted in milk infant formulae. In this group of analysed food products the most frequently used food additives were: potassium chloride (E508) – in 72%, tricalcium phosphate (E341) – in 63% and calcium carbonate (E170) – in 54%.

The other food additives introduced as sources of macroelements depended on the type of the product, e.g. potassium phosphate was not found in modified milk and potassium citrate in hypoallergenic modified milk. The smallest number of substances, only four, was found in hypoallergenic modified milk Nestle NAN I HA (Table 2).

In milk follow-on formulae, the same groups of food additives were found and also labelled as emulsifiers, sources of calcium and substances improving the technological characteristics and constituting sources of macroelements. This category of products did not contain trisodium phosphate (E339) (Table 3). None of the analysed brands of hypoallergenic modified milk follow-on formulae contained salts of citric acid – calcium citrate (E333), potassium citrate (E332), trisodium

Table 2. Ingredients listed by the producer on labels of infant formulae

Ingredients listed on labels of products											
Name of the product	E322	E471	E331	E332	E333	E340	E341	E508	E509	E511	E170
Modified milk											
BEBIKO 1	+	-	+	+	+	-	-		+	-	+
BEBILON 1	+	-	+	+	+	-	-	+	+	-	+
GERBER 1	+	-	-	+	+	+	-	+	+	-	+
HIPP 1	+	-	-	-	-	-	-	-	-	-	-
HUMANA 1	+	-	+	+	+	-	-	+	+	-	-
NESTLE NAN 1	+	-	-	+	+	+	-	+	+	-	+
Hypoallergenic modified milk (HA)											
BEBIKO 1 HA	+	+	-	-	-	-	+	-	-	+	-
BEBILON 1 HA	+	+	-	-	-	-	+	-	-	+	-
HIPP 1 HA	-	+	-	-	-	-	-	+	+	-	-
HUMANA 1 HA	-	+	+	-	-	-	-	+	+	-	-
NESTLE NAN 1 HA	-	-	-	-	-	-	+	+	+	-	+

Source: Own study.

citrate (E331) or potassium chloride (E508), because these products constitute only a supplement of an infant's diet and do not need to meet their nutritional needs in 100% [1–2].

The analysis of products commercially available in the Opole region showed that the most products, 72%, contained soy lethicin (E322), used as an emulsifier. Furthermore, hypoallergenic modified milk brands of infant formulae, which contained hydrolysed protein (labelled on HA packaging), more often than other products contained mono- and diglycerides of fatty acids (E471).

80% of the analysed cereal-based foods and other baby foods contained the following food additives:

Table 3. Ingredients listed by the producer on labels of follow-on formulae

Ingredients listed on labels of products											
Name of the product	E322	E471	E331	E332	E333	E340	E341	E508	E509	E511	E170
Modified milk											
BEBIKO 2	+	-	-	-	-	-	-	+	-	-	+
BEBILON 2	+	-	-	+	-	-	+	-	+	+	+
GERBER 2	+	+	-	-	+	-	-	-	-	+	-
HIPP 2	-	-	-	-	-	-	-	+	+	-	+
HUMANA 2	+	+	-	-	-	-	+	+	-	-	+
NESTLE NAN 2	+	-	+	-	+	+	+	-	-	+	-
Hypoallergenic modified milk (HA)											
BEBIKO 2 HA	+	+	-	-	-	+	+	-	+	-	-
BEBILON 2 HA	+	+	-	-	-	+	+	-	+	-	-
HIPP 2 HA	-	+	-	-	-	-	+	-	-	+	+
HUMANA 2 HA	-	-	-	-	-	-	-	-	-	-	+
NESTLE NAN 2 HA	-	-	-	-	-	-	+	-	-	+	-

Source: Own study.

soy lethicin (E322) as emulsifier and calcium carbonate (E170) as source of calcium. On the other hand, most of the products did not contain citric acid (E330), trisodium phosphate (E339) and potassium carbonate (E501), and locust bean gum (E410) was found only in gluten-free cereals (Table 4).

Table 4. Ingredients listed by the producer on labels of cereal-based foods and other baby foods

Ingredients listed on labels of products							
Name of the product	E170	E322	E410	E330	E339	E471	E501
Rice-milk cereal							
NESTLE	+	-	-	-	-	-	-
BOBOVITA	+	+	-	-	-	-	-
HUMANA	+	-	-	-	-	-	-
HIPP	+	-	-	-	-	-	-
Wheat-milk cereal							
NESTLE	+	-	-	-	-	-	-
BOBOVITA	+	+	-	-	-	-	-
HUMANA	+	-	-	+	-	-	+
HIPP	+	-	-	-	-	-	-
Semolina-milk cereal							
NESTLE	+	-	-	-	-	-	-
BOBOVITA	+	+	-	-	-	-	-
HIPP	+	-	-	-	-	-	-
Multigrain-milk cereal (5 grains, 8 grains)							
NESTLE	+	-	-	-	-	-	-
BOBOVITA	+	+	-	-	-	-	-
HUMANA	-	-	-	-	-	-	-
HOLLE	-	-	-	-	-	-	-
HIPP	+	-	-	-	-	-	-
Gluten-free cereal							
NESTLE	-	-	+	+	+	-	-
BOBOVITA	+	-	+	-	-	+	-

Source: Own study.

Ready-made meals are more and more used when feeding children between 1 and 3 years old. The analysed ready-made meals from such producers as: Agugu, BabyDream, Baby Sun, Bobovita, Gerber DoReMi and Gerber, HiPP, which constitute supplementary food did not contain any food additives. Their main ingredients were vegetables and different types of meat. Only in two cases, the contents of Gerber DoReMi baby dinners included mechanically separated meat (MSM).

All drinks and desserts in jars (BoboFruit, Baby Sun, Bobovita, Gerber, HiPP, BabyDream) contained a food additive – L-ascorbic acid (E300), listed as source of vitamin C.

In the case of oat cookies for children, all products contained gluten, as indicated on the packaging. Depending on the used raising agents, particular products were intended for different age groups. Cookies for the youngest children (starting from the 5th month of life), such as HiPP, contained only potassium hydrogen carbonate (E501). Only Miśkopty from Nestle, for children 9 months old or older, contained soy lethicin (E322) as an emulsifier. Despite the similarity of the food additives used by Nestle and Gerber, there is a difference in the age of the intended recipients of their products: cookies from Gerber are intended for children 12 months old or older and those from Nestle for 9 months old or older (Table 5), even though both products belong to one corporation – Nestle.

Table. 5. Ingredients listed by the producer on labels of cookies constituting supplementary food for infants and young children

Ingredients listed on labels of products						
Name of the product	E170	E 500	E503	E 501	E341	E322
GERBER (12 months)	+	+	+	-	+	-
HiPP (10 months)	-	+	-	-	-	-
HiPP (5 months)	-	-	-	+	-	-
NESTLE (9 months)	-	+	+	-	+	+
BOBOVITA (8 months)	+	+	+	-	-	-

Source: Own study.

Discussion

The contents of all groups of products intended for infants and young children are strictly regulated for the presence of food additives, nutrients and micro- and macroelements [3, 8]. It is one of the few groups of products with determined lowest and highest levels of content of particular nutrients [7]. Such strict regulations are dictated by the fact that infant milk formulae are usually the main source of nutrients and micro- and macroelements for infants. It is important that the sources of such macroelements as calcium, phosphorus or magnesium in modified milk are varied, similarly as in mother's milk. Both the content and the form of calcium in mother's milk is not constant and it can take the form of calcium carbonate, calcium chloride, calcium citrate and tricalcium phosphate and casein-related forms [14].

Food for infants and children up to three years old contains maltodextrins. Pursuant to the regulation of the Minister of Health on special purpose food groups of September 16th 2010, maltodextrins are authorised for use as a source of easily ingestible carbohydrates. The producers also use them for their emulsifying, filling, stabilizing, bonding, raising, extending freshness, sweetness reducing, highlighting taste and smell, and crystallisation delaying qualities [3, 9–12].

Another type of substances frequently added to these types of products are omega-3 acids, including eicosapentaenoic acid, pre- and probiotics, non-ingestible oligosaccharides, taurine and nucleotides. However, according to experts from the European Food Safety Authority (EFSA), there is no clear indication

that would require adding these substances to food for infants and young children [13].

Conclusions

1. The analysed products for infants and young children, irrespective of the producer, contained only substances authorised by the rules and regulations prevailing in Poland and in the European Union.

2. Among the analysed products, only ready-made meals did not contain any food additives.

References

1. Rozporządzenie Parlamentu Europejskiego i Rady (UE) nr 609/2013 z dnia 12 czerwca 2013 r. w sprawie żywności przeznaczonej dla niemowląt i małych dzieci oraz żywności specjalnego przeznaczenia medycznego i środków spożywczych zastępujących całodzienną dietę, do kontroli masy ciała. (Dz.U. UE. L 181/35).
2. Ustawa z dnia 25 sierpnia 2006 r. o bezpieczeństwie żywności. (Dz.U. 2006 nr 171, poz. 1225).
3. Szajewska H, Horvath A, Rybak A, Socha P. Karmienie piersią. Stanowisko Polskiego Towarzystwa Gastroenterologii, Hepatologii i Żywienia Dzieci. Stand Med, Pediatr 2016; 13: 9–24.
4. Indicators for Assessing Infant and Young Child Feeding Practices. Part 1. Definitions. Geneva, Switzerland: World Health Organization; 2008.
5. Michaelsen KF, Weaver L, Branca F, Robertson A. Feeding and nutrition of infants and young children. Guidelines for the WHO European Region, with emphasis on the former Soviet countries. Denmark: World Health Organization; 2000. Updated reprint 2003.
6. Rozporządzenie Ministra Zdrowia z dnia 22 listopada 2010 r. w sprawie dozwolonych substancji dodatkowych. (Dz.U. 2010 nr 232, poz. 1525).
7. Cielecka E, Dereń K. Jakość żywności dla niemowląt i małych dzieci. Probl Hig Epidemiol 2011; 92 (2): 187–192.
8. Weker H, Wiech M. Żywność dla niemowląt i małych dzieci w świetle nowych regulacji prawnych. Bromat Chem Toksykol 2008; 41 (3): 883–887.
9. Fortuna T, Sobolewska J. Maltodekstryny i ich wykorzystanie w przemyśle spożywczym. Żywn Nauka Technol Jakość 2000; 23: 100–109.
10. Dokic-Baucal L, Dokic P, Jakovljevic J. Influence of different maltodextrins on properties of O/W emulsions. Food Hydroc 2004; 18: 233–239.
11. Fortuna T, Sobolewska-Zielińska J, Juszczak L. Wybrane właściwości reologiczne roztworów maltodekstryn ziemniaczanych. Zesz Prob Post Nauk Rol 2002; 489: 413–422.
12. Gibiński M, Korus J. Maltodekstryny jako skrobiowe zamienniki tłuszczu. Biul Inst Hod Aklim Rośl 2006; 239: 303–318.
13. EFSA NDA Panel (EFSA Panel on Dietetic Products, Nutrition and Allergies). Scientific Opinion on the essential composition of infant and follow-on formulae. EFSA Journal 2014; 12 (7): 3760.
14. EFSA NDA Panel (EFSA Panel on Dietetic Products, Nutrition and Allergies). Scientific Opinion on Dietary Reference Values for calcium. EFSA Journal 2015; 13 (5): 4101–4182.

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Prace poglądowe | Reviews

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SUCCESSFUL GRANT-WRITING STRATEGIES FOR JUNIOR SCIENTISTS: AN AMERICAN PUBLIC UNIVERSITY PERSPECTIVE

STRATEGIE PISANIA WNIOSKÓW O DOTACJE BADAŃ DLA MŁODYCH PRACOWNIKÓW NAUKI: Z PERSPEKTYWY AMERYKAŃSKIEGO UNIWERSYTETU PUBLICZNEGO

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A – przygotowanie projektu badania | study design, **B –** zbieranie danych | data collection, **C –** analiza statystyczna | statistical analysis, **D –** interpretacja danych | interpretation of data, **E –** przygotowanie maszynopisu | manuscript preparation, **F –** opracowanie piśmiennictwa | literature review, **G –** pozyskanie funduszy | sourcing of funding

SUMMARY

The objective of this article was to summarize selected successful grant-writing strategies from the perspective of an American public university faculty member. Early sections focused on describing the American public university system aspects that constitute the background to incentivizing and rewarding successful grant-writing. The latter sections focused on examples of resources, from the personal to the national level for grant-wring. The article concluded with tips for successful grant-writing for junior scientists that are known to work regardless of the academic system. The author is a faculty member of one of the first public universities in the U.S. and a member of #1 ranked department in the U.S. in the area of agricultural and biological engineering. The author had a great opportunity to mentor junior scientists in Poland as a U.S. Fulbright Scholar. This article is a timely contribution to the ongoing efforts to reform the Polish university system. Specific solutions dealing with promoting and incentivizing excellence discussed in this article can be a useful input for consideration.

KEYWORDS: grant-writing, research funding, American public university

STRESZCZENIE

Celem tego artykułu było podsumowanie wybranych strategii pisania wniosków o dotacje na badania z perspektywy pracownika wydziału amerykańskiego uniwersytetu publicznego. Pierwsza część koncentruje się na opisywaniu aspektów amerykańskiego publicznego systemu akademickiego, które stanowią bazę pisania skutecznych wniosków o dotacje. Ostatnia część skupia się na środkach wspomagających pisanie grantów od poziomu personalnego do krajowego. W artykule zawarto wskazówki dla młodych naukowców w zakresie skutecznego pisania wniosków, bez względu na dany system akademicki. Autor jest pracownikiem wydziału jednej z pierwszych uczelni publicznych w Stanach Zjednoczonych i członkiem kadry wydziału notowanego na 1. miejscu w rankingu ogólnokrajowym w dziedzinie inżynierii rolniczej i biologicznej. Miał on doskonałą okazję mentoringu młodych naukowców w Polsce jako U.S. Fulbright Scholar. Ten artykuł wpisuje się do wysiłków na rzecz reformy polskiego systemu uniwersyteckiego. Konkretne rozwiązania zajmują się promowaniem i udoskonalaniem omówionych w tym artykule kwestii, które mogą być przydatne w tej dyskusji.

SŁOWA KLUCZOWE: pisanie wniosków, dotacje badań, amerykański uniwersytet publiczny

Grant writing – a part of American public university culture

Public university systems the U.S. continue to provide high quality education. Many of them continue to be ranked high in world's rankings of higher education institutions. They attract local and international students. American academia provides many opportunities for junior scientists (defined here as a Ph.D. student, postdoctoral fellow, and Assistant Professor) to launch a life-long career and be successful as a scientist, researcher, or faculty. The institution of public university is an integral part of American culture. It continues to play a major role in educating new generations of leaders, improving lives of individuals, serving communities, fostering the spirit of excellence, discovery, and life-long learning.

Successful grant-writing is an integral part of a "culture" intrinsic to many public American universities. A very simplified graphical presentation of complementary and synergistic relationships related to grant-writing is presented in Figure 1. Public universities rely on faculty members to write and win grants supporting their "scholarship of research, teaching and extension", hire and train graduate students and postdoctoral fellows. Graduate students and postdoctoral fellows engage in scholarly writing, providing basis to attract new grants, and new students. Visibility of scholarly writing, grant activity, and graduate student training in turn, is the basis of individual advancement, impacts the perception of university programs and their ranking among peers.

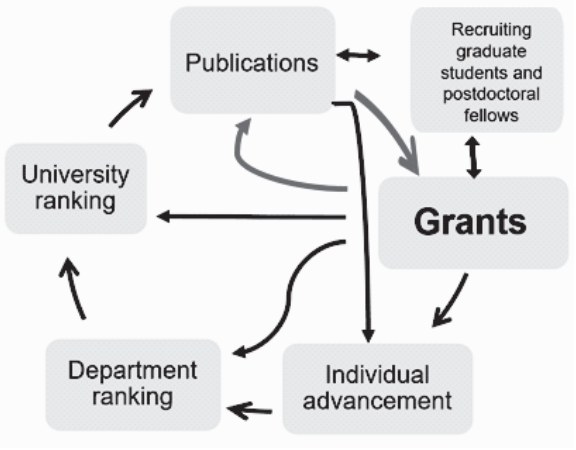

Figure 1. Simplified schematic of grant impact on academic scholarly activities, advancement and ranking

Many junior faculty members are supported by and involved with Cooperative Extension, a "third pillar" (besides research and teaching) of public, land-grant American universities. With more than 100 years of history, extension serves many public, private and non-profit sectors with direct assistance in the areas involving community, natural disaster issues, environment, family, farm, health and nutrition, lawn and garden, pest management, and youth [1].

Impact of successful grant writing on graduate and postgraduate student recruitment

Successful grant writing and winning awards enables search and recruitment of new graduate students (both at M.S. and Ph.D. level) and postdoctoral fellows. In less common cases, students write scholarship applications to federal grant programs, or in the case of international students, scholarship applications to their governmental agencies or institutions with a global reach. Foundations, and governmental organizations in the U.S. and abroad (e.g., China, Kazakhstan) also fund "full ride" scholarships covering graduate student expenses for travel, tuition, room and board, books and health insurance for up to 3 years for a Ph.D. at a premiere U.S. universities. These scholarships improve chances of finding a high quality graduate program in the U.S. Submitting a successful application for such scholarships requires initiative, preparation, and good grant writing skills.

In most cases, new M.S. and Ph.D. students are admitted to graduate programs only if their major professor has a grant to support him/her with graduate research scholarship/stipend. It is also a responsibility of the hiring professor to pay a share up to 100% of tuition. Thus, the graduate experience is for many students, a full-time job where the major professor is not only a mentor but also the immediate supervisor who won a grant with the budget to support the student/ /postdoctoral fellow. A Letter of Intent is drafted by the major professor itemizing deliverables and timeline. These deliverables are often precisely described in the grant funding for the student or a postdoctoral fellow. Admission to graduate programs is very competitive and global. It is driven by timing and availability of successful grant funding, matching skills, competencies and career plans of applying students and postdoctoral fellows. Students and postdoctoral fellows are responsible for completion of project deliverables (e.g., publications, final reports) which become integral part of their thesis or portfolio.

Ph.D. students are often engaged in preparation of research proposals as a required aspect of their writing, performing literature review, critical thinking, finding and articulating knowledge gaps and needs. Also, some Ph.D. students and many postdoctoral students are engaged in writing grant proposals to extend their funding and to continue scholarly activities.

Winning grants is increasingly more competitive. The right preparation strategy improves chances to win a grant funded by U.S. Government, U.S. states, industry, commodity groups, and foundations. In some cases, universities invest in creating graduate stipends in strategic research trusts that have a broad impact or are emerging to be the next highly-fundable area.

Impact of grant writing on advancement in academic ranks

Incentivizing successful grant-writing is institutionalized in many public universities. New faculty

positions for departments are created after departmental-level consensus and successful presentation (in writing) of the rationale for such an investment of university/public resources. Many new faculty positions are advertised globally to attract the best candidates. New faculty is typically hired at an Assistant Professor level (sometimes considered as a "junior faculty") and given a probationary "window" of time (e.g., 6 years) to prove his/her scholarly record is worthy of tenure and advancement to Associate Professor rank. This model gives junior faculty enormous freedom to act as professors-in-charge of their research programs. It also creates an enormous fiscal responsibility to support graduate students, postdoctoral fellows, and (in some cases) full-time laboratory or program staff.

Grant-writing is crucial in junior faculty member advancement. Universities incentivize faculty members by guaranteeing 9 month of salary per year. This model rewards faculty who can budget their summer salary into grant applications. Some universities allow the "buy-out" of teaching responsibilities for highly successful faculty members who win large grants and build large programs. The "buy-out" model enables flexibility to incentivize faculty members to write and win competitive grants and build large programs, minimizing concerns about the need to perform well in all areas of responsibility.

Impact of grant writing

This model is possible, in part, due to the lack of rigorous "pensum" (interpreted as a mandatory number of instructor-student contact hours for every faculty member). Many public universities employ faculty with negotiable position responsibility statement (PRS). The PRS system enables department-level decision making on individual faculty responsibilities and his/her share of teaching, research, extension, service and administration. This model promotes rewarding highly successful faculty according to their strength based on 0–100% share of responsibilities in main scholarship areas. The U.S. system allows for advancement in ranks based solely on good teaching, instruction, mentoring of students and writing scholarly articles about teaching. More documented impact such as grant funds, number of publications and citations, number of graduate students and their career placements is expected from faculty members with a larger share of the scholarship of research in their PRS. On the other hand, high marks from student class-climate surveys, number of publications about the scholarship of teaching is expected from faculty members with a larger share of the scholarship of teaching in their PRS. Many "land-grant" public universities provide highly successful programing in Extension and Outreach that is core part of university mission, i.e., solving problems important to the rural communities their serve. Thus, faculty members with "extension" appointments serve as a crucial link with stakeholders such as public, industry, local and regional governmental organizations.

Resources for successful grant writing for junior scientists

Startup package

Hiring new faculty member requires departmental, college, university and stakeholders consensus on the position scope. All this is followed by budgeting and a nationwide search. It is very common that a person who wins the competition for a new faculty member position comes from another university and program. This injects the department with fresh energy, diversity of experiences, and an opportunity to engage in new collaborations.

New junior faculty at Assistant Professor positions are given a "startup" package meant for successful launching of scholarly excellence and ones' career as a faculty member. The departmental level support is seen as crucial. It comes in different forms that can involve a number of following options: laboratory space, funding for new equipment, funding to recruit the first graduate student, lower expectations for administrative and service work for the department, and lower teaching load for first semester or year. All this is presumes that a junior faculty budgets time to successfully write proposals that in relatively short time will result in the "return of investment" that the department and university is making in hiring a new person.

Mentoring

New faculty members are often assigned a senior faculty mentor. This person helps new faculty to be more effective in managing time, allocating efforts to deliverables that count towards PRS and learning best practices in teaching, research, and extension. Mentoring by senior faculty in the area of grant-writing is crucial for many junior faculty. Mentors can serve with immediate feedback on writing and tips on specific programs and sources of funding. Junior faculty are also encouraged to volunteer their services as ad-hoc peer reviewers of grant applications and to volunteer to be panel members in various granting organizations. This type of volunteering is an extremely valuable lesson for junior faculty, i.e., learning how peer-review and grant proposal review panels work.

Departmental level resources for grant writing

Successful departments have implemented a number of resources to help their faculty to be successful in grant writing. These could include an option to "buy-out" part of teaching responsibilities by highly successful faculty members who bring significant external funds and manage large projects. Some departments have also invested in hiring a person dedicated to handle all forms involved in grants writing such as vita, current and pending support, conflict of interest and also building budgets appropriate for the proposal. In a well-functioning system, this person also helps the faculty member with university-level approval of the grant proposal forms, leaving faculty more time to write the actual science part of the proposal. In addition, this person distributes weekly updates on calls for proposals and current deadlines to all faculty.

Some departments have instituted a transparency in who has been writing submitting winning grants. This helps creating a culture of excellence and also is a motivation for faculty members to write proposals, since lists of faculty submitting and winning proposals are shared with all members on monthly basis. This effort also helps in departmental-level reporting and awarding highly successful faculty. Similar transparency for teaching assignments with course numbers, enrollment, and credit hour can also create a culture of trust and building shared common good for the department.

College level resources for grant-writing

Colleges are an intermediate level of administration between the departments and the university. College administration has a unique position to foster collaborative grant-writing efforts. It is common deficiency of less successful universities to limit interactions between faculty members at different departments. Yet, science today is increasingly collaborative both at the grant writing stage and publications. Some successful colleges promote networking by funding professional grant writing help, funding trips to workshops on grant-writing, and inviting grant program managers onto campuses for easy access and questions & answers sessions.

University level resources for grant-writing

University administration can play a major role helping junior scientists to be successful in winning grant funding. This is a multi-prong approach involves (a) providing funds for travel and meeting with program managers, (b) providing "seed" funding to form collaborative teams and proof-of-the-concept projects in strategically profitable areas, (c) networking with stakeholders (public, industry, government), and (d) communicating broad impact (e.g., health, national defense, safety and security, economy, food, energy, environment, climate change, crime, education).

National level resources for grant-writing

Grants.gov [2] is a one-stop clearinghouse for government-level funding available. Many universities help scientists by searching, screening and e-mailing (weekly newsletter) updates on open calls for proposals. Many government-level programs have introduced a 2-tier level of proposal writing aiming at early screening for proposal ideas for further development. This approach calls for mandatory pre-proposal stage (e.g., 2 page maximum) that is initially reviewed and feedback is provided to authors with suggestions on what to improve if the scientist chooses to submit fully developed proposal. This 2-tier approach saves time and resources for the individual scientist or team.

U.S. national level program managers are also available to contact (e-mail and phone) to discuss particular idea for a proposal and how it may fit into programs they manage. This level of assess helps to solicit better quality proposals and can save time and resources for junior faculty investing in writing large proposals with little or no feedback.

Personal level resources for grant-writing

Personal level resources are always available, yet often times they are the most difficult to adopt and use. The level of difficulty ties to human behavior. Writing grant proposals and manuscripts does not have built-in accountability like teaching does. For example, classroom teaching is scheduled into a weekly routine. Many professional writers agree that some level of accountability is helpful in actual completion of writing tasks (e.g., completion of grant proposal or manuscript). Thus, scheduling of writing into one's daily routine is key for success in work environment where there is "no time" for it. Writing needs to be prioritized. Professional writers argue that the writing time should be scheduled for minimum 30 min a day, preferably in the mornings when the mind is fresh [3]. Your writing time needs to be considered non-negotiable and treated with utmost respect as a meeting with another person. People implementing this personal-level change of attitude towards writing report dramatic increase of productivity, lower stress in managing work-personal life balance [3].

Tips for successful grant-writing

– Start early. Be thankful there is an opportunity to write. Schedule grant-writing into daily schedule (minimum 30 min a day). Keep daily "appointment" for writing as priority and with utmost respect. Develop a habit of daily writing that works for any type of writing including grant proposals, manuscripts, and reports.

– Find mentors and seek feedback. Do not aim for "perfection", aim at continuous progress with feedback-revisions built in on regular basis.

– Network with successful grant-writers and ask for feedback on your writing.

– Seek collaborators and do not limit it to your research area.

– Publish your completed work in premiere journals of your discipline. Know who cites your work.

– Develop and visualize your publishing and grant funding record on-line using many specialty sites (e.g. ORCID [4], Researcher ID [5], Scopus [6], Google Scholar [7], ResearchGate [8]) and social media (e.g., Facebook, Twitter, and LinkedIn).

– Volunteer to review grant proposals and manuscripts submitted for peer-review.

Technical tips for successful grant-writing

– Read, re-read the request for proposals. Make initial check for eligibility. Assess time available. Ask your administration for help with processing forms.

– Schedule daily writing (30 min per day).

– Develop bright, great idea how to address an important problem, need, gap in knowledge.

– Perfect the art of "selling" the idea. Write descriptive title. Focus on excellent Summary where every word is meaningful. Summary is often what decides in reviewers mind on how much time reviewers will read and treat the rest of the proposal.

– Use visuals, schematics, logic models, charts, figures, tables that convey the bright idea, significance, and Broader Impact. Write clearly using short sentences. Repeat the key words and phrases from the request for proposal. Be positive. Show enthusiasm and energy. Show complementary and synergistic collaborations.

– Complete a literature review that clearly documents that there is indeed an important problem to solve, gap in knowledge to fill, a need to address. Make sure you can clearly articulate that the problem/gap/ /need has a Broader Impact, i.e., it has a potential to benefit the society to which most of the public and experts will agree.

– Write focused objective(s) or hypotheses to be tested that clearly focus on the identified problem, gap or need. Your objectives must result in deliverables even if the proposed research will not yield expected results. Likewise, your hypotheses must be objectively testable. Avoid open-ended objectives. Be specific of what exactly will be measured, tested and write it convincingly to respond to "why-", "what for"-type of questions.

– Write the rationale statement to highlight what will be possible when the gap/need is addressed and problem solved and how it will benefit the society.

– Write a long-term goal. Highlight how your proposed project fits into broader and longer effort to solve some major problem.

– Add Methods that clearly follow the logic of objectives. Make sure reviewers understand you have means (e.g., laboratory space and equipment) to successfully complete this project.

– Write deliverables which are concreate outcomes (e.g., manuscripts published, major oral presentations at conferences, graduate students trained, progress and final report).

– Include preliminary results to project the aura of technical excellence, feasibility, and confidence that the proposed project will have high probability of success and good use of public or sponsor funds.

– Document prior work, collaborations, evidence of successful project completion.

– Develop realistic scope, budget and timeline for key deliverables.

– Address any constructive feedback from previous submission (if re-submitting).

– Finally, do not take rejection to grant proposal as a personal offense to you. Treat it as problem with the proposal, not with you.

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References

1. Extension.org. For Extension Professionals and Public They Serve [online] [cit. 15.06.2016]. Available from URL: https://extension.org/.
2. Grants.gov. Find. Apply. Succeed [online] [cit. 21.06.2016]. Available from URL: http:// http://www.grants.gov/.
3. The Monday Motivator. National Center for Faculty Development and Diversity [online] [cit.21.06.2016]. Available from URL: http://www.facultydiversity.org/?page=MondayMotivator.
4. ORCID. Connecting Research with Researchers [online] [cit. 21.06.2016]. Available from URL: http://orcid.org/.
5. Researcher ID. Thompson Reuters [online] [cit. 21.06.2016]. Available from URL: http://www.researcherid.com/.
6. Scopus. Elsevier B.V. [online] [cit. 24.06.2016]. Available from URL: https://www.scopus.com/.
7. Google Scholar [online] [cit. 25.06.2016]. Available from URL: https://scholar.google.com/.
8. Research Gate [online] [cit. 21.06.2016]. Available from URL: https://www.researchgate.net/.

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METHODS OF TRAINING AIMED AT ELIMINATING TISSUE HYPOXIA

METODY TRENINGOWE ELIMINACJI HIPOKSJI TKANKOWEJ

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A – przygotowanie projektu badania | study design, **B –** zbieranie danych | data collection, **C –** analiza statystyczna | statistical analysis, **D –** interpretacja danych | interpretation of data, **E –** przygotowanie maszynopisu | manuscript preparation, **F –** opracowanie piśmiennictwa | literature review, **G –** pozyskanie funduszy | sourcing of funding

SUMMARY

Chronic hypoxia is a common condition affecting the organ tissues and systems in the human body. Tissue hypoxia affects cell function, leading to cell damage and death, and may be the cause of many chronic diseases that are generally perceived as civilization diseases. The problem of eliminating or mediating the symptoms of hypoxia involves searching for a physiological mechanism that can prevent its development.

To maintain gas homeostasis in the blood, it is necessary to adjust the function of the respiratory system, which can only be achieved by special breathing training. The aim of this paper was to investigate the training methods directed at producing physiological hypercapnia as means of eliminating tissue hypoxia and to examine the existing methods of using physical exercise to obtain physiological hypercapnia. The simulation method of obtaining physiological hypercapnia is an alternative to the existing training methods aimed at eliminating tissue hypoxia. The human body requires a regular overdose of carbon dioxide (hypercapnia) to maintain physiological norms. Daily training allows the breathing, and consequently the blood CO_2 levels, to return to the normal.

KEYWORDS: hypercapnia, breathing training, hypoxia

STRESZCZENIE

Przewlekłe niedotlenienie komórek to częsty stan, w którym przebywają komórki narządów i układów organizmu człowieka współczesnego. Niedotlenienie prowadzi do niezgodności funkcjonowania organizmu, uszkodzenia tkanek, a nawet do śmierci. To niedotlenienie jest podstawą, a w rzeczywistości przyczyną wielu chorób przewlekłych, postrzeganych jako choroby cywilizacyjne. Problem wyeliminowania lub zmniejszenia objawów niedotlenienia determinuje konieczność znalezienia środków i fizjologicznego mechanizmu, który może zapobiegać rozwojowi tego stanu.

W celu utrzymania homeostazy gazowej konieczne jest dostosowanie funkcjonalności systemu oddechowego. Można to osiągnąć jedynie przez specjalny trening oddechowy. Celem pracy była analiza metodologii treningowej (imitacyjnej) wytwarzania hiperkapnii fizjologicznej jako środka eliminacji hipoksji. Metoda imitacyjna jest alternatywą dla istniejących środków treningowych wytwarzania hipoksji. Utrzymanie norm fizjologicznych w organizmie człowieka wymaga regularnego przedawkowania dwutlenku węgla (hiperkapnii). Dzięki codziennym treningom oddech, a co za tym idzie poziom CO_2 we krwi wracają do normy.

SŁOWA KLUCZOWE: hiperkapnia, trening oddechowy, hipoksja

Background

Hypoxia and carbon dioxide

Chronic hypoxia or oxygen starvation is a common condition affecting the tissues and systems of human organs. Tissue hypoxia affects cell function, leading to damage and death of the cell, and may be the cause of many chronic diseases that are generally perceived as inevitable diseases of age [1]. The symptoms of organ diseases appear when acute hypoxia is caused by a sequence of stresses. When brain structures are affected by acute hypoxia, instantaneous death may occur [2–3].

Research has shown that tissue cells can receive as little as 50% of the required dose of oxygen as a result of stress, as little as 15–20% due to environmental impacts, as little as 30% during exercise, and as little as 10% when rest [4–5]. In the elderly, this can be compounded by age-related pulmonary failure, resulting in premature aging, decreased energy, and numerous diseases.

In 1911, PM Albitsky found that metabolic carbon dioxide (CO_2), formed from the oxidation of nutrients, is partially released to the environment through the lungs. Some metabolic CO_2 is permanently retained in the body due to biological necessity. The CO_2 content of arterial blood is the most important indicator of homeostasis. Four parameters depend directly on the level of CO_2:

– vascular and bronchial tone;

– number of open capillaries;

– the degree of deoxygenation of oxyhemoglobin – i.e., the absorption of oxygen by the cells;

– the capacity of the buffer blood system [6].

The problem of eliminating or ameliorating the effects of hypoxia involves the search for a physiological mechanism that can act to prevent its development.

Methods of eliminating tissue hypoxia

The physiology of the human body is such that the level of CO_2 rises naturally during exercises, such as walking or running. Physiologists refer to this condition as "physiological hypercapnia".

What are the direct physiological consequences of hypercapnia? It is known that, at maximum physiological hypercapnia (such as arises from an aerobic burden equivalent to running about 10 km in an hour), there are 30 times more capillaries in an expanded state than in the absence of physiological hypercapnia; the level of oxyhemoglobin (where O_2 binds with hemoglobin) increases by a factor of 2–3; the arteriovenous difference in oxygen increases by a factor of 3–4 [2, 7].

There is another method that can also be referred to as "physiological hypercapnia". For five thousand years, Indian yogis have effectively used a training method for voluntary control of the breath to obtain a minimum respiratory minute volume (RMV) [8–9]. It was only in the twentieth century that, based on scientific discoveries of the Russian physiologists Albitsky and BF Verigo the increased appreciation of the fundamental role of carbon dioxide (CO_2) in the regulation of the mechanism of oxygen absorption (O_2) in the human body, KP Buteyko discovered the mechanism underlying the yogic practice and explained the therapeutic effect of reducing pulmonary ventilation at rest [4, 10]. This method lead to a practical application in the form of the first scientifically based technological hypercapnic breathing exercise.

Referred to as the method of volitional elimination of deep breathing (MVEDB), it is based on yogic exercises that aim for the arbitrary control of breathing through breath retention following exhalation and increasing the duration of the exhalation. As a result, the volume of breathing is reduced to the necessary minimum, reducing the normal physiological value of CO_2 concentration in the blood. The hypoxic syndrome was thus eliminated, leading to recovery. Yet despite the recognition and popularity enjoyed by Buteyko's method, it has not become widespread, as the exercises require willpower and a certain time investment. However, the possibility of eliminating of the underlying cause of health disorders (tissue hypoxia) by normalizing blood gas composition, as suggested by Buteyko, has contributed to the search for new means to generate this process in the human body.

A natural decrease in the intensity of external respiration mediated by the adaptation of the respiratory center is caused by regularly recurring physiological hypercapnia of sufficient intensity. This expresses itself as a decrease in the respiratory minute volume (RMV) among runners, athletes, yogis, and practitioners of Buteyko's method over time, reaching rest values of 2 liters per minute among advanced Indian yogis, 4.5 liters per minute among runners and athletes, and 4–5 liters per minute among users of Buteyko's method [11].

This natural reduction in RMV leads to the optimal containment of CO_2 in the body and provides a constant biological basis for normal metabolism due to the normalization of oxygen supplied for tissue cells at rest.

In this way, due to physiological hypercapnia, the normal functioning of the body both in motion and at rest is enabled. Therefore, the regular creation of a state of "physiological hypercapnia" is a necessary condition of normal physiology and its preservation for many years. There is need for long-term, daily, high-level physiological hypercapnia in order to successfully process restoring normal physiology and achieve a high level of health, which allows the RMV to be reduced gradually.

Simulation training

In 1998, on the basis of fundamental scientific knowledge of human nature, a practical and affordable way to create physiological hypercapnia was found (Russian Federation patent no. 2000117766 and international patent no. RTS/K1G/00260 by NA Agadjanyan, YN Mishustin, and SF Levkin) [11]. This

solution, marketed as the Samozdrav device, does not require great willpower or extensive physical effort from the user; it instead involves one or two 20-minute sessions per day of quiet breathing through a hypercapnicator device containing a special gas mixture; this is referred to as a "sports simulator". Most typically within four to ten months, an automatic normalization of the average daily level of CO_2 occurs thanks to a reduction in the RMV. This leads to a gradual restoration in cells' need for oxygen and in return of the energy levels of billions of cells to normal values, as well as a normalization of metabolism, and a fundamental self-recovery of the body that reduces the likelihood diseases of civilization.

The breathing of this mixture prevents the excretion of CO_2, which is formed continuously in the body, and leads to physiological hypercapnia just as during walking or running. After some time, its level in the arterial blood gradually increases, better supplying organ cells and systems with oxygen. During the session, a significant increase in the amount of oxygen supplied under physiological hypercapnia restores energy production in cells and restores normal metabolism; a result, there is an increasing in the production of CO_2, which is released into the blood, creating positive feedback.

The increased CO_2 blood level during the session lasts for several hours as a consequence of the intensified metabolism, and has a training effect on the respiratory center. Such hypercapnic training over several months gradually leads to normal breathing becoming less deep and more superficial. The pulmonary ventilation decreases and eliminates the excess CO_2 from the body; its level in the alveolar system increases to the norm. Accordingly, the network of capillaries opens up, the level of deoxygenated oxyhemoglobin increases, and oxygen starvation of the cells is gradually eliminated. Metabolic processes are thus normalized and the symptoms of many diseases disappear.

Moreover, cells acquire a reserve of oxygen, making it possible to carry out extreme physical activity and bear greater levels of mental stress, thus helping to prevent myocardial infarction [1].

RMV is a key indicator of the actual status of the body [11]. It has been shown that a person can remain healthy and active for decades, if his or her RMV does not exceed 4.5 liters per minute. The greater the amount by which the RMV exceeds this level, the more symptoms of pathology arise. Those who suffer from the diseases of civilization may have RMVs of 8–12 liters per minute. This seems like a very drastic law of physiology. But fortunately, for millions of people, the reverse process also makes sense: that is, the gradual reduction of the RMV to normal levels and the gradual recovery of health – as can be achieved with regular simulation training.

Such simulation training is an imperative of our times, when people with reduced health potential are forced to do rehabilitation exercises; such people should exercise in a way that is safe, easily available, quick, and correlates with the health level. But exercise may be too difficult, or unsafe for hypertensive or asthmatic patient, not to mention for elderly people, to begin the process of restoring health in the traditional way. These people should have an opportunity to train in a different way and have an alternative method for restoring their health. Studies of hypercapnic training involving different age groups (in Belarus, Germany, and Russia) have shown that this method optimizes the activities of the cardiovascular system of young and elderly people, and even of highly skilled athletes, and leads to normalization of the main indicators of health. At the end of the training course, a medical examination was performed, only rarely uncovering features of functional diseases [12–13].

Conclusions

1. Tissue hypoxia – the main reason for the decrease in energy and for pathology – is a consequence of the disturbance of homeostasis of the gas composition in the blood, in the form of a lack of carbon dioxide, the main regulator of metabolism.

2. To restore the homeostasis of the gas composition of the blood, and to restore the normal physiology of the body, repeated, daily, long-term, high level physiological hypercapnia is needed.

3. Physiological hypercapnia results from physical activity during long-term exercises (walking, running, etc.), or from breathing exercises that reduce pulmonary ventilation (yoga exercises, MVEDB).

4. The use of environmental factors in the form of an active breathing mixture, which is formed during natural breathing with the capnicator (physical simulator), is another possible training method for achieving the level of physiological hypercapnia and elimination of hypoxia required for normal physiology.

References

1. Agadžanjan NA. Ekologija čeloveka i normalizacija dychanija. Argumenty i Fakty. Zdorov'e 1999; 19: 5–6.
2. Litvickoj PF, red. Patofiziologija. Moskva: Medicina; 1995: 312––318.
3. Schwartzstein RM, Parker MJ. Respiratory physiology: a clinical approach. Philadelphia: Lippincott Williams & Wilkins; 2006.
4. Mišustin JuN. Vychod iz tupika. Ošibki mediciny ispravljaet fiziologija. Samara: Samarskij Dom Pečati; 2003: 48–52.
5. Millet GP, Roels B, Schmitt L, Woorons X, Richalet JP. Combining hypoxic methods for peak performance. Sports Med 2010; 40 (1): 1–25.
6. Agadžanjan NA, Krasnikov NP, Polunin IN. Fiziologičeskaja rol' uglekisloty i rabotosnosobnost' čeloveka. Moskva–Astrachan': Nal'čik; 1995.
7. Wang JS, Wu MH, Mao TY, Fu TC, Hsu CC. Effects of normoxic and hypoxic exercise regimens on cardiac, muscular, and cerebral hemodynamics suppressed by severe hypoxia in humans. J Appl Physiol 2010; 109 (1): 219–229.
8. Iyengar KS. Light on Pranayama: the yogic art of breathing. New York: Crossroad Publishing; 2006: 105–111.
9. Singleton M. Yoga body: the origins of modern posture practice. New York: Oxford University Press; 2010.

10. Buteyko VK, Buteyko MM. The Buteyko theory about a key role of breathing for human health: scientific introduction to the Buteyko therapy for experts. Voronezh: Buteyko Co Ltd; 2005: 10–20.
11. Nenašev AA. Ustranite pervopričiny bolezni. Samara: Samarskoj Universitet; 2000: 16–23.
12. Senin IP. Imitacionnye metodiki fizičeskoj kul'tury. Grodno: GrGU; 2005.
13. Senin IP. Simulation training. Saarbrücken: LAP LAMBERT Academic Publishing; 2014.

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HALITOSIS: CAUSES, DIAGNOSIS, AND TREATMENT

HALITOZA: PRZYCZYNY, DIAGNOSTYKA, LECZENIE

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A – przygotowanie projektu badania | study design, **B –** zbieranie danych | data collection, **C –** analiza statystyczna | statistical analysis, **D –** interpretacja danych | interpretation of data, **E –** przygotowanie maszynopisu | manuscript preparation, **F –** opracowanie piśmiennictwa | literature review, **G –** pozyskanie funduszy | sourcing of funding

SUMMARY

Nowadays halitosis is a common disorder, with a wide range of causes, mostly dental, laryngological, and gastrological. There are many ways to diagnose halitosis, but it is not always possible to determine its cause. There are also many ways of managing it, therefore patients should be encouraged to seek diagnosis and treatment for this troublesome ailment.

Halitosis (*halitus*: smell; *osis*: chronic dysfunction) refers to the presence of a persistent unpleasant mouth odor, which can last for years. Halitosis can also be referred to as fetor oris, bad breath, oral malodor, ozostomia, and stomatodysodia. Apart from actual halitosis, there are also pseudohalitosis and halitophobia, when the people around the patient detect no unpleasant mouth odor, but the patient believes it is present. Fetor oris is quite a common problem, with studies confirming about 15–30% incidence among the population. Bad breath may be a symptom of other diseases, such as gastrointestinal and respiratory tract disorders or metabolic disorders. Dietary and hygienic habits are of great significance in causing halitosis. The easiest and most common diagnostic method of establishing halitosis is for the doctor to smell the patient's exhaled air (the organoleptic method). Another easy test is the BANA test, which detects one of the proteolytic enzymes generated by the bacteria that colonise the plaque and the back of the tongue. There is also a test to objectively measure the severity of halitosis using the halimeter, a device that measures the amount of volatile sulfides in the exhaled air. Furthermore, there is gas chromatography, a very sensitive and accurate method of separately measuring the amount of each of the volatile sulfides in the exhaled air; unfortunately the test is very expensive. Halitosis management consists primarily of treating the underlying disease, and maintaining strict oral hygiene, using appropriate oral mouthwashes and chewing gums.

KEYWORDS: halitosis, halimeter, organoleptic measurement, volatile sulfides

STRESZCZENIE

W dzisiejszych czasach halitoza jest często występującym schorzeniem o różnych podłożach, na ogół stomatologicznym, laryngologicznym i gastrologicznym. Halitozę można diagnozować na wiele sposobów, lecz nie zawsze daje się ustalić jej przyczynę. Istnieje wiele dostępnych możliwości leczenia tej dolegliwości, dlatego należy zachęcać pacjentów, by zgłaszali się do lekarza i rozpoczynali kurację.

Halitoza (*halitus*: zapach; *osis*: przewlekłe zaburzenie) to uporczywy, nierzadko utrzymujący się przez lata, nieprzyjemny zapach z jamy ustnej. Inne nazewnictwo halitozy, które spotykamy w literaturze to: fetor oris, przykry

zapach z ust, nieświeży oddech, ozostomia i stomatodysodia. Oprócz halitozy prawdziwej rozpoznajemy również pseudohalitozę i halitofobię, kiedy to nieprzyjemny zapach z ust nie jest wyczuwalny przez otoczenie, ale pacjent uparcie skarży się na jego występowanie. Fetor ex ore jest obecnie dość powszechnym problemem, zgodnie z wynikami badań stwierdzonym u około 15–30% populacji. Dolegliwość ta może być objawem chorób nie tylko jamy ustnej, ale również przewodu pokarmowego, układu oddechowego, a także chorób metabolicznych. Bardzo istotnymi czynnikami w wywoływaniu halitozy są nasze przyzwyczajenia dietetyczne i higieniczne. Najprostszą i najpowszechniej stosowaną metodą określenia halitozy jest ocena zapachu powietrza wydychanego przez pacjenta za pomocą własnego węchu (badanie organoleptyczne). Praktycznym i łatwym w użyciu jest test BANA, wykrywający jeden z enzymów proteolitycznych wytwarzanych przez bakterie kolonizujące płytkę poddziąsłową i grzbiet języka. Do metod obiektywizujących zjawisko halitozy zaliczamy badanie za pomocą halimetru, urządzenia mierzącego zawartość lotnych związków siarki w powietrzu wydychanym przez pacjenta. Do bardzo dokładnych i czułych, ale zarazem i bardzo kosztownych metod diagnostycznych zalicza się chromatografię gazową, mierzącą pojedynczo związki siarki w wydychanym powietrzu. Leczenie halitozy polega przede wszystkim na leczeniu choroby podstawowej, poza tym na utrzymywaniu bardzo dobrej higieny jamy ustnej, stosowaniu odpowiednich płukanek i gum do żucia.

SŁOWA KLUCZOWE: halitoza, halimter, ocena organoleptyczna, lotne siarczki

Background

With the increase in interest in healthy lifestyles and hygiene, there has also been increased awareness of bad breath, leading individuals to consult with dentists, otorhinolaryngologists, and general practitioners.

The name "halitosis" (*halitus*: smell; *osis*: chronic disorder) was created in the 1920s and remains in common use in the medical literature and everyday speech. Synonyms include fetor oris, oral malodor, and bad breath [1–2].

The classification of halitosis distinguishes genuine halitosis (of oral or extraoral origin), from pseudohalitosis and halitophobia. Genuine halitosis is defined as a bad smell of unacceptable intensity from the oral cavity. In pseudohalitosis, patients believe that they are suffering from bad breath, but this is not sufficiently intense to be noticed by others. Pseudohalitosis can be managed through consultation (explaining of the results of laboratory tests, recommending literature, and training) and simple oral hygiene. A diagnosis of halitophobia should be made if the patient, following successful treatment for genuine halitosis or pseudohalitosis, continues to complain of bad breath, despite of absence of any symptoms in physical examination [1, 3–4].

The Vorher test allows patients with pseudohalitosis to be distinguished before applying specific tests for halitosis. It consists of a five-question test created by Christoph Benz of Ludwig Maximilian University, Munich. The test includes questions about the intensity of the bad breath according to the patient and other people [5].

Epidemiology of halitosis

Halitosis is a common problem: according to population studies, it affects 15–30% of the population. It is most common in seniors, patients with mental disorders, and those with ineffective oral hygiene [3].

Causes of halitosis

The most common causes of halitosis are stomatological diseases (over 80%), such as calculus, chronic gingivitis, periodontitis, caries, poor oral hygiene (mostly of the base of the tongue, which is very broad, segmented, and has many papillae, encouraging the deposition of food, epithelial cells, and saliva constituents), bacterial and fungal stomatitis, inflammatory alterations in mucus membrane and bones, tumors, developmental changes in mucosa and tongue, and piercing [1–2, 4, 6–8].

The second most common class of causes is laryngological origins (about 5–10% of cases), such as acute and chronic inflammation, tonsillolithiasis, tonsil pockets, acute and chronic rhinosinusitis, nasal polyps, obturation of the nasal duct (such as nasal septum deviation), foreign bodies in the nasal duct (mostly in children), diseases of the salivary glands, and tumors of the nasopharynx, sinus, upper respiratory tract and digestive tract [1, 3–4, 7–9].

Gastroenterological causes are also significant (5% of cases), and include gastroesophageal reflux disease (GERD), Crohn's disease, and ulcerative colitis. GERD is the most common gastroenterological cause of halitosis as acidic reflux can produce lesions of the oral cavity, esophagus, and oral epithelium [1–2, 4, 7–8].

Systemic diseases can also contribute to halitosis. These include diabetes (which can produce an acetone odor from the mouth), chronic renal diseases (fishy odor), hepatic failure, Sjogren syndrome, or ketosis, as in starvation [1, 7–8].

Xerostomy also affects oral odor, and all sources of dryness can also cause halitosis: these include psychosis, depression, stress, hyperthyroidism, GvHD reactions on transplantation, avitaminosis (deficiency of vitamin B_1 and B_6), AIDS, anemia, iron deficiency, hormonal disorders, sarcoidosis, amyloidosis, radiotherapy of head and neck tumors, and chronic treatment with diuretics, TLPD, antihistamines, hypotensive, neuroleptic, inhalation steroid, B-adrenomimetic, cholinolithical, chemotherapeutic, antibiotic, anxiolytic, cytostatics,

opioid painkillers and interferon drugs; in total, about 400 drugs decrease saliva production [10–11].

Dietary and hygienic habits contribute to halitosis: ineffective or rare brushing of the teeth, nonuse of oral rinses, and nonuse of dental floss can favor halitosis. Inappropriate oral hygiene promotes dental plaque on the surfaces of the teeth, gingiva, and dentures. Shortly after brushing, a pellicle forms, which thickens because of organic and nonorganic substance wasting. The plaque becomes covered by stains, made of a mixture of microorganisms (including those responsible for halitosis), excoriated epithelium cells, leucocytes, and remains of food [12].

Diet and addictions can also cause unpleasant mouth odors. For example, overconsumption of highly salted dishes, onions, and coffee can dries the mucus of the oral cavity, leading to halitosis. Eating garlic produces allyl methyl sulfide, which can leave a smell for 72 hours. Weight loss diets that cause the release of energy supplies (fats and proteins) may also cause halitosis as the metabolized products of the fats are released by the lungs. Meat consumption, which delivers proteins (which are made of peptides and amino acids) can be a cause of halitosis, too.

Smoking contributes significantly to halitosis development, as it favors xerostomy (32%), periodontal diseases, and molecules derived from cigarette smoke return with the blood to the lungs, causing so-called smoker's breath. Alcohol consumption can cause halitosis too, on account of its drying properties. Additionally, bacteria that live in the oral cavity (*Streptococcus salivarius, S. intermedius, S. mitis*) can transform ethanol to acetaldehyde using alcohol dehydrogenase.

Addiction to drugs such as amphetamines and methamphetamine influences saliva production. Other important factors in the etiology of mouth odor include breathing through the mouth, the flow of dry air during sleep, and a neutral or alkaline pH in the oral cavity–as well as other unknown factors [12].

There are thousands of bacterial species present in the oral cavity. The conditions that help these grow include an anaerobic environment and appropriate pH range; they consume food remains, excoriated epithelium, and blood serum components [4].

The bacteria responsible for halitosis are mainly anaerobic and produce strong smelling substances, such as hydrogen sulfide from cysteine (*Peptostreptococcus anaerobius*, *Eubacterium limosum*, and *Bacteroides* spp.), methyl mercaptate from methionine (*Fusobacterium nucleatum*, *Fusobacterium periodonticum*, *Eubacterium* spp., and *Bacteroides* spp.), hydrogen sulfide from blood serum (*Prevotella intermedia, Porphyromonas gingivalis, Treponema denticola*), mercaptate from blood serum (*Treponema denticola, Porphyromonas gingivalis, Porphyromonas endodontalis*), and dimethyl sulfide (*Eubacterium, Fusobacterium*); other substances are produced by *Campylobacter rectus*, *Prevotella oralis*, *Leptotrichia buccalis*, *Enterobacter cloacae, Fusobacterium periodonticum* [4, 7–8, 13].

Assessment of halitosis

The assessment of patients with an initial diagnosis of halitosis begin with the collection of a full medical history, encompassing also current treatment, oral hygiene, working conditions, and stressful situations at work and at home. It is necessary to perform a full physical examination, paying special attention to any white covering of the tongue, periodontium, dentition, and mucous membranes, examination of the patency of the salivary glands ducts, and oral hygiene. The evaluation should include a pantomogram evaluation, which is usually performed by a dentist. Full otorhinolaryngological and gastrological examinations are often necessary as well.

The examination of a patient with halitosis is based on a subjective organoleptic measurement of the oral odor. This can be performed by several methods.

In the first method, the patient gives a long exhalation into a tube 10 cm long and 24 mm in diameter. As the patient exhales, the doctor smells the other end of the tube for odor and rates the bad odor on a 0–4 or 0–5 scale [1, 3].

In the second method, the patient breathes through the nose only for three minutes. After this, the patient exhales through the mouth into a tube connected to a syringe with. The exhaled air is retained in the syringe by a valve. Later, a cup and straw are attached to the syringe and the smell of the sample is examined by a doctor [14].

Several scales are used in evaluating the intensity of bad breath. The first is the Rosenberg scale:

0: no smell,
1: the smell is hardly perceptible, questionable,
2: the smell is hardly perceptible, but not questionable,
3: obviously perceptible smell,
4: intense smell,
5: very intense smell [4, 6, 8].

The second scale used in the evaluation of the bad breath is the De Boever and Loeshe 0–5 scale and is similar to the Rosenberg scale. The third scale, the Filippi scale, is most commonly used by practitioners:

0: the smell is absent,
1: the smell is perceptible from 10 cm,
2: the smell is perceptible from 30 cm,
3: the smell is perceptible from 100 cm [12, 15].

In the organoleptic evaluation of halitosis, it is not possible to localize the exact origin of the smell (oral or nasal cavity, pharynx, or digestive system).

If there is suspicion of a laryngological disorder of the tonsils, bad breath is assessed by the Finkelstein test, which involves applying a massage and some pressure to both tonsils. The obtained excretion is evaluated for its smell separately for the left and the right tonsil.

0: the smell is absent,
1: the smell is perceptible from 1 cm,
2: the smell is perceptible from 10 cm [16].

The objective methods of evaluating halitosis are the halimeter and gas chromatography. Using a halimeter, the concentration of volatile sulfides is measured at the probe, which is inserted into the oral cavity (rather than measuring exhaled air). This method has limited accuracy, because not all microorganisms responsible for a bad breath produce volatile sulfides.

The halimeter test is performed in the morning and in the evening of the test day. The patient should restrain from drinking (except for mineral water), eating, smoking, chewing gum, and brushing teeth for three hours prior the test. On the day of the test, the patient should not use mouth fresheners, perfume, aftershave, lipstick, or other oral cosmetics. Two days before the test, the patient should restrain from drinking alcohol and eating onions or garlics. The test can be performed once three weeks have elapsed after the end of antibiotic therapy [6, 17–19].

During the test, the air in the oral and the nasal cavity is evaluated separately. Before the assessment the patient breathes through the nose for one minute; the probe is then placed on the back of the tongue while the patient continues to breathe through the nose. The results are obtained as parts per billion (ppb) of volatile sulfides. The results of the test are evaluated on a 0–4 Filippi scale:

0: < 100 ppb (lack of halitosis),
1: 100–179 ppb (benign halitosis),
2: 180–250 ppb (medium halitosis),
3: > 250 ppb (severe halitosis) [4, 8, 12].

Gas chromatography is the second objective method for evaluating bad breath. In this method, hydrogen sulfide, methyl mercaptane, and dimethyl sulfide are measured. Air from the oral cavity is collected using a syringe. Afterwards, the probe is introduced to a chromatograph using a cannula. After eight minutes of evaluation, a result is obtained as ng/10 ml. Gas chromatography is a very sensitive, accurate, and repeatable test, but is rarely used in practice because of its high cost [3, 7–8].

The practical and easy-to-perform BANA test is also used in the assessment of halitosis; it involves detecting the enzymatic decomposition of the reagent benzoyl-dL-arginine-L-naphthylamide. The enzyme that performs this is one of the proteolytic enzymes produced by gram-negative bacteria localized in the plaque and on the top of the tongue.

The test results correlate well with organoleptic measurement, but not with the halimeter or gas chromatography tests. It is impossible to determine the type of bacteria responsible for halitosis [3, 7].

Measuring the amount of saliva in basic secretion and following stimulation is an important element of bad breath diagnosis. During this test, the patient is asked to chew paraffin chewing gum for two minutes and to spit 5 minutes later. The saliva is collected in a calibrated cup.

Another test of saliva secretion is the Saliva-Check Buffer test. With this test, it is possible to also evaluate the viscosity, consistency, pH, amount of acid, and buffering ability of the saliva [12].

During the evaluation of halitosis, the covering of the tongue should be assessed. There are several scales used for this:

The Winkel index divides the surface of the tongue into six sections and sums the following assessment for each section:

0: no covering,
1: small amount of covering; the underlying color of the tongue is visible,
2: large amount of covering; the underlying color of the tongue is not visible [12];

Miyazaki index:

0: no covering,
1: covering visible on less than one third of the surface of the tongue,
2: covering visible on less than two thirds of the surface of the tongue,
3: covering visible on more than two thirds of the surface of the tongue [6, 12];

Shimizu index:

0: lack of covering,
1: thin covering, papillae are visible,
2: thick covering, papillae are not visible [12].

Management of halitosis

The most important part of halitosis management is the treatment of the underlying disorders through dental, otorhinolaryngological, gastroenterological, or general therapy. Apart from that symptomatic relief is of great important for the patient.

Different natural products have been used in different countries to reduce bad breath, including clove oil, parsley leaves, aniseed, cinnamon, guava peel, and egg shells [4].

The importance of the oral hygiene in halitosis management has long been proved. Such hygiene can be achieved through local antisepsis and mechanical cleaning, such as:

– brushing teeth and gums three times a day;
– removing the covering from the upper surface of the tongue using a special cleaner at least once a day at for 30–40 seconds (longer periods of mechanical cleaning are not recommended, as they may destroy the natural bacterial flora and cause candidiasis);
– rinsing the oral cavity and throat with antiseptic and antiodor mouthwash;
– using dental floss or interdental brush to clean the spaces between the teeth;
– using an oral irrigator.

Antiodor mouthwashes contain different substances, such as Meridol and the following:

– a complex of amine fluoride and tin fluoride that inactivates bacteria on the surface of the tongue and in the oral cavity;
– zinc lactate, which neutralizes volatile sulfides, creating sulfatide;

– other substances that neutralize unpleasant odors by inhibiting the transformation of amino acids to volatile sulfur compounds and CB12 – e.g., 0.3% zinc acetate, 0.025% chlorhexidine, and 0.05% sodium fluoride.

Antiseptic mouthwashes are based on:

– 0.12–0.2% chlorhexidine (Eludril, Corsodyl, Curasept), which reduces adhesion of bacteria by destroying their cell membranes;

– Essential oils (Listerine) such as thymol, menthol, eucalyptus, which destroy bacterial cell membranes and inhibit bacterial enzymes;

– Cetylopiridine chloride; mouthwashes with cetylopiridine chloride have 70% effectiveness and cause fewer side effects than those with chlorhexidine;

– Triclosan, which reduces volatile sulfur compounds.

The use of antiseptic mouthwashes is, however, limited by the amount of alcohol they contain, which causes drying of the oral mucosa [4, 7–8, 13, 17].

The most commonly used antiodor specific is chewing gum. It is important to use a chewing gum containing zinc or zinc, xylitol, and sodium fluoride.

Other methods of halitosis management include:

– zinc supplementation in form of tablets – for example, Halitomin and Hali-Z (which also contains xylitol);

– taking oxidizing tablets containing dehydroascorbic acid, which neutralizes volatile sulfides;

– chlorophyll tablets;

– active carbon tablets [20–22].

Probiotic treatment with *Streptococcus salivarius* K12 or *Lactobacillus salivarius* WB21 is a new approach to halitosis management. While using probiotics, the secretion of volatile sulfur compounds decreases, but after the treatment, the bacteria responsible for bad breath quickly recolonize. It is possible that the future of halitosis treatment will depends on the development of an appropriate vaccination [12, 23].

References

1. Dziechciarz P, Horvath A. Halitoza – choroba gastroenterologiczna? Pediatr Współcz Gastroenterol Hepatol Żywienie Dziecka 2009; 11 (1): 37–39.
2. Gońda-Domin M, Lisiecka K, Łuszczyńska A, Mokrzycka M, Szymanowicz J. Problem halitozy w chorobie refluksowej przełyku u dzieci – doniesienie wstępne. Czas Stomatol 2010; 63 (5): 293–300.
3. Mrówka-Kata K, Namysłowski G, Czecior E, Banert K, Ścierski W. Cuchnienie z ust. Forum Med Rodz 2008; 2 (3): 206–211.
4. Sroczyk Ł, Kawala B. Halitoza – przegląd piśmiennictwa. Dent Med Probl 2011; 8 (2): 255–260.
5. Benz Ch. Pseudohalitosis/Halitophobie. 5. Deutscher Halitosis Tag, Berlin 11–12.03.2016 [online] [cit. 29.09.2016]. Available from URL: https://www.quintessenz.de/events.php?ide=9684.
6. Quirynen M, Dadamio J, Van den Velde S, De Smit M, Dekeyser C, Van Tornout M, et al. Characteristics of 2000 patients who visited a halitosis clinic. J Clin Periodontol 2009; 36 (11): 970––975.
7. Scully C, Greenman J. Halitology (breath odour: aetiopathogenesis and management). Oral Dis 2012; 18 (4): 333–345.
8. Bollen CM, Beikler T. Halitosis: the multidisciplinary approach. Int J Oral Sci 2012; 4 (2): 55–63.
9. Ferguson M, Aydin M, Mickel J. Halitosis and the tonsils: a review of management. Otolaryngol Head Neck Surg 2014; 151 (4): 567–574.
10. Benz Ch. Medikamente, Speichelfluss & Halitosis. 5. Deutscher Halitosis Tag, Berlin 11–12.03.2016 [online] [cit. 29.09.2016]. Available from URL: https://www.quintessenz.de/events.php?ide=9684.
11. Kursun S, Acar B, Atakan C, Öztas B, Paksoy CS. Relationship between genuine and pseudohalitosis and social anxiety disorder. J Oral Rehab 2014; 41 (11): 822–828.
12. Filippi A. Halitosis. Professionelle Behandlung von Mundgeruch in der zahnärztlichen Praxis. 2. Aufl. Berlin: Quintessenz Verlags-GmbH; 2011.
13. Gokdogan O, Catli T, Ileri F. Halitosis in Otorhinolaryngology Practise. Iran J Otorhinolaryngol 2015; 27 (2): 145–153.
14. Kim DJ, Lee JY, Kho HS, Chung JW, Park HK, Kim YK. A new organoleptic testing method for evaluating halitosis. J Periodontol 2009; 80 (1): 93–97.
15. Seemann R, Conceicao MD, Filippi A, Greenman J, Lenton P, Nachnani S, at al. Halitosis management by the general dental practitioner – results of an international consensus workshop. J Breath Res 2014; 8 (1): 017101. Doi: 10.1088/1752-7155/8/1/017101.
16. Al-Abassi AM. Tonsillectomy for the treatment of halitosis. Niger J Med 2009; 18 (3): 295–298.
17. Erovic Ademovski S, Lingström P, Renvert S. The effect of different mouth products on intra-oral halitosis. Int J Dent Hygiene 2016; 14 (2): 117–123.
18. Romano F, Pigella E, Guzzi N, Aimetti M. Patients' self-assessment of oral malodour and its relationship with organoleptic scores and oral conditions. Int J Dent Hyg 2010; 8 (1): 41–46.
19. Iwanicka-Grzegorek E, Michalik J, Kepa J, Wierzbicka M, Aleksinski M, Pierzynowska E. Subjective patients' opinion and evaluation of halitosis using halimeter and organoleptic scores. Oral Dis 2005; 11 (Suppl. 1): 86–88.
20. Rosenberg M, Kulkarni GV, Bosy A, McCulloch CA. Reproducibility and sensitivity of oral malodor measurements with a portable sulphide monitor. J Dent Res 1991; 70 (11): 1436–1440.
21. Slot DE, De Geest S, van der Weijden FA, Quirynen M. Treatment of oral malodour. Medium-term efficacy of mechanical and/or chemical agents: a systematic review. J Clin Periodontol 2015; 42 (Suppl. 16): S303–S316.
22. Soares LG, Jonski G, Tinoco EMB, Young A. Short-term effect of strontium- and zinc-containing toothpastes and mouthrinses on volatile sulphur compounds in morning breath: a randomized, double-blind, cross-over clinical study. Eur J Oral Sci 2015; 123 (2): 72–79.
23. Seemann R, ed. Halitosismanagemement in der zahnärztlichen Praxis. Balingen: Spitta Verlag GmbH&Co. KG; 2006.

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SELECTED THEORIES OF AGEING

WYBRANE TEORIE STARZENIA SIĘ ORGANIZMÓW

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A – przygotowanie projektu badania | study design, **B –** zbieranie danych | data collection, **C –** analiza statystyczna | statistical analysis, **D –** interpretacja danych | interpretation of data, **E –** przygotowanie maszynopisu | manuscript preparation, **F –** opracowanie piśmiennictwa | literature review, **G –** pozyskanie funduszy | sourcing of funding

SUMMARY

Aging is a biological process, the mechanisms of which are not fully known to us. Therefore, there are many theories on the mechanisms governing it. This paper describes the four theories that provide information on the molecular aspects of aging of organisms. The first theory assumes the impact of telomere length on the length of life. Telomeres are nucleoprotein structures located at the ends of chromosomes, which protect against the loss of genetic information and which shorten with each cell cycle. Excessively shortened telomeres are conducive to the development of cancer, and aging of cells and organisms. The second, mitochondrial, theory describes the impact of accumulating mutations in the mtDNA on aging. According to this theory, the aging process is caused by free radicals, i.e. chemically reactive molecules, formed in the mitochondria of eukaryotic cells as the result of the reduction of molecular oxygen. The toxic effect of such reactive oxygen species leads to the accumulation of oxidative damage and malfunctioning of cells. According to the third, immunological, theory, the main cause of aging is decreased immune function and reduced amount of produced T and B lymphocytes and disturbances in the production of antibodies, all of which progress with age. According to the fourth, cell theory, homeostatic imbalance is the main cause of ageing. Aging of cells in the elderly causes them to be more prone to the so-called old-age diseases. Each of the described theories provides a better understanding of the extremely complex process that is ageing, even though they do not provide complete explanations of its mechanism.

KEYWORDS: theories of aging, mechanisms of aging, lifespan

STRESZCZENIE

Starzenie się jest złożonym procesem biologicznym, którego mechanizmy nie do końca są znane. Istnieje wiele teorii dotyczących mechanizmów tego procesu. W pracy opisano cztery teorie, które poruszają molekularny aspekt starzenia się organizmów. Jest to teoria telomerowa zakładająca wpływ długości telomerów na długość życia. Telomery to zlokalizowane na końcach chromosomów struktury nukleoproteinowe, chroniące przed utratą informacji genetycznej, ulegające skróceniu z każdym cyklem komórkowym. Nadmiernie skrócone telomery sprzyjają powstawaniu nowotworów, starzeniu się komórki i organizmów. Teoria mitochondrialna mówi o wpływie kumulujących się mutacji w mtDNA na procesy starzenia. Według niej za procesy starzenia odpowiedzialne są wolne rodniki powstające w mitochondriach komórek eukariotycznych w wyniku redukcji tlenu cząsteczkowego. Teoria immunologiczna za główną przyczynę starzenia uważa postępującą z wiekiem obniżoną czynność układu odpornościowego, zmniejszoną ilość powstających limfocytów T i B oraz zaburzenie produkcji przeciwciał. Teoria komórkowa w braku homeostazy upatruje główne przyczyny starzenia się organizmów. Starzenie komórkowe u osób w podeszłym wieku sprzyja zapadaniu na pewne typy chorób, nazywane starczymi. Każda z opisanych teorii umożliwia lepsze poznanie tego niezwykle złożonego procesu, jakim jest starzenie, choć nie wyjaśnia w pełni jego mechanizmów.

SŁOWA KLUCZOWE: teorie starzenia, mechanizmy starzenia, długość życia

Background

Ageing is a common biological process, which depends on a number of factors: genetic, environmental and random. It would seem that the genetic factors have the greatest effect, which can be supported by the relationship between the length of life and the species of the organism. Each organism living on Earth has a set of genes, which affect its metabolism, height and reproduction. However, there is no gene in the genome which would determine the length of life and ageing [1]. There are genes, though, participating in repairing DNA and ensuring homeostasis is stress conditions, which are said to affect longevity [2].

There are many theories of ageing and each strives to answer the question why and how we age. In this paper we discuss the telomere, mitochondrial, immunological and cell theories, which provide direct causes of ageing and describe its mechanisms [3].

Telomere Theory

Telomeres are DNA and protein structures located at the ends of chromosomes of eukaryotic cells. They safeguard the ends of chromosomes from degradation and loss of genetic information [4]. They are responsible for allowing the repair systems to determine which chromosome ends are good and which are damaged, for the spatial organisation of a nucleus and for the regulation of the transcription of genes located in subtelomere areas [5]. They prevent chromosome aberrations and ensure proper course of the recombination process [6].

The build and length of telomeres depends on the species, specimen, organ and even a single chromosome [7]. Human telomeres are composed of tandem repeats of the sequence (5'-TTAGGG-3')n in the double stranded cytosine-rich fragment of the DNA between 10 and 20 bp long and in the single stranded guanine-rich DNA between 50 and 300 nucleotide long [8]. In somatic cells, telomeres are shortened with each replication cycle. This phenomenon is the effect of the natural replication process of the end of the DNA [9]. The shorter the telomeres and the faster they are shortened, the faster a given organism ages [6]. The length of telomeres shortens with age, on average by 26 bp per year. Short telomeres are an indication of progressing ageing and can be interpreted as a signal to stop further cell division and apoptosis [10].

Each cell has a finite number of cell divisions, the so-called Hayflick limit, which affects the life span of a given organism. Telomeres act as "molecular clocks", an indicator of the critical value of the life span of a given cell. The Hayflick limit is characteristic for a given species and for a human being corresponds to ca. 80 divisions [11]. It is believed that the limited number of divisions and ageing of cells is a natural means for cells to prevent genetic instability. Lengthening of telomeres gives the cell more divisions, but also increases the risk of accumulating mutations which can lead to tumorigenesis [6].

Mitochondrial Theory

According to the mitochondrial theory of ageing, the ageing process is caused by free radicals. These highly chemically reactive molecules, usually found in cells, damage cellular components, which leads to impaired physiological function of cells and affects the progressing process of ageing [12]. The reactive oxygen species (ROS) are formed in mitochondria and therefore mitochondrion is the organelle which is the most susceptible to their effects. The noxious effects of the ROS lead to mutations in mtDNA and oxidative damage of other mitochondrial components. This damage impairs the working of the respiratory chain, which in turn leads to increased production of ROS and further mutagenesis [13]. Accumulation of mtDNA mutations causes the ageing of organisms. Lower mitochondrial function caused by impairment to the respiratory chain and lowered ATP production leads to cellular impairment and loss of function. These results are the most clearly visible in cells with high energy demands (nerve and muscle cells). An accumulation of mutated mtDNA molecules in somatic cells and lowered mitochondrial efficiency which can be observed with age corroborates this theory [3]. An accumulation of mtDNA mutations observed with age can also be caused by errors in replication and unsuccessful repairs of the DNA. Replication of mtDNA is independent of the cell cycle and unsuccessful repair of DNA. Errors made by mitochondrial DNA polymerase cause the accumulation of mutations, which surpasses the effectiveness of the repair systems. With age, the efficiency of mtDNA repair systems decreases substantially. Once the level of irreversible damage increases, despite the efforts of the repair systems, the mitoptosis (mitochondrial suicide) mechanism is activated [14].

Immunological Theory

According to this theory, the activity of the immune system deceases with age, which makes the organism more prone to infections and less efficient in destroying old and neoplastic cells, which leads to ageing and, eventually, death. This theory was developed by an American gerontologist, Roy Walford, who was considered a pioneer in biology and the medicine of ageing [15]. According to his hypothesis, the process of ageing of humans and other mammals is the result of incorrect immunological processes. Old-age diseases are very frequently the result of immune reaction regulation disorders and chronic inflammation [16]. According to the immunological theory, ageing is the result of malfunctions of the immune system, which is responsible for effectively combating antigens, i.e. destroying abnormal own cells and undesirable cells or foreign substances from the external environment.

The process of ageing is caused by changes in the development and biological function in most immune cells, which leads to unsuccessful destruction of changed own cells, decreased resilience to infections, and decreased effectiveness of vaccines. Some of the known changes (thymic atrophy, changes in the lymphocyte T composition) can limit the activity of immune cells to antigens of pathologically changed own cells [17–18].

Cell Theory

Ageing of cells is a complex process, comprised of many components. The first is the change of cellular morphology. Ageing cells grow and become more flat. This change is observed in case of both normal cells and neoplastic cells grown *in vitro*. Another indicator of cellular ageing is an increased activity of the lysosomal enzyme, beta-d-galactosidase. It is the best known and the most commonly used marker for cellular ageing [19]. Another change associated with ageing is increased cell granularity, which is probably associated with an increase in lysosome mass in aged cells [20]. Cellular ageing is accompanied by a number of changes associated with proteins which compose the cytoskeleton of the cells. During the ageing process, the β-actin and tubulin protein count changes [21].

Ageing is accompanied by demethylation of DNA, which can be observed in many types of cells and tissues. It was established that the level of demethylation decreases in cells grown *in vitro* and with the number of passages. Apart from DNA demethylation, the demethylation of certain genes, such as MYC and β-act gene, was established. The process of ageing also comprises of hypomethylation. Studies of fibroblasts showed, that ageing is accompanied by hypomethylation of certain genes, e.g. the p16INK4a gene. The profile of DNA methylation in aged fibroblasts was similar to that observed in the DNA of neoplastic cells [22].

DNA damage, which causes permanent activation of the response to damage track, leads to faster induction of the ageing processes. If repairing DNA is impossible, this track can lead to apoptosis (cell suicide), which is beneficial as it prevents overt proliferation and therefore prevents malignant transformation. Apoptosis also prevents transferring wrong genetic information to offspring cells. This process is therefore significant in maintaining the homeostasis of the organism. Homeostatic imbalance caused by proliferation or apoptosis can be associated with progressing ageing processes and tumorigenesis [1].

Conclusions

For many generations mankind dreamed of stopping the process of ageing, therefore it is not surprising that many scientific theories on the mechanisms of ageing exist. Each of these theories helps to better understand this incredibly complex biological phenomenon. In the future, better knowledge may allow humans to actually interfere and stop at least some indicators of ageing [23].

References

1. Sikora E. Starzenie i długowieczność. Post Bioch 2014; 60: 125––137.
2. Calabrese V, Cornelius C, Cuzzocrea S, Iavicoli I, Calabrese EJ. Hormesis. Cellular stress response and vitagenes as critical determinants in aging and longevity. Mol Aspects Med 2011; 32: 279–304.
3. Ivanova D, Yankova T. The free radical theory of aging in search of strategy for increasing life span. Folia Medica 2013; 55 (1): 33–41.
4. Oeseburg H, Boer R, Gilst WH, Harst P. Telomere biology in healthy aging and disease. Eur J Physiol 2010; 459 (2): 259–268.
5. Prescott J, Wentzensen I, Savage S, De Vivo I. Epidemiologic evidence for a role of telomere dysfunction in cancer etiology. Mutat Res 2012; 730 (1/2): 75–84.
6. Wysoczańska B. Zachowanie długości telomerów. Postępy Hig Med Dośw 2013; 67: 1319–1330.
7. Stewart J, Chaiken M, Wang F, Price C. Maintaining the end: roles of telomere proteins in end-protection, telomere replication and length regulation. Mutat Res 2012; 730 (1/2): 12–19.
8. Aida J, Izumiyama-Shimomura N, Nakamura K, Ishikawa N, Terai M., Matsuda Y, et al. Determination of telomere length by the quantitative fluorescence in situ hybridization (Q-FISH) Method. AJAC 2014; 5 (12): 775–783.
9. Armanios M, Blackburn E. The telomere syndromes. Nat Rev Genet 2012; 13 (10): 693–704.
10. Friedrich U, Griese E, Schwab M, Fritz P, Thon K, Klotz U. Telomere length in different tissues of elderly patients. Mech Ageing Dev 2000; 119: 89–99.
11. Hayflick L. The limited in vitro lifetime of human diploid cel strains. Exp Cell Res 1965; 37: 614–636.
12. Lapointe J, Hekimi S. When the theory of aging ages badly. Cell Mol Life Sci 2010; 60 (1): 1–8.
13. Lagouge M, Larsson N. The role of mitochondrial DNA mutations and free radicals in disease and ageing. J Intern Med 2013; 273 (6): 529–543.
14. Bratic A, Larsson N. The role of mitochondria of aging. J Clin Invest 2013; 123 (3): 951–957.
15. Walford RL. The immunologic theory of aging. Copenhagen: Munksgaard; 1969.
16. Caruso C, Candore G, Colonna-Romano G, Lio D, Franceschi C. Inflammation and life-span. Science 2005; 307: 208–209.
17. Fulop T, Fortin C, Lesur O, Dupuis G, Kotb R, Lord M, et al. The innate immune system and aging: what is the contribution to immunosenescence. Open Longevity Science 2012; 6: 121–132.
18. Gomez CR, Nomellini V, Faunce DE, Kovacs DJ. Innate immunity and aging. Exp Gerontol 2008; 43 (8): 718–728.
19. Kurz JD, Decary S, Hong Y, Erusalimsky JD. Senescence-associated β-galactosidase reflects an increase in lysosomal mass during replicative ageing of human endothelial cells. J Cell Sci 2000; 113: 3613–3622.
20. Lee BY, Han JA, Im JS, Morrone A, Johung K, Goodwin EC, et al. Senescence-associated beta-galactosidase is lysosomal beta-galactosidase. Aging Cell 2006; 5 (2): 187–195.
21. Nishio K, Inoue A. Senescence-associated alterations of cytoskeleton: extraordinary production of vimentin that anchors cytoplasmic p53 in senescence human fibroblasts. Histochem Cell Biol 2005; 123 (3): 263–273.
22. Issa JP. Aging, DNA methylation and cancer. Crit Rev Oncol Hematol 1999; 32 (1): 31–43.
23. Lopez-Otin C, Blasco MA, Partridge L, Serrano M, Kroemer G. The hallmarks of aging. Cell 2013; 153 (6): 1194–1217.

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   – Weinstein L, Swartz MN. Pathogenic properties of invading microorganisms. In: Sodeman WA jun, Sodeman WA, ed. Pathologic physiology: mechanisms of disease. Philadelphia: WB Saunders; 1974: 457–472.
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The quarterly journal HIGHER SCHOOL'S PULSE is a peer-reviewed scientific journal, open to students, graduates and staff of medical high schools.
Our mission is to lay foundations for cooperation and an exchange of ideas, information and experience in nursing, midwifery, physiotherapy, cosmetology, dietetics and public health.

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- **Reviews**
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1. Title in Polish and English, first names and family names of all authors and the institutional affiliation of each author – till 600 characters (with spaces).

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