

ОГЛЯДИ

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CURRENT TRENDS IN DENTAL CARIES PREVENTION: LITERATURE OVERVIEW

ABSTRACT

Introduction. It is known that the main dental diseases in general, and dental caries in particular, are considered manageable and can be prevented, but their prevalence is increasing from year to year. At the present stage, the system of prevention of dental diseases is becoming increasingly important.

Aim. The given article is dedicated to the overview of the current trends in dental caries prevention.

Results. Scientists single out traditional and modern approaches to caries management. There are four main traditional trends in caries treatment. They are surgical model, antibiotic model, probiotic approach, and caries balance concept. Nowadays more emphasis is being placed on dental caries prediction and caries risk analysis than mere detection of cavities which require immediate filling. While in the past, the cavities were filled at their earliest detection, now the indications for restorative treatment have narrowed. Instead of restorative treatment, plaque control measures are employed to promote remineralization and reversal of the dental caries process. Recent trends in caries prevention also include several approaches. One of the most widely applied is fluoride. One of the most widely studied now is caries vaccine.

Conclusion. Carrying out preventive measures for major dental diseases should be aimed, on the one hand, at eliminating etiological factors, and on the other hand, at increasing the resistance of hard and soft tissues of teeth and oral cavity, the body's resistance to adverse factors. The most common concepts of the etiology and pathogenesis of dental caries and periodontal tissue diseases indicate a direct relationship with bacterial status, oral hygiene and the level of body resistance. The experience in the prevention of dental caries showed that the most effective is the prevention of an individual focus.

Key words: caries, prevention, surgical model, antibiotic model, probiotic approach, fluoride, caries vaccine.

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СУЧАСНІ ТЕНДЕНЦІЇ ПРОФІЛАКТИКИ ЗУБНОГО КАРИЕСУ: ОГЛЯД ЛІТЕРАТУРИ

Вступ. Відомо, що основні стоматологічні захворювання загалом, і карієс зокрема, вважаються керованими і їм можна запобігти, але їх поширеність зростає з року в рік. На сучасному етапі система профі-

лактики стоматологічних захворювань набуває все більшого значення.

Мета. Дана стаття присвячена огляду сучасних тенденцій у профілактиці карієсу.

Результати. Вчені виокремлюють традиційні та сучасні підходи до лікування карієсу. Існує чотири основні традиційні тенденції лікування карієсу. Це хірургічна модель, антибіотична модель, пробіотичний підхід та концепція балансу карієсу. У наш час більше уваги приділяється прогнозуванню карієсу та аналізу ризику розвитку карієсу, ніж просто виявленню порожнин, які потребують негайного заповнення. У минулому порожнини заповнювалися при першому їх виявленні, тепер показання до відновного лікування збільшились. Замість відновного лікування застосовуються заходи боротьби з нальотами, що сприяють ремінералізації та зворотному розвитку карієсу зубів. Останні тенденції у профілактиці карієсу також включають кілька підходів. Однією із найбільш широко застосовуваних є фтор. Однією з найбільш широко вивчених зараз є вакцина проти карієсу.

Висновок. Проведення профілактичних заходів щодо основних стоматологічних захворювань має бути спрямоване, з одного боку, на усунення етіологічних факторів, а з іншого боку, на підвищення стійкості твердих і м'яких тканин зубів і порожнини рота, стійкості організму до несприятливих факторів. Найпоширеніші концепції етіології та патогенезу карієсу зубів та захворювань тканин пародонту вказують на прямий зв'язок із бактеріальним статусом, гігієною порожнини рота та рівнем стійкості організму. Досвід профілактики карієсу зубів показав, що найбільш ефективною є профілактика індивідуальної спрямованості.

Ключові слова: карієс, профілактика, хірургічна модель, антибіотична модель, пробіотичний підхід, фтор, карієсна вакцина.

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СОВРЕМЕННЫЕ ТЕНДЕНЦИИ ПРОФИЛАКТИКИ ЗУБНОГО КАРИЕСА: ОБЗОР ЛИТЕРАТУРЫ

Введение. Известно, что основные стоматологические заболевания в целом, и кариес в частности, считаются управляемыми и их можно предотвратить, но их распространенность растет из года в год. На современном этапе система профилактики стоматологических заболеваний приобретает все большее значение.

Цель. Данная статья посвящена обзору современных тенденций в профилактике кариеса.

Результаты. Ученые выделяют традиционные и современные подходы к лечению кариеса. Существует четыре основных традиционных тенденции лечения кариеса. Это хирургическая модель, антибиотиче-

ская модель, пробиотический подход и концепция баланса кариеса. В наше время больше внимания уделяется прогнозированию кариеса и анализа риска развития кариеса, чем просто выявлению полостей, которые требуют немедленного заполнения. В прошлом полости заполнялись при первом их обнаружении, теперь показания к восстановительному лечению сузились. Вместо восстановительного лечения применяются меры борьбы с налетами, способствующие реминерализации и обратному развитию кариеса зубов. Последние тенденции в профилактике кариеса также включают несколько подходов. Одной из наиболее широко применяемых является фтор. Одной из наиболее широко изученных сейчас является вакцина против кариеса.

Выводы. Проведение профилактических мероприятий основных стоматологических заболеваний должно быть направлено, с одной стороны, на устранение этиологических факторов, а с другой стороны, на повышение устойчивости твердых и мягких тканей зубов и полости рта, устойчивости организма к неблагоприятным факторам. Самые распространенные концепции этиологии и патогенеза кариеса зубов и заболеваний тканей пародонта указывают на прямую связь с бактериальным статусом, гигиеной полости рта и уровнем устойчивости организма. Опыт профилактики кариеса зубов показал, что наиболее эффективной является профилактика индивидуальной направленности.

Ключевые слова: кариес, профилактика, хирургическая модель, антибиотическая модель, пробиотический подход, фтор, кариесная вакцина.

Introduction. Human development and vigorous activity led to a constant change in the environment, and now we are talking about the so-called anthropogenic impact of unfavorable environmental factors, which, along with inappropriate human nutrition, have acquired the status of risk factors that are realized in growth as general somatic diseases. It is known that the main dental diseases in general, and dental caries in particular, are considered manageable and can be prevented, but their prevalence is increasing from year to year. At the present stage, the system of prevention of dental diseases is becoming increasingly important.

Aim. The given article is dedicated to the overview of the current trends in dental caries prevention.

Results. Scientists single out traditional and modern approaches to caries management. There are four main traditional trends in caries treatment. The first one is **surgical model**, which predates our current understanding of dental caries. The given model is consistent with the original concept that dental caries is a gangrenous process. Gangrene was treated by amputation and such, carious teeth were originally extracted. Later on, with the development of science, just the demineralized portions or gangrenous

portions of the tooth were removed. This surgical model eventually created bigger and bigger cavities as secondary dental caries progressed even after restorative treatment, subsequently requiring re-treatment, until eventually the tooth was lost. With the shift from the surgical model to a medical model of disease management, the newer strategies emphasize disease prevention and conservation of tooth structure [1].

The second traditional approach to caries treatment is **antibiotic model**. As seen from its name, this model deals with application of chlorhexidine, povidone iodine, fluoride, penicillin, or other antimicrobials/antibiotics. These agents kill a broad spectrum of organisms. It was concluded that the broad spectrum antibiotics or antimicrobials are not effective long-term unless their application is periodically repeated [2].

The opposite approach to the one mentioned above is **probiotic approach**. The term *probiotic* means that mechanisms are employed to selectively remove only the pathogen while leaving the remainder of the oral ecosystem intact [3]. One criticism of probiotic approaches is that they do not address other pathogens that may be involved in a disease process. They have genetically modified a *Streptococcus mutans* organism so that it no longer produces acid while competing aggressively for the ecologic niche where the wild type *S mutans* is found [2].

Finally, there is the **caries balance concept** which was first appeared in 1999 [4]. There is a strong scientific evidence that caries balance concept can be used in treating caries as a disease for all ages [2].

Nowadays more emphasis is being placed on dental caries prediction and caries risk analysis than mere detection of cavities which require immediate filling. Lee states that while in the past, the cavities were filled at their earliest detection, now the indications for restorative treatment have narrowed. Instead of restorative treatment, plaque control measures are employed to promote remineralization and reversal of the dental caries process [1].

Recent trends in caries prevention also include several approaches. One of the most widely applied is **fluoride**, which is named WHO approach for 21st century. In the second half of the 20th century the focus shifted to the development and evaluation of fluoride toothpastes and rinses and, to a lesser extent, alternatives to water fluoridation such as salt and milk fluoridation [5].

Bretz & Rosa claim that current methods of caries prevention are not effective for the high caries risk patient. Fluorides and chlorhexidine are arguably the most common agents utilised for the prevention of oral diseases having been available for use to the general population for about 65 and 40 years, re-

spectively. These chemical modality treatments are often prescribed by dental practitioners and alternately used for in-home oral care. The body of evidence that they are effective in the prevention of oral diseases suggests that control of dental caries in low and moderate risk patients, can be attained. However, for groups of individuals at high risk for dental caries the evidence for efficacy and effectiveness of these agents remains obscure [6].

Recent developments in deciphering the human oral microbiome have allowed to not only survey in depth the types of bacteria that are associated with dental health and disease, but to understand how these bacteria behave in health and disease. This has profound implications for therapy development in the future once we understand the metabolic activity of acidogenic species in dental caries. This will allow for development of methods to recognize and inhibit virulence factors. Other approaches may be of value such as the study of probiotics by introducing beneficial bacteria into the oral environment that compete with cariogenic bacterial that need to be tested in large clinical trials. Similarly, methods of bacterial transplantation and/ or bacterial replacement in the oral cavity may show promising avenues in the control of dental caries for high caries risk patients [6].

The next trend in the disease management is **caries vaccine**. Jia et al stated that enhancement of mucosal and systemic immune responses is still a challenge for the application of DNA vaccine [7]. As it is known, streptococcus mutans is the main cause of dental caries. Through adhesion, it attaches to the dental pellicle and breaks down sugars for energy to produce lactic acid, causing an acidic environment around the tooth. As a result, demineralization of the enamel and, subsequently, the dentin occurs. Factors involved in the dental caries process include the tooth, bacteria in the form of a dental plaque, and a diet containing sugar. The quantity, quality, and frequency of sugar intake have a definitive influence on the incidence and prevalence of caries [1]. Culshaw et al in their study showed that Mutans streptococcal glucosyltransferases (GTF) have been demonstrated to be effective components of dental caries vaccines. Thus, the authors identified a peptide with projected avid Major Histo Compatibility-binding activity that elicited immunoreactivity with native GTF and demonstrated protection against dental caries infection after immunization, implying that this peptide may be important in a subunit dental caries vaccine [8; 9; 10]. However, none of these vaccines have appeared on the market thus far due to difficulty in inducing and maintaining high levels of antibodies in oral fluids; research is still ongoing for clinical applications [1].

Conclusion. Carrying out preventive measures for major dental diseases should be aimed, on the one hand, at eliminating etiological factors, and on the other hand, at increasing the resistance of hard and soft tissues of teeth and oral cavity, the body's resistance to adverse factors. The most common concepts of the etiology and pathogenesis of dental caries and periodontal tissue diseases indicate a direct relationship with bacterial status, oral hygiene and the level of body resistance.

The experience in the prevention of dental caries and periodontal tissues showed that the most effective is the prevention of an individual focus. Since dental caries does not progress without the bacteria present in dental plaques, daily plaque removal by brushing, flossing, and rinsing is one of the best ways to prevent dental caries and periodontal disease. Proper brushing and flossing methods may be taught at the dental office. In this case, the choice of a preventive scheme remains at the discretion of the dentist. At the same time, instilling hygiene skills and proper oral care are among the leading ways to prevent dental caries.

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