

# Analysis of changes in biochemical parameters of oral liquid under the influence of lecithin-calcium complex in young patients with multiple caries

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Given the high prevalence of dental caries, it is important to find new means and methods of prevention. At present preparations of natural origin, such as lecithin and calcium citrate, are widely used.

**The aim** was to study the lecithin-calcium complex effect on the oral fluid biochemical parameters of individuals with multiple dental caries.

**Materials and methods.** 85 KhNMU Dental Faculty students-volunteers were examined. Groups of participants were formed depending on the dental caries intensity level index value for the oral fluid biochemical parameters determination (degree of oral dysbiosis, antioxidant-prooxidant index) in patients before and after the start of the lecithin-calcium complex treatment course.

**Results.** In persons with multiple dental caries the degree of dysbiosis is 3 times higher than normal, the concentration of calcium decreases by 1.5 times and the antioxidant-prooxidant index reduces by 2 times. After lecithin-calcium complex treatment course the dysbiosis degree decreases almost by 8 times, the concentration of calcium and API return to normal. This indicates the ability of the lecithin-calcium complex to regulate the oral cavity microbiocenosis and restore antioxidant-prooxidant indices.

**Conclusions.** In patients with multiple dental caries the phenomena of the oral cavity dysbiosis, a decrease in the protective antioxidant system level and a decrease in the oral fluid calcium concentration are observed. The lecithin-calcium complex intake during the month completely eliminated the phenomenon of dysbiosis in the oral cavity, increased the antioxidant-prooxidant system level and the oral fluid calcium concentration to normal.

## Key words:

caries, lecithin, calcium citrate, dysbiosis, antioxidant-prooxidant index.

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## Аналіз змін біохімічних параметрів ротової рідини під впливом лецитин-кальцієвого комплексу в молоді з множинним карієсом

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З огляду на високу поширеність карієсу зубів, актуальним є пошук нових засобів і методів профілактики. Нині поширені препарати природного походження, як-от лецитин і цитрат кальцію.

**Мета роботи** – вивчення впливу лецитин-кальцієвого комплексу на біохімічні показники ротової рідини осіб із множинним карієсом зубів.

**Матеріали та методи.** Обстежили 85 студентів-добровольців, які навчаються на стоматологічному факультеті ХНМУ. Групи учасників сформовані залежно від величини індексу рівня інтенсивності карієсу зубів для визначення біохімічних показників ротової рідини (ступеня дисбіозу порожнини рота, антиоксидантно-прооксидантного індексу) у пацієнтів до та після курсу лецитин-кальцієвого комплексу.

**Результати.** В осіб із множинним карієсом зубів ступінь дисбіозу втричі перевищує норму, концентрація кальцію знижується в 1,5 раза, антиоксидантно-прооксидантний індекс (АПІ) – удвічі. Після приймання курсу лецитин-кальцієвого комплексу ступінь дисбіозу знижується майже у 8 разів, концентрація кальцію та АПІ поверталися до норми. Це свідчить про здатність лецитин-кальцієвого комплексу регулювати мікробіоценоз порожнини рота й відновлювати антиоксидантно-прооксидантні показники.

**Висновки.** У пацієнтів із множинним карієсом зубів спостерігають явища дисбіозу порожнини рота, зниження рівня захисної антиоксидантної системи та зниження концентрації кальцію в ротовій рідині. Приймання протягом місяця лецитин-кальцієвого комплексу усунуло явище дисбіозу в ротовій порожнині, підвищило до норми рівень антиоксидантно-прооксидантної системи та концентрацію кальцію в ротовій рідині.

## Ключові слова:

карієс, лецитин, цитрат кальцію, дисбіоз, антиоксидантно-прооксидантний індекс.

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## Анализ изменений биохимических параметров ротовой жидкости под влиянием лецитин-кальциевого комплекса у молодежи с множественным кариесом

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Учитывая высокую распространенность кариеса зубов, актуальным является поиск новых средств и методов профилактики. Широкое распространение в настоящее время нашли препараты природного происхождения, такие как лецитин и цитрат кальция.

**Цель работы** – изучение влияния лецитин-кальциевого комплекса на биохимические показатели ротовой жидкости лиц с множественным кариесом зубов.

**Материалы и методы.** Обследованы 85 студентов-добровольцев, обучающихся на стоматологическом факультете ХНМУ. Группы участников были сформированы в зависимости от величины индекса уровня интенсивности кариеса зубов для

## Ключевые слова:

кариес, лецитин, цитрат кальция, дисбиоз, антиоксидантно-прооксидантний индекс.

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определения биохимических показателей ротовой жидкости (степени дисбиоза полости рта, антиоксидантно-прооксидантного индекса) у пациентов до и после приема курса лецитин-кальциевого комплекса.

**Результаты.** У лиц с множественным кариесом зубов степень дисбиоза в 3 раза превышает норму, снижаются концентрация кальция в 1,5 раза, антиоксидантно-прооксидантный индекс (АПИ) – в 2 раза. После приема курса лецитин-кальциевого комплекса степень дисбиоза снижается почти в 8 раз, концентрации кальция и АПИ возвращались к норме. Это свидетельствует о способности лецитин-кальциевого комплекса регулировать микробиоценоз полости рта и восстанавливать антиоксидантно-прооксидантные показатели.

**Выводы.** У больных с множественным кариесом зубов отмечают явления дисбиоза полости рта, снижение уровня защитной антиоксидантной системы и снижение концентрации кальция в ротовой жидкости. Прием в течение месяца лецитин-кальциевого комплекса полностью устранил явления дисбиоза в ротовой полости, повысил до нормы уровень антиоксидантно-прооксидантной системы и концентрацию кальция в ротовой жидкости.

**The purpose** of this work was to study the effect of calcium citrate containing complex and as a source of phosphorus – lecithin on the oral fluid biochemical indicators in persons with multiple dental caries.

The choice of biochemical parameters of the oral fluid was due to the fact that the condition of latter largely determines the carious lesion pathogenesis [1–5]. Among the selected biochemical parameters were inflammation markers (MDA, TPA), a member of the remineralization system – calcium, one of the antioxidant system factors – enzyme catalase, and finally, enzymatic indicators of oral microbiocenosis state – urease and lysozyme.

**Materials and methods**

85 Kharkiv National Medical University 2, 3 and 5 courses Dental Faculty students-volunteers were examined. A survey of volunteer students in the clinic was conducted

under standard conditions of the dental office by questioning and objective clinical oral cavity assessment with the use of diagnostic dental instruments. The condition of the oral cavity was examined according to the method proposed by WHO. When collecting anamnesis, attention was focused on harmful habits related to dental health, including the frequency of carbohydrate-containing foods consumption, irregular oral hygiene and low level of motivation for dental pathology. Patients underwent initial clinical examination and oral cavity sanitation with subsequent dynamic observation (after 6 and 12 months).

The analysis of the clinical examination results made it possible to form three groups of participants depending on the level of dental caries intensity (LCI) index value, which was performed using the index of carious tooth decay intensity – CFE index (C means the number of carious teeth, F – the number of sealed teeth, E -the number of removed or to be removed teeth), with division by patient’s age and interpretation according to Leus P.A. recommendations. For the adult population LCI <0.15 – low and LCI from 0.15 to 0.30 – average; LCI from 0.31 to 0.60 – high and LCI >0.60 indicates a very high level of caries intensity.

The control group consisted of 12 apparently healthy patients, without severe dental and somatic pathology, with LCI from 0 to 0.30. Criteria for patients with caries selection, based on objective clinical examination data, were the presence of a high and very high level of tooth decay (0.31 to 0.60 and above 0.60). Basic group included 52 patients in initial state and 21 patients in one month of lecithin-calcium complex treatment.

Patients of the study groups received a scheme of complex hygienic and preventive measures, which included the observance of rational and balanced diet, the rules of oral hygiene and hygiene control every two months during the year of observation. For individual oral hygiene throughout the year, Colgate toothpaste, “Triple Action with Fluoride” with an active fluoride concentration of 1450 ppm F (1.1 %) twice a day, a toothbrush with a high cleaning index, dental floss, “Colgate Plax” softener complex action “Tender mint” containing sodium fluoride (0.025 %), which was applied twice a day after tooth brushing within a month twice a year.

Additionally, from the first day of the examination patients of the basic group received a tableted lecithin-calcium complex “Lecithin-2”, manufactured by the NPA “Odesa Biotechnology” (TU U 15.8-13903778-82-2000) [3]. The composition of the drug includes: sunflower lecithin and calcium citrate in a ratio of 1:1. Patients took daily dose of 600 mg of lecithin-calcium complex three times a day for half an hour before eating 1 tablet until complete resorption

**Table 1.** Biochemical indicators of oral fluid in patients with tooth decay before and after the lecithin-calcium complex treatment

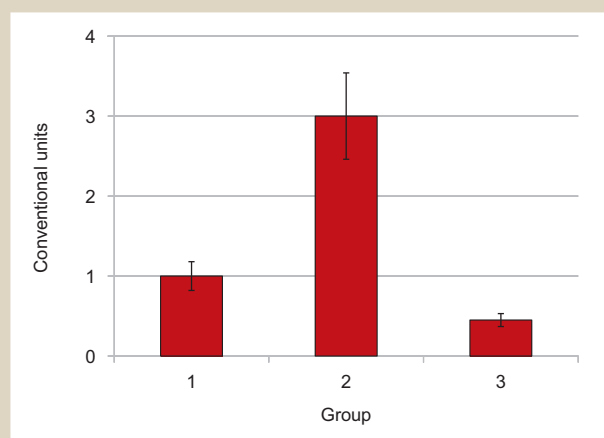
Indicators, units	Control group (n = 12)	Basic group:	
		Initial state (n = 52)	In 1 month (n = 21)
MDA, mk-mole/l	0.25 ± 0.01	0.23 ± 0.01 P > 0.05	0.20 ± 0.02 P > 0.05 P <sub>1</sub> > 0.1
TPA, nkat/l	3.00 ± 0.21	4.05 ± 0.39 P < 0.05	2.91 ± 0.29 P > 0.8 P <sub>1</sub> < 0.05
Catalase, mkat/l	0.305 ± 0.033	0.140 ± 0.01 P < 0.001	0.270 ± 0.053 P > 0.3 P <sub>1</sub> < 0.05
Calcium, mmole/l	0.92 ± 0.04	0.68 ± 0.04 P < 0.001	0.88 ± 0.03 P > 0.7 P <sub>1</sub> < 0.01

P: indicator of significant differences with the control group; P<sub>1</sub>: indicator of significant differences with the basic group.

**Table 2.** Activity of urease and lysozyme in oral fluid of patients with tooth decay before and after the lecithin-calcium complex treatment

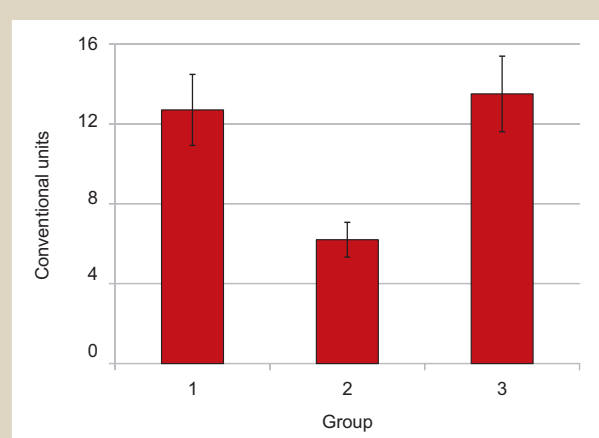
Enzyme activity	Control group (n = 12)	Basic group:	
		Initial state (n = 52)	In 1 month (n = 21)
Urease (U), mkat/l	0.104 ± 0.01	0.150 ± 0.03 P > 0.05	0.030±0.009 P < 0.05 P <sub>1</sub> < 0.001
U <sub>relative</sub>	1.0	1.44 ± 0.19	0.29 ± 0.08
Lysozyme (L), units/l	62 ± 3	30 ± 2 P < 0.001	50 ± 3 P < 0.05 P <sub>1</sub> < 0.001
L <sub>relative</sub>	1.0	0.48 ± 0.03	0.81 ± 0.06

P: indicator of significant differences with the control group; P<sub>1</sub>: indicator of significant differences with the basic group.



**Fig. 1.** Degree of the oral cavity dysbiosis.

Control group (1), patients with multiple caries (2), and patients after the lecithin-calcium complex treatment (3).



**Fig. 2.** Antioxidant-prooxidant index.

Control group (1), patients with multiple caries (2), and in patients after the lecithin-calcium complex treatment (3).

in the oral cavity. The course of prevention was carried out within one month twice a year.

In patients on the first day of the examination, and then a month later, unstimulated saliva (morning on an empty stomach) was collected in accordance with the recommendations [6].

After the oral liquid centrifugation (3000 rpm, 15 minutes, 0 ... +5 °C) the volume of saliva was measured, the supernatant was taken, the concentration of malonic dialdehyde (MDA) [7,8], total proteolytic activity (TPA) [9], catalase activity [10], urease [11,12] and lysozyme [13], as well as the concentration of calcium [14], were determined.

To compare the indices, the oral liquid was as practically healthy, without pronounced dental and somatic pathology.

The relative activities of urease and lysozyme ratio was used to calculate the degree of the oral cavity dysbiosis according to the enzymatic method of A. Levitsky [15], and the antioxidant-prooxidant index (API) was calculated as the ratio of catalase activity and MDA concentration [7].

Statistical processing of data was carried out using the licensed package of programs Biostatistics v.4.03 and Statistica v.5.0, the obtained results reliability was assessed by the Student's t-test, with a critical significance level  $P \leq 0.05$ .

## Results and discussion

*Table 1* presents the results of oral fluid biochemical parameters determination in patients before and after 1 month of the lecithin-calcium complex intake, as well as in healthy people. As it can be seen from these data, only two markers of inflammation (MDA and TPA) increase significantly in persons with caries and also reliably return to normal after the lecithin-calcium complex treatment.

In patients with caries, the oral fluid calcium concentration is significantly 1.5 times reduced, but returns to normal after the course of treatment, which indicates the restoration of saliva remineralizing function.

In patients with tooth decay the catalase activity as one of antioxidant enzymes decreases by more than 2 times, and in a month of the lecithin-calcium complex intake this

figure almost returns to normal.

*Table 2* presents the results of urease (reflecting the degree of microbial contamination) and lysozyme (the most important factor of nonspecific immunity) activity determination, and also their relative activities are calculated, which are necessary for the oral cavity dysbiosis degree determination.

As it can be seen from these data, the activity of urease in the oral fluid of patients is slightly higher than normal (however,  $P > 0.05$ ), and after the lecithin-calcium complex treatment the activity of urease decreases by 5 times, which indicates a decrease in the oral cavity microbial contamination. On the contrary, the activity of lysozyme in the oral fluid of patients with caries is more than 2 times lower than in the norm, and after the lecithin-calcium complex intake significantly increases, although it does not return to normal.

The results of oral dysbiosis degree calculations regarding the relative activities of urease and lysozyme are shown in the *Fig. 1*, from which it can be seen that in persons with dental caries the degree of dysbiosis is 3 times higher than normal, and after a course of lecithin-calcium treatment it decreases almost by 8 times. This indicates the ability of the lecithin-calcium complex to regulate oral microbiocenosis, which certainly has a beneficial effect not only on the teeth condition, but also on other tissues of the oral cavity, and possibly on the whole organism state.

The change in the API index in patients with caries before and after the lecithin-calcium complex treatment is shown in the *Fig. 2*.

From these data it is clear that the index of API falls in patients by 2 times, and after treatment returns to normal. Since this index reflects the state of one of the body's defense systems, then, the lecithin-calcium complex in the form of the drug lecithin-calcium complex ensures the body's defense systems restoration.

## Conclusions

1. In patients with multiple dental caries, the oral cavity dysbiosis, decrease in the protective antioxidant system level and decrease in the oral fluid calcium concentration are observed.

2. The lecithin-calcium complex intake during the month completely eliminated the oral cavity dysbiosis phenomenon, raised the level of the antioxidant-prooxidant system and the oral fluid calcium concentration to normal.

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