



Research Paper

## Possibilities of compositions “pyrogenic nanosilica + nano- $\text{Al}_2\text{O}_3$ + plant/herbal dispersions” for prophylaxis, self-restoration and delay in the development of carious & near-dental pathologies.

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### Abstract

*It is shown that the topic of preventive and preclinical (extra-clinical) dental care has not been developed (despite the progress in practical prosthetic and filling dentistry).*

*In the introduction, the rationale for the need for such work is presented, with an emphasis on the natural basis of the processes of self-restoration of teeth. The authors draw broad analogies with self-restoration in technical (construction, road, auto, air), medical (self-medication / prevention of suppuration and small scratches), and other areas.*

*Theoretical assumptions and views on the processes of self-restoration of carious, traumatic and other dental lesions are presented. Methods for creating tooth powders from public&cheap components are proposed for use by non-specialists in places unsuitable for traditional treatment & prophylaxis.*

*All these assumptions and hypotheses were confirmed in the results of observations as the well-being of patients as with visual information (photo, X-ray images) of the treated groups of affected teeth.*

*The conclusions made confirm the possibility of effective prophylaxis and self-restoration of dental systems by non-operational exposure to special complexes of dental powders, pastes and rinsing systems (in compliance with the correct teeth's exploitation).*

*The work is compiled from preclinical studies on volunteers, with the assistance of consultants from dental clinics.*

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## I. INTRODUCTION

### 1A. Why teeth corrode. Historical reference.

Over the past 100 years, dentistry has experienced tremendous progress. In fact, people have learned to make any kind of teeth for themselves, regardless of general health and circumstances. At the same time, population growth, crises and the settlement of new territories (as well as the fashion for a healthy lifestyle and prevention) arouse interest in preventive methods of self-medication. This applies to all stages of dental diseases.

Teeth work at the forefront of life in extreme conditions, withstanding colossal changes in temperature, aggressive influences and pressures. In fact, they work in roughly the same conditions as abrasive cutting edges, car tires, shoe soles and other wear-and-tear parts.

Human evolution defined only two changes of teeth (milk and permanent), and it were enough - for in prehistoric times we lived 15-35 years. Also, the teeth were adapted for completely different loads - for chewing materials of medium hardness at moderate temperatures [1]. But now teeth often process food that is too soft or too hard, very sweet, salty or too sour, often with a sharp change from cold to too hot. But this requires completely different teeth, which are not able to appear in just 5-10 thousand years of evolution [1].

Thus, wear and tear of teeth in our conditions is a normal phenomenon, and dentistry has become an adequate response to this problem in recent centuries. Post-war dentistry of the 50-70s is very similar to modern dentistry. Nevertheless, the issues of prevention and self-healing of carious diseases remain poorly studied topics. They are on the sidelines of the main stamam business, which operates 85% in the field of prosthetics, filling, surgery and other areas known to us [1].

The topic of prevention is taking its first cautious steps. These are, for example, the mineralization of children's teeth, mineralization and healing of the initial forms of caries, and experimental experiments on volunteers (which rarely get into the open press). The discovery of hydroxyapatite-fluoride complexes, gluconate-nano-oxide pastes, hormonal and other systems that stimulate the tooth to heal itself can be considered a great success in preventive dentistry. Today, a method of similar treatment of the very first forms of caries or enamel microcracks (whitening) is recognized.

However, this does not solve the problem. Firstly, the accumulated experience does not yet allow guaranteeing success in all cases of preventive treatment. Secondly, such dental professional points are not everywhere. Thirdly (and this is the main thing), few people go to the dentist even at the earliest stages of caries, and even more so with simple enamel whitening.

The overwhelming majority of patients are people with pain in the teeth, large chips, abrupt changes in the bite (due to chips, etc.), fluxes and other deep lesions. As a rule, we are talking about the deepest or small, very dangerous and fast-growing carious lesions, or their consequences - large chips of enamel and dentin.

Even the filling and prosthetic dentistry of the early 21st century does not always give an acceptable answer to these problems. For example, if the entire upper part of the tooth is damaged (with the nerve going deeper or with the remaining "single roots"), it is already impossible to talk about any fillings and pins. The tooth is removed by a surgeon, despite the fact that acceptable prophylaxis and possible self-crystallization could extend its life.

But practical dentistry in the issue of treatment and elimination of the consequences of caries still adheres to the principles of 60-100 years ago. So, it is often believed that a carious cavity can be cured only by significant removal of the affected tissue. Right up to completely healthy tissues, followed by a filling. If such removal involves the removal of a nerve, it is removed without hesitation. If all this is difficult, the patient can also safely be sent not to remove the tooth. This practice is reminiscent of the outdated practices of other restorative industries with which dentistry can be somewhat comparable.

### **1B. Dentin & Enamel. What is it?**

As you know, dentin is a natural polymer composite with a high degree of inorganic component - up to 70% hydroxyapatite and silicates. The rest is natural collagen polymer. The enamel has practically the same chemical composition, but with a higher proportion of inorganics, which is why its Mohs hardness is 6-6.5. This is higher than glass and steel (4-5 according to Mohs), but much lower than quartz (8) - which is why we have many problems with chipping and damage to teeth when accidentally biting stone (mainly quartz-granite) or bone (with silica edges) particles in food.

Previously, it was believed that, unlike enamel, dentin does not have the ability to self-repair at all, or has lost it in the process of evolution. This seems strange, given that our mammalian relatives (and even more so many reptiles) have excellent positions here. Crocodiles change their teeth dozens of times in a lifetime. So, in mice and hamsters (although they live only 2-3 years), teeth grow back like in humans, skin and bones. Cases of overgrowth of dental tissue (including in the wrong direction with the formation of thorns) are also known in cows and horses. It cannot be that the human body was so weak that it lost forever this ability, which is common in nature.

Most likely, this function is either in hibernation, or cannot be realized due to a lack of "building material" in the dental cavity itself or in the tissues that feed the tooth. The successes of recent years in matters of enamel re-mineralization directly indicate the possibility of remineralization (albeit partial) of dentin, even with very deep lesions.

### **1C. How it is working in other domains.**

Here are examples from the road and construction industries. Earlier in construction, fungus in the walls was removed only by removing a very significant layer of plaster and even the wall. With subsequent cementation of the cavity. Often it turned out to be difficult, and then the affected fragment was replaced with a new block. All these time-consuming processes are largely in the past, thanks to the latest fungicidal and bactericidal primers, the method of UV or radiation exposure, and other innovative methods.

Also, the restoration of products has long been using methods of impregnation of cracked or damaged fragments, rather than total "amputation" of them with replacement with new copies.

Even in road repairs, the old costly methods of replacing and patching road cavities are a thing of the past - by completely cutting off the old layer and applying a new one. Now in use (in developed countries)

polymer-concrete and other special compounds, poured into the cavity and polymerized there. However, there remains an effective and "popular method" of filling road pits with ordinary rubble or construction waste, followed by its self-subsidence and partial curing (pressing).

Car service has been using rust converters for several decades. they have become powerful competitors to the traditional methods of completely cutting off a rusted or otherwise corroded fragment of a car, with the application of fiberglass or metal linings. Converters now do not even require preliminary cleaning or degreasing of the place: the liquid turns rust, together with dirt and other deposits, into a relatively strong crystallizate.

The operating conditions of the teeth can also be compared to the operating conditions of tires, soles and incisors. Common is rapid corrosion after micro-damage (unless repaired by linings).

### **1C. An attempt at a literary review.**

It is difficult to conduct a qualitative review on this topic due to the lack of the necessary publications. Most often, dentists (despite serious progress in improving the quality of filling cements) and the scientists who serve them still remain in the wake of the old methods. Which are really convenient - but not for all patients (especially the poor and remote from clinics), as well as for doctors. Even the terms "self-hardening", "self-healing", "prophylactic" - refer to dental filling and prosthetic masses [2-6], - but not really preventive (preventing filling and prosthetics) systems.

Today, in the available literature, there are almost no scientific sources on natural prophylactic formulations (homeopathic, self-crystallizing in the cavity, etc.). There are only reports of prophylaxis with antibiotics [8] or artificial compounds for self-build-up of micro-damage to the enamel [7].

Also, on the world market there are more than 10 proven toothpastes with enhanced protective and anti-cariogenic activity. They are presented as "super-innovative" formulations from the world's leading institutions for enamel protection (in rare cases - restoration of damaged areas of the tooth [14]). Advertisements often contain phrases like "active calcium", "liquid enamel", "innovative glycerophosphate (amino-, gluconato-) calcium complex", etc. [12-15].

However, a simple analysis of the composition of these pastes shows that these are the same ordinary toothpastes, only with an increased content of active components (hydroxyapatite, sodium monofluorophosphate, glycerophosphate and calcium gluconate). Like ordinary toothpastes, they (obviously - for attractiveness) contain components that are unnecessary and potentially harmful to the teeth - aroma, dyes, aspartame, surfactants and detergents. None of the gel on sale contains natural ingredients (herbal powders, natural mineral micro-nano-particles) & nano-SiO<sub>2</sub> or nano-Al<sub>2</sub>O<sub>3</sub>.

Meanwhile, even bad dentists are not always and not everywhere enough to solve the problems of the population. In a number of cities and villages, the network of stomatological services is either insufficient or unacceptable (expensive, travel far, queue a month in advance, etc.). In other cases, the dentist chooses a more convenient option for the extraction of a tooth or nerve (followed by expensive imposition of bridges, pins and implants). It is high time to raise the issue of the prevention of stomatological diseases, and even about effective methods of self-healing of carious and other lesions - by analogy with other restoration industries.

**1.5. An attempt at a literary review.** It is difficult to conduct a qualitative review on this topic due to the lack of the necessary publications. Most often, dentists (despite serious progress in improving the quality of filling cements) and the scientists who serve them still remain in the wake of the old methods. Which are really convenient - but not for all patients (especially the poor and remote from clinics), as well as for doctors. Even the terms "self-hardening", "self-healing", "prophylactic" - refer to dental filling and prosthetic masses [2-6] - but not really preventive (preventing filling and prosthetics) systems.

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Meanwhile, even bad dentists are not always and not everywhere enough to solve the problems of the population. In a number of cities and villages, the network of stomatological services is either insufficient or unacceptable (not cheap, travel far, queue a month in advance, etc). In other cases, the dentist chooses a more convenient option for the removal of a tooth or nerve (followed by expensive imposition of bridges, pins and implants). It is high time to raise the issue of the prevention of stomatological diseases, and even about effective methods of self-healing of carious and other lesions - by analogy with other restoration industries.

In the last 20 years, we have carried out a significant range of works on the creation of acrylic polymer composites with nano-SiO<sub>2</sub> for filling and prosthetic dentistry [2,7,16-18]. The resulting product was sold in Eastern Europe and the ex-USSR in the form of the Oxomat and Oxomat-Dipol trademarks [2]. The Institute of Surface Chemistry took part in the development of Ukrainian toothpastes. However, on the issue of self-restoration compositions, we also do not have substantiated publications. It's time to fix this flaw. The first results of the experiment have already been given by us in the abbreviated abstracts of the European conferences [10-11]. They are published as an article for the first time.

There are many theories about tooth decay (an overview on this topic may be presented separately). However, it is possible to single out a number of general simplified provisions, from which it is relatively easy to obtain the first ways to solve problems of prevention.

Tooth decay can be simply compared to the destruction of other systems that endure extreme stress. These are, for example, car tires and boot soles, pliers and secateurs; highways with busy traffic and bad climate; Polymer materials under load and lighting, etc. Common to the carious process are the stages of appearance of lesions in the integrity of products / coatings. This is, oversimplified:

1. Loss of components that ensure the integrity of dental structure. In polymers, this is leaching/degassing of the plasticizer/stabilizer, destruction of polymer chains into shorter ones, salting out and precipitation of filler microparticles. In road surfaces, this is the loss of elasticity of the tar component of the asphalt. In teeth, this is demineralization of dental tissue and enamel.

2. The appearance of micro- and nanocracks, defects and proto-cavities. In tooth enamel, this is particularly manifested by discoloration (whitening).

## **II. DENTAL SELF-RESTORATION. HOW IT CAN WORK.**

The idea of this work is the assumption of a high self-protective and even self-restorative ability of both the enamel of the teeth (which has already been proven earlier) and the dentin itself.

Figure 1 schematizes the possible self-healing process when applying (or rubbing) powders and pastes with components of "building materials" for restoration.

Experimental dentistry and medical chemistry today prefer to operate with nano-objects (nanohydroxyapatite, nanosilica, colloidal chalk, etc.). However, the complexity of obtaining and the high cost of nano-components force us to look for a way of simpler compositions.

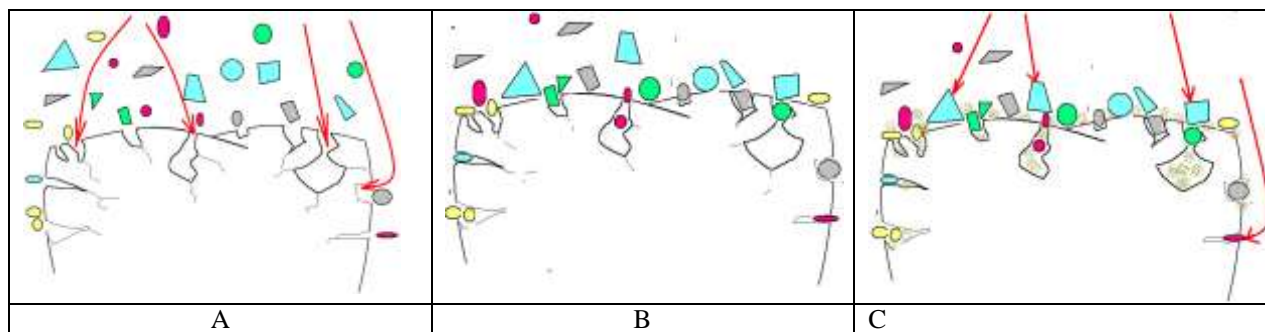
If we assume that the tooth itself "chooses" the necessary particles from the offered ones (and the rest will self-remove), then it is quite possible to use any poly-dispersed powders. Another obscure aspiration of the current preventive dentistry is the multicomponent nature of commercial toothpastes. They usually contain an inert filler (nano- or micromel, calcium carbonate), supplied with many additives and additives of dubious utility (saccharin, aspartame, potent surfactants, stabilizers and preservatives). For this reason, many pastes are not recommended to be left without thorough rinsing.

Figure 1 shows how simple and effective the natural scheme of self-healing cavities is at any stage of development. This is of course real only if

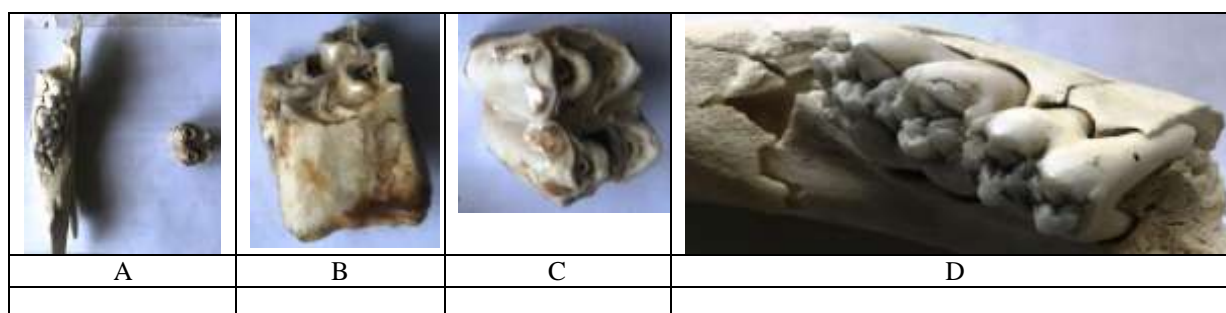
- A) high immunity (at least local);
- B) the presence of "correct building materials" in the field of dental tissues;
- C) regular high hygiene in the area of the affected area;
- D) acceptable self-attitude towards a positive result;
- E) other individual factors (climate, lifestyle, regularity of procedures, individual characteristics).

In real life, as a rule, we have lack of several of their points. As a result of which the self-restoration mechanism slows down to a complete stop or goes unnoticed (for example, building up 0.5-1 microns per year). More often, the contrary situation is realized -when, instead of self-healing, there is self-wear and tear - which we observe often on the radiographs of the dentist.

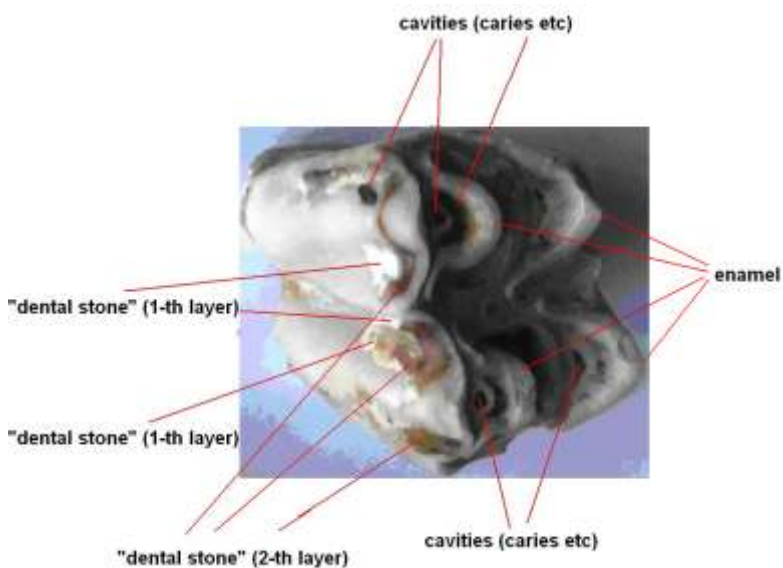




**Fig. 1.** Scheme of the Dental "self-repair" - the most probable mechanism of self-restoration with the help of micro- and nanoparticles that accidentally or systemically fall into the tooth cavity.



**Fig. 2.** Fragments and samples of teeth of domestic ungulates - cows, etc. (after exposure in 30% KClO).



**Fig. 4.** Typical variants of self-restorative action by "dental stone calculus" in cattle.

### 3. The first results of the experiments.

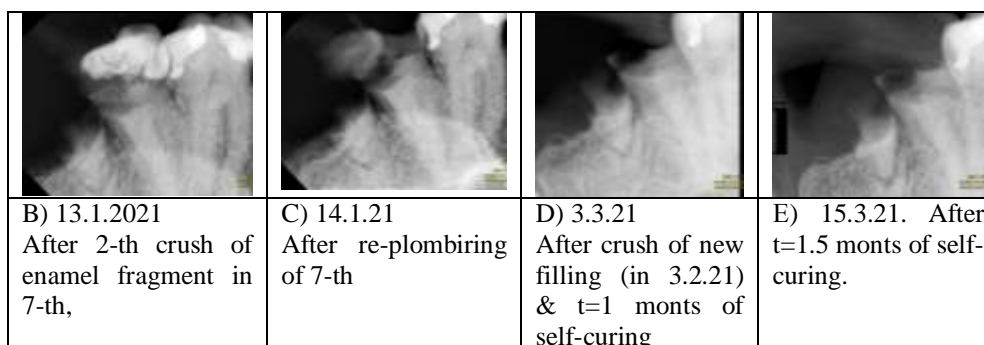


Fig.2. X-ray (Rentgen-Puluylampe “Visiograph”) photo of investigated zone of 6,7 & 8 teeth of Patient 1. This can be illustrated by X-ray images of the severely damaged upper left tooth No 7 in Patient-A. At the stage of the breakaway of a large part of the enamel (Fig. 2B) due to the caries under the filling (plombiring), a re-filling was carried out (Fig. 2C). However, the filling turned out to be too large (and was in contact with the gum), and fell out after 2 weeks (3.2.2021). After that, the attending dentist and dentists of other clinics refused to refill it and even pinning (and sent the patient to remove the tooth).

Strong, including at night Periodic, moderate Rare, weak (with general weakening)

Table 1. Patient-A's well-being during the observation period (1.12.2020 - 1.6.2021). Absent - no sensations or they are normal

in the area of the affected tooth 7	1.12.21-13.1.21	14.1-3.2.21	3.2.-3.3.21	3.3-15.3.21	15.3-15.4.21	15.4-1.6.21
Toothaches (and its ricochets in other areas)	Increasing frequency of moderate intensity, including at night	Periodic weak	Strong, including at night	Intermittent medium intensity	Rare, weak (after general weakening)	<b>Absent</b>
Sensitivity to cool/warm	Regular medium intensity	<b>Absent</b>	Wery strong	Strong	Strong	<b>Absent</b>
Sensitivity to hard eat	<b>Absent</b>	<b>Absent</b>	Strong	Medium	Weak	<b>Absent</b>
Food jam at tooth 7	Strong	Weak	Wery strong	Strong	Medium	Weak
Food jam near/in other teeth	Medium	Medium	Medium	Weaker than Medium	Weak	<b>Absent</b>
irritation, inflammation and suppuration in / around the teeth	3	1	2	1	0	0
Chips in the area of tooth 7, number	3	1	1	0 - 1	0	0
Chipping near other teeth	2	0 - 1	0 - 1	0	0	0
Bad smell or taste in the mouth	Often	Often	Often	Sometimes	Sometimes	<b>Absent</b>
General well-being in the teeth	Bad	Normal	Bad	Medium	Normal	Normal
General well-being around the teeth	Medium	Normal	Medium	Medium	Normal	Good
Psychological condition (in relation to teeth)	Bad	Medium	Wery bad	Wery bad	Medium	Good

According to modern views, the exposed dentin in the gums is unable to withstand either loads or the action of aggressive liquid media, and must quickly collapse, with subsequent inflammation of the adjacent areas, and infection of adjacent teeth. However, the Patient accepted the scheme of self-healing and partial restoration of tooth residues proposed by us (with powders based on herbs and nano-oxides, rinsing, etc.). By this time, the tooth represented a bare root in the gum, cleaned "for filling", with a 2 \* 2 mm particle of enamel protruding above the gum.

A month later, on 3.3.2021, the Patient-A returned to the clinic and performed an X-ray in order to find out the degree of root damage by caries (since the tooth began to feel more strongly chilling and hard food, and sometimes pain). In case of deepening caries, the patient was ready for immediate removal. However, to the surprise of the doctors observing the tooth, no negative changes (tooth chipping, carious zones, tooth holes) were observed (Fig. 2D). On the contrary, self-closure of all adjacent interdental areas is seen from the X-ray photograph (compare Fig. 2D and Fig. 2A, B, C). In addition to that, it is clearly visible above the 8th tooth (also a destructed root in the gum).

Table 2. The number of recorded effects, according to estimates in the experimental groups.

	Positive	No effect	Negative
Self-healing	6	3	1
Decreased sensitivity	7	2	1
Termination of food-stuck in / between the teeth	8	2	0
Strengthening the cutting function, resistance to solid inclusions	8	2	0
Smoothing the relief of damage	5	4	1



Fig.3. Visual info on self-repair. Molars and posterior teeth of Patient-B. 1,3 and 4 - were processed; 2 - not processed and destroyed.

### III. DISCUSSION ON THE RESULTS OF THE EXPERIMENT.

#### 3.1. Limitations of this method.

With all the positives, one must understand the limits of the possibilities of self-healing. The use of the declared methods significantly expands the boundaries, but does not cancel them. Table 3 shows the main limitation - the impossibility of (fast) growth of dental tissue in volume - especially lateral chips and deep lesions. This function will continue to be at the mercy of official dentistry and artificial polymer-composite materials.

Indeed, self-repair technologies with “friendly” micro-nanoparticles operate with micron-sized coatings. In the best case, blurring and self-overgrowing of round (surrounded by dental tissue) cavities of any depth is possible (which is noticeable in the molars in Figs. 3 and 4). Build-up of side chips, leading and cutting edges, etc. - much more effective in the dentist's chair.

The possibilities of self-help for very deep lesions (flux, periostitis, etc.) and anaerobic inflammation under the filling have not been studied either. In these cases, external influence may be useless or too slow.

As you can see, all the limitations are similar to those we have with skin lesions. We treat small cuts and even suppurations ourselves (iodine, brilliant green, ointments, medical glue, adhesive plaster, etc.) - and this is up to 80% of all injuries. But deep and non-healing wounds, trophic and gangrenous lesions are better not to trust self-medication. We are talking about how to "pull up" dental self-prophylaxis to the usual standards of self-profilaxis of skin injuries. In the meantime, people with the slightest dental issues - either immediately run to the dentists (who often immediately operate and violate the delicate balance), or do not pay any attention until major problems appear.

Tab. 3. Some features of the “self-repair” method (estimation).

General action (Enamel, gums etc)	Sensitivity	Food jams	Enamel chipping/crushing	Dental inflammations, irritations	Very deep lesions	Volumetric tissue build-up	Smell / taste	Open tooth holes/pores	Closing tooth holes/pores
Strengthens	Eliminates	Eliminates	Stops	Eliminates	Preserves	Not	Eliminates	Stops growth	Sometimes

Now, almost every toothpaste marketed is claimed to be "anti-caries" or "preventative." This is partly the case in the segment of expensive and premium goods. But we must take into account the rate of the majority of the population on the cheapest segment. And these are usually aroma-sweetened (which is already harmful to the teeth) microdispersed CaCO<sub>3</sub> and SiO<sub>2</sub> (which is ineffective) or even gypsum-chalk (which is harmful) mixtures.

#### 3.2. Comparison with dominant methods and attitudes.

Now, almost every toothpaste marketed is claimed to be "anti-caries" or "preventative." This is partly the case in the segment of expensive and premium goods. But we know - the majority of customers buy the cheapest segment of toothpastes. And these are usually aroma-sweetened (which is already harmful to the teeth) microdispersed CaCO<sub>3</sub> and SiO<sub>2</sub> (which is ineffective) or even gypsum\chalk (which is harmful) mixtures.

Also, you should take into account the lack of the correct culture of using toothpastes. The overwhelming majority of people (including the dentists themselves!) Retain their acquired habits from childhood. For example, treat your teeth as an alien hostile element of your body, ready at any moment (usually at the most inappropriate) to betray and strike (break, rot, get sick). The dentist is seen here as a miraculous savior - even when it comes to the complete removal of a nerve or even a tooth. At the same time, few people even think to assume that teeth have no less regenerative power than, for example, skin, bones, eyes, hair or blood vessels.

There are also known regions where people do not get caries at all - albeit with an ultra-low culture of dental care.

The foregoing suggests that the teeth can easily repair most microdamages on their own - if they are given "building material" and freed from mechanical (chewing too hard/elastic, hot/super cold) and sanitary problems (domination & remnants of carious food, acidic food/drink, etc.)

It is evident that in many cases even filling can play the opposite role - just as a hermetically applied plaster or medical glue stops the healing processes on the skin and activates putrefactive inflammation. Dental tissue is an open system, and sealing it with a filling or crown inevitably leads to known complications under the prosthetic onlays (and this is a recognized problem that has caused the emergence of dental creams such as Corega). Meanwhile, by activating the healing potential of the tooth, it is theoretically possible to achieve partial (sufficient for -\+ normal life of the tooth) self-healing.

In areas with insufficiently developed dentistry, we often can meet people with problem or dilapidated teeth, which, however, continued to function. When oral examining of village-people, in place of the teeth, it possible to find: gum growths, thickenings or even gray-brown growths directly on the affected (or formerly affected) areas of the teeth or their remnants ("stumps"). They serves as a forced "natural seal" from scrap materials (dust, plant fibers, microparticles of sand and limestone, etc.). The lifespan of such self-substitutes is obviously very different, but it can reach many years.

There have been cases when the replacement of such "ugly" (but working and not disturbing) formations with "beautiful fillings" or whitening from the dentist led to a rapid or gradual collapse of both the tooth itself and the adjacent teeth and tissues. Of course, such self-healing is possible in places with an acceptable composition of "good dust" in air, dental powders & foods, and with a certain immune response in the patient-s organism.

Most likely, every dentist (and even an ordinary person) in life has met such cases among people who have come into contact with him. It remains only to put these facts on the basis of scientific research, and expand the base of mineralizing prophylactic pastes and preparations for deep lesions and tooth decay.

4. Approximate formulations of prophylactic and restorative powders from commonly available components.

1. *Coniferous powder*. The needles and cones (if necessary, washed and dried) are ground with a coffee grinder. The fine fraction is sieved through a sieve and used. A suitable amount (1:1 or 1:2) of nano-dispersed SiO<sub>2</sub> (pyrogenic silica) is added to the mixture, if possible, nano-Al<sub>2</sub>O<sub>3</sub>, nano- or micro CaCO<sub>3</sub> (or commercial tooth powder). Due to coniferous resins, the effect of fixing nano-microparticles in the pores and cavities of the tooth is enhanced. In this case, coniferous components enhance the disinfecting effect, and nanooxides - the sorbing effect. If desired, you can add a small dose of water-hardening micro-silicates (cement, white clay) or other components (gypsum, quartz).

2. *Tea powder*. After use, the brewed tea is dried and crushed in a coffee grinder. Next, nano- and micro-inorganic components are added (as in claim 1).

3. *Mint powder*. The mint is dried and ground in a coffee grinder. Next, nano- and micro-inorganic components are added (as in claim 1).

4. *Sage powder*. The shavings purchased at the pharmacy are crushed. Next, nano- and micro-inorganic components are added (as in claim 1).

5. *Hop powder*. The hop cones are collected, washed and dried. Further - as in paragraph 1.

These powders can be freely mixed, add a fine fraction of other medicinal herbs (cinnamon, oak bark, coriander, rosemary, mint), at the request of the user. When cleaning with such powders, it is not necessary to rinse thoroughly right away. On the contrary, their beneficial effect will last if left on the teeth for a comfortable time. For example, rub-in powders can be left overnight and rinsed out in the morning.

These methods are very convenient in the field, as well as for children when rinsing is difficult (for example, outside the bath or if the child almost fell asleep forgetting to brush his teeth).

The combination of these powders with toothpastes & re-mineralisators (which have inaccessible and clinically proven components such as fluorides and hydroxyapatite) apriority can enhance the self-restorative effect.

#### IV. FIRST CONCLUSIONS

1. Nature has provided ample (including hidden) opportunities on the regenerative capabilities of bone and dental tissues. This resonates widely in the household sector - especially in regions with undeveloped or expensive dentistry. However, as applied to teeth, this topic has not yet found development, as evidenced by the absence or lack of regular data in scientific periodicals.

2. The results first regular scientific experiments on self-regeneration of dental tissues at any degree of damage, were presented. It has been shown that the use of powders and pastes based on micro(nano)particles of plant and



mineral origin makes it possible to obtain acceptable or unexpectedly good results in eliminating pathologies and problems of teeth and around-dental tissues.

3. Based on the results of studies, approximate methods of self-restoration were proposed without consulting specialists. Several recipes for making self-restoring tooth powders based on commonly available components are presented. Obtaining these compositions (subject to elementary process sanitation) is possible in any conditions, without special qualifications and without the involvement of expensive components.

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