

TABLE 1. Residual element content in precursors by  $\text{Yb}_2\text{O}_3$

Element	Content [wt %]
Hf	1,2
Al	0,25
Ca	~0,01
Fe	< 0,01
Na	< 0,01
Ba	< 0,001

The ultimate bending strength of ceramics stabilized by  $\text{CeO}_2$  and  $\text{Yb}_2\text{O}_3$  remained without changes after aging in hot water environment.

The quantity of residual elements in the synthesized powders is insignificant; its qualitative composition is not dangerous to health. As TABLE 1 shows, among residual elements, the content of Hf is the maximal one, which is an inseparable residual element of Zr.

Investigation of subacute toxicity was carried out in conditions where white mice intragastrically repeatedly received ceramic extracts. During the whole observation period, there were no cases of test animal death or changes in appearance, behavior, eating, and physical activity compared to control group. The toxicity index was 98% with the standard value from 70 to 120%. Sample extracts did not show any hemolytic action in experiments in vitro with isolated erythrocytes of rabbits: hemolysis was 0% with the permissible value less than 2%.

Ceramics based on T-ZrO<sub>2</sub> stabilized by  $\text{CeO}_2$  and  $\text{Yb}_2\text{O}_3$  are nontoxic, meets the requirements of standardized documentation, and can be applied as a material for medical purposes.

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### References

- [1]. Piconi C., Maccauro G. Zirconia as a ceramic biomaterial// Biomaterials -1999, pp 1-25.
- [2]. N.A. Mikhailina, L.I. Podzorova, M.N. Rumyantseva, L.I. Shvorneva, O.A. Ceramic on the basis of Tetragonal Zirconium dioxide for restoration dentistry// Inorganic Materials: Applied Research, 2010, Vol. 1, No. 4, pp. 335-338.

## COMPARATIVE ASSESSMENT OF THE PREPARATIONS "BIOSITAL" AND "KAFAM" INFLUENCE COMBINED WITH ELECTROACUPUNCTURE ON THE HEALING OF ALVEOLAR PROCESSES OF THE MAXILLA BONES IN EXPERIMENT

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### Introduction

It's well known that special care rendering by stomatological health authorities is in great demand. Bone defects left in the maxilla bones after the healing of chronic odontogenic infection focuses, treatment of non-cancerous growth after the implants extraction considerably reduce the maxilla bone strength and worsen conditions of the tooth system functioning, provoke disturbance of the chewing function what has negative influence on the human body state [1,5]. Thus, development and introduction into the clinical practice of the new complex methods of patients rehabilitation with bone defects of alveolar processes allowing effective recovery and reconstruction of the injured tissues and remain the main direction in maxillofacial surgery and stomatology.

Toxico-hygienic examinations of «Biosital» and «Kafam» preparations made before, demonstrated that they have bioactive characteristics due to the calcium and phosphorus migration from the surfaces of these materials when contacting with the blood plasma which cause there high osteogenic indices. There are scientific medical works confirming the positive effects of electroacupuncture on the processes of bone modeling [4]. But the range of morphological aspects of the complex interaction of mentioned above osteotropic medicines with biological tissues during the acupuncture treatment is not yet studied and examined actually.

Aim of the work was to make comparative evaluation of the preparations «Biosital», «Kafam» influence and electroacupuncture treatment with electronic device «Vityaz AET-01» in skin projection of acupoints on the process of the alveolar sockets healing after the teeth extraction on the lower jaw in experiment according to the clinic macroscopic visual evaluation data.

### Objects and methods

Examination was performed according to the Regulations for experiments on animals [2]. Experiment was done on 45 sexually mature males of Shinshila rabbits of the same age and weight. All animals were divided into 5 series, 9 animals in every one. The first series was the control one. Animals of this series had operation for the central incisor extrac-

tion on the lower jaw and the alveolar sockets were filled in with blood clot after operation. Alveolar sockets of the second series animals were filled in with bioactive materials «Biosital» mixed with the animal blood. Alveolar sockets of the third series animals were filled in with bioactive materials «Kafam». Alveolar sockets of the fourth and fifth series were filled in with «Biosital» and «Kafam» medicines with postoperative electroacupuncture treatment, 10 sessions. We irritated acupoints similar with GI4, E36, VB20, VG26 for a man determined according to the information about acupuncture application in veterinary [3]. Total treatment lasted 15 minutes.

Effectiveness of complex application of «Biosital», «Kafam» and electroacupuncture was determined according to the dynamic supervision indices on the postoperative wounds state on the 3, 7, 14, 21, 30 days, 1,5, 2, 3 and 6 months postoperatively.

## Results

Postoperative inflammatory reactions in the region of the alveolar socket of the extracted teeth of the series 1-3 demonstrated that animals had pronounced edema and hyperemia of the mucous tunic on the region of the wound sutures on the third day after operation.

In the series 4 and 5 the edema was insignificant by the same term, the mucous tunic of the postoperative wound was pink-pale, the sutures were intact.

The edema of the mucous tunic of alveolar processes of the lower jaw remained for the animals of the series 1, 2, 3, 4 by the 7 day in the region of the alveolar socket. The socket with the blood clot was filled in by the granulation substance in the third. Granulation tissue covered the implantation material. At the same time, the 4-Series had a slight hyperemia of the mucous tunic in the region of sutures, in the 5 Series the mucous tunic was pink-pale and swelling and hyperemia were absent.

On the 14th day of observation in the animals of the 1st series we stated fragmentation remains of blood clot in the sockets of the extracted teeth. In the 2nd series the granulated preparation «Kafam» appeared in the form of small rounded conglomerates alternating with organizing granulation tissue. In the 3rd series the implantation materials were visualized in the form of individual large dense fragments of polygonal shapes, closely adjacent to the walls of the alveoles. In individuals of the 4th and 5th series we registered the visual scar absence, its boundaries could not be determined during palpation.

On the 21th day the animals of the 1st series had no signs of inflammation and fistulas in the mucous tunic in the surgical wound. In the 2nd series the mucous tunic of the alveolar process was without changes and deformation. It should be noted that the aesthetic indices of scars for animals of third series was significantly higher with respect to the Series 1 and 2. In the 4th, 5th series the mucous tunic in the postoperative wound region was pink-pale pink without visible changes. During the detailed study of the macropreparations, the clumps of granules separated by strands of young regenerate bone of gray color were fixed in 4-Series. In the 5-series the regenerated bone was gray and clearly visualized throughout.

After 30 days of observation in the animals of the 1st series the mucous tunic in the region of socket of extracted tooth had a physiological color. Visually we determined a significant reduction in the height of alveolar socket in extracted tooth region. In the 2nd, 3rd series of swelling of the mucous tunic in the region of extracted tooth was absent, the height reducing in the alveole region of the extracted incisor was

not observed. Examination of macropreparations in the 4th and 5th series showed that the wells are made of dense fibrous tissue in the upper, granulation «Kafam» and «Biosital» is not found. Degradation signs were not determined.

## Conclusion

Analysis of the results provides a basis to conclude that the complex application of the implant preparations «Kafam» and «Biosital» combined with electroacupuncture in experiment has positive effects on the processes of their osteoregeneration of acquired defects of the alveolar processes of the lower jaw.

## References

- [1] Chudakov O.P. et al. Biosital and its forms in maxilla-facial surgery, Abstrakt XVII Congress of the European Association for Cranio-Maxillo-facial Surgery. – Tours: 167, 2004.
- [2] Denissov S.D., Morozkina T.S. Requirements to the scientific experiment on the animals, *Zdravooohranenie*: 4, 40-42, 2001.
- [3] Longo F., Gazzola M. Scientific basis of veterinary acupuncture, Abstract book. XV World congress on medical acupuncture (25-27 may 2012, Athens, Greece): 39-40, 2012.
- [4] Pashkevich L.A., Pohodenko-Chudakova I.O., Shevela T.L. Acupuncture influence on the processes of osteointegration in the system mandibula – dental implant by morphological examinations data, *Medical Journal*: 3 (37), 109-112, 2011.
- [5] Ulyanova T.M. et al. Application of the new bone-replaeng material «Kafam» in stomatology, *Engeneering of biomaterials - Cracow*: 12-13, 2004.