## AP09260954 «To study the dynamics of reparative osteogenesis and restructuring of the duplex allograft, harvested according to the Marburg bone bank system, in combination with osteoinductive substances»

## Relevance

Currently, the standard of treatment for bone defects of various etiologies is filling it with an auto- or allograft. However, most of the allografts used are imported and are not registered in the state register of medicines, medical devices and medical equipment, which complicates the use of these drugs in the territory of the Republic of Kazakhstan. It is worth noting the high cost of foreign osteoplastic materials for orthopedic operations, in addition, large volumes of these drugs are required when replacing defects. The creation of a duplex domestic osteoplastic material combined with osteoinductive substances will make it possible to heal patients with bone defects and false joints, reduce disability, get an economic effect from reducing the cost and the possibility of exporting the drug to the near and far abroad.

### Purpose

To study the efficacy, dynamics of reparative osteogenesis and restructuring of a duplex domestic allograft harvested according to the Marburg bone bank system, in combination with osteoinductive substances when filling bone defects in rabbits.

## **Expected results**

On the basis of the comparative study, a method will be developed for the treatment of bone tissue defects, which will allow filling the voids and will ensure the enhancement of local bone regeneration. This technique will improve the quality of reconstructive and restorative operations on bones. The economic effect of this study is to reduce the cost of purchasing an allograft, in view of the procurement of our own, from the heads of the femurs removed from patients after hip arthroplasty. The above will reduce the cost of purchasing bone tissue from foreign manufacturers, create conditions for the production of domestic bone allografts in the territory of the Republic of Kazakhstan, and cover the need for trauma and orthopedic departments for a safe donor bone. Stimulation of osteogenesis will make it possible to obtain a new treatment technology in traumatology and orthopedics, reduce the time and number of hospitalizations, and reduce disability, which has not only economic, but also social effect.

#### **Research team**

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Main publications on the topic of the project:

1 Tashmetov E., Saginova D., Kamyshansky E. Evaluation of bone regeneration in bone defects treated with allograft: an experimental study in a rabbit model // 41<sup>st</sup> SICOT orthopaedic World congress / г. Будапешт, Венгрия, (15-18 сентября 2021 г.). - 2021. (электронный: <u>https://sicot.eventsair.com/QuickEventWebsitePortal/budapest-2021/event-programme/Speaker/GetSpeakers?Length=7</u>).

2 Elyarbek Tashmetov, Dina Saginova, Evgeny Kamyshansky, Ibrahim Rustambek. Tplatelet-rich plasma with heat-treated bone allograft in the bone defect regeneration (the animal model) //  $29^{\text{th}}$  Annual Meeting EORS / г.Рим, Италия, (15-17 сентября 2021 г.). - 2021. - Р.302.

3 Тулеубаев Б.Е., Сагинова Д.А., Сагинов А.М., Ташметов Э.Р., Керимбеков Т.И. Гистологическая характеристика репаративного остеогенеза при применении PRP с костным аллографтом// Materials of the International Scientific and Practical Conference Dedicated to the  $20^{\text{th}}$  Anniversary of National Scientific Center of Traumatology and Orthopaedics named after Academician N.D. Batpenov / г. Нур-Султан, Казахстан, (29 сентября – 01 октября 2021 г.). - 2021. - С.: 31-32.

Security documents:

1) Ташметов Э.Р., Рустамбек И.Ф., Абдуллаева С.Б. Алгоритм рентгенологической оценки репаративной регенерации костного дефекта при применении костного аллотрансплантата в модели на животных. Жануарлар моделінде сүйек аллографты қолдану арқылы сүйек ақауларының репаративті регенерациясын рентгендік бағалау алгоритмі. Свидетельство о государственной регистрации прав на объект авторского права № 19384 (2021 год).

# Achieved results:

As a result of the literature review in the main international databases (Pubmed, Scopus, Clarivate, Elibrary, etc.), the main substances, osteogenesis activators (PRP, BMP, bone marrow concentrate), used *in vitro* and *in vivo* were identified. Algorithms for histological and radiological assessment of the study are developed. Histological and histochemical assessment is carried out on the basis of the analysis of cellular-inflammatory infiltrate and the ratio of newly formed fibrous, bone and cartilaginous tissues. X-ray assessment - based on an analysis of the size of the defect, periosteal reaction, bone regenerative formation and its restructuring. A number of surgical procedures were carried out to form models of a bone defect in rabbits under intravenous anesthesia, as a result of which an experimental model of a bone defect was developed in rabbits. The assessment of the regeneration of the bone defect was carried out by clinical, macroscopic and radiological research methods.

### **Information for potential users**

The results of the study can be implemented in surgical hospitals in the treatment of bone defects, nonunions, or other pathologies requiring bone replacement. In addition, the research results will be useful to a wide range of scientific specialists, undergraduates and doctoral students working in the field of orthopedics, surgery, oncology, etc. The developed proposals will be useful for surgeons, oncologists, phthisiatricians and traumatologists