

A STEP FORWARD IN EARLY MICROBIAL DETECTION FOR CORNEAL TISSUE

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Purpose Although standard microbiological controls effectively detect most contaminants, the early identification of certain microorganisms—including filamentous fungi—remains challenging. The objective of this study is to evaluate the meaningfulness of incorporating a microbiological control of the retrieval medium as a means to further improve microbiological surveillance.

Methods Two consecutive periods were compared in terms of microbiological detections, the initial period extends from March 2023 to August 2024, during which routine microbiological monitoring was conducted, while the subsequent period covers the months from September 2024 to August 2025, when an additional control of the retrieval medium, prior culturing, was included. Routine monitoring includes three microbiological controls: (1) Culture preservation medium five to seven days after the initiation of culture; (2) culture preservation medium subsequent to the final corneal evaluation and (3) transport medium 24 hours after the cornea relocation.

Results This study evaluates the differences of first microorganism's detection between two subsequent periods with different microbiological controls procedures. During the first period (March 2023–August 2024), where the samples were obtained only from culture preservation and transport media, 67,71% of the positive samples were detected in the first preservation media control and only 4,17% in the transport media. However, in the second period (September 2024–August 2025), following the implementation of retrieval medium control, the majority of positives (91,47%) were identified in that sample. It was observed that almost 70% of the positive results in retrieval media corresponded to the group of coagulase-negative staphylococci (CoNS), which would have been undetectable in subsequent controls due to the presence of antibiotics in the media.

Excluding CoNS, other microorganisms were still detected in the retrieval media, being around 78% of positive samples. The early detection of positive samples in retrieval media, is translated to a clear decrease of positive samples in the first preservation media control (17,24%) and in the transport media control (3,43%), this is due to the fact that if a positive result is detected at any point within the culture corneal circuit, it indicates the discarding of the tissue, leaving fewer positives in subsequent controls. In addition, these results demonstrate that including a retrieval medium control markedly improves the early detection of microorganisms that would otherwise go undetected, such as those in the CoNS group.

Conclusions Despite the fact that the standard microbiological sampling routine is capable of detecting a significant proportion of positives derived from the culture preservation media, the implementation of retrieval medium control has been demonstrated an early microbial detection in corneal tissue. The implementation of this early control would allow eye banks to optimise the management of positive results, ensuring their

microbiological safety. Consequently, safer corneal grafts could be offered to recipients.

FILATOV'S SCHOOL OF CORNEAL PRESERVATION YESTERDAY, TODAY, TOMORROW

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Objective To trace the history of the establishment of the first corneal harvesting and preservation laboratory in Ukraine and the process of its transformation into an eye bank during war-time.

Materials and Methods Archival materials from the Filatov Institute covering a 100-year period were analyzed. Statistical analysis of the data obtained was performed using the ANOVA method repeated measures.

Results In 1936, the first corneal harvesting and preservation laboratory in Ukraine was established at the Ukrainian Institute of Experimental Ophthalmology (now the V.P. Filatov Institute of Eye Diseases and Tissue Therapy of the National Academy of Medical Sciences of Ukraine), headed by Academician Volodymyr Petrovych Filatov. For 70 years, this laboratory conducted fundamental scientific research into methods of corneal preservation. For the first time, biomicroscopic, biochemical, and morphological changes in the cornea under different temperature preservation regimes were described, and the optimal conditions were identified. The world's first method of cold corneal preservation developed by V.P. Filatov was further advanced through the development of preservation media and new cold storage methods, which are currently used in eye banks across Europe. At present, due to military operations on the territory of Ukraine and the large number of shrapnel-related ocular injuries among both military personnel and civilians, the demand for donor corneas has increased sharply. This required urgent modernization and reorganization of the corneal preservation laboratory at the V.P. Filatov Institute and its transformation into an eye bank in accordance with European standards in order to ensure timely provision of donor corneal tissue to all patients in need. Collaboration was established with the Lublin Eye Bank (Poland), where colleagues generously shared their experience. Subsequently, a training course was completed at the Monza Eye Bank (Italy); participation took place in the annual EEBA 2025 scientific conference 'The Bridge' in Rome (Italy); the necessary equipment was acquired; and the comprehensive course 'Cornea Evaluation in Eye Banking' was attended in Venice (Italy). After acquiring the required knowledge and practical skills, their implementation into clinical practice began. Since February 2025, the eye bank has been operating using European cold corneal preservation technology, which has reduced waiting times for donor tissue and, over the course of 2025, enabled a 16.7% increase in the number of keratoplasties performed in the trauma and corneal pathology departments of



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the V.P. Filatov Institute of Eye Diseases and Tissue Therapy compared with 2024.

Conclusions The establishment of an eye bank at the V.P. Filatov Institute of Eye Diseases and Tissue Therapy has significantly improved the timeliness and quality of surgical care for patients requiring keratoplasty.

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EVALUATION OF ELECTRON-BEAMED, PRE-CUT CORNEAL ALLOGENIC INTRASTROMAL RING SEGMENTS (E-CAIRS) IN A RABBIT MODEL: IMPLICATIONS FOR BIOCOMPATIBILITY AND STANDARDIZED DISTRIBUTION

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Purpose Keratoconus management using CAIRS offers a biologically compatible alternative to synthetic ring segments. However, current workflows rely on freshly cut tissue, limiting standardization and availability. Electron-beam (e-beam) sterilization provides a promising alternative by devitalizing keratocytes, reducing immunogenicity, and enhancing stromal stability, enabling eye banks to prepare pre-cut, shelf-stable CAIRS suitable for wider distribution. This study evaluated the feasibility, biocompatibility, and corneal topographic effects of electron-beam sterilized, pre-cut CAIRS (e-CAIRS) implanted

in a rabbit model and assessed their potential as a standardized, eye-bank-processable tissue product.

Methods Human donor corneas unsuitable for transplantation were processed at Lions World Vision Institute to prepare e-CAIRS. The tissue was cut into ring-segment following common CAIRS specifications (width 0.75 mm, thickness 0.55 mm) and subsequently sterilized using electron-beam (e-beam) irradiation. Three New Zealand White rabbits underwent unilateral implantation of a single e-CAIRS segment. An intrastromal tunnel was created using the Ziemer FEMTO-LDV-Z8 femto-second laser, followed by segment insertion after dehydration. Postoperative follow-up was carried out for 12 weeks with slit lamp, anterior-segment-optical-coherence-tomography (AS-OCT), and ATLAS corneal topography to assess segment position, corneal response, and integration.

Results All implantations were completed without intraoperative complications. At week 1, slit-lamp showed translucent e-CAIRS with localized stromal edema, which resolved by week 2. By week 12, implants became clearer but remained partially translucent. Across all postoperative timepoints, the tissue surrounding the implant remained clear, with no haze or neovascularization. AS-OCT confirmed segment integration and progressive epithelial remodelling. e-CAIRS implants exhibited an initial reduction in thickness during the first two weeks, likely reflecting postoperative edema resolution and hydration equilibration with the recipient stroma. From week 2 onward, implant thickness remained relatively stable, reflecting biomechanical settling and stromal remodelling around the implant. Central anterior stromal thickness above the implant remained stable in the first two weeks, followed by a substantial increase at week 12 (from 91.3 to 123.7 μ m), indicating epithelial remodelling. Peripheral anterior thickness demonstrated an early postoperative peak at week 2 and remained elevated at later timepoints (121.3 $\rightarrow$ 147.3 $\rightarrow$ 146.5 μ m). Corneal topog-