Ayoob Karimizade, Ph.D.

Assistant Professor | Eye Research Center | Iran University of Medical Sciences

Tehran, Iran | karimiayoob2016@gmail.com

Google Scholar: Profile | ORCID: 0000-0002-5585-0024 | LinkedIn: Profile

PROFESSIONAL PROFILE

Dr. Ayoob Karimizade is an Assistant Professor at the Eye Research Center, Iran University of Medical Sciences. He is a tissue engineer and biomaterials researcher whose current work emphasizes eye tissue engineering, regenerative ophthalmology, corneal and retinal applications, and biomaterial-assisted ocular drug/cell delivery. His technical expertise includes injectable hydrogels, nanocomposite scaffolds, electrospinning, 3D bioprinting, stem cell-compatible biomaterials, and translational regenerative medicine.

His doctoral training and previous research in cartilage tissue engineering, MSC-loaded injectable hydrogels, wound healing scaffolds, and hydrogel-based drug delivery provide a strong biomaterials foundation that is now being translated toward ocular tissue repair and vision-related regenerative strategies.

RESEARCH INTERESTS

- Eye tissue engineering and regenerative ophthalmology
- Corneal and retinal regenerative medicine
- Biomaterials for age-related macular degeneration
- Injectable and in situ-forming hydrogels for ocular tissue repair
- 3D bioprinting and electrospinning for tissue-engineered constructs
- Ocular drug delivery and biomaterial-assisted cell delivery
- Stem cell-compatible matrices and 3D cell culture systems
- Collagen-, hyaluronic acid-, chondroitin sulfate-, and chitosan-based biomaterials
- Cartilage tissue engineering and MSC-loaded hydrogel platforms
- Wound healing and translational biomaterials

EDUCATION

Ph.D. in Tissue Engineering

Dissertation: Injectable Hydrogel Nanocomposite of Collagen/Hyaluronic Acid/Chondroitin Sulfate Seeded with Bone Marrow Stem Cells for Articular Cartilage Tissue Engineering.

M.Sc. in Medical Nanotechnology

Thesis: Preparation of Plastic Compressed Nanostructured Collagen Hydrogel Scaffold Enriched with Culture Medium Containing Skin Fibroblasts and Hair Follicles as a Construct for Skin Repair.

RESEARCH FOCUS

Dr. Karimizade's current research is centered on the design and development of biomaterial-based platforms for eye tissue engineering. His work aims to adapt injectable hydrogels, electrospun scaffolds, 3D-bioprinted constructs, and cell-compatible matrices for corneal and retinal repair, ocular disease modeling, age-related macular degeneration, ocular drug delivery, and biomaterial-assisted cell therapy.

This research direction builds on his previous experience in regenerative biomaterials, including stem cell-laden hydrogels, nanofiber-reinforced scaffolds, hydrogel-based drug delivery systems, and tissue-mimetic polymeric matrices.

MAIN RESEARCH THEMES

1	**Biomaterials for Eye Tissue Engineering** Development of hydrogel, electrospun, bioprinted, and cell-compatible biomaterial platforms for corneal and retinal tissue engineering, ocular tissue repair, retinal disease modeling, and regenerative ophthalmic applications.
2	**Injectable Hydrogels and Ocular Delivery Platforms** Design of injectable and in situ-forming hydrogels based on natural polymers such as collagen, hyaluronic acid, chondroitin sulfate, and chitosan for tissue repair, drug delivery, cell delivery, and biomimetic microenvironment engineering.
3	**3D Bioprinting, Electrospinning, and Scaffold Fabrication** Application of 3D bioprinting, electrospinning, and scaffold fabrication methods to develop structurally organized and biologically compatible constructs for regenerative medicine and ocular applications.
4	**Translational Biomaterials and Biomedical Product Development** Translation of biomaterials research into smart hydrogel-based wound healing systems, diagnostic/biological kits, patented biomedical formulations, and regenerative medicine products.

SELECTED RESEARCH PROJECTS

Biomaterial Platforms for Ocular Tissue Engineering

Development of hydrogel-, scaffold-, electrospinning-, and 3D-bioprinting-based strategies for corneal and retinal tissue engineering, with emphasis on age-related macular degeneration, regenerative ophthalmology, and biomaterial-assisted ocular therapies.

Injectable Hydrogel Systems for Regenerative Medicine

Design and evaluation of injectable and mechanically tunable hydrogel systems for tissue repair, stem cell-compatible microenvironments, and controlled therapeutic delivery.

Nanofiber-Reinforced Hydrogels and Scaffold Systems

Fabrication of fibrous nanocomposite hydrogels using collagen, chitosan/polyvinyl alcohol, cellulose nanofibers, and related polymeric systems to improve mechanical stability and extracellular matrix-like architecture.

Prior Doctoral Research in Cartilage Tissue Engineering

Development of collagen/hyaluronic acid/chondroitin sulfate-based injectable hydrogel nanocomposites seeded with bone marrow-derived mesenchymal stem cells for articular cartilage tissue engineering.

Hydrogel-Based Drug Delivery and Wound Healing Systems

Development of collagen-based and chitosan-based hydrogel platforms for wound healing and therapeutic delivery, including drug-loaded biomaterials designed to support tissue repair.

GRANTS AND FUNDED RESEARCH

Grant / Source	Role	Project / Topic
Iran National Science Foundation Grant	Principal Investigator / Postdoctoral Researcher	Fabrication of photo-responsive double-crosslinked injectable hydrogels for cartilage tissue repair.
Mazandaran University of Medical Sciences Research Grant	Principal Investigator	In vivo cartilage healing using injectable MSC-loaded hydrogels for tissue regeneration.
Collaborative Research Grant	Research Collaborator	Formulation of hyaluronic acid hydrogel loaded with terbinafine lipid nanostructures for the treatment of onychomycosis.

SELECTED PUBLICATIONS

#	Title	Journal	Year	DOI
1	Collagen short nanofiber-embedded chondroitin sulfate-hyaluronic acid nanocomposite: A cartilage-mimicking in situ-forming hydrogel with fine-tuned properties.	International Journal of Biological Macromolecules	2024	10.1016/j.ijbiomac.2024.131051
2	Preparation of Short Collagen Nanofibers for Injectable Hydrogels: Comparative Assessment of Fragmentation Methods, Physicomechanical Properties, and Biocompatibility.	Macromolecular Materials and Engineering	2024	10.1002/mame.202300460
3	Continuous Chitosan/Poly(Vinyl Alcohol) Nanofiber in Collagen Hydrogel to Prepare Mechanically Robust Fibrous Nanocomposite for Tissue Engineering.	Macromolecular Bioscience	2025	10.1002/mabi.202500230
4	Luteolin-incorporated fish collagen hydrogel scaffold: An effective drug delivery strategy for wound healing.	International Journal of Pharmaceutics	2024	10.1016/j.ijpharm.2024.124138
5	Fabrication of 3D chitosan/polyvinyl alcohol/brushite scaffolds for biomedical applications.	International Journal of Biological Macromolecules	2024	10.1016/j.ijbiomac.2024.132874
6	Collagen/cellulose nanofiber hydrogel scaffold: Physical, mechanical and cell biocompatibility properties.	Cellulose	2020	10.1007/s10570-019-02841-y

RESEARCH IMPACT

- Selected for the front cover of Macromolecular Bioscience, Issue 9, 2025, for the article with DOI: 10.1002/mabi.202500230.
- Recognized as a most-read research item in Macromolecular Bioscience for work on continuous chitosan/poly(vinyl alcohol) nanofiber-reinforced collagen hydrogels.
- Recipient of research funding for injectable hydrogel-based regenerative medicine projects.

INNOVATION, PATENTS, AND PRODUCT DEVELOPMENT

Dr. Karimizade has contributed to innovation and translational biomedical technology development in the fields of biomaterials, regenerative medicine, wound healing, and diagnostic/biological systems.

- Patent/formulation of anti-sensitivity toothpaste
- Zitabio RNA extraction column kit
- Sulfated glycosaminoglycan assay kit
- Cell spray system

LEADERSHIP AND TRANSLATIONAL ACTIVITIES

Chief Executive Officer - Zist Tarmim Baft Khazar Knowledge-Based Company

Directed translational biomaterials and wound healing product development, including smart hydrogel-based formulations incorporating chitosan and antibiotic agents for full-thickness wound repair. Responsibilities included research coordination, product-oriented biomaterial design, regulatory documentation, biomedical product development, and knowledge-based company activities in regenerative medicine and biomedical technologies.

INTERNATIONAL COLLABORATION

Collaborated with the Department of Chemical and Biomolecular Engineering at the University of California, Los Angeles (UCLA), USA, on the development of collagen short nanofiber-embedded chondroitin sulfate-hyaluronic acid nanocomposite hydrogels with tunable properties for cartilage tissue engineering applications.

PRESENTATIONS

• **Preparation of Plastic Compression Nanostructured Collagen Hydrogel Scaffold for Skin Repair** - Oral Presentation, Tabari Annual Student Conference, 2019.

• **Preparation of Collagen Hydrogel Scaffold Enriched with Skin Fibroblasts and Hair Follicles for Skin Repair** - Oral Presentation, 4th Iranian Congress on Progress in Tissue Engineering, 2018.

• **Evaluating the Effect of pH on Mechanical Strength of Nanostructured Collagen Hydrogels** - Poster Presentation, 2nd Nanomedicine and Nanosafety Conference, 2017.

• **Preparation of Nanostructured Collagen Hydrogel with High Mechanical Properties for Skin Scaffold Applications** - Poster Presentation, 2nd Nanomedicine and Nanosafety Conference, 2017.

HONORS AND AWARDS

First-Ranked Team Member - 3rd Startup Event on Stem Cell and Regenerative Medicine

Council for Development of Stem Cell Sciences and Technologies & MAPSA Ltd., Tehran, Iran | 2018. Contributed as a team member to the development and presentation of a stem cell and regenerative medicine startup idea that was ranked first by the selection committee.

Selected Candidate for Academic Recruitment Support - JAHAT Program

National Elites Foundation, Iran. Recognized as a selected candidate under the JAHAT Program, a national support pathway for introducing eligible researchers to universities, research institutes, and research centers for potential academic or research faculty recruitment.

University Recognition for Thesis Excellence

Mazandaran University of Medical Sciences. Recognized for the scientific quality and impact of the doctoral thesis in tissue engineering and regenerative biomaterials.

Special Commendation from the University President

Mazandaran University of Medical Sciences. Received special commendation for contributions to stem cell-based innovation, regenerative medicine research, and biomedical entrepreneurship.

Front Cover Selection - Macromolecular Bioscience

Macromolecular Bioscience, Issue 9 | 2025. Selected for the front cover of Macromolecular Bioscience for the article with DOI: 10.1002/mabi.202500230.

PEER REVIEW AND PROFESSIONAL SERVICE

Reviewer for international peer-reviewed journals in biomaterials, nanobiotechnology, polymers, tissue engineering, and regenerative medicine, including:

- Biomaterials
- International Journal of Biological Macromolecules
- Journal of Nanobiotechnology
- Journal of Polymers and the Environment

TECHNICAL EXPERTISE

Biomaterial Design and Fabrication

- Injectable hydrogel synthesis
- Collagen-based scaffolds
- Hyaluronic acid and chondroitin sulfate hydrogels
- Chitosan-based biomaterials
- Nanocomposite hydrogels
- Electrospinning
- 3D bioprinting
- Scaffold fabrication
- Drug delivery systems

Cell and Tissue Engineering

- 3D cell culture
- Stem cell encapsulation
- Mesenchymal stem cell-based tissue engineering
- Chondrogenic differentiation
- Cell-biomaterial interaction studies
- In vitro and in vivo biocompatibility assessment

RESEARCH VISION

Dr. Karimizade's long-term research vision is to establish translational biomaterial platforms for regenerative ophthalmology. Building on his expertise in injectable hydrogels, nanofiber-reinforced scaffolds, stem cell-compatible matrices, electrospinning, 3D bioprinting, and drug delivery systems, his future work aims to develop advanced biomaterials for corneal and retinal tissue engineering, age-related macular degeneration, ocular drug delivery, and biomaterial-assisted cell therapy.

His research seeks to connect fundamental biomaterials science with clinically relevant strategies for tissue repair, with the ultimate goal of advancing regenerative medicine approaches for vision-threatening diseases.