Impact Factor: 9.9 ISSN-L: 2544-980X

Scientific Novelty of Connective Tissue Biochemistry

Khodzhieva Dilrabo Kamilzhonovna [1]

Resume: The article is of an overview and discussion nature, devoted to the problems of physiology and biochemistry of the connective tissue system, its interactions with the mononuclear phagocyte system (SMF) in the initiation and implementation of fibrosis processes. The view of fibrotic conditions as a "hypertrophied" nonspecific reaction of the body aimed at preserving homeostasis, in which the pathological activation of SMF cells plays an initiating role as a result of their endocytosis of biocompatible factors of various nature, coupled with non-specific activation of expression, synthesis and secretion of lysosomal enzymes and growth factors, is presented and reasoned by their own data and research results of other authors. factors.

Key words: connective tissue, fibrous proteins fibrosis, extracellular matrix, macrophages, fibroblasts, time does not become clearer.

Connective tissue, including the extracellular matrix, resident and transient cellular elements, along with the regulatory systems of the body, unites various organs into a multifunctional self-regulating supersystem.

Unlike softer tissues such as the brain and liver, connective tissue is a more durable fibrous material necessary for the mechanical function of the body. The fibrous proteins that make up the extracellular matrix of a tissue determine whether it will have structural stiffness (bones), tensile strength (tendons) or elasticity (blood vessels, skin, lungs). They are embedded in an amorphous base substance consisting of hyaluronic acid, non-fibrous glycoproteins and proteoglycans.

Several different types or superfamilies of collagen differ in the composition of α-chains, which determines their function and, consequently, their location. For example, type I collagen consists of two α1 chains and one α2 chain (α12a2).

1. Type I collagen: found in most connective tissues, including bones.
2. Type II collagen: found in cartilage and vitreous.
3. Type III collagen: found in the skin, lungs and blood vessels.
4. Type IV collagen: located in the basement membranes and forms networks, gathering into a flexible leaf-shaped multilayer network.

Collagen spontaneously collects into fibrils. To avoid premature assembly of fibers inside the cell, a precursor form, procollagen, is synthesized. Procollagen synthesis involves (1) extensive posttranslational modification of the α-chain polypeptide and (2) assembly of the α-chain into procollagen.

α-chain (preprocollagen) It is first directed to the endoplasmic reticulum (ER) by means of a signal sequence, which is immediately removed into the ER. The selected proline and lysine residues are then hydroxylated into ER. The selected hydroxylysine residues are glycosylated by galactosyltransferase and glucosyltransferase.

[1] Department of general education and fundamental sciences, Bukhara Innovative Medical Institute, Bukhara, Uzbekistan

The pro-α chains spontaneously assemble into procollagen triple helices inside the ER. The resulting molecule has propeptide elongations at both ends, which still prevents spontaneous assembly into collagen fibrils. Procollagen is transferred from the EPR to the Golgi apparatus and packed into secretory vesicles.

Procollagen is secreted into the extracellular matrix by exocytosis (fusion with the plasma membrane), and procollagen peptidases remove the ends of the propeptide. Procollagen then forms units called tropocollagen, which spontaneously assemble into collagen fibrils.

Collagen fibrils are further strengthened by the formation of cross-links between adjacent lysine side chains by the enzyme lysyl oxidase. This is a slow, continuous process throughout a person's life. Stitching allows scar tissue to strengthen over time after wound healing, but also causes collagen to harden, which contributes to a decrease in vascular elasticity with age.

Collagen can be reconstructed by degradation by metalloproteinases. The action of these digestive enzymes is balanced by a tissue metalloproteinase inhibitor. In patients with osteoarthritis, there is an imbalance between metalloproteinases and their tissue inhibitors, which allows degradation to prevail over reconstruction.

The cause of osteogenesis imperfecta is unstable type I collagen molecules. They form an abnormal matrix and lead to the formation of weakened bones. One form of the disease leads to death in utero; with a less severe form, the patient's bones easily break ("brittle bones") and wound healing slows down. Patients with a less severe disease, Ehlers-Danlos syndrome, have defective, poorly stitched collagen molecules, which leads to skin stretching and sagging joints.

At the same time, various insufficiently studied, but often occurring pathological processes occur in this system, which are commonly referred to by the terms: sclerosis, fibrosis, cirrhosis, keloid scar.

In particular, in myocardial infarction, necrosis of cardiomyocytes is accompanied by a change in the content of extracellular matrix components involved in scar formation: fibronectin [2], glycosaminoglycans [3] depending on the size of the necrosis site and hydroxyproline (collagen marker) depending on the age of patients [4]. From the first days of the disease, there has been an increase in the concentration of the amino terminal peptide procollagen type III, a marker of type III collagen synthesis [5]. At the same time, there is evidence that the processes of organ fibrosis can develop simultaneously with the processes of destruction, but not at these loci. In them, fibrous tissue is formed after the cessation of the damaging factor, that is, as a replacement fibrosis. This was especially pronounced in the lymphoid organs of the same animals [8]. A similar pattern was also observed in the lungs after infection of mice with influenza A/H1N1 viruses (manifestations of early pneumofibrosis) [9, 10]. However, fibrosis processes do not always develop due to the destruction of cells and tissues. Thus, we have previously shown that fibrosis processes begin to form long before the development of destruction processes both in structures that are not commonly referred to as organs and tissues (tuberculous granulomas) and in the parenchyma of organs [11-13].

All this indicates that there are some opportunities and tools for studying the mechanisms of regulation of metabolic processes in connective tissue both in ontogenesis and pathology conditions. However, the mechanisms of the achieved results require further research. It is obvious that not only fibroblastic cells, but also macrophages are related to the processes of connective tissue homeostasis. Lysosomal proteases and the family of matrix metalloproteinases of macrophages are able to realize their potential in case of their probable contacts with elements of connective tissue and under appropriate conditions for interaction. Currently, the molecular mechanisms underlying the processes of collagen degradation have not been sufficiently studied. Collagen metabolism is a two-stage process that includes extracellular cleavage by proteases, followed by absorption by SMF cells and an intracellular stage of lysosomal depolymerization. Extracellular degradation of collagen involves the identification of specific sites of cleavage by enzymes of matrix metalloproteinases (MMRaz) [18].

It should be emphasized that the processes of fibrosis develop only in a multicellular organism consisting of cells of various types, some of which have direct contact with the external environment, while for

others such an external environment is probably nearby cells (of one or another histotype) and extracellular matrix, or foreign bodies. At the same time, it is obvious that with the loss of cells of one or more cells of other histotypes by the mechanism of necrosis, fibrosis develops according to the substitution principle. But at the same time, outside the necrosis zone and, in general, even before the formation of necrosis in the body, in the presence of activated macrophages among intact parenchymal cells, constitutive fibroblasts and their synthesis of connective tissue structures proliferate and activate. Thus, it can be assumed that the process of fibrosis is a non-specific reaction of the body, and is initiated by activated macrophages in a multicellular organism, the "purpose" of which, in its most general form, is probably to isolate cells from contact with the external environment with their potential or real possibility as a factor of homeostasis disturbance in the body. It is acceptable that macrophages can "perceive" not only living organisms, but also contacts with inanimate structures (prostheses, etc.) by the external environment.

Literature

1. Ким Л.Б., Березовская Г.А., Лайвин А.Н., Цыба Л.П., Котова И.И., Калмыкова Е.Ю., Куликов В.Ю. Динамика содержания фибронектина у больных в процессе раннего постинфарктного ремоделирования // Бюллетень СО РАМН. 2002; 4: 63–66.
2. Путятина А.Н., Ким Л.Б. Биохимические маркеры постинфарктного заместительного фиброза у мужчин различного возраста // Патология кровообращения и кардиохирургия. 2011; 4: 57–60.
3. Halimova, Y. S. (2023). Morphofunctional Aspects of Internal Organs in Chronic Alcoholism. *AMALIY VA TIBBIYOT FANLARI ILMIY JURNALI*, *2*(5), 83-87.
4. Togaydullaeva, D. D. (2022). ARTERIAL GIPERTONIYA BOR BEMORLARDA KOMORBIDLIK UCHRASHI. *TA'LIM VA RIVOJLANISH TAHLILI ONLAYN ILMIY JURNALI*, *2*(11), 32-35.
5. Togaydullaeva, D. D. (2022). Erkaklarda yurak ishemik kasalligining kechishida metabolik sindrom komponentlarining ta'siri. *Fan, ta'lim, madaniyat va innovatsiya*, *1*(4), 29-34.
6. Dilmurodovna, T. D. (2023). MORPHOLOGICAL ASPECTS OF THE THYROID GLAND IN VARIOUS FORMS OF ITS PATHOLOGY. *American Journal of Pediatric Medicine and Health Sciences (2993-2149)*, *1*(8), 428-431.
7. Dilmurodovna, T. D. (2023). Morphological Signs of the Inflammatory Process in the Pancreas in Type I and Ii Diabetes Mellitus. *EUROPEAN JOURNAL OF INNOVATION IN NONFORMAL EDUCATION*, *3*(11), 24-27.
8. Dilmurodovna, T. D. (2023). КЛИНИКО-МОРФОЛОГИЧЕСКИЕ ОСОБЕННОСТИ ТЕЧЕНИЕ ВОСПАЛИТЕЛЬНОГО ПРОЦЕССА В ПОДЖЕЛУДОЧНОЙ ЖЕЛЕЗЕ ПРИ САХАРНОМ ДИАБЕТЕ I И II ТИПА. *ОБРАЗОВАНИЕ НАУКА И ИННОВАЦИОННЫЕ ИДЕИ В МИРЕ*, *33*(1), 173-177.
9. Khafiza, J., & Dildora, T. (2023). Frequency of Comorbid Pathology among Non-Organized Population. *Research Journal of Trauma and Disability Studies*, *2*(4), 260-266.
10. Dilmurodovna, T. D. (2023). Clinical and Diagnostic Features of the Formation of Arterial Hypertension in Young People. *EUROPEAN JOURNAL OF INNOVATION IN NONFORMAL EDUCATION*, *3*(12), 41-46.
11. Dilmurodovna, T. D. (2024). DIABETES MELLITUS IN CENTRAL ASIA: PROBLEMS AND SOLUTIONS. *Лучшие интеллектуальные исследования*, *12*(4), 204-213.
12. Тогайдуллаева, Д. Д. (2024). ОБЩИЕ ОСОБЕННОСТИ ТЕЧЕНИЕ САХАРНОГО ДИАБЕТА В СРЕДНЕЙ АЗИИ. *Лучшие интеллектуальные исследования*, *12*(4), 193-204.

13. Tog‘aydullaeva, D. D. (2024). GIPERTENZIYA BOR BEMORLARDA MODDALAR ALMASINUVINING BUZULISHI BILAN KELISHI. *Лучшие интеллектуальные исследования*, *14*(4), 130-137.
14. Dilmurodovna, T. D. (2024). FACTORS CAUSING ESSENTIAL HYPERTENSION AND COURSE OF THE DISEASE. *Лучшие интеллектуальные исследования*, *14*(4), 138-145.
15. Shokirov, B. S. (2021). Halimova Yu. S. Antibiotic-induced rat gut microbiota dysbiosis and salmonella resistance Society and innovations.
16. Нарзулаева, У. Р., Самиева, Г. У., & Насирова, Ш. Ш. (2021). ИССИҚ ИҚЛИМДА КЕЧУВЧИ ГИПЕРТОНИЯ КАСАЛЛИГИНИНГ БОШЛАНҒИЧ БОСҚИЧЛАРИДА ГЕМОРЕОЛОГИК БУЗИЛИШЛАР. ЖУРНАЛ БИОМЕДИЦИНЫ И ПРАКТИКИ, 6(1).
17. Нарзулаева, У., Самиева, Г., Лапасова, З., & Таирова, С. (2023). Значение диеты в лечении артериальной гипертензии . Журнал биомедицины и практики, 1(3/2), 111–116. https://doi.org/10.26739/2181-9300-2021-3-98
18. Narzulaeva Umida Rakhmatulloevna, Samieva Gulnoza Utkurovna, & Ismatova Marguba Shaukatovna (2020). SPECIFICITY OF THE CLINICAL COURSE OF THE INITIAL STAGES OF HYPERTENSION IN ARID ZONES OF UZBEKISTAN AND NON-DRUG APPROACHES TO TREATMENT. Кронос, (4 (43)), 15-17.
19. Umida Raxmatulloevna Narzulaeva, & Mohigul Abdurasulovna Bekkulova (2023). Arterial gipertenziya etiologiyasida dislipidemiyaning xavf omili sifatidagi roli. Science and Education, 4 (2), 415-419.
20. Narzulaeva, U. R., & Samieva, G. U. (2021). Nasirova ShSh. Hemoreological Disorders in The Early Stages Of Hypertension In Hot Climates. Journal of Biomedicine and Practice, 6(1), 221-225.
21. Dilsora Nuriddinovna Juraeva, Umida Rakhmatulloevna Narzulaeva, & Kurbonova Gulbahor Aslamovna. (2022). GENDER DIFFERENCES IN THE PARACLINICAL FEATURES OF THE COURSE OF TRIGEMINAL NEURALGIA. World Bulletin of Public Health, 8, 186-190. Retrieved from https://www.scholarexpress.net/index.php/wbph/article/view/751
22. Toxirovna, E. G. (2024). GIPERPROLAKTINEMIYA KLINIK BELGILARI VA BEPUSHTLIKKA SABAB BO’LUVCHI OMILLAR. Лучшие интеллектуальные исследования, 14(4), 168-175.
23. Toxirovna, E. G. (2024). QANDLI DIABET 2-TUR VA O’LIMNI KELTIRIB CHIQARUVCHI SABABLAR. Лучшие интеллектуальные исследования, 14(4), 86-93.
24. Халимова, Ю. С., & Шокиров, Б. С. (2021). Репродуктивность и жизнеспособность потомства самок крыс при различной длительности воздействия этанола. In *Актуальные вопросы современной медицинской науки и здравоохранения: Материалы VI Международной научно-практической конференции молодых учёных и студентов, посвященной году науки и технологий,(Екатеринбург, 8-9 апреля 2021): в 3-х т.*. Федеральное государственное бюджетное образовательное учреждение высшего образования «Уральский государственный медицинский университет» Министерства здравоохранения Российской Федерации.
25. Khalimova, Y. S. BS Shokirov Morphological changes of internal organs in chronic alcoholism. *Middle European scientific bulletin*, 12-2021.
26. Шокиров, Б. С., & Халимова, Ю. С. (2022). ДИСБИОЗ ВЫЗВАННЫЙ АНИБИОТИКАМИ КИШЕЧНОЙ МИКРОБИОТЫ КРЫС И УСТОЙЧИВОСТЬ К САЛМОНЕЛЛАМ. *Scientific progress*, *3*(2), 766-772.
27. Salokhiddinovna, X. Y. (2023). Clinical Features of the Course of Vitamin D Deficiency in Women of Reproductive Age. *EUROPEAN JOURNAL OF INNOVATION IN NONFORMAL EDUCATION*, *3*(11), 28-31.

28. Шокиров, Б., & Халимова, Ю. (2021). Антибиотик-индуцированный дисбиоз микробиоты кишечника крыс и резистентность к сальмонеллам. *Общество и инновации*, *2*(4/S), 93-100.
29. Salokhiddinovna, X. Y. (2023). MORPHOLOGICAL CHANGES IN PATHOLOGICAL FORMS OF ERYTHROCYTES. *EUROPEAN JOURNAL OF MODERN MEDICINE AND PRACTICE*, *3*(11), 20-24.
30. Saloxiddinovna, X. Y. (2023). ERITROTSITLAR PATOLOGIK SHAKLLARINING MORFOLOGIK O'ZGARISHLARI. *ОБРАЗОВАНИЕ НАУКА И ИННОВАЦИОННЫЕ ИДЕИ В МИРЕ*, *33*(1), 167-172.
31. Шокиров, Б., & Халимова, Ю. (2021). Antibiotic-induced rat gut microbiota dysbiosis and salmonella resistance. *Общество и инновации*, *2*(4/S), 93-100.
32. Шокиров, Б. С., & Халимова, Ю. С. (2021). Пищеварительная функция кишечника после коррекции экспериментального дисбактериоза у крыс бифидобактериями. In *Актуальные вопросы современной медицинской науки и здравоохранения: Материалы VI Международной научно-практической конференции молодых учёных и студентов, посвященной году науки и технологий,(Екатеринбург, 8-9 апреля 2021): в 3-х т.*. Федеральное государственное бюджетное образовательное учреждение высшего образования «Уральский государственный медицинский университет» Министерства здравоохранения Российской Федерации.
33. Salokhiddinovna, X. Y. (2023). Anemia of Chronic Diseases. *Research Journal of Trauma and Disability Studies*, *2*(12), 364-372.
34. Salokhiddinovna, X. Y. (2023). MALLORY WEISS SYNDROME IN DIFFUSE LIVER LESIONS. *Journal of Science in Medicine and Life*, *1*(4), 11-15.
35. Salohiddinovna, X. Y. (2023). SURUNKALI KASALLIKLARDA UCHRAYDIGAN ANEMIYALAR MORFO-FUNKSIONAL XUSUSIYATLARI. *Ta'lim innovatsiyasi va integratsiyasi*, *10*(3), 180-188.
36. Халимова, Ю. С. (2024). КЛИНИКО-МОРФОЛОГИЧЕСКИЕ ОСОБЕННОСТИ ВИТАМИНА D В ФОРМИРОВАНИЕ ПРОТИВОИНФЕКЦИОННОГО ИММУНИТА. *ОБРАЗОВАНИЕ НАУКА И ИННОВАЦИОННЫЕ ИДЕИ В МИРЕ*, *36*(3), 86-94.
37. Saloxiddinovna, X. Y. (2024). CLINICAL FEATURES OF VITAMIN D EFFECTS ON BONE METABOLISM. *ОБРАЗОВАНИЕ НАУКА И ИННОВАЦИОННЫЕ ИДЕИ В МИРЕ*, *36*(5), 90-99.
38. Saloxiddinovna, X. Y. (2024). CLINICAL AND MORPHOLOGICAL ASPECTS OF AUTOIMMUNE THYROIDITIS. *ОБРАЗОВАНИЕ НАУКА И ИННОВАЦИОННЫЕ ИДЕИ В МИРЕ*, *36*(5), 100-108.
39. Saloxiddinovna, X. Y. (2024). MORPHOFUNCTIONAL FEATURES BLOOD MORPHOLOGY IN AGE-RELATED CHANGES. *Лучшие интеллектуальные исследования*, *14*(4), 146-158.
40. Saloxiddinovna, X. Y. (2024). CLINICAL MORPHOLOGICAL CRITERIA OF LEUKOCYTES. *Лучшие интеллектуальные исследования*, *14*(4), 159-167.