New Day in Medicine
Новый День в Медицине
NDM

# TIBBIYOTDA YANGI KUN

Ilmiy referativ, marifiy-ma'naviy jurnal









AVICENNA-MED.UZ

ISSN 2181-712X.
EiSSN 2181-2187

9 (95) 2026

***Сопредседатели редакционной коллегии:***

**Ш. Ж. ТЕШАЕВ,**
**А. Ш. РЕВИШВИЛИ**

Ред. коллегия:
М.И. АБДУЛЛАЕВ
А.А. АБДУМАЖИДОВ
Р.Б. АБДУЛЛАЕВ
Л.М. АБДУЛЛАЕВА
А.Ш. АБДУМАЖИДОВ
М.А. АБДУЛЛАЕВА
Х.А. АБДУМАДЖИДОВ
Б.З. АБДУСАМАТОВ
У.О. АБИДОВ
М.М. АКБАРОВ
Х.А. АКИЛОВ
М.М. АЛИЕВ
С.Ж. АМИНОВ
Ш.Э. АМОНОВ
Ш.М. АХМЕДОВ
Ю.М. АХМЕДОВ
С.М. АХМЕДОВА
Т.А. АСКАРОВ
М.А. АРТИКОВА
Д.Т. АШУРОВА
Ж.Б. БЕКНАЗАРОВ (главный редактор)
Е.А. БЕРДИЕВ
Б.Т. БУЗРУКОВ
Р.К. ДАДАБАЕВА
М.Н. ДАМИНОВА
К.А. ДЕХКОНОВ
Э.С. ДЖУМАБАЕВ
А.А. ДЖАЛИЛОВ
Н.Н. ЗОЛОТОВА
А.Ш. ИНОЯТОВ
С. ИНДАМИНОВ
А.И. ИСКАНДАРОВ
А.С. ИЛЬЯСОВ
Э.Э. КОБИЛОВ
А.М. МАННАНОВ
И.Ю. МАМАТОВА
Д.М. МУСАЕВА
Т.С. МУСАЕВ
М.Р. МИРЗОЕВА
Ф.Г. НАЗИРОВ
Н.А. НУРАЛИЕВА
Ф.С. ОРИПОВ
Б.Т. РАХИМОВ
Х.А. РАСУЛОВ
Ш.И. РУЗИЕВ
С.А. РУЗИБОЕВ
С.А.ГАФФОРОВ
С.Т. ШАТМАНОВ (Кыргызстан)
Ж.Б. САТТАРОВ
Б.Б. САФОЕВ (отв. редактор)
И.А. САТИВАЛДИЕВА
Ш.Т. САЛИМОВ
Д.И. ТУКСАНОВА
М.М. ТАДЖИЕВ
Г.Ж. УЛУГБЕКОВА
А.Ж. ХАМРАЕВ
Б.Б. ХАСАНОВ
Д.А. ХАСАНОВА
Б.З. ХАМДАМОВ
Э.Б. ХАККУЛОВ
Г.С. ХОДЖИЕВА
Г.У. НУРОВА
А.М. ШАМСИЕВ
А.К. ШАДМАНОВ
Н.Ж. ЭРМАТОВ
Б.Б. ЕРГАШЕВ
Н.Ш. ЕРГАШЕВ
И.Р. ЮЛДАШЕВ
Д.Х. ЮЛДАШЕВА
А.С. ЮСУПОВ
Ш.Ш. ЯРИКУЛОВ
М.Ш. ХАКИМОВ
Д.О. ИВАНОВ (Россия)
К.А. ЕГЕЗАРЯН (Россия)
DONG JINCHENG (Китай)
КУЗАКОВ В.Е. (Россия)
Я. МЕЙЕРНИК (Словакия)
В.А. МИТИШ (Россия)
В И. ПРИМАКОВ (Беларусь)
О.В. ПЕШИКОВ (Россия)
А.А. ПОТАПОВ (Россия)
А.А. ТЕПЛОВ (Россия)
Т.Ш. ШАРМАНОВ (Казахстан)
А.А. ЩЕГОЛОВ (Россия)
С.Н ГУСЕЙНОВА (Азарбайджан)
Prof. Dr. KURBANHAN MUSLUMOV(Azerbaijan)
Prof. Dr. DENIZ UYAK (Germany)

# ТИББИЁТДА ЯНГИ КУН
# НОВЫЙ ДЕНЬ В МЕДИЦИНЕ
# NEW DAY IN MEDICINE

***Илмий-рефератив, маънавий-маърифий журнал***
***Научно-реферативный,***
***духовно-просветительский журнал***

УЧРЕДИТЕЛИ:

БУХАРСКИЙ ГОСУДАРСТВЕННЫЙ МЕДИЦИНСКИЙ ИНСТИТУТ
ООО «ТИББИЁТДА ЯНГИ КУН»

Национальный медицинский исследовательский центр хирургии имени А.В. Вишневского является генеральным научно-практическим консультантом редакции

Журнал был включен в список журнальных изданий, рецензируемых Высшей Аттестационной Комиссией Республики Узбекистан (Протокол № 201/03 от 30.12.2013 г.)

**РЕДАКЦИОННЫЙ СОВЕТ:**

М.М. АБДУРАХМАНОВ (Бухара)
Г.Ж. ЖАРЫЛКАСЫНОВА (Бухара)
А.Ш. ИНОЯТОВ (Ташкент)
Г.А. ИХТИЁРОВА (Бухара)
Ш.И. КАРИМОВ (Ташкент)
У.К. КАЮМОВ (Тошкент)
Ш.И. НАВРУЗОВА (Бухара)
А.А. НОСИРОВ (Ташкент)
А.Р. ОБЛОКУЛОВ (Бухара)
Б.Т. ОДИЛОВА (Ташкент)
Ш.Т. УРАКОВ (Бухара)

**9 (95)**

**2026**

*Сентябрь*

www.bsmi.uz
https://newdaymedicine.com
E: ndmuz@mail.ru
Тел: +99890 8061882

***Received: 20.08.2026, Accepted: 10.09.2026, Published: 15.09.2026***

**UDC 611.631:616.348-002.44:615.322**

# HISTOCHEMICAL CHANGES IN THE TESTIS OF WHITE OUTBRED RATS UNDER EXPERIMENTAL ULCERATIVE COLITIS AND THEIR CORRECTION WITH DANDELION (TARAXACUM OFFICINALE) ROOT EXTRACT

*Boltayev Feruzbek Gayrat ugli*[1] https://orcid.org/0009-0007-4524-5502
*Tilavov Tolibjon Bakhtiyor ugli*[2] https://orcid.org/0009-0008-0781-9285
*Dilnoza Akhrorovna Khasanova*[2] https://orcid.org/0000-0003-0433-0747

[1]Samarkand State Medical University Uzbekistan, Samarkand, st. Amir Temur 18, Tel: +99818 66 2330841 E-mail: sammu@sammu.uz
[2]Bukhara State Medical Institute named after Abu Ali ibn Sina, Uzbekistan, Bukhara, st. A. Navoi. 1 Tel: +998 (65) 223-00-50 e-mail: info@bsmi.uz

✓ ***Resume***

***Background. Ulcerative colitis (UC) frequently affects men of reproductive age, and its systemic oxidative-inflammatory burden may remodel the testicular extracellular matrix; however, the histochemical basis of this remodelling and its correction have not been characterized. We aimed to assess, by age, the van Gieson (collagen) and Alcian blue (glycosaminoglycan, GAG) histochemical changes in the rat testis under experimental UC and their correction with dandelion (Taraxacum officinale) root extract.***

***Materials and methods. One hundred fifty outbred male rats (6 and 9 months) were allocated to three groups (n=25 per age): intact control; UC (4% acetic acid, 2 mL, intrarectal); and UC treated with T. officinale root extract (200 mg/kg/day, orally, 14 days). Paraffin sections were stained with van Gieson and Alcian blue (pH 2.5); the collagen and GAG area fractions (%) were quantified by digital morphometry (QuPath). Data were analysed by two-way ANOVA with the Tukey test ($p<0.05$).***

***Results. UC markedly increased interstitial matrix deposition. At 9 months the collagen area fraction rose 2.24-fold (from 13.1±0.5% to 29.4±1.2%) and the GAG area fraction 4.62-fold (from 2.9±0.2% to 13.4±0.7%); the changes were greater at 9 than at 6 months ($p<0.001$). Dandelion root extract significantly attenuated fibrosis, reducing collagen by 37.1% and GAG 2.39-fold relative to UC ($p<0.01$), without full normalization.***

***Conclusion. Experimental UC induces age-dependent testicular interstitial fibrosis, expressed as increased collagen and glycosaminoglycan deposition; T. officinale root extract exerts a partial, histochemically verified antifibrotic and gonadoprotective effect.***

***Keywords: ulcerative colitis; testis; interstitial fibrosis; collagen; glycosaminoglycans; van Gieson; Alcian blue; Taraxacum officinale; rat.***

# ТАЖРИБАВИЙ ЯРАЛИ КОЛИТДА ОҚ ЗОТСИЗ КАЛАМУШЛАР МОЯГИНИНГ ГИСТОКИМЁВИЙ ЎЗГАРИШЛАРИ ВА УЛАРНИ МОМОҚАЙМОҚ (TARAXACUM OFFICINALE) ИЛДИЗИ ЭКСТРАКТИ БИЛАН КОРРЕКЦИЯЛАШ (ВАН-ГИЗОН ВА АЛЦИАН КЎКИ ТАДҚИҚОТИ)

*Болтаев Ферузбек Гайрат ўғли*[1], *Тилавов Толибжон Бахтиёр ўғли*[2], *Хасанова Дилноза Ахроровна*[2]

[1]Самарқанд давлат тиббиёт университети Ўзбекистон, Самарқанд, Амир Темур 18, Тел: +99818 66 2330841 E-mail: sammu@sammu.uz
[2]Абу али ибн Сино номидаги Бухоро давлат тиббиёт институти Ўзбекистон, Бухоро ш., А.Навоий кўчаси. 1 Тел: +998 (65) 223-00-50 e-mail: info@bsmi.uz

✓ ***Резюме***

***Долзарблиги. Ярали колит (ЯК) кўпинча репродуктив ёшдаги эркакларда учрайди ва касалликка хос тизимли оксидатив-яллиғланиш юки моякнинг ҳужайралараро матрицасида қайта тузилиш жараёнларини юзага келтириши мумкин. Бироқ ушбу қайта тузилишнинг гистокимёвий асослари ва уни коррекциялаш имкониятлари етарлича ўрганилмаган. Тадқиқотнинг мақсади экспериментал ЯК шароитида каламушлар моягида ёшга боғлиқ ван Гизон (коллаген) ва альциан кўки (гликозаминогликанлар, GAG) гистокимёвий ўзгаришларни ҳамда уларни момоқаймоқ (Taraxacum officinale) илдизи экстракти билан коррекциялаш самарадорлигини баҳолашдан иборат.***

***Материаллар ва усуллар. 6 ва 9 ойлик 150 та эркак оқ зотсиз каламуш уч гуруҳга (ҳар бир ёш учун n=25) ажратилди: интакт назорат; ЯК (4% сирка кислотаси, 2 мл, интраректал юборилди); ЯК + T. officinale илдизи экстракти (200 мг/кг/кун, оғиз орқали, 14 кун). Парафин кесмалари ван Гизон ва альциан кўки (pH 2,5) билан бўялди; коллаген ва GAG майдон улуши (%) рақамли морфометрия усулида (QuPath) миқдорий баҳоланди. Маълумотлар Тьюки мезони қўлланган икки омилли дисперсион таҳлил (ANOVA) ёрдамида таҳлил қилинди (p<0,05).***

***Натижалар. ЯК интерстициал матрикс компонентларининг тўпланишини сезиларли даражада оширди. 9 ойлик ҳайвонларда коллагеннинг майдон улуши 2,24 мартага (13,1±0,5% дан 29,4±1,2% гача), GAG майдон улуши эса 4,62 мартага (2,9±0,2% дан 13,4±0,7% гача) ошди; ушбу ўзгаришлар 6 ойлик ҳайвонларга нисбатан 9 ойликларда яққолроқ бўлди (p<0,001). Момоқаймоқ илдизи экстракти фиброз жараёнини сезиларли даражада сусайтириб, ЯК гуруҳига нисбатан коллаген миқдорини 37,1% га, GAG миқдорини эса 2,39 мартага камайтирди (p<0,01), бироқ кўрсаткичларни тўлиқ меъёрлаштирмади.***

***Хулоса. Экспериментал ЯК мояк интерстициал тўқимасида ёшга боғлиқ фиброз жараёнини келтириб чиқаради, бу коллаген ва гликозаминогликанларнинг ортиқча тўпланиши билан намоён бўлади. T. officinale илдизи экстракти қисман, гистокимёвий жиҳатдан тасдиқланган антифибротик ва гонадопротектор таъсир кўрсатади.***

***Калит сўзлар: ярали колит; мояк; интерстициал фиброз; коллаген; гликозаминогликанлар; ван Гизон; альциан кўки; Taraxacum officinale; каламуш.***

## ГИСТОХИМИЧЕСКИЕ ИЗМЕНЕНИЯ СЕМЕННИКОВ БЕЛЫХ БЕСПОРОДНЫХ КРЫС ПРИ ЭКСПЕРИМЕНТАЛЬНОМ ЯЗВЕННОМ КОЛИТЕ И ИХ КОРРЕКЦИЯ ЭКСТРАКТОМ КОРНЯ ОДУВАНЧИКА (TARAXACUM OFFICINALE) (ИССЛЕДОВАНИЕ ПО ВАН-ГИЗОНУ И АЛЬЦИАНОВОМУ СИНЕМУ)

*Болтаев Ферузбек Гайрат угли[1], Тилавов Толибжон Бахтиёр угли[2], Хасанова Дилноза Ахроровна[2]*

[1]Бухарский государственный медицинский институт имени Абу Али ибн Сины, Узбекистан, г. Бухара, ул. А. Навои. 1 Тел: +998 (65) 223-00-50 e-mail: info@bsmi.uz
[2]Самаркандский государственный медицинский университет Узбекистан, г.Самарканд, ул. Амира Темура 18, Тел: +99818 66 2330841 E-mail: sammu@sammu.uz

✓ ***Резюме***

***Актуальность. Язвенный колит (ЯК) часто встречается у мужчин репродуктивного возраста, а обусловленная заболеванием системная оксидативно-воспалительная нагрузка может вызывать ремоделирование внеклеточного матрикса яичка. Однако гистохимические основы данного ремоделирования и возможности его коррекции остаются недостаточно изученными. Целью настоящего исследования было оценить возраст-зависимые гистохимические изменения коллагена и гликозаминогликанов (GAG) в яичках крыс при экспериментальном ЯК с использованием окрашивания по ван Гизону и альциановым синим, а также изучить возможность их коррекции экстрактом корня одуванчика лекарственного (Taraxacum officinale).***

***Материалы и методы. 150 самцов белых беспородных крыс в возрасте 6 и 9 месяцев были распределены на три группы (n=25 для каждого возраста): интактный контроль; ЯК (4% уксусная кислота, 2 мл, интраректально); ЯК + экстракт корня T. officinale (200 мг/кг/сут, перорально, в течение 14 дней). Парафиновые срезы окрашивали по ван Гизону и альциановым синим (pH 2,5); площадь коллагена и гликозаминогликанов (%) количественно оценивали методом цифровой морфометрии с использованием программного обеспечения QuPath. Данные анализировали с помощью двухфакторного дисперсионного анализа (ANOVA) с последующим применением критерия Тьюки (p<0,05).***

***Результаты. ЯК значительно увеличивал отложение компонентов интерстициального матрикса. У 9-месячных животных площадь коллагена увеличивалась в 2,24 раза (с 13,1±0,5% до 29,4±1,2%), а площадь GAG - в 4,62 раза (с 2,9±0,2% до 13,4±0,7%); выраженность изменений была выше у 9-месячных животных по сравнению с 6-месячными (p<0,001). Экстракт корня одуванчика лекарственного достоверно ослаблял фиброз, снижая содержание коллагена на 37,1%, а GAG - в 2,39 раза по сравнению с группой ЯК (p<0,01), однако полного восстановления показателей до нормальных значений не происходило.***

***Заключение. Экспериментальный ЯК вызывает возраст-зависимый интерстициальный фиброз яичка, проявляющийся повышенным отложением коллагена и гликозаминогликанов. Экстракт корня T. officinale оказывает частичное, гистохимически подтвержденное антифибротическое и гонадопротекторное действие.***

***Ключевые слова: язвенный колит; яичко; интерстициальный фиброз; коллаген; гликозаминогликаны; ван Гизон; альциановый синий; Taraxacum officinale; крыса.***

## Relevance

Inflammatory bowel disease, including ulcerative colitis (UC), has become a global disorder with a rising incidence, and because it frequently presents during the reproductive years its extraintestinal effects on the male reproductive system are of growing concern [1,2]. Clinically, men with UC show reduced semen quality and increased sperm DNA fragmentation [2], and experimental colitis produces testicular oxidative stress and impaired spermatogenesis [3,4].

Beyond germ-cell loss, a key but under-studied component of testicular injury is remodelling of the interstitial extracellular matrix (ECM). Testicular fibrosis is characterized by excessive deposition of ECM proteins - principally collagens - in the peritubular and interstitial compartments, thickening of the lamina propria, activation of peritubular myoid cells into myofibroblasts, and destruction of the blood-testis barrier, all of which impair spermatogenesis and may cause irreversible loss of reproductive function [5]. In chronic testicular inflammation, exemplified by experimental autoimmune orchitis, fibrotic remodelling with collagen and fibronectin accumulation and peritubular thickening is a hallmark of severe disease [6,7].

Histochemical staining provides an accessible, quantitative window on this remodelling: van Gieson staining reveals collagen and interstitial fibrosis, whereas Alcian blue demonstrates acidic GAGs. Despite the mechanistic importance of ECM remodelling, the testicular histochemical response to UC and its pharmacological correction have not been examined. Dandelion (Taraxacum officinale) root is rich in phenolics, flavonoids and inulin and has antioxidant, anti-inflammatory and steroidogenesis-supporting properties [8,9]; at moderate doses (~200 mg/kg) it protects the testis, whereas high aqueous doses are anti-fertility [10]. Our group has previously reported age-dependent testicular changes in chronic renal failure corrected with Ferula moschata root [11].

**The present study** was therefore undertaken to determine, quantitatively and across two ages, whether experimental UC induces testicular interstitial fibrosis - increased collagen (van Gieson) and GAG (Alcian blue) deposition - and whether T. officinale root extract can correct this histochemical remodelling.

## Materials and methods

The study was performed at Abu Ali ibn Sino Bukhara State Medical Institute on 150 outbred male rats of two ages (6 and 9 months). All animal experiments complied with the ARRIVE 2.0 guidelines and were carried out in accordance with EU Directive 2010/63/EU and the NIH Guide for the Care and

Use of Laboratory Animals (NIH Publications No. 8023, revised 1978); the study was approved by the local ethics committee of the Institute (Protocol No. 7 of 4 July 2025; document code EA61820710).

Rats were randomly assigned to three groups (n=25 per age): intact control; experimental UC induced with 4% acetic acid (2 mL, intrarectal, under light anaesthesia; controls received saline), confirmed by disease activity index, macroscopic and histological criteria; and UC treated with T. officinale root extract (200 mg/kg/day, oral gavage, 14 days). Testes were excised, fixed in 10% neutral buffered formalin, dehydrated, embedded in paraffin and sectioned at 4-5 μm.

Sections were stained with van Gieson (picrofuchsin) to demonstrate collagen (red) against yellow muscle/cytoplasm, and with Alcian blue (pH 2.5) to demonstrate acidic glycosaminoglycans (blue). Histochemical morphometry was performed in QuPath calibrated with a stage micrometre: the collagen area fraction (van Gieson) and the GAG area fraction (Alcian blue) were quantified as the percentage of positively stained interstitial area in standardized fields by an observer blinded to group allocation, in at least 8-10 fields per animal. Data were processed in IBM SPSS Statistics as mean±SEM; normality was assessed by the Shapiro-Wilk test; group, age and their interaction were tested by two-way ANOVA with the Tukey HSD post hoc test, and non-normal variables by the Mann-Whitney and Kruskal-Wallis tests. Two-sided $p<0.05$ was significant.

## Results and discussions

**Collagen (van Gieson) - control.** In the control group collagen was confined to a thin, regular peritubular layer and delicate interstitial septa; the collagen area fraction was low and stable (12.6±0.5% at 6 months, 13.1±0.5% at 9 months) (Fig. 1A).

**Collagen - ulcerative colitis.** Under UC, collagen deposition increased markedly in both the peritubular and interstitial compartments, with thickening of the tubular wall and widening of the interstitium (Fig. 1B). The collagen area fraction rose to 26.3±1.1% at 6 months and 29.4±1.2% at 9 months, a 2.09- and 2.24-fold increase over control, respectively ($p<0.001$), indicating interstitial fibrosis that was more pronounced at 9 months.

**Collagen - correction.** Dandelion treatment reduced collagen deposition to 17.8±0.8% (6 months) and 18.5±0.8% (9 months), a 32.3% and 37.1% reduction relative to UC ($p<0.01$), with partial restoration of the delicate peritubular pattern (Fig. 1C); values nevertheless remained above control.

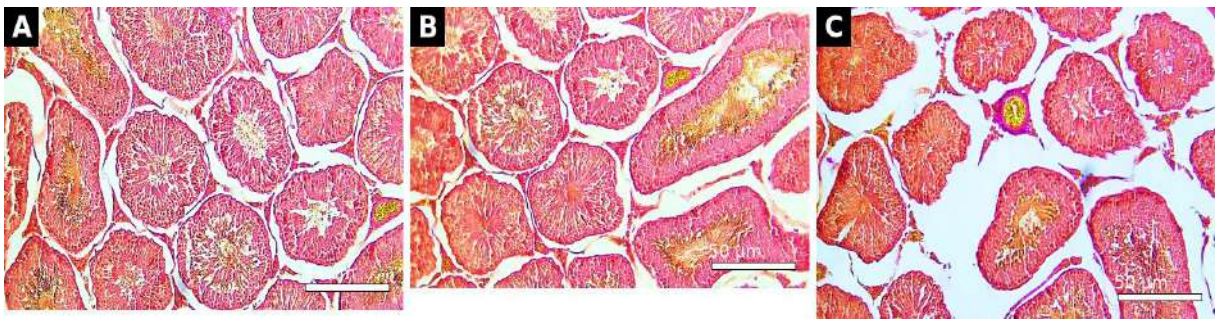



Fig. 1. Collagen (van Gieson) in the rat testis at 9 months. (A) Control - thin peritubular collagen; (B) ulcerative colitis - marked peritubular and interstitial collagen deposition (fibrosis); (C) correction with Taraxacum officinale - reduced collagen. Scale bar = 50 μm.

**Glycosaminoglycans (Alcian blue) - control.** In controls, Alcian-blue-positive GAGs were scarce, forming a faint interstitial reaction; the GAG area fraction was 2.6±0.2% (6 months) and 2.9±0.2% (9 months) (Fig. 2A).

**Glycosaminoglycans - ulcerative colitis.** UC strongly intensified the Alcian blue reaction, with abundant interstitial GAG accumulation (Fig. 2B). The GAG area fraction increased to 12.1±0.6% at 6 months and 13.4±0.7% at 9 months - a 4.65- and 4.62-fold increase over control ($p<0.001$) - the steepest relative change among all indices, again greater at 9 months.

**Glycosaminoglycans - correction.** Dandelion treatment reduced GAGs to 5.2±0.3% (6 months) and 5.6±0.3% (9 months), a 2.33- and 2.39-fold reduction relative to UC ($p<0.01$) (Fig. 2C), consistent with attenuation of interstitial remodelling.

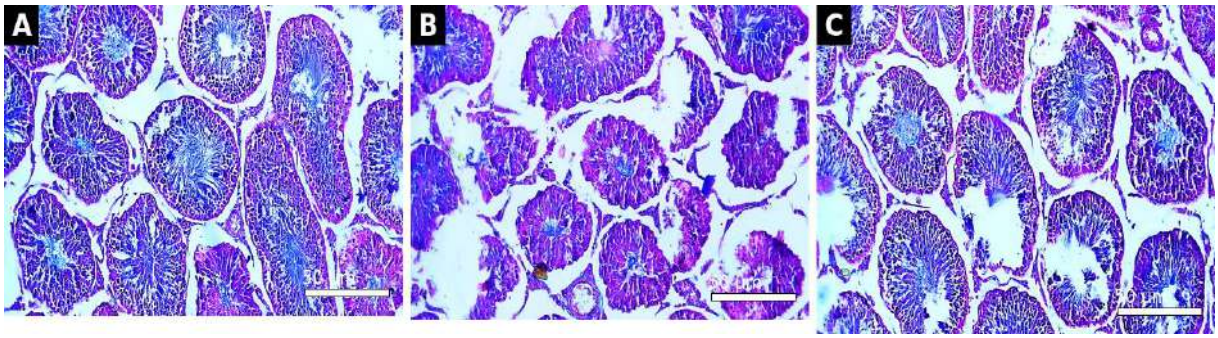



Fig. 2. Acidic glycosaminoglycans (Alcian blue, pH 2.5) in the rat testis at 9 months. (A) Control - scarce interstitial reaction; (B) ulcerative colitis - abundant interstitial glycosaminoglycan accumulation; (C) correction with Taraxacum officinale - reduced reaction. Scale bar = 50 μm.

**Table 1. Testicular collagen (van Gieson) and glycosaminoglycan (Alcian blue) area fraction, % (mean±SEM, n=25).**

| Index / group | 6 months | 9 months |
|---|---|---|
| Collagen: control | 12.6±0.5 | 13.1±0.5 |
| Collagen: UC | 26.3±1.1*** | 29.4±1.2*** |
| Collagen: correction | 17.8±0.8†† | 18.5±0.8†† |
| GAG: control | 2.6±0.2 | 2.9±0.2 |
| GAG: UC | 12.1±0.6*** | 13.4±0.7*** |
| GAG: correction | 5.2±0.3†† | 5.6±0.3†† |

**** p<0.001 vs control; †† p<0.01 vs UC (two-way ANOVA, Tukey HSD).*

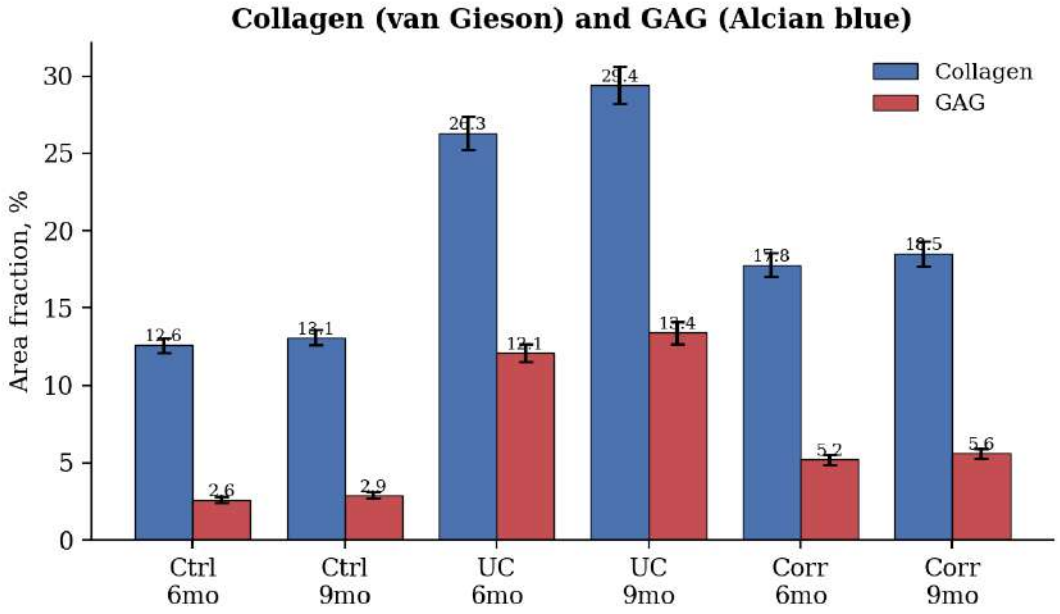



Fig. 3. Collagen (van Gieson) and glycosaminoglycan (Alcian blue) area fraction across groups and ages (mean±SEM)

This study provides a quantitative histochemical account of testicular interstitial remodelling in experimental UC and of its correction by T. officinale root extract. UC roughly doubled interstitial collagen and increased GAGs more than four-fold, the changes being greater at 9 months, and dandelion treatment significantly attenuated both without full normalization.

These findings align with the current understanding of testicular fibrosis, in which excessive peritubular and interstitial ECM deposition - principally collagen - together with lamina propria thickening and peritubular myoid-cell activation impairs spermatogenesis and disrupts the blood-testis

barrier [5]. In chronic testicular inflammation such as experimental autoimmune orchitis, collagen and fibronectin accumulation and peritubular thickening are hallmarks of severe disease [6,7], and comparable interstitial fibrosis with increased collagen has been documented in impaired human spermatogenesis. Our histochemical results extend this concept to a systemic extraintestinal trigger: the oxidative-inflammatory milieu of UC, reproduced by the acetic acid model and known to drive testicular oxidative stress and spermatogenic failure [3,4], is accompanied by a parallel accumulation of collagen and acidic GAGs. The particularly steep rise in GAGs is consistent with early proteoglycan-rich matrix expansion during active remodelling.

The antifibrotic effect of dandelion root extract is mechanistically plausible. At the same 200 mg/kg regimen the extract reduces lipid peroxidation, restores antioxidant enzymes and lowers pro-inflammatory and apoptotic mediators while supporting steroidogenesis [8], and dandelion enhances steroidogenic enzyme expression in Leydig cells [9]; by dampening the oxidative-inflammatory drive it plausibly limits myofibroblast activation and ECM deposition. The moderate dose is important, since high aqueous doses of the plant are anti-fertility [10]; our data confirm that, in the protective window, the root extract behaves as an antifibrotic gonadoprotector. The age dependence of both fibrosis and its correction agrees with our previous report of age-dependent testicular changes in chronic renal failure corrected with Ferula moschata root [11].

To our knowledge this is the first histochemical demonstration of UC-induced testicular interstitial fibrosis and of its correction by a natural phytopreparation, evaluated across two ages. Limitations include extrapolation from a rat model, the acute-to-subacute nature of the acetic acid model, the single dose and duration tested, and reliance on histochemical area fractions; immunohistochemical (α-smooth muscle actin, collagen I, fibronectin) and molecular confirmation and dose-response studies are warranted.

## Conclusion

Experimental ulcerative colitis induces age-dependent testicular interstitial fibrosis, expressed histochemically as a 2.24-fold increase in collagen and a 4.62-fold increase in glycosaminoglycans at 9 months, more severe than at 6 months. Taraxacum officinale root extract (200 mg/kg/day, 14 days) significantly reduces this collagen and glycosaminoglycan accumulation, exerting a partial, histochemically verified antifibrotic and gonadoprotective effect.

**Ethics, funding and competing interests**

All procedures were approved by the local ethics committee of Abu Ali ibn Sino Bukhara State Medical Institute (Protocol No. 7 of 4 July 2025; document code EA61820710) and complied with the ARRIVE 2.0 guidelines, EU Directive 2010/63/EU and the NIH Guide (NIH Publications No. 8023, revised 1978). This research received no specific external funding. The authors declare no competing interests. Artificial-intelligence tools were used solely for language translation and editing.

LIST OF REFERENCES:

1. Ng SC, Shi HY, Hamidi N, Underwood FE, Tang W, Benchimol EI, et al. Worldwide incidence and prevalence of inflammatory bowel disease in the 21st century: a systematic review of population-based studies. Lancet. 2017;390(10114):2769-2778. doi:10.1016/S0140-6736(17)32448-0.
2. Wdowiak A, Gujski M, Bojar I, Raczkiewicz D, Bartosińska J, Wdowiak-Filip A, et al. Chronic inflammation impairs male fertility: a case-control study in ulcerative colitis patients. J Clin Med. 2021;10(7):1460. doi:10.3390/jcm10071460.
3. Parmar A, Trivedi PP, Jena GB. Dextran sulfate sodium-induced ulcerative colitis leads to testicular toxicity in mice: role of inflammation, oxidative stress and DNA damage. Reprod Toxicol. 2014;49:171-184. doi:10.1016/j.reprotox.2014.08.004.
4. Azmy AM, Abd Elbaki BT, Ali MA, Mahmoud AA. Effect of ozone versus naringin on testicular injury in experimentally induced ulcerative colitis in adult male albino rats. Ultrastruct Pathol. 2022;46(5):439-461. doi:10.1080/01913123.2022.2132337.
5. Xu Y, Hu P, Chen W, Chen J, Liu C, Zhang H. Testicular fibrosis pathology, diagnosis, pathogenesis, and treatment: a perspective on related diseases. Andrology. 2025;13(6):1322-1332. doi:10.1111/andr.13769.

6. Fijak M, Pilatz A, Hedger MP, Nicolas N, Bhushan S, Michel V, et al. Infectious, inflammatory and 'autoimmune' male factor infertility: how do rodent models inform clinical practice? Hum Reprod Update. 2018;24(4):416-441. doi:10.1093/humupd/dmy009.
7. Kauerhof AC, Nicolas N, Bhushan S, Wahle E, Loveland KA, Fietz D, et al. Investigation of activin A in inflammatory responses of the testis and its role in the development of testicular fibrosis. Hum Reprod. 2019;34(8):1536-1550. doi:10.1093/humrep/dez109.
8. Abdel-Magied N, Abdel Fattah SM, Elkady AA. Differential effect of Taraxacum officinale L. (dandelion) root extract on hepatic and testicular tissues of rats exposed to ionizing radiation. Mol Biol Rep. 2019;46(5):4893-4907. doi:10.1007/s11033-019-04939-9.
9. Chung HJ, Noh Y, Kim MS, Jang A, Lee CE, Myung SC. Steroidogenic effects of Taraxacum officinale extract on the levels of steroidogenic enzymes in mouse Leydig cells. Anim Cells Syst (Seoul). 2018;22(6):407-414. doi:10.1080/19768354.2018.1494628.
10. Tahtamouni LH, Alqurna N, Al-Hudhud MY, Al-Hajj HA. Dandelion (Taraxacum officinale) decreases male rat fertility in vivo. J Ethnopharmacol. 2011;135(1):102-109. doi:10.1016/j.jep.2011.02.027.
11. Tilavov TB, Khasanova DA. Age-dependent morphological, morphometric and Ki-67 proliferative changes in the rat testis under experimental chronic renal failure and their correction with Ferula moschata (sumbul) root. Tissue Cell. 2026;104:103899. doi:10.1016/j.tice.2026.103899.
12. Johnsen SG. Testicular biopsy score count: a method for registration of spermatogenesis in human testes: normal values and results in 335 hypogonadal males. Hormones. 1970;1(1):2-25. doi:10.1159/000178170.
13. MacPherson BR, Pfeiffer CJ. Experimental production of diffuse colitis in rats. Digestion. 1978;17(2):135-150. doi:10.1159/000198104.
14. Bankhead P, Loughrey MB, Fernández JA, Dombrowski Y, McArt DG, Dunne PD, et al. QuPath: open source software for digital pathology image analysis. Sci Rep. 2017;7:16878. doi:10.1038/s41598-017-17204-5.
15. Suleimen A, Rakhimova B, Jangildinova S, et al. Morphometric characteristics of rat testes tissue after exposure to dust-salt aerosols of the Aral Sea. Biology (Basel). 2025;14(4):380. doi:10.3390/biology14040380.

**Entered 20.08.2025**