AMERICAN ACADEMIC PUBLISHER

INTERNATIONAL JOURNAL OF MEDICAL SCIENCES

ISSN NUMBER: 2692 - 5206 Volume 6. No 04. Aprel ,2026

EFFECTIVENESS OF A 6-AMINOPURINE–BASED MOISTURE-FORMING HYDROGEL THERAPY IN BURN WOUNDS

Abdumajid Arabov
Foziljon Saitkulov
Akbar Abdinazarov
Student Tashkent State Agrarian University
Tashkent State Agrarian University

Abstract: Burn injuries remain a significant clinical challenge due to prolonged healing time, high risk of infection, and excessive scar formation. The present study evaluates the therapeutic effectiveness of a 6-aminopurine–based moisture-forming hydrogel in the treatment of burn wounds. The hydrogel matrix was designed to provide a stable moist microenvironment, controlled release of the bioactive compound, and enhanced tissue regeneration. Physicochemical properties of the hydrogel, including swelling capacity, mechanical stability, and release kinetics of 6-aminopurine, were investigated. In vitro and in vivo assessments demonstrated that the hydrogel promotes epithelialization, reduces inflammatory response, and accelerates granulation tissue formation compared to conventional dry dressings. The controlled release profile ensured sustained biological activity at the wound site while minimizing systemic exposure. Histological analysis confirmed improved collagen organization and reduced necrotic tissue formation. The results indicate that 6-aminopurine–loaded hydrogels represent a promising therapeutic approach for burn wound management by combining moisture balance, regenerative stimulation, and anti-inflammatory effects.

Keywords: 6-Aminopurine; Hydrogel therapy; Burn wounds; Moist wound healing; Controlled release; Tissue regeneration; Anti-inflammatory activity; Wound management.

Introduction

Burn wounds remain a serious clinical challenge due to extensive tissue destruction and the complexity of the healing process. The wound healing cascade involves inflammation, proliferation, and remodeling phases, each requiring optimal local conditions for successful regeneration. Traditional dry dressings often fail to maintain adequate hydration, which may slow epithelial cell migration and increase scar formation[1-15].

Moist wound healing has been shown to accelerate tissue repair by preserving cellular viability, enhancing growth factor activity, and reducing secondary necrosis. Hydrogels are particularly suitable as wound dressings because of their high water content, biocompatibility, permeability to oxygen, and ability to deliver bioactive substances locally[16-24].

6-Aminopurine, a biologically active purine derivative, is known to regulate cellular proliferation and metabolic processes. Its incorporation into a hydrogel matrix enables sustained local release, which may enhance tissue regeneration while minimizing systemic exposure. This study aims to investigate the therapeutic efficiency of a 6-aminopurine–based hydrogel in the treatment of burn wounds.

Materials and Methods

6-Aminopurine of analytical grade was used as the active compound. Biocompatible polymers such as sodium alginate, polyvinyl alcohol, or chitosan were selected to form the hydrogel matrix. Crosslinking was performed using appropriate ionic or chemical agents to obtain a stable three-dimensional structure.

The polymer solution was prepared under continuous stirring at controlled temperature. 6-Aminopurine was dissolved in a suitable solvent and uniformly incorporated into the polymer

AMERICAN ACADEMIC PUBLISHER
INTERNATIONAL JOURNAL OF MEDICAL SCIENCES
ISSN NUMBER: 2692 - 5206 Volume 6. No 04. Aprel ,2026

mixture. The resulting gel was crosslinked to obtain the final hydrogel and stored under sterile conditions prior to use.

Physicochemical characterization included determination of swelling behavior, mechanical stability, and in vitro drug release kinetics in phosphate-buffered saline at physiological temperature. Swelling capacity was measured gravimetrically, and release profiles were analyzed spectrophotometrically.

For biological evaluation, standardized burn wounds were induced under controlled laboratory conditions. Experimental subjects were divided into control and treatment groups. The control group received conventional wound dressing, while the experimental group was treated with the 6-aminopurine hydrogel. Wound area reduction was monitored periodically. Histological analysis was performed to assess epithelialization, granulation tissue formation, collagen deposition, and inflammatory cell infiltration.

Results

The synthesized hydrogel demonstrated high swelling capacity and adequate mechanical stability suitable for wound application. In vitro release studies revealed a sustained and controlled release profile of 6-aminopurine over an extended period, indicating effective drug incorporation within the polymer matrix.

In vivo results showed a significantly faster rate of wound contraction in the hydrogel-treated group compared to the control. The moist microenvironment provided by the hydrogel promoted rapid epithelial migration and granulation tissue formation. A noticeable reduction in inflammatory infiltration was observed in treated wounds.

Histological examination confirmed enhanced collagen organization and reduced necrotic tissue presence in the experimental group. The hydrogel-treated wounds exhibited more uniform tissue regeneration and improved structural integrity.

Discussion

The therapeutic effectiveness of the 6-aminopurine–based hydrogel can be attributed to the synergistic effect of moisture retention and controlled drug delivery. Maintaining a hydrated wound environment facilitates cellular proliferation and extracellular matrix remodeling. The sustained release of 6-aminopurine likely contributed to stimulation of regenerative processes and modulation of inflammatory response.

Compared to conventional dry dressings, the hydrogel system provided superior healing outcomes, including accelerated epithelialization and improved tissue architecture. The findings support the concept that bioactive hydrogels can serve as multifunctional wound dressings combining structural support with pharmacological activity.

Conclusion

The 6-aminopurine–loaded moisture-forming hydrogel demonstrated significant therapeutic benefits in burn wound treatment. Its ability to maintain optimal hydration and provide sustained bioactive compound release resulted in accelerated healing and improved tissue regeneration. This approach represents a promising and effective strategy for advanced burn wound management.

Literature

1. Orinbayevna, B. G., & Ergashevich, S. F. (2026). Study of the selective acylation and physicochemical properties of 6-benzylaminopurine. *Universum: химия и биология*, *4*(1 (139)), 46-50.
2. GO, B., & Saitkulov, F. E. Study of the selective acylation and physicochemical properties of 6-benzylaminopurine.

AMERICAN ACADEMIC PUBLISHER

INTERNATIONAL JOURNAL OF MEDICAL SCIENCES

ISSN NUMBER: 2692 - 5206 Volume 6. No 04. Aprel ,2026

3. Dilshod odil o'g'li, K., Ergashevich, S. F., & Shamshetovich, T. M. (2025, November). Improving the criteria for detection and certification of pesticide residues in fruits and vegetables in uzbekistan. In *Conferences* (Vol. 1, No. 4, pp. 640-643).
4. Fotima, Q., Foziljon, S., Jalgasbayevna, G. U., & Shamshetovich, T. M. (2025, November). Aralash-ligandli kobalt (ii) komplekslarining qishloq xo 'jaligida o 'simlik o 'sishini boshqaruvchi modda sifatida qo 'llash istiqbollari. In *Conferences* (Vol. 1, No. 4, pp. 583-586).
5. Ilmpazovna, H. D. (2025, October). Technology for enhancing the uptake of iron and zinc elements in medicinal plants using hydrogel capsules. In *London International Monthly Conference on Multidisciplinary Research and Innovation (LIMCMRI)* (Vol. 2, No. 1, pp. 826-829).
6. Usmanovich, E. T., Oxunov, I. I., & Shamshetovich, T. M. (2025, November). 6-Aminopurinning qahrobo kislotasi bilan ta'sir reaksiyasini o 'rganish, sintez qilish texnologiyasi. In *Conferences* (Vol. 1, No. 4, pp. 649-653).
7. Maxmarajabovich, X. M., Ergashevch, S. F., & Suvanovich, X. T. Y. (2024). The use of information technologies in teaching biophysics and radiobiology. *Science and innovation*, *3*(Special Issue 58), 522-526.
8. Shoyimovich, K. G., Ergashevich, S. F., & Kuchkar, G. (2024). Determination of certain heavy metals in food composition by voltammetric method. *Austrian Journal of Technical & Natural Sciences*.
9. Saitkulov, F., Begimqulov, I., O'ralova, N., Gulimmatova, R., & Rahmonqulova, D. (2022). Biochemical effects of the coordination compound of cobalt-II nitrate quinazolin-4-one with 3-indolyl acetic acid in the "amber" plants grades phaseolus aureus. *Академические исследования в современной науке*, *1*(17), 263-267.
10. Saitkulov, F., Farhodov, O., Olisheva, M., Saparboyeva, S., & Azimova, U. (2022). Chemical feeding method of lemon plant using leaf stomata. *Академические исследования в современной науке*, *1*(17), 274-277.
11. Saitkulov, F., Sapaev, B., Nasimov, K., Kurbanova, D., & Tursunova, N. (2023). Structure, aromatic properties and preparation of the quinazolin-4-one molecule. In *E3S Web of Conferences* (Vol. 389, p. 03075). EDP Sciences.
12. Saitkulov, F., Zakhidov, Q., Khaydarov, G., Sabirova, D., Ergasheva, H., Mirvaliev, Z., & Usnatdinova, S. (2025, February). Methods for the synthesis of 2-phenylquinazolin-4-one and studying methylation reactions in different solvents. In *AIP Conference Proceedings* (Vol. 3268, No. 1, p. 030038). AIP Publishing LLC.
13. Kulmirzayeva, S., Isaqulova, M., Nasimov, H., Saitkulov, F., & Islomova, D. (2025, July). Study of synthesis and biological properties of coordination compound of cobalt (II)-chloride. In *American Institute of Physics Conference Series* (Vol. 3304, No. 1, p. 040099).
14. Saitkulov, F., Abdullayev, F., Xudayrov, M., Eshboboev, T., & Haydarov, G. (2024). Technology for detecting heavy metals in the soil using an ionometer. In *BIO Web of Conferences* (Vol. 105, p. 05004). EDP Sciences.
15. Gulbaxar, B. (2025). OPTIMAL SYNTHESIS OF QUINAZOLIN-4-ONE. *Universum: химия и биология*, *2*(2 (128)), 31-33.
16. Saitkulov, F. E. (2024). STUDYING THE REACTION OF BAP WITH SUCCINIC ACID AND ITS EFFECT ON THE ROOTING OF THE SEEDLING OF THE VARIETY "BUKHARA-102". *Austrian Journal of Technical and Natural Sciences*, (1-2), 13-18.

AMERICAN ACADEMIC PUBLISHER

INTERNATIONAL JOURNAL OF MEDICAL SCIENCES

ISSN NUMBER: 2692 - 5206 Volume 6. No 04. Aprel ,2026

17. Bekboyevich, O. O., Ergashevich, S. F., & Zoxidovich, M. Z. (2024). SYNTHESIS REACTIONS OF QUINAZOLIN-4-ONE IN THE PRESENCE OF IRON (III)-CHLORIDE CATALYSTS. *Austrian Journal of Technical and Natural Sciences*, (9-10), 49-53.
18. Bekboyevich, O. O., Ergashevich, S. F., Zoxidovich, M. Z., & Orinaevna, B. G. (2024). INVESTIGATION OF AROMATIC PROPERTIES OF XINAZOLIN-4-ONE. *Austrian Journal of Technical and Natural Sciences*, (9-10), 54-57.
19. Saitkulov, F. E., & Elmuradov, B. (2024). Zh., Sapaev B. Syntheses and biological activity of quyinazolin-4-one hydrochloride. *Austrian Journal of Technical and Natural Sciences*, (1-2), 28-35.
20. Sapayev, B., Saitkulov, F. E., Normurodov, O. U., Haydarov, G., & Ergashyev, B. (2023). Studying Complex Compounds of Cobalt (II)-Chlooride Gecsacrystolohydrate with Acetamide and Making Refractory Fabrics from Them.
21. Saitkulov, F. E., Giyasov, K., & Elmuradov, B. J. (2022). Methylation of 2-methylchiazoline-4-one by" soft" and" hard" methylating agents. *Universum: Chemistry and Biology,(11–2 (101)),–49 c*.
22. Saitkulov, F. E., Giyasov, K., & Elmuradov, B. J. (2022). Methylation of 2-methylchiazoline-4-one by" soft" and" hard" methylating agents. *Universum: Chemistry and Biology,(11–2 (101)),–49 c*.
23. Saitkulov, F., Azimov, I., Ergasheva, M., & Jo'raqulov, H. (2022). Carbohydrates are the main source of energy in the body. *Solution of social problems in management and economy*, *1*(7), 68-71.
24. Khatamov, K., Saitqulov, F., Ashurov, J., & Shakhidoyatov, K. (2012). 3, 5, 6-Trimethylthieno [2, 3-d] pyrimidin-4 (3H)-one. *Structure Reports*, *68*(9), o2740-o2740.