**Project information**

Project: IRN AR 19679386

**“Development of a thermoregulated transdermal patch with antibacterial and anti-inflammatory action”**

**Relevance:** Creating effective drugs with minimal side effects on the human body is a top priority for researchers and pharmaceutical manufacturers. Even the leading countries of the world need new medicines, new ways to use them, since the rejuvenation of many serious diseases, the deterioration of the environment, agricultural products and the constant urbanization of the population,. The use of transdermal patches makes possible to deliver medicinal substances bypassing the gastrointestinal tract and other organs to the target or pain site, avoiding the difficulty and harm of oral delivery. This contributes not only to a significant increase in the efficiency and volume of drugs used, but also to improve consumer’s demands.

In this project, innovative transdermal patches with thermoregulated polymers (TTP) will be developed to promote the release of drugs under the influence of human body temperature. As a medicinal active substance in TTP, an extract of dandelion growing in the Republic of Kazakhstan will be used. The project, both nationally and internationally significant, contributes to improving the quality of life of the patient through the development of an innovative, easy-to-use TTP with antibacterial and anti-inflammatory effects. For the Kazakh pharmaceutical industry, the development of innovative drugs using domestic raw materials is relevant.

**Objective of the project:** The aim of the project is to develop a thermoregulated transdermal patch with antibacterial and anti-inflammatory action, containing bioactive components of dandelion officinalis (Taraxacum officinale).

**Expected results:** As a result of the project implementation, a thermoregulated transdermal patch with antibacterial and anti-inflammatory action containing bioactive components of dandelion (Taraxacum officinale) will be developed. A thermoregulated transdermal patch design will be carried out. A technological solution will be developed to isolate the medicinal components of dandelion growing on the territory of the Republic of Kazakhstan. The rate of drug release will be investigated. Preclinical studies of laboratory samples of the developed thermoregulated patches will be carried out. The developed patch will be tested for compliance with the EurAsEC pharmacopoeial articles. A technological scheme for the creation of a thermoregulated transdermal patch will be prepared. A patent application will be filed on the topic of the project.

**Research team members**

All planned work on the project is carried out by a team of 11 researchers and an accountant responsible for financial transactions. Project manager: Begimova Gulzeinep Urisbaevna. The main researchers are leading researcher Kurmanbaeva I.A., 2 senior researchers Musaeva A.Zh., Kusneeva A.E. and researcher Smailova K.S.

Talented students of KazNMU were involved in the implementation of the project as researchers in the specialties of Pharmacy and TPP. Students are trained in scientific research skills.

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| WhatsApp Image 2024-01-24 at 10.59.52  **Dr. Begimova Gulzeynep Urisbaevna** - Doctor of Philosophy (PhD), specialty 6D072100 - Chemical Technology of Organic Substances. Associate Professor of the Department of Chemistry of NAO “Kazakh National Medical University named after S.D. Asfendiyarov". h-index 2 (Scopus). Research interests: Development of methods for chromatographic analysis of 1,1 - dimethylhydrazine and its transformation products (2005-2010); Directed design for the development of new aminophosphonates and their derivatives - synthetic analogues of enzymes and phytohormones (2013-2016); Development of new biologically active heteroorganic compounds and their molecular complexes. Synthesis and practical application of these compounds as 31P-NMR sensors in studies of the surface of amorphous substances and polymer morphology (2016-2020); Catalytic processing of natural and associated gases, as well as mine methane from new nanostructured composite materials in order to obtain economically important products of petrochemical synthesis (2016-2020); Development of a pharmaceutical substance with controlled release based on cyclodextrins (2020-2021). Scientific internships: Internship at Moscow State University (Moscow) (April, 2015); University of Regensburg (Germany, June-August 2015); Participant with oral presentation at the annual conference “Chisa” in Prague, Czech Republic (2018-2021); in Agios Nikolaos, Greece (2019); in Azerbaijan with diploma student Kim Camilla (April, 2020);  Winner of the competition "Tourist grants" for young scientists and university students of the Foundation of the First President. More than 50 scientific publications have been published in co-authorship, including in foreign journals with a non-zero impact factor included in the international citation databases Web of Science and Thompson Reuters, 1 study guide, 1 patent of the Republic of Kazakhstan for a utility model. Experience in the direction of the project - more than 11 years.  <https://www.scopus.com/authid/detail.uri?authorId=57189211712>   1. Galiya Sayakova , Assyl Boshkayeva , Galiya Ibadullayeva, Akzhonas Khamitova, Gulzeynep Begimova Actual prospects of using some types of larch growing in Kazakhstan in medicine // JOURNAL of MEDICINE and LIFE. VOL: 15 ISSUE: 8 AUGUST 2022 DOI:10.25122/jml-2021-0373. Q3 2. Begimova G.U., Komashko L.V., Tungatarova S.A. Nickel-containing compounds for the catalytic conversion of methane to gas synthesis // News of the National Academy of Sciences of the Republic of Kazakhstan. Series Chemistry and Technology. - 2019. - Vol. 6, No 438. - P. 79-85. IF 0,080. <https://doi.org/10.32014/2019.2518-1491.77> 3. Begimova G. and et., Nanosized Composite Pt-Ru Catalysts for Production of Modern Modified Fuels // Chemical Engineering and Technology, 2019, 42, No. 4, P. 1–8 DOI: 10.1002/ceat.201800522, Impact factor (2022) 1,728 Q2 4. Tungatarova S.A., Xanthopoulou G., Kaumenova G.N., Zhumabek M., Baizhumanova T.S., Grigorieva V.P., Komashko L.V., Begimova G.U. Development of composite materials by combustion synthesis method for catalytic reforming of methane to synthesis gas // News of the National Academy of Sciences of the Republic of Kazakhstan. Series Chemistry and Technology. - 2018. - Vol. 6, No 432. - P. 6-15. IF 0,080. [https://doi.org/10.32014/2018. 2518-1491.20](https://doi.org/10.32014/2018.%202518-1491.20). 5. Begimova G., Tungatarova S.A. New Getero(N-,P-)organic’ Synthesis Biological Active Compounds with the use of Microwave Activation // Proceedings of the 21st Conference on Process Integration, Modelling and Optimisation for Energy Saving and Pollution Reduction. 25–29 August 2018. Prague, Czech Republic. Guest Editors: T.G. Walmsley, P.S. Varbanov, R. Su, J.J. Klemeš. – P. 140-145 6. [Tungatarova, S.A.](https://www.scopus.com/authid/detail.uri?authorId=10341273600), [Xanthopoulou, G.](https://www.scopus.com/authid/detail.uri?authorId=6601973394), [Baizhumanova, T.S.](https://www.scopus.com/authid/detail.uri?authorId=36052521200), [Sarsenova, R.O.](https://www.scopus.com/authid/detail.uri?authorId=57188551247), [Begimova, G.U.](https://www.scopus.com/authid/detail.uri?authorId=57189211712) Dry reforming and oxidative conversion of methane on composite materials prepared by self-propagating combustion synthesis and impregnation method // 12th Natural Gas Conversion Symposium 2019, 2019, pp. 536–539 7. Begimova Gulzeynep, Alisher Nurgeldy, Altybay Arailym, Berillo Dmitriy, Kim Kamilla Development of hydrogel plates with controlled release of a drug based on gelane and alginate // Pharmaceutical journal №4 2021 pp 36-42 |
| WhatsApp Image 2024-02-02 at 16.40.11  **Dr. Kurmanbayeva Indira Altaevna,** PhD, candidate of chemical sciences, associate professor. Research interests: development of nanomaterials, pharmaceuticals, development of lithium-ion batteries, synthesis and encapsulation of SiO2, selective hydrogenation, dechlorination of dioxins. h-index 7 (Scopus).  She began her scientific activity during her postgraduate studies at the D.V. under the auspices of UNESCO, developing a catalyst for the hydrodechlorination of dioxins. For 4 years she worked as a cosmetologist-formulator in the cosmetic companies "Urker cosmetics", "Beauty expert". From 2012 to 2020, she worked at Nazarbayev University and its subsidiaries in projects for the development of lithium-ion batteries: synthesis and characterization of materials, battery testing. In 2014-2015, she was the scientific director of the technology commercialization project "Development of an innovative lithium-ion sulfur battery without lithium metal for renewable energy sources, electric vehicles and electronics", funded by the World Bank and the Ministry of Education and Science of the Republic of Kazakhstan. Under her leadership, 2 grant projects from the Ministry of Education and Science of the Republic of Kazakhstan were completed, one of which is on the topic“Zinc-Based Water Rechargeable Battery: A Safe and Economical Battery for Space Applications (WPAOC)” (02/01/2018 - 12/31/2020). She co-authored more than 15 articles in international rating journals, co-authored 1 European and more than 10 Kazakh patents. In the course of supervising the graduate work of KazNMU students, preliminary research was done on the topic of the project: extraction from rose hips, barberry, dandelion, the creation of polymer patches, including those with a temperature-controlled polymer poly 2-ethyl-2-oxazalin.  <https://www.scopus.com/authid/detail.uri?authorId=15737320200>  <https://scholar.google.com/citations?user=ELrsUxUAAAAJ&hl=ru&oi=ao>   1. I. Kurmanbayeva, A. Mentbayeva, A. Nurpeissova, Z. Bakenov Advanced Battery Materials Research at Nazarbayev University: Review // Eurasian Chem.-Technol. J. 23 (2021) 199‒212 2. I Kurmanbayeva, L. Rakhymbay, K.Korzhinbayeva, A.Adi, D.Batyrbekuly, A. Mentbayeva, Z Bakenov. [Tetra propyl ammonium hydroxide as a zinc dendrite growth suppressor for rechargeable aqueous battery](javascript:void(0)) // **Frontiers in Energy Research** – 2020 - 8, 324, IF 2.746 3. N Baikalov, N Serik, S Kalybekkyzy, I Kurmanbayeva, Z Bakenov. [High Mass-Loading Sulfur-Composite Cathode for Lithium-Sulfur Batteries](javascript:void(0)) // **Frontiers in Energy Research** – 2020 - 8, 207 IF 2.746 4. R. Zakarina, I. Kurmanbayeva (@), Z. Bakenov, Suppression of zinc dendrite formation on anode of Zn/LiFePO4 aqueous rechargeable batteries using electrodeposition // **Materials Today: Proceedings**. – 2020. – V. 25 (1). – P. 93 – 96, **IF=0.97** (2018),https://doi.org/10.1016/j.matpr.2019.12.278 5. I. Kurmanbayeva, A. Mentbayeva, A. Sadykova, A. Adi, Z. Mansurov, Z. Bakenov, Silica from Kazakhstan Rice Husk as an Anode Material for LIBs // **Eurasian Chemico-Technological Journal**. – 2019. – V. 21(1). – P.75-81, https://doi.org/10.18321/ectj794., **CS=0.52.** 6. Li H., Wang J., Li Y., Zhao Y., Tian Y., Kurmanbayeva I., Bakenov Z. 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Bakenov, High mass-loading of sulfur-based cathode composites and polysulfides stabilization for rechargeable lithium/sulfur batteries // **Frontiers in Energy Research**. – 2015. – **V.** 3 . – P. 22, IF 2.746doi: 10.3389/fenrg.2015.00022 14. европейский патент №15194636.5-1108/3128580 «Lithium metal free Silicon/Sulfur battery» 15. патент РК №32004 «Литий-ионный аккумулятор с органическим электролитом и катодом на основе гексацианоферрата (II) никеля» 16. патент РК № 100413 «Свободный от металлического лития кремний/ серный аккумулятор» / «Lithium metal free Silicon/Sulfur battery» 17. патент РК №31628 «Непроточная аккумуляторная Zn/NiOOH батарея» 18. патент РК №32682 «Отвал» 19. патент РК на полезную модель №1065 «Инвалидная коляска» 20. патент РК №32536 «Свободностоящий катод для литий-ионной серной аккумуляторной батареи» 21. патент РК № 33974 «Ультратонкое мультислойное покрытие сепаратора для литий-серных батарей» |
| C:\Users\indira\Desktop\Проект Патчи\личные документы\Айсулу фото.jpg  **Dr. Mussaeva Aissulu Zhaparbaevna**, chemist by education, candidate of technical sciences. She began her scientific activity during her postgraduate studies (2002 - 2004) at the A. Bekturov Institute of Chemistry, developing technologies for obtaining fertilizers based on phosphorus-containing lime mud. Has experience in developing and implementing an integrated management system in the field of quality, ecology, labor protection and health safety, as well as energy management in accordance with the requirements of international standards ISO 9001, 14001, 18001, 50001. Also has experience in teaching chemistry at the NIS in Almaty for students in grades 7-12 in English, Kazakh and Russian |
| **C:\Users\indira\AppData\Local\Packages\5319275A.WhatsAppDesktop_cv1g1gvanyjgm\TempState\4F9EC8DF9F1F7B84F2A3F69C4AF72BA9\Изображение WhatsApp 2024-03-01 в 11.58.47_2c21bca2.jpg**  **Dr. Kusnieva Aliya Erkenovna** Doctor Ph.D., Candidate of Chemical Sciences, graduated from the Faculty of Chemistry of KazGU named after al-Farabi, specialty - 02.00.06 - Chemistry of macromolecular compounds. She began her scientific activity during her postgraduate studies in 1999-2001. at the Institute of Chemistry named after A.B. Bekturov in the laboratory of "Ion-exchange resins" under the guidance of Academician of the Ministry of Education and Science of the Republic of Kazakhstan Yergozhin E.E. and Doctor of Chemical Sciences, Professor Kurmanaliev M.K. Scientific research - development of immobilized crown compounds. Kusnieva A.E. worked as the head of the GMP quality control department at JSC "Scientific Center for Anti-Infectious Drugs", a leading expert of the Department of Pharmaceutical Expertise of Medicinal Products at the Republican State Enterprise on the REM "National Center for Expertise of Medicines, Medical Devices and Medical Equipment" of the Ministry of Health and Social Development of the Republic of Kazakhstan. Has experience in the field of quality control and evaluation of pharmaceutical technology for the production of medicines, development of regulatory documentation in the GLP/GMP good practice system, dealt with accreditation in accordance with the requirements of international standards IS0 9001-2015, ISO 17025-2019. Currently working at KazNMU named after. S. D. Asfendiyarova, Associate Professor, Department of Engineering Disciplines and Good Practices.  1-Кусниева А.Е., Бекешева К.Б., Курманалиева А.Р. Система контроля качества на производстве лекарственных средств. - Сборник тезисов, докладов международной конференции «Поиск и разработка новых противоинфекционных лекарственных средств» - 17-19 Сентября 2014 г. – Алматы - С.42-44 г.  2 - Кусниева А.Е., Азембаев А.А. - Системы управления качеством на фармацевтическом предприятии согласно стандартам GMP - Журнал «Вестник АГИУВ» № 1 (17) 2012 г., С.53-54 |
| C:\Users\indira\AppData\Local\Packages\5319275A.WhatsAppDesktop_cv1g1gvanyjgm\TempState\2BCACD12D3CA5349F2706AB1BAE04E0C\Изображение WhatsApp 2024-02-01 в 12.48.57_70e5b4ec.jpg  **Smailova Kenzhegul Spabekovna** - doctoral student, master of chemical sciences, since 2020 she has been working at KazNMU named after S. Asfendiyarov, teaching courses “Chemistry and technology of synthetic compounds”, “Pharmaceutical chemistry”, “General methods of research and analysis of drugs”. She began her teaching career during the magistracy, taught the discipline "Chemistry" at the Almaty State Electromechanical College. Smailova K.S. completed her doctoral studies at the Kazakh Women's Pedagogical Institute (2008 - 2022), where she studied the chemical composition and release of biologically active components of nettle, dandelion and kok saghyz plants. Area of ​​scientific interests - bioorganic chemistry. Methods for isolation and identification of biological active components. In the project, she will perform the tasks of collecting raw materials, extracting dandelion components, preclinical testing of TTP. She has published 5 articles and more than 15 abstracts in the field of medicinal plant research.  1 - Азимбаева Г.Е., Смаилова К.С. Dandelion Plant above ground part of the research on the structure, composition and distribution of pectin // Химический журнал Казахстана - 2020, - №1, Б.108-114.  2 - Азимбаева Г.Е., Бакибаев А.А., Смаилова К.С. Выделение полифенола из taraxacum // Химия и химическая технология в XXI веке. XXI Международная научно-практическая конференция студентов и молодых ученых. Томский политехнический университет, - 2020, - С.496-497.  3 - Азимбаева Г.Е., Түгелбаева А.Р., Әлімхан Ұ.С., Смаилова К.С. Бақ-бақтың жер үсті бөлігінің химиялық құрамын зерттеу // Заманауи жастардың ғылыми пікір таласы: өзекті мәселелері, жетістіктері және иннованциялары» атты дәстүрлі VI Республикалық ғылыми-тәжірибелік конференция Алматы, - 2019. - Б. 81-83.  4 - Азимбаева Г.Е., Утегенова А.Қ., Әбдуғаппар С.М., Смаилова К.С. Көк-сағыздың жер үсті бөлігінің химиялық құрамын зерттеу // «Заманауи жастардың ғылыми пікір таласы: өзекті мәселелері, жетістіктері және иннованциялары» атты дәстүрлі VI Республикалық ғылыми-тәжірибелік конференция Алматы, - 2019. - Б. 118-120.  5 - Азимбаева Г.Е., Бакибаев А.А., Смаилова К.С. Изучение аминокислотного состава растении taraxacum officinale wigg, произрастающих на территории казахстана // Материалы Международной научно- практической конференции “Наука в современном мире” г. Нефтехамск, Башкортостан - 2021. - С.50.  6 - Азимбаева Г.Е., Бакибаев А.А., Абдикерим М.С., Смаилова К.С. Obtaining flavonoid from taraxacum kok-saghyz rodin plant growing in kazakhstan //  [Известия НАН РК. Серия химии и технологии](https://journals.nauka-nanrk.kz/chemistry-technology/issue/view/12) - [2021- № 2](https://journals.nauka-nanrk.kz/chemistry-technology/issue/view/12) - С.155-158.  7 - Азимбаева Г.Е., Женис.Ж., Смаилова К.С. Изучение химического состава и биологического активного вещества растений Taraxacum koksaghyz rodin // “Узбекистонда табиий бирикмалар кимёсининг ривожи ва келажаги” илмий-амалий конференцияси материаллари тўплами - 2021. - 56-57.  8- Азимбаева Г.Е., Бакибаев А.А., Смаилова К.С. Қосүйлі қалақай құрамындағы аминқышқылының мөлшерін анықтау //Абай атындағы ҚазҰПУ-нің Хабаршысы, «Жаратылыстану-география ғылымдары» сериясы 2014.- №1 (39).  9- Азимбаева Г.Е., Смаилова К.С. Taraxacum kok-saghyz rodin өсімдігі –биоактивті заттар қоры // Химический журнал Казахстана - 2020. - №1, Б. 221-227. |