

МІНІСТЕРСТВО ОХОРОНИ ЗДОРОВ'Я УКРАЇНИ
НАЦІОНАЛЬНИЙ ФАРМАЦЕВТИЧНИЙ УНІВЕРСИТЕТ
ІНСТИТУТ ПІДВИЩЕННЯ КВАЛІФІКАЦІЇ СПЕЦІАЛІСТІВ ФАРМАЦІЇ
КАФЕДРА ОРГАНІЗАЦІЇ, ЕКОНОМІКИ ТА УПРАВЛІННЯ ФАРМАЦІЄЮ

**ПІДГОТОВКА СПЕЦІАЛІСТІВ ФАРМАЦІЇ
В РАМКАХ КОНЦЕПЦІЇ
«НАВЧАННЯ ПРОТЯГОМ ЖИТТЯ
(LIFE LONG LEARNING)»:
НАУКА, ОСВІТА, ПРАКТИКА**

**МАТЕРІАЛИ ІV НАУКОВО-ПРАКТИЧНОЇ
ІНТЕРНЕТ КОНФЕРЕНЦІЇ
З МІЖНАРОДНОЮ УЧАСТЮ, ЯКА ПРИСВЯЧЕНА
ПАМ'ЯТІ ПРОФ. ТОЛОЧКО ВАЛЕНТИНА МИХАЙЛОВИЧА**

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REGARDING TO THE TOPIC OF BLOCKCHAIN TECHNOLOGY PROGRESS AND ITS USE IN THE PHARMACEUTICAL INDUSTRY

Kovalov V. V., Bobrytska L. A., Zhuravel I. O.,

Oliinyk S.V., Shevchenko V. O.

Institute for Advanced Training of Pharmacy Specialists

National University of Pharmacy, Kharkiv, Ukraine

volodyakw@gmail.com

Introduction. As an important part of society, the pharmaceutical industry cannot exist in the modern world without further development. Blockchain technology began to develop in the 1990s.

Blockchain technology uses a distributed database maintained as a chain of records (blocks) containing a set of interconnected, cryptographically protected data. These records are chronologically sequential and immutable, and changes to them are possible only through coordinated actions within a network of data processing centers and corresponding identical versions of the database (definition is taken from Resolution of the Cabinet of Ministers of Ukraine No. 1238 of October 29, 2024).

Blockchain technology has the following properties:

- Transparency: all network participants can verify the data.
- Immutability: a record in the blocks cannot be forged or deleted.
- Decentralization: data is stored on many nodes (computers) distributed in the network and not in a single data storage location.
- Security: cryptography protects transactions from falsification and hacking.

Currently, there are many scientific publications on related topics, including those by our colleagues O. V. Posilkina and A. G. Lisna (Scientific and practical approaches to managing the safety and efficiency of pharmaceutical supply chains using digital technologies, 2019 and Analysis of the state of implementation of digital technologies in pharmaceutical supply chain activities, 2023).

Aim. The goal is to study the relevance of using blockchain technology in the pharmaceutical industry and the main stages of its development.

Methodology and research methods were used to achieve the set goal. To achieve the set goal, the following general scientific research methods were used for data processing: analysis, synthesis, comparison, generalization, and systematization.

Results and discussion. Regarding the development of blockchain Regarding the development of blockchain from its inception to the present day, the concept of blockchain was pioneered by Ralph Merkle ("Merkle tree") as well as Stuart Haber and W. Scott Stornetta, who created a system of timestamps for documents in the late 1970s–1990s.

With the emergence of the popularity of the Bitcoin cryptocurrency, which was the first practical application of blockchain, the technology began to choose (2008). The first blockchain 1.0 appeared in 2009 as a principle of recording transactions.

The peak of popularity fell on (2017-2018). The period of significant growth of interest in blockchain was associated with the boom of ICOs (initial coin offerings), which made it possible to raise funds for crowdfunding.

After 2019, Blockchain technology continues to be used in various industries, in addition to cryptocurrencies, in particular, in cybersecurity, banking, After 2019, Blockchain technology continues to be used in various industries, in addition to cryptocurrencies, in particular, in cybersecurity, banking, user identification systems and other financial transactions.

Another major milestone in the evolution of blockchain was reached in 2020, with the acceleration of applications centered around decentralized finance, or DeFi. Only the most significant stages of the blockchain technology development are listed.

The use of blockchain technology in the pharmaceutical industry is rational: to track the supply chain of drugs from the manufacturer to the pharmacy, which reduces the risk of counterfeiting; guaranteeing the authenticity of drugs - applying a unique QR code to the packaging or NFC tag, the data about which is stored in the blockchain; when conducting clinical trials - research data is recorded in the blockchain to avoid their changes, to ensure transparency and trust between scientists, patients and regulators; in pharmacovigilance - storing information in a transparent

and secure system; in controlling the prescription of drugs that are in subject-quantitative accounting.

Conclusions: using blockchain technology in the pharmaceutical industry and healthcare systems can increase data security, transparency, trust, and the overall efficiency of these systems, from drug development to patient use.

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