

Structural Models, Classification of the Pharmacokinetics of Drugs, Substances

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Abstract

This article shows the analytical results of the positive results obtained when using the "Discussion-Discussion" method of interactive teaching methods in explaining the topic to students.

Keywords: Mathematical modeling, structural models, structural elements, spatial structures, pharmacokinetic model, substance concentration, pharmacological processes.

Introduction

- "Structural models" from the field of mathematical modeling in biology and medicine. "Classification of the pharmacokinetics of drugs. **Substances** "on the 3rd year, group 301 of the 2nd pediatric and medical-biological faculty of the Tashkent Pediatric Institute. The number of students was 14 people, and we started our lesson by dividing the participants into 2 groups, giving a brief information about the Bachs-discussion method.

TALK-DISCUSSION METHOD is a teaching method conducted in the form of mutual discussion-discussion and exchange of ideas with students on a topic. Discussions are held when the study group is divided into two or more small groups, where participants exchange views on a topic. Debate is an effective way to discuss the issue under study. It involves a group discussion of some controversial issue, during which the truth is revealed.

According to the practical teacher Ch. Kupisevich, "this is an exchange of ideas between a teacher and students or only between students on a specific topic." These opinions can be your own or other people's opinions. An effective discussion is characterized by the presence of different opinions, the desire to find the most appropriate solution to a didactic problem, and the active participation of interlocutors in it. Compared to lectures and conversations, it creates a more favorable environment for activating students, influencing their psyche and, in

particular, their creative imagination. Debates require from students not a simple answer to the question posed, but a rational, emotionally colored and meaningful option for solving a didactic problem, a clear and precise expression of their thoughts. It causes strong emotional experiences among the participants, contributes to the emergence of socio-psychological phenomena in different groups, develops teamwork skills and the ability to listen to the positions of other students.

Classification of structural models.

There are four types of structural models: spatial, temporal, physical and hierarchical.

- Spatial structures are usually used to describe the geometry of the object under study and the location of its individual elements in space. Such structures are best represented by network and matrix graphs, whose vertices indicate the location of elements, and the edges indicate the distance between them or other connection conditions.

As an example of a spatial-structural model, a structural diagram of the circulatory system in parts of the human body is given, that is, it shows an increase in blood pressure as a result of violations of the circulatory system in the human body, the formation of blood clots in blood vessels.

- Temporary structural models are widely used in networks and planning, as well as in queuing theory.

In temporal structures, the stages of the ongoing process or the state of the system at a given moment of time act as elements. Relations here are the conditions for the transition from one stage of the system to another or from one state to another. For example, so-called network diagrams (routine maps) are widely used in production. They are graphs whose vertices are the necessary production operations, and with the help of edges the sequence and duration of these operations are indicated. When modeling queuing systems, it is convenient to use the "death and reproduction" block diagram, which is a linear graph (a sequential set of system states expanded into a single chain). It is believed that the system serves a random flow of applications accessing it.

Then the relations between the elements of the system (its states at different points in time) are the conditions for the arrival of a new request, which can be characterized, for example, by the intensity of the corresponding random flows of events.

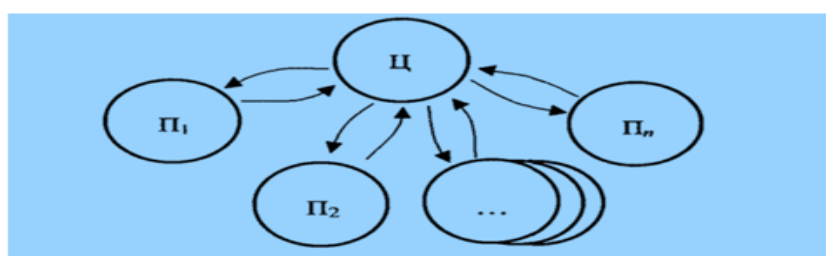
-Physical structural models are used to describe the complex physical properties of the object under study using simple structural elements. To model controlled systems, hierarchical block diagrams are widely used, assuming the presence of several levels of information processing and decision making.

The main task of the hierarchical structure is the distribution of information processing and decision-making functions between individual elements.

Image-1. an example of a two-level scientific hierarchical structure of the control system is shown. In this system, there is one privileged element that has the ability to control the rest of the elements. This privileged element is usually called the center (c), and the remaining elements are under the control of the so-called center (C) and are in constant contact with it (Pi).

(P_i , $i=1, \dots, n$).

The relationships in this model are the conditions for the exchange of information, financial and material resources between the center (regional health care) and manufacturers (district health organizations). It should be noted that in the above flowchart, there are no relationships (horizontal relationships) between producers. The inequality of the elements of the system is manifested in the ability of the center to determine the rules for the formation of influence on producers and thereby direct the actions of lower elements in the right direction. This scheme is considered a structural model that can be easily generalized to the multilevel structure of science that exists in the field of medicine.



A pharmacokinetic model is often a simplified mathematical description of how the concentration (amount) of a test substance changes over time in a biological system.

The fundamentals of pharmacokinetics were created by scientists of different specialties in different countries.

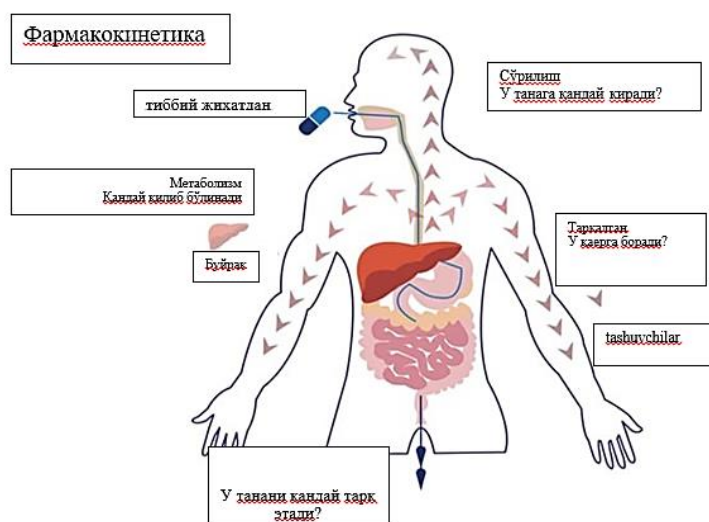
- In 1913, the biochemists L. Michaelis and M. Menten proposed an equation for the kinetics of enzymatic processes, based on the original work of Victor Henri, this equation is widely used to describe the metabolism of drugs in modern pharmacokinetics.
- Swedish physiologists E. Widmark, D. Tandberg (1924) and T. Theorell (1937) used systems of differential equations in the analysis of various methods of drug administration.
- American physiologist W. Hamilton and colleagues (1931) used the method of statistical moments to evaluate pharmacokinetic parameters from experimental data.
- English biochemists H. Brim, W. Thorpe and K. White (1951) explained the basics of drug metabolism.

Practical aspects of the use of pharmacokinetics to optimize the pharmacotherapy of K. in France. Lapp (1948-1956), A. Van Gemert and others in Denmark (1950), E. Kruger-Timmer (1960) and, in fact, pharmacokinetics - Dost 1968) in Germany (the latter is the author of the term "pharmacokinetics").

The development of pharmacokinetics until the beginning of the 50s.

The 20th century was limited by the availability of highly sensitive and selective methods for the analysis of trace concentrations of medicinal substances in the biological environment and insufficient computerization of research. Thanks to the solution of these problems, pharmacokinetics has been further developed. The development of pharmacokinetics in different countries is different, and basically it originated as a science in Russia in the 60s. and V. A. Filov, V. N. Soloviev and V. P. Associated with the names of Yakovlev.

A pharmacokinetic model is often a simplified mathematical description of how the concentration (amount) of a test substance changes over time in a biological system.



Pharmacokinetic modeling can be considered as a special case of non-linear modeling. The human body is a complex mechanism in which the absorption, distribution, metabolism and excretion of substances can occur depending on the substance itself and the current state of the body, and often with unclear feedback.

Therefore, it is practically impossible, and in many cases even undesirable, to reflect and describe all possible factors affecting the kinetics of a substance. Nevertheless, it can be imagined that the substance can be distributed in limited areas of the body, then called chambers, and the transition of the substance from one chamber to another is described by some equation.

Pharmacokinetic modeling is supposed to be considered as a special case of non-linear modeling.

In all cases, when the drug is not introduced into the vascular bed, it enters the bloodstream by absorption; in solid form, dissolution (release) occurs first, and then the drug molecules enter the systemic circulation, more often by simple diffusion from the injection site, and sometimes by active transport. Dosage forms of long-acting (delayed-release) provide a slow controlled absorption of the drug into the body and its bioavailability.

Distribution to organs and tissues

In the body, the drug is distributed between the blood, intercellular fluid and tissue cells. The distribution depends on the relative affinity of drug molecules for blood and tissue biomacromolecules. A necessary condition for the implementation of the pharmacological

action of a medicinal substance is its penetration into the target tissues; on the other hand, the penetration of the drug into insensitive tissues reduces the effective concentration and may cause unwanted side effects (eg, carcinogenesis).

Medicinal substances are excreted from the body unchanged or as products of biochemical changes (metabolites). The most common processes in the course of metabolism are oxidation, reduction, hydrolysis, as well as compounds with glucuronic, sulfate, acetic acids and glutathione residues. Metabolites are usually more polar and water soluble than the parent drug, so they are more rapidly excreted in the urine.

Metabolism can be spontaneous, but most often it is catalyzed by enzymes (for example, cytochromes) localized in cell membranes and in cell organelles of the liver, kidneys, lungs, skin, brain, etc.; some enzymes are localized in the cytoplasm. The biological significance of metabolic changes lies in the preparation of fat-soluble drugs for excretion from the body.

Medicinal substances are excreted from the body with urine, feces, sweat, saliva, milk and exhaled air. Excretion depends on the rate of delivery of the drug to the organ that is excreted by the blood, and the correct functioning of the excretory systems. Water-soluble drugs are usually excreted through the kidneys. This process is determined by the sum of three main processes: glomerular (glomerular) filtration, tubular secretion and reabsorption. The filtration rate is directly proportional to the free drug concentration in plasma; tubular secretion is carried out by saturated transport systems in the nephron and is characteristic of some organic anions, cations and amphoteric compounds; neutral forms of drugs can be reabsorbed. Polar drugs with a molecular weight of more than 300 are excreted mainly with bile, and then with feces: the excretion rate is directly proportional to the intake of bile and the ratio of the concentration of the drug in the blood and bile.

In the process of passing our lesson in a practical form using the **“Talk-discussion” method**, we divided 14 students into the 2nd group and started a discussion on the topic. No matter how the lecture is delivered to students, in a practical lesson using the interactive method "Talk-discussion" using additional didactic materials

(6 students of the 5th grade, 3 students of the 4th grade, 3 students of the 3rd grade, 2 students of the 2nd grade) with the results.

$$7,14 \% \cdot 6 = 43,02 \%$$

$$7,14 \% \cdot 3 = 21,42 \%$$

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$$7,14 \% \cdot 2 = 14,28 \%$$

100% academic performance is 64.44% of a positive analytical indicator.

This method serves to ensure the activity of students in the educational process, to teach them to think freely and substantiate the knowledge gained.

Result:

As a result of the interactive method of covering the topic and communicating with students, we were able to fully assimilate all the knowledge related to the topic. The "talk-discussion" method differs from other methods and its positive side is that the student freely expresses what

he knows, and the rest of the students complete the thought, so the discussion covers the entire topic. The positive rate of **64.44% was achieved through the skillful use of such an educational method.**

Conclusion:

In the process of using interactive teaching methods, we will achieve positive results if we know what type of method is suitable for a given topic and if we are ready for it. METHOD "TALK - DISCUSSION" - a teaching method carried out in the form of mutual discussion and exchange of ideas with students on a topic. If the discussion divides the study group into two or more small groups, during the exchange of views of the participants on the topic (note), if their activity and evaluation processes are announced, it will be noticed that students will try to move forward and show good results. This leads to an increase in positive results.

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Literature

1. Мирзиёев Ш.М. Буюк келажакимизни мард ва олижаноб халқимиз билан бирга қурамыз. – Т.: Ўзбекистон, 2017. – 488 б.
2. Мирзиёев Ш.М. Қонун устуворлиги ва инсон манфаатларини таъминлаш – юрт тараққиёти ва халқ фаровонлигининг гарови. – Т.: Ўзбекистон, 2017. – 48 б.
3. Мирзиёев Ш.М. Танқидий таҳлил, қатъий тартиб-интизом ва шахсий жавобгарлик – ҳар бир раҳбар фаолиятининг кундалик қоидаси бўлиши керак. – Т.: Ўзбекистон, 2017. – 104 б.
4. Ўзбекистон Республикаси Президентининг Фармойиши “Ўзбекистон Республикасини янада ривожлантириш бўйича ҳаракатлар стратегияси тўғрисида” 07.02.2017 й., ПФ-4947,
5. Ўзбекистон Республикаси қонун ҳужжатлари тўплами, 2017 й., 6-сон, 70-модда, 20 сон, 354-модда, 23-сон, 448-модда.
6. Ўзбекистон Республикаси қонун ҳужжатлари тўплами, 2017 й.
7. Олимов Қ., Абдуқудусов О., Узокова Л., Аҳмеджонов М., Жалолова Д. “Қасб таълими услубияти” Тошкент. “Молия иқтисод” 2006 й.
8. Ходжабоев А., Хусанов И. “Қасб таълим методологияси” Тошкент. “Фантехнология” 2007 й.
9. Тожибоева Д. “Махсус фанларни ўқитиш методикаси” Т.: “Фан ва технологиялар” 2007.69
10. Авлиёқулов Н. “Замонавий ўқитиш технологиялари” Тошкент. 2001й.
11. Азизхўжаева Н.Н. “Педагогик технологиялар ва педагогик маҳорат” Тошкент. 2003
12. Исмаилова З.К. Педагогика. Дарслик. – Т.: Молия-иқтисод, 2008.
13. Хакимова М.Ф. Қасб педагогикаси. Ўқув қўлланма. – Тошкент: Фан ва технологиялар, 2007.

14. Муслимов Н.А. ва бошқалар. Касб таълими педагогикаси фанидан ўқув-услубий мажмуа. – Т.: ТДПУ, 2011 й.
15. Хошимова М.К. “Педагогик технологиялар ва педагогик маҳорат” фанидан маърузалар матни. Тошкент. 2012 й.
16. Хошимова М.К. “Касб таълимида янги педагогик технологиялар” фанидан маърузалар матни. Тошкент. 2012 й.
17. Л.В. Голиш, Д.М. Файзуллаева “Педагогик технологияларни лойиҳалаштириш ва режалаштириш” Тошкент. “Иқтисодиёт” 2009 й.
18. Самарский А.А., Михайлов А.П. Математическое моделирование. – М. Физматлит. 2005.
19. Музафаров Х.А., Баклушин М.Б., Абдураимов М.Г. Математическое моделирование. Ташкент, Университет. 2002 г.
20. Зарубин В.С. Математическое моделирование в технике: учеб. пособие для студ вузов/ Зарубин В.С.-2-е изд.- Москва.: Изд-во МГТУ им. Н.Э.Баумана, 2003. -496 с.
21. Тарасевич Ю.Ю. Математическое и компьютерное моделирование. – М., УРСС, 2003.
22. Введение в математическое моделирование. Под.ред. В.П.Трусова. –М.Логос. 2005.
23. Арнольд В.И. Жесткие и мягкие математические модели. М.,МСНМО. 2000.
24. Тарасевич, Ю.Ю. Математическое и компьютерное моделирование. Вводный курс: Учебное пособие / Ю.Ю. Тарасевич. - М.: ЛИБРОКОМ, 2013. - 152 с.
25. Савельева Г.М., Бреусенко В.Г., Голова Ю.А., Каппушева Л.М., Шилина Е.А., Мишиева О.И., Штыров С.В. Современные методы диагностики и лечения гиперпластических процессов эндометрия в постменопаузе. Международный медицинский журнал. 2005;11(2):73-77.
26. Медицинская литература: Клиническая лабораторная диагностика. Учебник в 2-х томах. Том 2 - 2021г. Авторы: Кишкун А.А., Беганская Л.А. – ГЭОТАР Медиа (2021)
27. Бозоров Э.Х. Медицинская информатика. -Т.: «Fan va technology», 2019, 352 стр.
28. Омельченко В.П., Демидова А.А. практикум по медицинской информатике 2001г. 101000, Москва, ул. Покровка, д.25, стр.1, оф.2.
29. Королюк И.П. Медицинская информатика : Учебник / И.П. Королюк. – 2 изд., перераб. и доп. – Самара : ООО «Офорт» : ГБОУ ВПО «СамГМУ». 2012.— 244 с; ил.
30. Омельченко В. П. Медицинская информатика : учебник / В. П. Омельченко, А. А. Демидова. — Москва : ГЭОТАР-Медиа, 2018. — 528 с. — Текст : электронный // Консультант студента: электронная библиотека медицинского вуза / Издательская группа "ГЭОТАР-Медиа"; ООО "ИПУЗ". — Москва, 2010. — URL: <http://www.studmedlib.ru/book/ISBN9785970443200.html> (дата обращения: 22.05.2020). — Режим доступа: для зарегистрир. пользователей НБ ПетрГУ.
31. Информатика и медицинская статистика / под ред. Г. Н. Царик. — Москва : ГЭОТАР-Медиа, 2017. — 304 с. — Текст: электронный // Консультант студента: электронная библиотека медицинского вуза / Издательская группа "ГЭОТАР-Медиа"; ООО "ИПУЗ". — Москва, 2010. — URL : <http://www.studmedlib.ru/book/ISBN9785970442432.html> (дата обращения: 22.05.2020). — Режим доступа: для зарегистрир. пользователей НБ ПетрГУ.

32. Х.С Далиев, Э.Х Бозоров в/б . Медицинская электроника. -Т .:, «Fan va texnologiya», 2019, 400 стр.
33. Медэлектроника–2022. Средства медицинской электроники и новые медицинские технологии : сб. науч. ст. XIII Междунар. науч.-техн. конф. (Республика Беларусь, Минск, 8-9 декабря 2022 года). – Минск : БГУИР, 2022 – 341 с.
34. Бакалов, В. П. Медицинская электроника: основы биотелеметрии : учебное пособие для среднего профессионального образования / В. П. Бакалов. — 2-е изд., испр. и доп. — Москва : Издательство Юрайт, 2023. — 326 с. — (Профессиональное образование). — ISBN 978-5-534-07678-3. — Текст : электронный // Образовательная платформа Юрайт [сайт]. — URL: <https://urait.ru/bcode/516794> (дата обращения: 23.03.2023).
35. Галушко, В. А. Г16 Электротехника и основы электроники : учеб.-метод. пособие для студентов факультета —Управление процессами перевозок / В. Н. Галушко ; М-во образования Респ. Беларусь, Белорус. гос. ун-т трансп.— Гомель : БелГУТ, 2012. — 186 с
36. Соловьев, В. Н. Фармакокинетика : руководство / В. Н. Соловьев, А. А. Фирсов, В. А. Филов. — М. : Медицина, 1980. — 424, [2] с. : ил. — УДК 615.015(035)(G).
37. Лакин, К. М. Биотрансформация лекарственных веществ : общие вопросы / К. М. Лакин, Ю. Ф. Крылов. — М. : Медицина, 1981. — 341, [1] с. — УДК 615.9(G).
38. Фармакокинетика // Фармакология : уч. пос. / Под. ред. Ю. Ф. Крылова и В. М. Бобырева. — М. : ВУНМЦ, 1999. — 115 с.
39. Холодов Л. Е., Яковлев В. П. Клиническая фармакокинетика. — М., 1985.
40. Wagner J. G. Fundamentals of clinical pharmacokinetics. — Hamilton, 1975.
41. Есиргапович К.А. и соавт. САМЫЕ ПРОСТЫЕ РЕКОМЕНДАЦИИ ПО СОЗДАНИЮ ВЕБ-САЙТА // Международный междисциплинарный исследовательский журнал «Галактика». – 2022. – Т. 10. – №. 2. – С. 758-761.
42. Бахрамов Р., Маликов М., КУБАЕВ А. Методика использования функционально-дифференциального уравнения при выявлении паразитов у детей //Международный журнал инноваций в инженерных исследованиях и технологиях. – 2021. – Т. 8. – №. 3. – С. 10-14.
43. Кубаев А.Е. и соавт. Методы и объемы создания базы данных в программе ms access в программе ms access по медико-биологическому планированию и созданию базы данных для хранения информации, перейти к теме модулей практических занятий в системе онлайн //АКАДЕМИЯ: Международный многопрофильный исследовательский журнал. – 2021. – Т. 11. – №. 3. – С. 779-792.
44. Кубаев А. Э., Абдуллаева С. Б. ТИББИЙ ТАСВИР ОЛИЩА РАДИОЛОГИЯ СОХАСИНИНГ ТАВСИФЛАНИШИ //Galaxy International Interdisciplinary Research Journal. – 2022. – Т. 10. – №. 7. – С. 121-127.
45. Кубаев А. Э., Абдуллаева С. Б. ТИББИЙ ТАСВИРЛАРНИ ШАКИЛЛАНИШИ //BARQARORLIK VA YETAKCHI TADQIQOTLAR ONLAYN ILMIY JURNALI. – 2022. – Т. 2. – №. 5. – С. 104-109.

-
46. Esirgapovich K. A. et al. Use of Electronic Government Interactive Service System in Uzbekistan //Web of Scholars: Multidimensional Research Journal. – 2023. – Т. 2. – №. 2. – С. 13-22.
47. Esirgapovich K. A., Berdievna A. S. FORMATION OF STUDENTS'SKILLS IN USING THE INTERNET AND HIT THE DIGITAL TECHNOLOGIES //Galaxy International Interdisciplinary Research Journal. – 2022. – Т. 10. – №. 2. – С. 748-751.
48. Кубаев А., Икромов Н. ЖЕНЬШЕНЬ: ЛЕЧЕБНЫЕ СВОЙСТВА И ПРОТИВОПОКАЗАНИЯ //International Bulletin of Medical Sciences and Clinical Research. – 2023. – Т. 3. – №. 2. – С. 52-56.
49. Кубаев А. Э. и др. ПОЛЕЗНЫЕ СВОЙСТВА РАСТЕНИЯ-ШИПОВНИКА //PEDAGOG. – 2022. – Т. 1. – №. 4. – С. 961-963.
50. Кубаев А. Э. и др. “MOBIL ALOQA TIZIMLARINI RIVOJLANTIRISH ISTIQBOLLARI” MAVZUSINI O ‘QITISH METODIKASI //BARQARORLIK VA YETAKCHI TADQIQOTLAR ONLAYN ILMIY JURNALI. – 2023. – Т. 3. – №. 3. – С. 491-496.
51. Esirgapovich, K. A. ., & Ubaydullaevich, G. D. . (2023). Visual Imaging Processes in Medical Imaging. INTERNATIONAL JOURNAL OF INCLUSIVE AND SUSTAINABLE EDUCATION, 2(2), 35–40. Retrieved from
52. <http://inter-publishing.com/index.php/IJISE/article/view/1041>
53. Xusainov A., Kubayev A. AXBOROT TEXNOLOGIYALARINING BIZNESDAGI O’RNI //Eurasian Journal of Mathematical Theory and Computer Sciences. – 2023. – Т. 3. – №. 1. – С. 38-41.
54. Бозоров Эркин Ходжиевич, Кубаев Асалиддин Эсиргапович. (2023). ИНТЕРАКТИВНЫЕ МЕТОДЫ ОБУЧЕНИЯ, ИСПОЛЬЗУЕМЫЕ При ОБУЧЕНИИ МАТЕМАТИЧЕСКОМУ МОДЕЛИРОВАНИЮ. Инновационная технология: Журнал методических исследований, 4(03), 96-103. <https://doi.org/10.17605/OSF.IO/FZGWY>.