

Mechanism of Action of Drugs Against Viruses and Tumors: Influence on DNA and RNA Enzymes Mechanism of Action of Drugs Against Viruses and Tumors: Influence on DNA and RNA Enzymes

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Annotation: Antiviral and antitumor drugs play a key role in modern medicine. Their action is often associated with disruption of normal enzymes involved in the synthesis and replication of DNA and RNA, which disrupts vital processes in both viruses and cancer cells. This article discusses the main mechanisms of action of these drugs and their effect on DNA and RNA enzymes.

Keywords: drugs, viruses, infections, enzymes, process, replication, molecular level, antiviral, drug, DNA.

Introduction: Viruses cannot replicate on their own without the participation of the host, since they do not have their own replication mechanisms. They use enzymes of the host cells to synthesize their genetic information, which makes them targets for antiviral drugs. One of the most effective ways to affect viruses is to block the enzymes involved in the synthesis of their genetic information. For example: nucleoside inhibitors (eg, acyclovir, zidovudine) act on the DNA and RNA polymerases of viruses, inhibiting their ability to synthesize viral DNA or RNA. Acyclovir is used to treat herpesvirus infections by acting on the viral DNA polymerase enzyme, disrupting the replication of viral DNA. Ribavirin is a drug that suppresses the replication of viruses such as hepatitis C and respiratory syncytial virus by inhibiting viral RNA polymerase, which prevents the synthesis of viral RNA. Many viruses, such as HIV and hepatitis C, require specific enzyme activity to break down their proteins during the viral assembly process. Protease inhibitors (eg, lopinavir for HIV) block this process, resulting in nonfunctional viral particles. Reverse transcriptase inhibitors. Some viruses, such as HIV, use the enzyme reverse transcriptase to convert their RNA into DNA, which is then integrated into the host cell genome. Drugs such as zidovudine and lamivudine inhibit reverse transcriptase, preventing the creation of viral DNA and its integration into the host cell.

Antiviral drugs often target the inhibition of enzymes that are involved in the replication of viral DNA or RNA. These enzymes include:

- Reverse transcriptase inhibitors (RNA-based viruses, such as HIV) - Reverse transcriptase inhibitors (eg, zidovudine) block the conversion of viral RNA into DNA. - DNA polymerases (eg, herpes, hepatitis viruses) - inhibitors such as acyclovir interfere with the replication of viral DNA.
- Proteases - protease inhibitors (eg, ritonavir for HIV) block the maturation of viral particles.

Antitumor drugs. Oncological drugs act on enzymes involved in the processes of replication, transcription and synthesis of cellular components, which leads to the death of tumor cells. Antibiotics that inhibit DNA synthesis: Some chemotherapeutic drugs, such as cisplatin and dactinomycin, disrupt DNA synthesis in cancer cells. Cisplatin causes the formation of cross-links between DNA strands, which prevents their normal replication and transcription. Dactinomycin blocks the activity of the DNA ribosome, which also leads to disruption of the synthesis of cellular components. Topoisomerase inhibitors: Topoisomerases are enzymes that relax supercoiled DNA, which is necessary for DNA replication and transcription. Drugs such as topotecan and irinotecan inhibit the activity of these enzymes, which leads to breaks in the DNA, impaired replication, and cell death. Microtubule-

targeting drugs: Drugs such as taxanes (eg, paclitaxel) affect microtubules, which are involved in cell division. They stabilize microtubules, which leads to cell cycle arrest in the mitotic phase and, ultimately, to apoptosis (programmed cell death).

Many antiviral and antitumor drugs act on enzymes involved in the replication and transcription of DNA and RNA. This effect can be either direct, such as by inhibiting enzymes, or indirect, such as by blocking the synthesis of molecules necessary for these processes. The mechanism of action of drugs usually includes:

- Inhibition of DNA or RNA synthesis by directly interfering with the work of polymerases or other enzymes.
- Disruption of the structure or function of DNA, which makes it impossible for it to replicate or transcribe.
- Blocking of cell division processes, which is especially effective against rapidly dividing tumor cells.

Conclusion: Drugs used to treat viral infections and cancers effectively affect enzymes involved in the replication and transcription of DNA and RNA. This allows for the effective blocking of processes necessary for the reproduction of viruses and tumor growth. Modern antiviral and chemotherapeutic drugs are aimed at specific forms. These are some key areas that may be useful in investigating the mechanism of action of antiviral and antitumor drugs with a focus on DNA and RNA enzymes.

Literature:

1. Аронбаев Д. М. и Раимкулова Ч.А. Вода «живая» и «мертвая». новые факты об антиоксидантных и релаксационных характеристиках электроактивированной воды //Universum: химия и биология. – 2021. – №. 2 (80). – С. 26-31.
2. Аронбаев С. Д. и Раимкулова Ч.А. Screen-printed электроды в инверсионно-вольтамперометрическом определении тяжелых металлов //Universum: химия и биология. – 2020. – №. 5 (71). – С. 22-34.
3. Раимкулова Ч. А., Аронбаев С. Д., Аронбаев Д. М. САЛИВОДИАГНОСТИКА: ПРОШЛОЕ, НАСТОЯЩЕЕ, БУДУЩЕЕ //Universum: химия и биология. – 2023. – №. 1-2 (103). – С. 27-37.
4. Нарбаев К., Раимкулова Ч. А. ВЫБОР УСЛОВИЙ СПЕКТРОФОТОМЕТРИЧЕСКОГО ОПРЕДЕЛЕНИЯ ИОНОВ АММОНИЯ ИНДОФЕНОЛЬНЫМ МЕТОДОМ //The 7 th International scientific and practical conference “Science, innovations and education: problems and prospects”(February 9-11, 2022) CPN Publishing Group, Tokyo, Japan. 2022. 842 p. – 2022. – С. 161.
5. Раимкулова Ч. А., Холмуродова Д. К. РАЗРАБОТКА МЕТОДОВ И УСТРОЙСТВ ДЛЯ НЕИНВАЗИВНОГО КОНТРОЛЯ НЕКОТОРЫХ КЛИНИЧЕСКИ ЗНАЧИМЫХ БИОМАРКЕРОВ //ЖУРНАЛ ГЕПАТО-ГАСТРОЭНТЕРОЛОГИЧЕСКИХ ИССЛЕДОВАНИЙ. – 2022. – №. SI-2.
6. Раимкулова Ч. А. и др. ОПТИМИЗАЦИЯ УСЛОВИЙ ОБРАЗОВАНИЯ ИНДОФЕНОЛЬНОГО КОМПЛЕКСА ДЛЯ СПЕКТРОФОТОМЕТРИЧЕСКОГО ОПРЕДЕЛЕНИЯ ИОНОВ АММОНИЯ //Norwegian Journal of Development of the International Science. – 2022. – №. 77-1. – С. 3-9.