ANTIVIRAL AND HEPATOPROTECTIVE PROPERTIES OF LICORICE (GLYCYRRHIZA GLABRA L.) IN HEPATITIS B

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Abstract: Chronic hepatitis B remains a major global health concern, characterized by hepatocellular injury, chronic inflammatory processes, and the potential development of liver fibrosis. This article examines the potential antiviral activity and hepatoprotective properties of biologically active compounds found in medicinal plants, with particular emphasis on licorice (Glycyrrhiza glabra L.). Glycyrrhizin and its derivatives, which are among the principal bioactive constituents of licorice, are of particular interest because of their potential antiviral, anti-inflammatory, antioxidant, and hepatoprotective effects. A review of the available scientific literature indicates that glycyrrhizin-based preparations have been associated with improvements in biochemical markers of liver injury, including reductions in alanine aminotransferase (ALT) and aspartate aminotransferase (AST) levels in certain clinical studies. Furthermore, the potential effects of these compounds on hepatitis B surface antigen (HBsAg) secretion and their capacity to modulate inflammatory processes are discussed. However, improvements in liver function associated with glycyrrhizin-based preparations should not be interpreted as evidence of complete viral eradication.

Keywords: licorice, Glycyrrhiza glabra L., chronic hepatitis B, glycyrrhizin, antiviral activity, hepatoprotective effects, liver injury, anti-inflammatory activity, antioxidant activity, phytotherapy

Аннотация: Хронический гепатит В остается одной из актуальных проблем современного здравоохранения во всем мире. Данное заболевание характеризуется повреждением гепатоцитов, хроническими воспалительными процессами и потенциальным развитием фиброза печени. В настоящей статье рассматриваются потенциальная противовирусная активность и гепатопротекторные свойства биологически активных соединений лекарственных растений, в частности солодки голой (Glycyrrhiza glabra L.). Особое внимание уделяется глицирризину и его производным, которые представляют значительный интерес благодаря потенциальным противовирусным, противовоспалительным, антиоксидантным и гепатопротекторным эффектам. Анализ доступной научной литературы свидетельствует о том, что применение препаратов на основе глицирризина в ряде клинических исследований ассоциировалось с улучшением биохимических показателей повреждения печени, включая снижение активности аланинаминотрансферазы (АЛТ) и аспартатаминотрансферазы (АСТ). Кроме того, обсуждаются потенциальное влияние указанных соединений на секрецию поверхностного антигена вируса гепатита В (HBsAg) и их способность модулировать воспалительные процессы.

Ключевые слова: солодка голая, Glycyrrhiza glabra L., хронический гепатит В, глицирризин, противовирусная активность, гепатопротекторное действие, повреждение печени, противовоспалительная активность, антиоксидантная активность, фитотерапия

INTRODUCTION: Chronic hepatitis B is one of the major challenges in modern medicine. It is an infectious disease caused by the hepatitis B virus (HBV) and is characterized by long-term damage to liver tissue. This disease can trigger chronic inflammatory processes in liver cells, leading to the development of liver fibrosis and cirrhosis and, in some cases, hepatocellular carcinoma. In the treatment of chronic hepatitis B, suppressing viral replication, reducing liver damage, and preventing disease-related complications are of great importance. Currently, antiviral drugs such as tenofovir and entecavir are considered the main therapeutic agents for the treatment of chronic hepatitis B. At the same time, investigating additional therapeutic approaches aimed at protecting liver cells, reducing inflammatory processes, and limiting oxidative stress remains an important area of scientific research. From this perspective, the study of medicinal plants and their biologically active compounds is of particular importance. Licorice (Glycyrrhiza glabra L.) is one of the medicinal plants that has been used in traditional medicine and pharmaceutical practice since ancient times. Its chemical composition includes glycyrrhizin, glycyrrhetinic acid derivatives, flavonoids, isoflavonoids, and other biologically active substances. These compounds have attracted scientific interest due to their potential anti-inflammatory, antioxidant, and antiviral properties against certain viruses. The pharmacological properties of licorice are primarily associated with the active compounds present in its chemical composition. The plant root is particularly important as a source of glycyrrhizin. Glycyrrhizin belongs to the group of triterpenoid saponins and, following metabolism in the body, may produce glycyrrhetinic acid derivatives. These compounds may influence biological membranes, inflammatory mediators, and certain cellular signaling pathways. In addition, flavonoids found in licorice, including liquiritin, liquiritigenin, glabridin, and other compounds, are distinguished by their antioxidant properties. They may help limit oxidative stress caused by the effects of free radicals. However, the biological activity of licorice is not determined by a single compound, as the overall effect of the plant extract may depend on interactions among several different constituents. Furthermore, the chemical composition of the plant varies depending on its species, growing conditions, geographical origin, and processing methods. Therefore, when evaluating the effectiveness of licorice-based preparations, it is necessary to con-

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sider their chemical composition and degree of standardization. The antiviral properties of glycyrrhizin and its derivatives found in licorice have been investigated in numerous scientific studies. The biological activity of these compounds against certain viruses has been demonstrated in experimental studies, although their mechanisms of action may vary depending on the type of virus and the research model used. In processes associated with hepatitis B virus infection, the potential effects of glycyrrhizin-based preparations are investigated in relation to virological indicators and inflammatory processes in liver cells. The complexity of HBV infection is reflected in the persistence and replication of the virus in hepatocytes, as well as its interaction with the body's immune system. Therefore, evaluating antiviral activity requires the investigation of important virological markers, including HBV DNA levels, hepatitis B surface antigen (HBsAg), hepatitis B e-antigen (HBeAg), and other relevant indicators. Some studies have discussed the effects of glycyrrhizin-based preparations on HBsAg secretion and inflammatory processes in liver cells. However, these effects should not be equated with the complete elimination of the virus from the body. The biological activity of glycyrrhizin-based preparations may depend on their composition, dosage, duration of administration, and the patient's clinical condition. Therefore, additional high-quality clinical studies are required to determine the effectiveness of compounds found in licorice against hepatitis B. The hepatoprotective properties of licorice are associated with its biological effects, which may help protect liver cells from damage. In chronic hepatitis B, liver tissue injury is determined not only by the biological characteristics of the virus but also by the body's immune response to the infection and the associated inflammatory processes. Prolonged inflammation may lead to hepatocyte damage, the development of fibrosis in liver tissue, and impaired liver function. The anti-inflammatory properties of glycyrrhizin and certain flavonoids found in licorice are of scientific importance in relation to these processes. These compounds may influence the activity of certain inflammatory mediators and cellular signaling pathways. However, the extent to which mechanisms identified under laboratory conditions are manifested in clinical settings depends on the composition of the preparation, its pharmacokinetics, and the conditions of administration. Therefore, evaluating the hepatoprotective effects of licorice requires relying not only on theoretical mechanisms but also on the results of clinical studies. The antioxidant properties of biologically active compounds found in licorice also play an important role in investigating the mechanisms of liver protection. Oxidative stress occurs when the balance between the production of reactive oxygen species in the body and the antioxidant systems responsible for neutralizing them is disrupted. This process may contribute to damage to cell membranes, proteins, and other cellular structures. Flavonoids and other phenolic compounds present in licorice possess antioxidant activity, and their effects on free radical-related processes have been investigated in experimental studies. These properties help explain the potential role of licorice in liver protection. Nevertheless, the detection of antioxidant activity under laboratory conditions does not, by itself, prove clinical effectiveness in patients with chronic hepatitis B. Controlled clinical trials involving standardized preparations are necessary to establish such conclusions. The effects of glycyrrhizin-based preparations on liver function indicators have also been investigated in scientific literature. A network meta-analysis published by Gao et al. in 2023 evaluated the efficacy of glycyrrhizic acid preparations in patients with chronic hepatitis B. The analysis included 53 randomized controlled trials, and certain preparations were found to be associated with improvements in alanine aminotransferase (ALT) and aspartate aminotransferase (AST) levels. ALT and AST enzymes are important biochemical indicators used to assess liver cell injury. Increased activity of these enzymes may indicate damage to liver cells; however, these markers do not fully reflect all aspects of the disease. Although a decrease in enzyme levels may indicate a reduction in liver injury, it does not necessarily mean that the virus has been completely eliminated, fibrosis has stopped progressing, or the risk of cirrhosis has disappeared. Furthermore, the results obtained from studies of glycyrrhizin-based preparations cannot be directly generalized to all extracts of the Glycyrrhiza glabra L. plant, as their compositions and pharmaceutical properties may differ. Particular attention should also be paid to safety issues when evaluating the clinical significance of licorice-based preparations. Long-term administration or consumption of high doses of glycyrrhizin may cause adverse effects, including increased blood pressure, sodium and fluid retention in the body, and decreased potassium levels in the blood.

Such conditions are particularly important for individuals with existing cardiovascular and kidney diseases. The safety of licorice preparations depends on their composition, duration of administration, the patient's general health condition, and their interactions with other medications. Therefore, it is not appropriate to use licorice or glycyrrhizin-based preparations as independent treatments for hepatitis B. Their use should be individually evaluated by a qualified healthcare professional. According to the recommendations of the World Health Organization (WHO), antiviral medications that suppress viral replication, such as tenofovir and entecavir, play an important role in the treatment of chronic hepatitis B. Licorice-based preparations may be considered as an additional therapeutic approach only if their efficacy and safety are supported by appropriate clinical evidence. Future research should focus on standardizing the chemical composition of Glycyrrhiza glabra L., determining its glycyrrhizin content, investigating the mechanisms of action of its active compounds, and evaluating their interactions with other medications. In clinical studies, alongside ALT and AST levels, it is also necessary to analyze HBV DNA levels, HBsAg dynamics, liver fibrosis, adverse effects, and long-term clinical outcomes in patients. Such a comprehensive approach will help determine the actual therapeutic potential of biologically active compounds found in licorice. Furthermore, separate investigations of extracts obtained from different Glycyrrhiza species and standardized preparations will improve the accuracy of scientific findings. This will make it possible to assess more precisely the potential role of licorice-based preparations in the treatment of hepatitis B.

CONCLUSION: In conclusion, glycyrrhizin, glycyrrhetinic acid derivatives, and flavonoids found in licorice

(Glycyrrhiza glabra L.) have attracted scientific interest due to their antiviral, anti-inflammatory, antioxidant, and hepatoprotective properties. Existing studies suggest that certain glycyrrhizin-based preparations may have beneficial effects on liver enzyme levels. However, these findings do not prove that licorice can completely eliminate the hepatitis B virus or replace standard antiviral treatment. Therefore, further in-depth investigation of the antiviral and hepatoprotective properties of licorice in hepatitis B, standardization of the chemical composition of its preparations, and the implementation of high-quality clinical studies are necessary. Scientific research in this field may help determine more precisely the therapeutic potential of biologically active compounds found in licorice for the treatment of liver diseases in the future.

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