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THE EFFECT OF SUBSTANCES OBTAINED FROM THE PLANT LICIRICE (GLYCYRRHIZA glabra L) ON THE ORGANISM AND IMMUNE SYSTEM AFTER LIGHT THERAPY

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Abstract
Licorice root and its primary active component, glycyrrhizic acid, have long been studied for their therapeutic properties, including anti-inflammatory, antiviral, and hepatoprotective effects. This research investigates the effects of licorice root extract on the immune system, with a specific focus on its impact following radiation-induced secondary immunodeficiency. The study utilizes 25 male white red-eyed rats, which were exposed to light therapy using the Terabalt apparatus to induce immunodeficiency. Rats were divided into five groups, with varying treatments of glycyrrhizic acid solutions (0.01% and 0.03%) and Polyoxidonium, while a control group received no radiation. Antibody-producing cells, erythrocytes, and leukocytes were assessed post-treatment. Results indicated that glycyrrhizic acid significantly influenced the proliferation of T- and B-lymphocytes, highlighting its potential as a biostimulant to enhance immune function. These findings suggest that licorice root extract can play a crucial role in mitigating the adverse effects of radiation therapy and promoting immune recovery.

Keywords: Licorice, Glycyrrhizic acid, Terabalt apparatus, Antibody, Antigen, biostimulant, Immunity, Polyoxidonium drug.

Introduction

Licorice root has been studied and continues to be studied for its ability to treat many diseases since ancient times. In addition to studying the effects of licorice root extracts on the immune system, we also need to study the changes in the body after radiation therapy and the effects of licorice root extracts on them, and the effects of licorice root extracts on the immune system after radiation therapy. Glycyrrhizinic acid (GK) has been scientifically proven to have several therapeutic properties, such as anti-inflammatory, anti-ulcer, anti-allergic, antioxidant, anti-tumor, anti-diabetic, hepatoprotective, and is used for the treatment of. It is also used in the treatment of serious diseases such as premenstrual syndrome, general colds, viral infections,

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viral hepatitis, human immunodeficiency virus (HIV) and acquired immunodeficiency syndrome (AIDS) [1]. Licorice is a natural source of glycyrrhizin and is also an integral component of traditional Japanese Kampo medicines, and licorice extract is used in cosmetics, food supplements, tobacco, and confectionery [3]. The root extract of G. glabra is also known to act as an antilipidemic and antihyperglycemic agent [2]. In addition to these uses, glycyrrhizic acid is active against DNA and RNA viruses, including Herpes simplex, Varicella zoster, and human papillomaviruses. The antiviral effect is apparently due to the induction of interferon production. At concentrations that are not toxic to normal cells, it inhibits the replication of viruses [4]. In addition, glycyrrhizic acid may be used to prevent age-related immune involution and cognitive impairment. This has been confirmed by experiments on mice, which have shown its effect on
T-lymphocytes and B-lymphocytes by activating the proliferation of certain clones of them. [7]

The purpose of the work

To study the effect of licorice root solution on the body and determine the changes in the body under the influence of light therapy, to determine the effect of licorice root solution on the body after light therapy.

Materials and methods

Male white red-eyed rats, 2-3 months old and weighing 130-180g, were used for the study. The rats were kept under standard conditions with standard food and water. The room where the rats were kept was maintained at 20-28˚C and 50% humidity. The rats were kept in these conditions for 20 days before the experiment and were kept in normal conditions until the experiment. A total of 25 white red-eyed rats were used for the experiment. We prepared 0.01%, 0.03% of glycyrrhizic acid and polyoxidonium drug in the rat norm and injected them into the hind legs of the rats for 5 days. On the 6th day, antibody-producing cells in the spleen and erythrocytes and leukocytes in the blood were determined using the Yerne and Nordin method. As a model of secondary immunodeficiency, we exposed rats to light and thereby induced secondary immunodeficiency in rats. For light therapy, I used the “Terabalt” apparatus located at the “Republican Specialized Scientific and Practical Medical Center for Oncology and Radiology”. We exposed the rats to 3 gr of light and placed them in separate groups. After exposing the rats to light, they were kept in a room with a temperature of 20-28 ° C and 50% humidity for 10 days, then we treated them with drugs for 5 days and on the 6th day we determined the number of antibody-producing cells in the rats (injection). As a drug, 0.01%, 0.03% of Glycyrrhizin acid solution and 0.5 mg of Polyoxidonium were prepared and injected into the rat.

Secondary immunodeficiency: The rats were initially kept in normal conditions and separated into separate groups. Then, using the Terabalt apparatus located at the Republican Specialized Scientific and Practical Medical Center for Oncology and Radiology, the rats were exposed to 3G radiation. During the radiation exposure process, they were placed in separate cages, and the rats were placed in a small cage. The cages should not be made of iron because when exposed to radiation, the iron in their radiation can absorb or reduce the radiation. In this case,

the rats that received radiation may not receive the same amount, that is, some of the rats may receive less radiation, while others may receive more radiation. For our experiment to be successful, they must receive the same amount of radiation. Then, we can observe exactly how the drugs affect them when they are given the drug.
The cages were made of wood, in which a cage measuring 30 cm wide, 30 cm high and 10 cm thick was made and the rats were placed in groups, in which the rats were placed evenly inside the cage and through this we could send light to all parts of the rats at a uniform rate. Each group was sent a separate light, in which the light was sent not only from the top but also from the bottom. All the processes were monitored from the outside. After the light was sent, they were divided into groups for storage and kept in normal conditions and fed with normal food. After we sent light to the rats, we kept them in normal conditions for 10 days and monitored the changes in them, and starting from the 11th day, we gave them drugs for 5 days.

The sequence of the experiment. We needed 25 white rats with red eyes for our experiment. Initially, we kept the rats in normal conditions and fed them in a room with a temperature of 20-28˚C and 50% humidity. Then, in order to conduct radiation therapy on the rats, we used the "Terabalt" apparatus located at the "Republican Specialized Scientific and Practical Medical Center for Oncology and Radiology" to send 3G light to the rats. The rats were placed in a small cage with the rat. The cages should not be made of iron, because when they are exposed to light, the iron substance can absorb or reduce the light. In this case, the rats that received the light may not receive the same amount, that is, some of the rats may receive less light, while others may receive more light. For our experiment to be successful, they must receive light in a uniform amount, so that we can observe exactly how the drug affects them. The rats were placed in a wooden cage, i.e. a cage with a side of 30 cm, a height of 30 cm and a thickness of 10 cm, and were placed in groups with the rats. In this way, the rats were placed evenly inside the cage, and through this, we could send light to all parts of the rats in a uniform rate. Separate light was sent to each group, in which the light was sent not only from the top but also from the bottom. All processes were controlled and monitored from the outside because the effect of light can have a negative effect on humans. The room where the Terabalt apparatus was located was fully equipped with a camera and other equipment, and the processes such as how much light was sent were controlled and monitored from a computer located outside the room. We divided 25 rats into groups of 5, and out of these, 4 groups were placed in separate cages and taken to be exposed to light. The remaining 1 group of rats was taken as a healthy control. A total of 20 rats in the remaining 4 groups were exposed to light as described above. After the light was sent, the rats were kept under the same conditions for 10 days with normal food and moisture, and after 10 days, the drug was injected into their hind legs for 5 days, and all changes in the rats were recorded during this time.
Initially, the rats were divided into separate groups, and then 5 rats were taken into 5 groups, and then they were grouped together, resulting in a total of 25 rats.

Group 1. The rats were given radiation therapy and were kept in normal conditions for 10 days and fed. Then, starting from the 11th day, they were injected with 0.5 mg of 0.01% glycyrrhizin acid solution into the hind leg every day. The changes in the rats were monitored. All their

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changes were recorded. First, the rat masses were measured and found to be 137g, 130g, 160g, 150.56g, 144g. They were given the drug on the 5th day, and then the results were taken for analysis on the 6th day.

Group 2. Rats were sent for radiation therapy and were kept under normal conditions and fed for 10 days. Then, starting from the 11th day, 0.5 mg of 0.03% glycyrrhizin acid solution was injected into their hind legs every day. Changes in the rats were monitored. All their changes were recorded. First, the rat masses were measured and found to be 142.9 g, 150.56 g, 165 g, 160 g, 160 g, respectively. After the drug was administered on the 5th day, the results were taken for analysis on the 6th day.

Group 3. Rats were sent for radiation therapy and were kept in normal conditions and fed for 10 days. Then, starting from the 11th day, we determined the amount of Polyoxidonium drug per rat and started to inject it into the hind leg every day at 0.5 mg. Changes in the rats were monitored. All their changes were recorded. First, the rat masses were measured and it was determined that they were 160g, 135g, 138.15g, 165g, 128.69g, respectively. After the drug was administered to them on the 5th day, the results were taken from them for analysis on the 6th day.

Group 4. The rats were not subjected to radiation therapy, we used them as control rats, that is, we gave them 0.5 mg of NaCl solution every day, just like the rats that received radiation therapy. Their changes were minimal, and they were healthy rats, which is very effective for comparing them with sick rats and for observing the effects of radiation therapy. Their body weights were also measured and were found to be 140.5 grams, 141.29 grams, 170 grams, 175 grams, and 135.3 grams, and the results of the analysis were obtained from them.

Group 5. The rats were taken to the radiation therapy and were initially taken to a place under normal conditions and fed. After the radiation therapy, they were kept in normal conditions for 10 days. This group of rats was taken as a sick control, that is, the rats were given radiation therapy but they were kept as a control, that is, in order to study the difference between healthy rats and how the rats that were given radiation therapy reacted to the drug after being given the drug, and how the rats that were given radiation therapy reacted to the drug without any drug after the radiation therapy, that is, how the rats themselves reacted to the radiation therapy. This allows us to compare the rats after radiation therapy and how they changed after the drug was given to healthy and radiation therapy rats. This allows us to compare the rats that received radiation therapy with healthy and radiation therapy rats and see how the rats that were given the drug reacted. We will be able to analyze the changes. The weights of this group of rats were determined to be 151.3g, 138.9g, 153.1g, 141.2g, respectively. Like all rats, they were fed normal conditions and food for 10 days after radiation therapy. Starting from the 11th day, 0.5mg of NaCl solution was injected into the hind legs of the rats. It was injected for 5 days, and on the 6th day, the results were taken from them and recorded.

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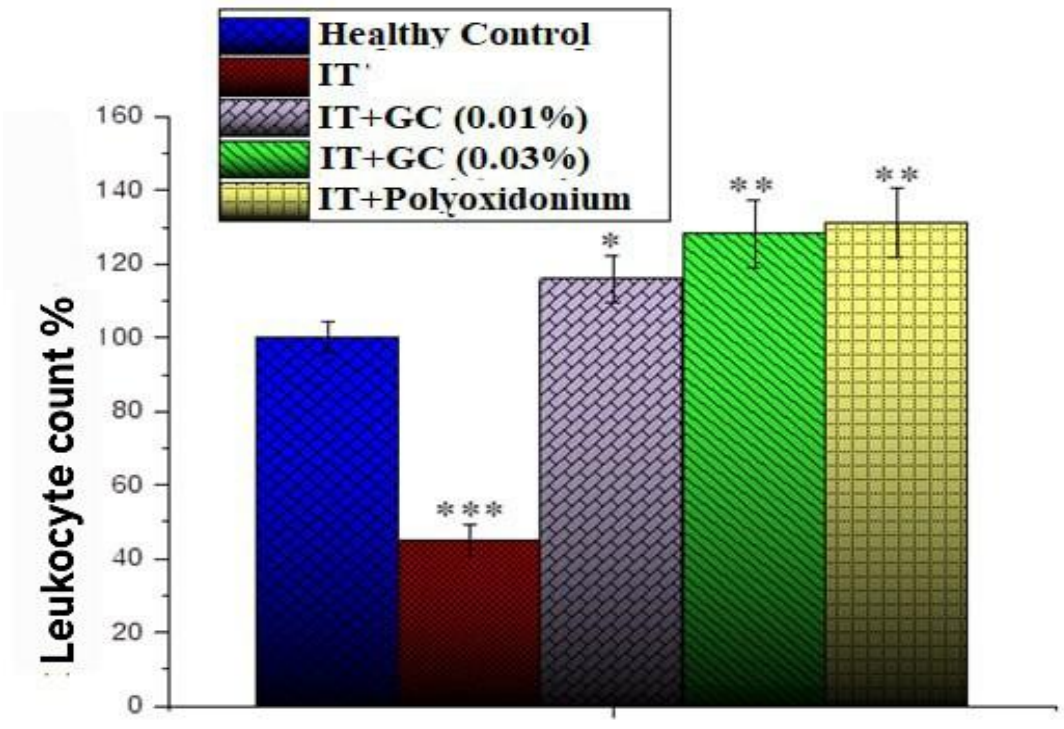
Table 1 To observe the effect of a solution prepared from natural glycyrrhizin on the immune system, comparing it with an immunostimulant at different doses in immunodeficiency (IT) (0.01%; 0.03%)M±m (n=25).

No.	Experiment groups	Leukocytes in the blood × 10^9/L	Red blood cells × 10^6/μL	Protein content in blood plasma g/l
1.	Healthy Control	3.6±0.27	8 ±0.47	7.24 ±0.49
2.	IT (light-exposed) P	2.3±0.17 ***	9.3 ±0.74 *	6.17 ±0.38 *
3.	IT+GC (0.01%) P	4± 0.42 *	7.5±0 , 41 *	9.88 ±0.45 **
4.	IT+GC (0.03%) P	4.3±0.38 **	9.4± 0.12 *	9.22 ±0.86 **
5.	IT+Polyoxidonium P	4.9±0.41 **	9.5 ±0.35 *	9.58 ±0.72 **



From experience expected result in rats immune system lifter medicine tools from the test transfer and this in line anise from the wire removable compounds immune to the system the secret of the effect to study their how normally to give this through their how much amount good strong effect to do to determine. Initially rats immune system how drugs and how effect to do tracked down, immune to the system anise solution good effect to do observation for various in quantity separate take their effect to do in rats your blood composition and proteins quantitative changes this including rats leukocytes amount changes observed. In experiments anise from the wire taken from compounds the most good effect to do quantitative indicators determined.

Table 2 between rats treated with a solution prepared from natural glycyrrhizin (n=25) were measured.

No.	Experiment groups	LEU +2 CEELL / UL	GO + mmoI / L -	URO + umoI / L 1	BIL - UmoI / L	PRO + - g / L	GLU + - mmoI / L	SG g/cm³	BLD +2 CELL/µL	pH mol/L	Vc +1 mmoI/L
1.	Hello . Control	56± 4.64	0.5 ±0.04	44 ±5.09	8.6 ±7.35	0.3 ±0.04	2.8 ±0.39	1.027 ±0.14	66 ±5.19	5.6 ±0.953	2.24 ±0.36
2.	IT (light-exposed)	88 ±7.98	0.5 ±0.02	49.5 ±3.76	8.6 ±7.05	0.3 ±0.06 g/L	2.8 ±0.270	1.02 ±0.16	101.7 ±9.17	6.1 ±0.75	1.2 ±0.78
3.	IT+GK (0.01%)	131 ±10.65	0.5 ±0.09	33 ±2.89	8.6 ±4.11	0.15 ±0.04	2.8 ±0.19	1.019 ±0.45	61.7 ±7,072	6.5 ±0.69	1.2 ±0.14
4.	IT+GK (0.03%)	70 ±6.56	0.5 ±0.01	44 ±3.71	8.6 ±3.65	0.44 ±0.03	2.8 ±0.187	1.029 ±0.19	136.7 ±8,176	6.1 ±0.48	1.2 ±0.36
5.	IT+Polyoxidoniu m	70 ±4.053	0.5 ±0.03	46 ±4.08	8.6 ±6.76	0.48 ±0.07	2.8 ±0.73	1.028 ±0.73	96.25 ±8.03	5.9 ±0.36	1.96 ±0.74

Conclusion

The experiments showed that different doses of solutions obtained from the licorice plant had different effects. At the same time, we monitored the changes in the rats after light therapy and were able to compare them with healthy rats. We wrote down the results and put them in a table. From the results, we could see that the secondary immune system of the rats after light therapy was affected and weakened, and when we gave them glycyrrhizinic acid, their immune system improved. We compared the results with healthy rats. The results obtained show that a 0.03% solution of glycyrrhizinic acid was more effective and improved immunity. Initially, it was observed that the immune system of the rats that received light therapy was significantly reduced compared to healthy rats, and this was also noticeable in their behavior.

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