Biological activity of the mummy. Publication 12: Effects on Certain Biochemical blood parameters: content of protein fractions and mineral metabolism

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SUMMARY

The results of numerous experimental studies to study the effect of mummy on some biochemical blood parameters are analyzed. It has been shown that mummy extract has a pronounced effect on mineral metabolism, as well as on some biochemical parameters of blood, in particular, on the content and ratio of protein fractions.

Key words: mummy, mummy extract, protein fractions, total protein, albumin,globulins, electrolytes, calcium, phosphorus, potassium, sodium, magnesium, iron, copper.

The spectrum of biological activity of mummy, described in numerous bibliographic sources, is very wide. Due to the fact that changes in the biochemical parameters of blood occur in various diseases, it seemed to us expedient in this publication to present the results of an information and analytical study on this topic.

This publication is a logical continuation of our previous works [8, 9], devoted to preclinical studies of the effect of mummy on some blood parameters.

I. Influence on the content of protein fractions

There are studies by N.A. Shelkovsky, O. I. Andreeva et al. (1965) by influenceoral and intravascular administration of mummy extract on the ratio of protein fractions of blood serum [11]. The experiments were carried out on 30 dogs, from which blood was taken from the femoral vein for analysis before the experiment and after 5-30-60-90 minutes from the start of administration of 40-20-10-5-1% solutions of the mummy extract intraarterially and 1% solution intravenously ... The total serum protein was determined refractometric [11].

In healthy dogs, total serum protein levels range from 6.1 to 7.7% (average 7.3 g%). With intra-arterial administration of 1 and 5% solutions of mummy extract, a decrease in the total amount of protein was found. The most pronounced decrease was observed with the introduction of a 1% solution of mummy extract: after 5 minutes - by 6%, after 60 minutes - by 18.3% and by the end of the experiment by 8.1% in relation to the initial data [11]. In other studies, N.A.Shelkovsky et al. (1972) an attempt was made to elucidate the effect of intravascularintroduction of mummy extract on the ratio of protein fractions [12].

There were 4 series of experiments (5 in a series) on adult dogs weighing from 12 to 21 kg. Blood for analysis was taken from the femoral vein before the experiment and after 5-30-60-90 minutes, 12 and 24 hours after intra-arterial injection of 1 and 5% solutions of mummy extract and intravenous - 1% solution at the rate of 1 ml of solution per 1 kg the weight of the animal.Series I (control group) consisted ofintact animals. It showed no noticeable fluctuations in the ratio of protein fractions. Albumin (units of measurement which are not indicated in the work) were 40.59-1.39; globulins - 7.24-0.29; 9.77-0.81; 11.93-0.35; 30.47-2.52 [12].

Series II consisted of animals that received intra-arterial 5% solution of mummy extract. In the first 1.5 hours after administration, there were no changes in the ratio of protein fractions ($P < 0.5$). Changes occurred after 12 and 24 hours and were expressed in an increase in the albumin fraction to 141% ($P < 0.05$) and a decrease in globulins to 60%, 24% at $P < 0.001$ [12].

Series III consisted of animals that received intra-arterial 1% solution of mummy extract. In the first 1.5 hours after administration, no pronounced changes in the ratio of protein fractions were also noted. The trend towards an increase in albumin occurred in the first minutes after administration and was within the statistical error ($P < 0.5$). By the end of the day, there was a decrease in globulin fractions and an increase in albumin ($P < 0.01$). The latter was the most pronounced and

accounted for 141% of the initial data [12].

Series IV consisted of animals that received intravenous 1% solution of mummy extract. In the first minutes, there was a gradual increase in the albumin fraction, which by the end of the day was 130% (P <0.01), and a sharp decrease in globulins to 21% (P <0.001) [12].

Thus, intra-arterial and intravenous administration of mummy extract was accompanied by a pronounced increase in the content of fine proteins and a decrease in the content of coarse proteins in the peripheral blood [12].

T.M. Tukhtaev (1972) in the study of biochemical parameters of blood andof hematopoietic organs, the positive effect of mummy extract on healthy animals (rats) was noted. So, when orally administered to healthy animals at 500 mg / kg of an aqueous solution of mummy extract for 2 weeks, it was noted: an increase in the total amount of protein in the serum, a change in protein fractions, the activity of transaminases, alkaline phosphatase, pseudocholinesterase, cholesterol, aldolase, mineral and nucleic acid exchanges [5].

The effect of mummy on the content of protein fractions during chronic exposure to benzene was studied by Yu.N. Nuraliev (1973) in experiments on 24 rabbits and 100 rats [3, 4]. Chronic poisoning was caused by daily (for 8 days) administration of benzene at a dose of 0.8 ml / kg (for rabbits) and at a dose of 1.6 ml / kg (for rats) [4].

It has been shown that chronic benzene intoxication contributes to a sharp and statistically significant (P <0.05–0.01) decrease in the total amount of protein and albumin fraction in blood serum [4]. Shilajit administered for therapeutic or prophylactic purposes at a dose of 150 mg / kg caused a statistically significant (P <0.01–0.001) increase in the content of total protein and albumin fractions of blood serum in rabbits and rats during all periods of the study [4].

The amount of γ-globulins (especially in rats) was higher in the experimental group of animals than in the control group. However, this increase, according to the authors, cannot be considered statistically significant (P> 0.1–0.2) [4].

Experiments on rabbits have shown that the protective effect of mummy and its positive effect on protein metabolism is best manifested in cases where drug treatment began from the 10th day of intoxication [3, 4]. A comparative study of the protoplastic effect of mummy and pentoxil showed that the latter at a dose of 30 mg / kg in the period from 7 to 14 days of the study significantly increased the content of total protein, albumin and γ-globulin fractions of blood serum in rabbits with chronic benzene poisoning. However, the severity and reliability of these effects when using pentoxil was much less than in experiments using mummy [3, 4].

The presence of dysproteinemia in benzene intoxication is apparently associated with a violation of the albumin-forming function of the liver and suppression of the function of the reticuloendothelial systems [4].

Studies of the effect of mummy on the protein composition of blood in experimental fractures of the long bones of animals were carried out by A.Sh. Shakirov (1965-1968, 1978) and N.M. Madzhidov et al. (1980). The results of these studies are presented in [6]. It was found that oral administration of Shilajit increases the content of protein fractions. As a result, the osmotic function of proteins is enhanced and the body's metabolic processes, including regenerative ones, are improved [6].

The improvement of protein-forming function is evidenced by the results influence mummy of studies by T.M. Mukhamedova et al. (1980) [2].

The effect of the Pamir mummy on the content of total protein and protein fractions in benzene cytopenia was studied by I. Aminzhonov (1981). Benzene cytopenia in rabbitsreproduced by subcutaneous injection of benzene at the rate of 0.8 ml / kg of body weight of the animal for 7 days. A complete complete blood count was performed in the initial state and on the 3rd, 8th, 15th, 22nd, 29th day after the last injection of benzene [1].

Rabbits I experienced (20) groups received the Pamir mummy orally from the first day from the beginning of benzene administration and within 14 days after it at the rate of 50 mg / kg of animal weight. AnimalsII control (35) the groups received 5.0 ml of saline solution at the same time,

as the test subjects [1].

In the course of the study, it was shown that the complete restoration of the amount of total protein in animals of the control group occurred on the 15th day of the experiment. In experimental animals, this indicator did not fall during all periods of the study, but, on the contrary, increased as a result of treatment. The amount of albumin in rabbits in the experimental group returned to normal on the 8th day; in control - on the 15th day of the experiment [1].

II. Effect on electrolyte metabolism

It is known that a violation of the exchange of calcium, phosphorus and electrolyte balance in the body leads to shifts in metabolic and recovery processes at the cell level, and affects the function of the kidneys, vascular and central nervous system.

ON. Shelkovsky and O.I. Andreeva (1965) studied the effect of various dosesextract of mummy on the concentration of electrolytes in the blood in acute experiments on dogs under light morphine-ether anesthesia. In six series of experiments, shifts in electrolyte concentration were studied upon intravascular administration of mummy extract at a concentration of 1% (10 mg / kg), 5% (50 mg / kg), 10% (100 mg / kg), 20% (200 mg / kg), 40% (400 mg / kg). In five series, the drug was administered intra-arterially, in the sixth - intravenously in the form of a 1% solution. Taking blood samples from experimental animals was carried out from the femoral vein at different times: before and 5, 30, 60, 90 minutes after drug administration [10].

The initial values (before the introduction of mummy) the concentration of potassium in the blood serum ranged from 17.5 mg% to 19 mg% (average 18 mg%). 5 and 30 minutes after administration of the drug, the concentration of potassium in the blood serum slightly changed upward or downward in comparison with the initial values. After 60 minutes, a regular drop in potassium concentration was noted: with intra-arterial administration of a 1% solution - by 4.8%, 5% - by 6.1%, and with intravenous administration of a 1% solution - by 8.6% in relation to original data. 90 minutes after intra-arterial injection of 1% and 5% solutions of mummy extract, the concentration of potassium in the blood continued to remain at a lower level compared to the initial values. With the intravenous administration of a 1% solution, an increase in the concentration of potassium was noted by 13.5%, after 60 minutes - by 4,

The initial values of sodium in all experimental animals in the blood serum ranged from 324 to 369 mg% (average 340 mg%). Chlorine levels in the blood range from 326 to 332 mg% (average 351 mg%). In the course of research, it was not possible to note any changes in the content of sodium and chlorine, regardless of the concentration and time of administration of the mummy extract [10].

The initial values of the content of inorganic phosphorus in the blood ranged from 5.01 to 5.96 mg% (average 5.40 mg%). In the course of the study, the following pattern was revealed: the degree of increase in the concentration of phosphorus in the blood depends on the time elapsed since the beginning of administration and the concentration of the injected drug. So, after 90 minutes, the phosphorus concentration, compared with the initial values, with intra-arterial administration of a 1% solution increased by 6.6%, and with the introduction of a 5% solution - by 25%. The most effective, in comparison with intra-arterial (6.6%), are intravenous (16%) [10].

The initial values of the magnesium content in the blood ranged from 2.3 to 3 mg% (on average 2.7 mg%). When analyzing the data obtained, the dependence of the magnesium concentration on the concentration of the administered drug was noted. So, with intra-arterial and intravenous administration of a 1% solution of mummy, the concentration of magnesium in the blood increased by 10.3% and 8.7%. With the introduction of a 5% solution of mummy extract, a decrease in magnesium in the blood was noted by 15.3% in relation to the initial data [10].

When analyzing the content of calcium in blood serum, a direct dependence of the calcium content on the concentration of the administered mummy extract was observed. With the introduction of 1% and 5% solutions of mummy extract, no changes in calcium concentration were observed throughout the experiment. With the introduction of higher concentrations of mumiyo extract, the level of calcium increased. So, 60 minutes after the introduction of a 10% solution, the calcium content in the blood increased by 8.4% and remained at this level until the end of the experiment [10].

5 minutes after the introduction of a 20% solution of mummy extract, the concentration of calcium

increased by 72.7%. By the end of the experiment, the latter reached 97.2%. 5 minutes after the introduction of a 40% solution, there was an increase in the calcium content in the blood by 20.9%, which by the end of the experiment reached 71.3% in relation to the initial data [10]. Yu.N. Nuraliev (1973 g) in Experiments on 40 rabbits and 90 white rats studied the effect of mummy on the content of calcium, phosphorus, potassium, sodium and chloride in the blood serum before and after 7-fold administration of benzene and on the next 7, 14, 21 days of treatment. In the control series, additional studies were carried out on the 35th day from the onset of intoxication. In a comparative aspect, the therapeutic effect of the drug pentoxil, which stimulates metabolic processes, was studied [3].

Research results have shown that when animals are poisoned with benzene, the concentration of calcium and phosphorus drops sharply. Conversely, the concentration of potassium and sodium rises sharply. Under the influence of mummy, there was a significant (P <0.01–0.001) increase in phosphorus and a slight decrease in potassium in the blood. Preliminary (before the injection of benzene) administration of mummy prevented benzene hypocalcemia for the entire duration of the study [3].

When comparing the effects of mummy and the metabolic process stimulator pentoxil, it was shown that the latter did not have a noticeable effect on the calcium content in the blood serum (P> 0.1), but contributed to a significant (P <0.01) increase in the phosphorus content in the blood serum: from 8.9 ± 1.0 to 12.1 ± 0.5 mg% (relative to 4.34 ± 0.10 - 5.00 ± 0.02 mg% in control animals). Shilajit, in contrast to pentoxil, somewhat reduced the content of sodium and chloride in the blood serum (P <0.05) [3].

Thus, the results of the studies carried out indicate that with benzene intoxication, mummy increases the content of calcium and phosphorus in the blood serum, normalizes the content of potassium. The authors explain the decrease in the content of sodium and chloride in the blood serum by the diuretic effect of the drug and a decrease in the content of fluid in the tissues [3].

It is well known that mineral metabolism is directly related to the processes of bone tissue regeneration. In this regard, the studies of some authors (R. Bekieva (1965), Z.I. Ibragimova (1970), A. Sh. Shakirov (1978) and N.M. Madzhidova et al. (1980))are devoted to the study of the composition and content of certain minerals in the blood of laboratory animals with experimental bone fractures. The results of these studies are presented in detail in [6]. It was shown that the maximum content of calcium, potassium and phosphorus in the blood is observed during the formation of callus. The introduction of mummy led to a rapid and sharp increase in the level of vital macro- and microelements: copper, manganese, iron and cobalt in the blood and bone regenerate [6].

Studies by other authors (K.Yu. Yuldashev and S.K. Saidkarimov (1978), M.F. Fazylova and T.R. Khalikov (1978)) are devoted to the study of the effect of mummy on the leveltrace elements in experimental myocardial infarction. An increase in the content of iron and copper under the action of mummy in experimental myocardial infarction has been shown, which contributes to the intensification of the oxidative process in the affected organ [7]. Copper is also involved in the mobilization of carbohydrates. Therefore, the increase in its content in the affected areas under the influence of mummy can be regarded as an adaptive response of the body [7].

The effect of the Pamir mummy on the metabolism of some post-hemorrhagic anemia trace elements was studied by I. Aminzhonov (1981) on two groups of dogs [1]. I experienced (18) a group of animals received the mummy inside at the rate of 5 mg / kg of body weight for 14–21 days. II control (12) - received 5.0 saline solution for 14-21 days [1].

After bloodletting, animals of both groups developed anemic syndrome and increased copper content. The maximum increase in copper concentration was observed in dogs of the control group on the 12th and 14th days after phlebotomy. During this period, the blood of control dogs had the lowest levels of serum iron and hemoglobin [1].

In the course of studies of animals with acute post-hemorrhagic anemia, the authors revealed a correlation between the content of hemoglobin and serum iron, on the one hand, and the concentration of copper in the plasma, on the other: a decrease in the content of hemoglobin and serum iron, accompanied by an increase in the concentration of copper in the plasma. That is, the accumulation of copper in plasma increases according to the severity of anemia [1]. A slight increase in the concentration of copper in dogs of the experimental group compared with animals in the control group

group is explained by the fact that in the experimental group the decrease in the amount of hemoglobin and serum iron was less pronounced [1].

III. The discussion of the results

The results of the information and analytical research carried out were summarized by us in Table 1.

From the data in table 1 it can be seen that under the influence of mummy there is an increase in the total amount of protein in the blood serum; an increase in the content of fine and a decrease in the content of coarse proteins in the peripheral blood; increasing the content of protein fractions. As a result, the osmotic function of proteins is enhanced and the body's metabolic processes, including regenerative ones, are improved. The introduction of mummy is accompanied by a significant increase in the content of iron and copper in experimental myocardial infarction, which contributes to the intensification of the oxidative process in the affected organ.

Mumiyo preparations for benzene intoxication cause a significant increase in the level of calcium and phosphorus in the blood of rabbits and white rats. This is most clearly manifested during the formation of callus, which indicates the stimulation of bone tissue regeneration by mummy preparations.

IV. Conclusion

On the basis of numerous experimental studies, mummy preparations can be considered promising drugs for the treatment of disorders of macro- and microelement metabolism of various etiologies. However, in order to introduce mummy preparations into clinical practice, it is necessary to conduct experimental and clinical studies on standardized samples of dry mummy extract for all of the listed indications. In this case, special attention should be paid to scientifically grounded selection of doses and routes of administration of dry mummy extract in each specific case.

Table 1

The effect of mummy on some biochemical blood parameters

№ п/п	Автор исследования, библиографическая ссылка	Год	Характеристика объекта исследования				Результаты исследований
			Название препарата и его концентрация	Способ и дозы введения	Опытные животные или объект исследования	Место отбора проб мумиё	
I. Влияние на содержание белковых фракций							
1.	Н.А.Шелковский, О.И. Андреева и др. [11]	1965	экстракт мумиё	внутрисосудистое	собаки	не указано	При внутриартериальном введении 1 и 5 % растворов экстракта снижается общее количество белка. Максимальное снижение – при введении 1 % раствора: через 5 мин. – на 6 %, через 60 мин. – на 18,3 % и к концу опыта на 8,1 % по отношению к исходному.
2.	Н.А. Шелковский, С.Е. Шелковская [12]	1972	экстракт мумиё	Внутриартериальное и внутривенное	собаки	не указано	Увеличивается содержание в периферической крови мелкодисперсных белков и уменьшается – грубодисперсных белков.
3.	Т.М. Тухтаев [5]	1972	экстракт мумиё	пероральное по 500 мг/кг водного раствора в течение 2-х недель	крысы	не указано	Увеличивается общее количество белка в сыворотке, изменяются белковые фракции, активность трансаминаз, щелочной фосфатазы, псевдохолинэстеразы, холестерина, альдолазы, минерального и нуклеинового обменов.
4.	Ю.Н. Нуралиев [3, 4]	1973 – 1977	водный экстракт мумиё	пероральное – 150 мг/кг	кролики (24), крысы (100)	Средняя Азия, Забайкалье	Повышается содержание общего белка и альбуминовых фракций сыворотки крови. Защитное действие мумиё и его положительное влияние на обмен белков оптимально проявляется при начале лечения с 10-го дня интоксикации.
5.	А.Ш. Шакиров [6]	1965 – 1968	мумиё	пероральное с пищей в разовой дозе: – 0,2 г в течение 10 дней; – 0,1 г в течение 25 дней; – 0,1 г в течение 30 дней; – 0,1 г в течение 40 дней; – 0,15 г в течение 20 дней и 0,1 г в течение 30 дней.	собаки и кролики	Средняя Азия	Увеличивается содержание белковых фракций, усиливается осмотическая функция белков и улучшаются обменные процессы.
6.	Н.М. Маджидов с соавт. [6]	1980	мумиё	пероральное с пищей в разовой дозе: – 0,1 г в течение 25 дней; – 0,1 г в течение 10 дней; – 0,2 г в течение 10 дней; – 0,15 г в течение 20 дней и 0,1 г в течение 30 дней.	собаки и кролики	Средняя Азия	Увеличивается содержание белковых фракций.
7.	Т.М. Мухамедов с соавт. [2]	1980	мумиё	не указано	не указано	не указано	Улучшается белковообразовательная функция печени.
8.	И. Аминжонов [1]	1981	мумиё	пероральное из расчета 50 мг/кг массы животного	кролики	Памир	Увеличивается количество общего белка во все сроки исследования. Нормализуется количество альбуминов.
II. Влияние на обмен электролитов							
9.	Ю.Н. Нуралиев [3, 4]	1973 – 1977	водный экстракт мумиё	пероральное – 150 мг/кг	кролики (40), белые крысы (90)	Средняя Азия, Забайкалье	Увеличивается содержание фосфора, незначительно понижается содержание калия в крови. Превентивное введение мумиё предотвращало бензоловую гипокальциемию на весь период исследования.

№ п/п	Автор исследования, библиографическая ссылка	Год	Характеристика объекта исследования				Результаты исследований
			Название препарата и его концентрация	Способ и дозы введения	Опытные животные или объект исследования	Место отбора проб мумиё	
10.	Н.А. Шелковский и О.И. Андреева [10]	1965	экстракт мумиё	Внутривенное, внутриартериальное	собаки	не указано	Незначительно изменяется концентрация калия в сыворотке крови через 5 и 30 минут после введения. Через 60 минут понижается концентрация калия: при внутриартериальном введении 1 %-ного р-ра – на 4,8 %, 5 %-ного – на 6,1 %; при внутривенном введении 1 %-ного р-ра – на 8,6 % по отношению к исходным данным. Содержание натрия и хлора не изменяется. При внутривенном введении 1 %-ного р-ра концентрация калия повышается на 13,5 %, через 60 минут – на 4,5 % по сравнению с исходной. Повышение концентрации фосфора в крови зависит от времени с начала введения и концентрации экстракта. Концентрация магния в крови зависит от концентрации вводимого экстракта. При внутриартериальном и внутривенном введении 1 %-ного р-ра мумиё, концентрация магния увеличивалась на 10,3 % и 8,7 %; 5 %-ного р-ра уменьшалась на 15,3 % по сравнению с исходной. Установлена прямая зависимость содержания кальция от концентрации вводимого экстракта: при введении 1 %-ного и 5 %-ного р-ров изменения концентрации кальция отсутствовали; при введении более высоких концентраций экстракта содержание кальция повышалось.
11.	Р. Бекиев [6]	1965	мумиё	через зонд 7 % раствор из расчёта 1 см³ на 1 кг веса	кролики	не указано	Способствует повышению уровня кальция и фосфора в крови.
12.	З.И. Ибрагимов [6]	1970	мумиё	нет данных	кролики	не указано	Способствует быстрому и резкому повышению уровня меди, марганца, железа и кобальта в крови и костном регенерате при экспериментальном переломе.
13.	А.Ш. Шакиров [6]	1965–1968	мумиё	пероральное (дозы см. п. 5)	собаки и кролики	Средняя Азия	Активизирует минеральный обмен: повышает уровень кальция, калия и фосфора.
14.	Н.М. Маджидов с соавт. [6]	1980	мумиё	пероральное (дозы см. п. 6).	собаки и кролики	Средняя Азия	Активизирует минеральный обмен: повышает уровень кальция, калия и фосфора.
15.	В.Н. Исмаилова [6]	1965	мумиё-асиль	0,01-0,05-0,1-0,2 г/кг	кролики	не указано	Способствует повышению уровня кальция и фосфора в крови.
16.	К.Ю. Юлдашев и С.К. Саидкаримов [7]	1978	мумиё-асиль	перорально 200 мг/кг	кролики-самцы породы шиншилла весом 2,5–3 кг	не указано	Нормализует содержание железа в очаге некроза сердца на фоне его увеличения в остальных зонах. Снижает уровень меди в очагах некроза сердца на фоне увеличения ее содержания в перинекротической и отдаленной зонах.
17.	М.Ф. Фазылов и Т.Р. Халиков [7]	1978	мумиё	перорально в дозе 200 мг/кг	кролики	не указано	Способствует нормализации уровня и перераспределению железа и меди в сердце.

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