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INFLUENCE OF MUMIJO ON COAGULATION AND FIBRINOLYTIC ACTIVITY

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Abstract: Mumijo (Shilajit) is a traditional herbo-mineral substance widely used for its reported therapeutic and biological properties. The present study evaluated the effects of Mumijo on selected coagulation and fibrinolytic parameters. Blood clotting time, plasma recalcification time, plasma tolerance to heparin, thrombin time, fibrinogen concentration, fibrinolytic activity, and total plasma protein were assessed at baseline and after 30 and 60 minutes of administration. Mumijo produced a marked prolongation of blood clotting time and thrombin time. Plasma recalcification time and plasma tolerance to heparin also increased progressively during the observation period. Fibrinolytic parameters showed a significant time-dependent change at 60 minutes, while fibrinogen concentration showed a temporary reduction. Total plasma protein remained relatively stable. These findings suggest that Mumijo may influence the coagulation–fibrinolytic system and may possess hemostasis-modulating or anticoagulant properties. Further studies are required to determine the underlying mechanisms, dose dependence, safety, and clinical significance of these effects.

Introduction

Traditional medicine (TM) represents an extensive and culturally diverse body of knowledge, practices, skills, and therapeutic approaches that have been transmitted, modified, and developed across generations within different societies. Its foundations are generally based on cultural traditions, accumulated empirical experience, observations of natural phenomena, and long-established healing practices. Traditional medicine is used not only to maintain general health and well-being but also for the prevention, recognition, diagnosis, and management of a wide range of physical and psychological disorders (1). Although many traditional practices originated independently of modern biomedical science, increasing scientific interest in recent decades has encouraged systematic investigation of medicinal plants, minerals, animal-derived products, and other naturally occurring substances used in traditional healthcare. Such research has identified numerous biologically active compounds and has provided evidence suggesting that some traditional remedies may possess antioxidant, anti-inflammatory, antimicrobial, immunomodulatory, metabolic, or other pharmacological properties, thereby creating opportunities for the development of novel therapeutic agents (2).

Traditional medicine is represented by several established medical systems, including Traditional Persian Medicine (TPM), Traditional Arabic Medicine, Traditional Chinese Medicine (TCM), and Ayurveda, the traditional medical system of India (3). These systems differ in their theoretical frameworks, diagnostic approaches, therapeutic methods, and materia medica, yet they share an important reliance on naturally derived substances. Among the natural materials historically incorporated into these systems, Mumijo occupies a particularly distinctive position because of its unusual origin, complex chemical composition, and long history of medicinal application. The substance is known internationally by numerous names reflecting the languages and cultural traditions of different regions, including Shilajit in Hindi, Silajatu in Bengali, Rock Juice in Tibetan, Conqueror of Mountains in Sanskrit, Hajarul-Musa in Arabic, Moomiaii in

Persian, Myemu in Russian, and Mumie in German. Mumijo is generally described as a viscous, resinous, pale-brown to dark-brown natural material and is also commonly characterized as mineral pitch or mineral wax. Its distinctive appearance, mountain-associated origin, and traditional reputation have contributed to its use for more than 3,000 years, particularly as a rejuvenating, restorative, strengthening, and adaptogenic substance (4). The formation of Mumijo is not yet completely understood, and three major explanatory concepts have traditionally been proposed: biological, geological, and bio-mineralogical theories. According to the biological hypothesis, Mumijo develops through the prolonged degradation and transformation of plant-derived organic material and possibly animal excretions under particular environmental and physicochemical conditions. Microbial activity, temperature, moisture, pressure, and prolonged exposure to the surrounding environment may contribute to the progressive transformation of precursor materials into the complex organic matrix characteristic of Mumijo.

The geological hypothesis, in contrast, emphasizes the contribution of long-term geological processes and physicochemical transformations occurring within mountainous rock formations. The bio-mineralogical theory integrates these perspectives by proposing that Mumijo may arise through interactions between organic precursors and the mineral constituents of the surrounding geological environment, resulting in an organo-mineral complex with characteristics that cannot be attributed exclusively to either biological or geological sources. The chemical and potentially biological properties of the final product may therefore depend strongly on environmental factors, including the species and abundance of local vegetation, geological and soil composition, altitude, temperature, humidity, microbial activity, and other regional conditions (7). Such environmental variability may explain why Mumijo collected from different geographical locations can exhibit differences in color, viscosity, mineral content, organic composition, and biological activity. In general, Mumijo has been reported to contain approximately 60–80% organic material and 20–40% inorganic constituents, with a broad spectrum of mineral and trace elements, including iron (Fe), calcium (Ca), copper (Cu), zinc (Zn), magnesium (Mg), manganese (Mn), molybdenum (Mo), and phosphorus (P) (8). The organic fraction is particularly important from a pharmacological perspective because it contains humic substances, fulvic acids, humic acids, dibenzo-alpha-pyrones, and other chemically diverse constituents that may contribute to the biological effects attributed to the material. The mineral fraction may likewise contribute to its overall physicochemical properties, although the presence of minerals should not automatically be interpreted as evidence of therapeutic efficacy. The historical importance of Mumijo is especially evident in the literature of Persian medicine, where it has been discussed by several influential physicians and scholars. During the 10th century, Ahvazi, in Kamāl as-Sanā'a, recommended Mumijo for several conditions, including cold-related headaches, hemoptysis, and asthma. Avicenna subsequently described Mumijo in The Canon of Medicine and regarded it as a potent tonic that could be used to strengthen the brain, support fertility, and address a variety of other health conditions. Later, during the 12th century, Jurjani documented the use of Mumijo in Zakhire Khwārizmshāhi, describing applications associated with inflammatory conditions, ulcers, and disorders affecting the urinary tract and prostate (5). These historical accounts demonstrate that Mumijo was not regarded merely as a single-purpose remedy but was traditionally incorporated into a broader therapeutic framework in which its perceived strengthening, restorative, and systemic effects were considered relevant to multiple disorders. In traditional medical practice, Mumijo has subsequently been administered in different quantities and formulations for a broad range of conditions, including urinary tract disorders, jaundice, gallstones, gastrointestinal disturbances, enlargement of the spleen, epilepsy, hypersensitivity reactions, neurological disorders, chronic bronchitis, tuberculosis, eczema, anemia,

and diabetes mellitus (9). The extensive range of traditional indications has contributed to continuing scientific interest in Mumijo; however, traditional therapeutic use and modern clinical efficacy should be considered separately, because historical application does not by itself establish effectiveness or safety according to contemporary evidence-based medical standards. One of the major obstacles to the wider medicinal utilization of naturally collected Mumijo is the possibility of biological contamination, particularly contamination by fungi and associated mycotoxins. Such contaminants can arise during collection, environmental exposure, processing, or inappropriate storage and may significantly affect the safety and quality of the final product (10). Consequently, appropriate purification, authentication, microbiological testing, contaminant screening, and standardized quality-control procedures are important when Mumijo is considered for pharmaceutical, nutraceutical, or other biomedical applications. In addition to its historical applications, traditional practitioners have attributed a broad spectrum of pharmacological and physiological effects to Mumijo. These include aphrodisiac and anti-inflammatory activities as well as applications in musculoskeletal conditions such as bone fractures, arthritis, and spondylitis. Traditional use has also extended to the management of edema and hemorrhoids, promotion of rejuvenation and recovery, enhancement of wound healing, and regulation of metabolic processes (7). From a biochemical perspective, particular interest has been directed toward the humic and fulvic acid fractions of Mumijo. These chemically complex substances have been associated experimentally with antioxidant, anti-inflammatory, antimutagenic, and immunomodulatory activities, and these properties have contributed to hypotheses concerning a possible role in cancer prevention or treatment (8).

These findings have generated interest in the possible antidiabetic and cardiometabolic properties of Mumijo, although further mechanistic studies and controlled clinical investigations are necessary to establish whether similar effects occur in humans. Other experimental observations have suggested that Mumijo may stimulate nucleic acid synthesis and facilitate the transport or utilization of minerals within tissues such as skeletal muscle and bone, which may provide a possible biochemical basis for some of its traditionally described restorative and strengthening effects (4). In addition, Mumijo has been associated with increased diuresis and natriuresis, indicating potential effects on renal handling of water and sodium and possibly contributing to some of its traditional applications involving fluid balance and urinary disorders (12). The diverse biological activities attributed to Mumijo may arise from the combined actions of its numerous organic and inorganic constituents rather than from a single active compound. Its chemical complexity also means that geographical origin, collection conditions, purification procedures, extraction methods, and storage can substantially influence the composition and biological activity of different preparations. Therefore, standardization of Mumijo preparations is essential for meaningful comparison between experimental studies and for ensuring reproducibility, quality, and safety. Overall, the extensive historical use of Mumijo within Traditional Persian Medicine, Ayurveda, Traditional Arabic Medicine, and other traditional healthcare systems, together with findings from experimental investigations, identifies it as a chemically complex natural product with potentially multifaceted biological activities. Its reported antioxidant, anti-inflammatory, immunomodulatory, metabolic, tissue-supportive, and other pharmacological properties provide a rationale for continued investigation, while its compositional variability and potential contamination highlight the importance of rigorous toxicological evaluation and quality control (7,8,10,11,12). Further research integrating pharmacognosy, analytical chemistry, molecular pharmacology, toxicology, and clinical science may help clarify the active constituents, mechanisms of action, therapeutic doses, safety profile, and clinical relevance of Mumijo and

determine which of its numerous traditional applications can be supported by modern scientific evidence.

Materials and Methods.

The study was conducted on 10 clinically healthy adult dogs (n = 10) of both sexes, weighing 12–18 kg. All animals were maintained under standard vivarium conditions with free access to water and a balanced diet. The experimental protocol was approved by the Institutional Animal Ethics Committee and complied with international principles of humane animal treatment.

The animals received an aqueous extract of Alai mumiyo orally at a dose of 25 mg/kg body weight. Blood samples were collected from the cephalic vein at three time points: before administration (baseline), 30 minutes after administration, and 60 minutes after administration.

Venous blood was drawn into tubes containing 3.8% sodium citrate (9:1 ratio). The samples were centrifuged at 3000 rpm for 15 minutes to obtain platelet-poor plasma, which was used for coagulation tests.

Data are presented as mean ± standard error of the mean (SEM). Differences between time points were evaluated using Student's t-test. Differences were considered statistically significant at $p < 0.05$.

Results and Discussion

Administration of the Alai mumiyo extract at a dose of 25 mg/kg caused marked changes in several indices of the blood coagulation system in dogs. The results are presented in Table 1.

Table 1. Effect of Alai Mumiyo Extract at a Dose of 25 mg/kg on Some Blood Coagulation Parameters in Dogs (n = 10) (time in seconds unless otherwise stated)

Parameter	Baseline	After 30 min	After 60 min
Blood clotting time	354 ± 30	↑900*	↑900*
Plasma recalcification time	94 ± 10	134 ± 12	149 ± 13*
Plasma tolerance to heparin	292 ± 34	473 ± 44*	425 ± 36*
Thrombin time	13 ± 2.2	72 ± 15*	72 ± 15*
Fibrinogen (mg %)	330 ± 46	260 ± 34	290 ± 33
Fibrinolytic activity (min)	79 ± 4.5	90 ± 4.2	136 ± 11*
Total protein (g %)	7.8 ± 0.3	7.8 ± 0.3	8.0 ± 0.3

Statistically significant differences ($p < 0.05$) compared with baseline values.

The coagulation profile demonstrated a marked time-dependent effect following Mumijo administration. Blood clotting time increased from 354 ± 30 s at baseline to 900 s at both 30 and 60 min, representing a substantial prolongation. Plasma recalcification time also increased progressively from 94 ± 10 s to 134 ± 12 s at 30 min and 149 ± 13 s at 60 min, with the 60-min value showing statistical significance. Plasma tolerance to heparin increased from 292 ± 34 s to 473 ± 44 s at 30 min and remained elevated at 425 ± 36 s at 60 min. Similarly, thrombin time increased markedly from 13 ± 2.2 s to 72 ± 15 s at both post-treatment intervals. These findings collectively indicate that Mumijo may exert an anticoagulant or inhibitory influence on several stages of coagulation. Fibrinolytic activity increased from 79 ± 4.5 min at baseline to 90 ± 4.2 min after 30 min and significantly to 136 ± 11 min after 60 min, suggesting a time-dependent alteration in

fibrinolytic processes. Fibrinogen concentration decreased initially from 330 ± 46 to 260 ± 34 mg%, followed by partial recovery to 290 ± 33 mg%, although these changes were not marked as significant. Total protein remained essentially unchanged (7.8 ± 0.3 to 8.0 ± 0.3 g%), indicating that the observed coagulation changes were unlikely to result from major alterations in overall plasma protein concentration. Overall, the results suggest that Mumijo significantly modifies hemostatic parameters, particularly clotting time, thrombin time, heparin tolerance, and fibrinolytic activity. Further studies are required to clarify the underlying mechanisms and determine the clinical relevance of these effects.

Conclusion

The findings indicate that Mumijo has a pronounced influence on hemostatic function, characterized mainly by prolongation of blood clotting time, plasma recalcification time, thrombin time, and plasma tolerance to heparin, together with increased fibrinolytic activity. These effects became more evident with increasing observation time, particularly after 60 minutes, suggesting a time-dependent modulation of the coagulation–fibrinolysis system. The relatively stable total plasma protein concentration indicates that the observed changes were not associated with substantial alterations in overall protein levels, while the modest changes in fibrinogen suggest that other components of the coagulation pathway may contribute to the observed response. Overall, Mumijo may possess anticoagulant and/or hemostasis-modulating properties; however, further studies are necessary to identify the specific mechanisms involved, establish dose-dependent effects, and evaluate its safety and clinical significance, particularly in individuals with coagulation disorders or those receiving anticoagulant therapy.

References

1. Qi Z, Kelley E. The WHO Traditional Medicine Strategy 2014-2023: A perspective. Science. 2014;346:S5-S6.
2. “WHO Traditional Medicine Strategy 2014-2023”. World Health Organization Retrieved 2014-04-20. 2013.
3. Shahriari M, Zare F, Nimrouzi M. The Curative Role of Bitumen in Traditional Persian Medicine. Acta Med Hist Adriat. 2018;16(2):283-92.
4. Olivieri MF, Marzari F, Kesel AJ, Bonalume L, Saettini F. Pharmacology and psychiatry at the origins of Greek medicine: The myth of Melampus and the madness of the Proetides. J Hist Neurosci. 2017;26(2):193-215.
5. Shirbeigi L ZA, Naghizadeh A, Alizadeh Vaghasloo M. The Concept of Temperaments in Traditional Persian Medicine. Trad Integr Med. 2017;2(3):143-56.
6. Frolova N, Kiseleva L, Tatiana. Chemical composition of mumijo and methods for determining its authenticity and quality (a review). Pharma Chem J. 1996;30(8):543-7.
7. Agarwal SP, Khanna R, Karmarkar R, Anwer MK, Khar RK. Shilajit: a review. Phytother Res. 2007;21(5):401-5.
8. Verma A, Kumar N, Gupta L, Chaudhary S. Shilajitin Cancer Treatment: Probable Mode of Action. Int J Pharmaceutic Bio Arch. 2016;7(1):12-6.
9. Stohs SJ, Singh K, Das A, Roy S, Sen CK. 12-Energy and Health Benefits of Shilajit. In: Bagchi D, editor. Sustained Energy for Enhanced Human Functions and Activity. Academic Press; 2017. p. 187-204
10. Ghosal S, Lal J, Singh SK, Goel RK, Jaiswal AK, Bhattacharya SK. The need for formulation of Shilajit by its isolated active constituents. Phytother Res. 1991;5(5):211-6

11. Trivedi N, Mazumdar B, Bhatt J, Hemavathi K. Effect of shilajit on blood glucose and lipid profile in alloxaninduced diabetic rats. Indian J Pharmacol. 2004;36(6):373-6.
12. Загрутдинов Ф.Ф., Мамадалиев Ш.И., Болтабоева Д.Ф. Влияние Среднеазиатских Видов Мумиё на диурез и натрий урез у Крыс. Open Herald: Periodical of Methodical Research. Volume 2, Issue 5, May, 2024, 12-14