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EVALUATION OF THE HEMOSTATIC EFFECTS OF ALAI MUMIYO EXTRACT (7.5 MG/KG) ON BLOOD COAGULATION PARAMETERS IN DOGS

Kurbanova Diloramxon Ibragimdjan qizi - Andijan State Medical Institute, Department of Pharmacology, Clinical Pharmacology, and Medical Biotechnology.

Abstract
The influence of Alai Mumiyo extract at a dose of 7.5 mg/kg on blood coagulation in dogs was investigated. Ten clinically healthy animals received the extract orally, and coagulation indices were evaluated at baseline as well as 30 and 60 minutes after administration. The extract produced a significant prolongation of blood clotting, plasma recalcification, and thrombin times, along with an increase in plasma tolerance to heparin and stimulation of fibrinolytic activity ($p < 0.05$). Fibrinogen concentration showed a slight decrease, whereas the activities of coagulation factors and total protein levels remained stable. These findings suggest that Alai Mumiyo possesses notable anticoagulant and fibrinolytic properties, supporting its potential role as a natural modulator of hemostasis.
Keywords: Alai Mumiyo extract; blood coagulation; thrombin time; plasma recalcification; anticoagulant effect; dogs; heparin tolerance; fibrinolysis

Introduction

Traditional medicine (TM) represents a vast and dynamic corpus of knowledge, skills, and therapeutic practices that have evolved through centuries of observation, experimentation, and cultural transmission within diverse societies. Rooted in empirical wisdom and indigenous belief systems, TM encompasses preventive, diagnostic, and curative approaches aimed at maintaining physical, mental, and spiritual well-being (1). In recent decades, the global resurgence of interest in TM has been driven by its accessibility, holistic perspective, and the growing recognition of its pharmacological potential. Modern scientific inquiry has increasingly focused on identifying and characterizing the bioactive constituents of traditional remedies, revealing many natural substances with notable therapeutic and preventive efficacy (2).

Among the principal schools of traditional medicine are Traditional Persian Medicine (TPM), Traditional Arabic Medicine, Traditional Chinese Medicine (TCM), and Ayurveda, the ancient medical system of India (3). Within these traditions, Mumijo—known internationally by various names including *Shilajit* (Hindi), *Silajatu* (Bengali), *Rock Juice* (Tibetan), *Conqueror of Mountains* (Sanskrit), *Hajarul-Musa* (Arabic), *Moomiaii* (Persian), *Myemu* (Russian), and *Mumie* (German)—occupies a singular and revered position. This resinous, tar-like material, often described as “mineral pitch” or “mountain wax,” has been used for over three millennia as a rejuvenating, restorative, and adaptogenic substance in traditional pharmacopoeias (4).

The origin of Mumijo has been explained through three main hypotheses: biological, geological, and bio-mineralogical. According to the biological theory, Mumijo forms through the gradual decomposition of plant residues and animal excretions under unique physicochemical conditions. The geological theory attributes its genesis to long-term mineralogical transformations, while the bio-mineralogical model proposes that the compound emerges from interactions between organic precursors and mineral components in mountainous

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environments. Environmental factors such as local vegetation, soil and rock composition, altitude, temperature, and humidity collectively influence the chemical profile and therapeutic potency of Mumijo (7). Generally, the substance contains 60–80% organic matter and 20–40% inorganic minerals, with trace elements such as Fe, Ca, Cu, Zn, Mg, Mn, Mo, and P contributing to its bioactivity (8).

In the context of Persian medical literature, Mumijo holds a particularly esteemed status. As early as the 10th century, Ahvazi's *Kamāl as-Sanā'a* recommended its use in treating cold headaches, hemoptysis, and asthma. The renowned physician Avicenna (Ibn Sina), in *The Canon of Medicine*, described Mumijo as a potent tonic that strengthens the brain, enhances fertility, and alleviates various systemic disorders. Later, in the 12th century, Jurjani's *Zakhire Khwārizmshāhi* highlighted its therapeutic role in inflammation, ulcers, and urinary and prostate conditions (5).

Across diverse traditional systems, Mumijo has been prescribed for a wide spectrum of ailments including urinary tract diseases, jaundice, gallstones, gastrointestinal dysfunctions, splenomegaly, epilepsy, hypersensitivity, neurological disorders, chronic bronchitis, tuberculosis, eczema, anemia, and diabetes (9). Despite its extensive ethnomedical applications, challenges such as fungal contamination and mycotoxin presence remain obstacles to its safe and standardized use (10).

Traditional practitioners ascribe to Mumijo a broad range of pharmacological effects, including aphrodisiac, anti-inflammatory, and antiarthritic actions, as well as applications in wound healing, edema, hemorrhoids, and tissue regeneration (7). Modern analyses have identified fulvic and humic acids as key bioactive components responsible for its antioxidant, anti-inflammatory, antimutagenic, and immunomodulatory properties, potentially contributing to its anticancer and adaptogenic potential (8). Experimental studies have further documented reductions in blood glucose levels, improvements in lipid metabolism (11), stimulation of nucleic acid synthesis, enhancement of mineral absorption in bone and muscle tissue (4), and promotion of diuretic and natriuretic responses (12).

Taken together, historical, ethnomedical, and experimental evidence converge to portray Mumijo as a multifunctional natural substance with significant biological activity. Its complex organic–mineral composition, broad pharmacological profile, and long-standing traditional use make it a compelling candidate for modern pharmacological exploration and potential integration into evidence-based therapeutics.

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Materials and Methods

The study was conducted on 10 clinically healthy adult dogs (n = 9) 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. An **Alai Mumiyo extract** was used as the test preparation. The extract was freshly prepared and administered **orally** at a dose of **7.5 mg/kg body weight**. The control (baseline) values were obtained prior to administration, and subsequent measurements were taken **30 minutes** and **60 minutes** after dosing.

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

The effect of Alai Mumiyo extract administered at a dose of 7.5 mg/kg on selected blood coagulation parameters in dogs is presented in Table 1.

Table 1. *Effect of Alai Mumiyo Extract at a Dose of 7.5 mg/kg on Some Blood Coagulation Parameters in Dogs (n = 9)* (time in seconds unless otherwise stated)

Parameter	Baseline	After 30 min	After 60 min
Blood clotting time	244±25	↑900	↑900
Plasma recalcification time	67±4,5	111±10.5	104±7.0
Plasma tolerance to heparin	226±16	353±16	352±17
Thrombin time	16±1,3	120±13	120±13
Factor V activity	16±0 ,4	16±0,4	17±0,4
Factor VII + X activity	37±1,5	47±2,4	47±4,7
Fibrinogen (mg %)	278±18	296±6,6	297±8,1
Fibrinolytic activity (min)	77±7	86±11	68±3

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

Administration of the extract produced a marked prolongation of the blood clotting time, which increased from a baseline value of 244 ± 25 s to 900 s after 30 and 60 minutes of administration ($p < 0.05$). A similar trend was observed for the plasma recalcification time, which significantly increased from 67 ± 4.5 s to 111 ± 10.5 s at 30 minutes and 104 ± 7.0 s at 60 minutes ($p < 0.05$).

The plasma tolerance to heparin also significantly increased from 226 ± 16 s at baseline to 353 ± 16 s and 352 ± 17 s after 30 and 60 minutes, respectively ($p < 0.05$). The thrombin time showed a pronounced and sustained elevation, rising from 16 ± 1.3 s to 120 ± 13 s at both 30 and 60 minutes ($p < 0.05$).

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In contrast, the activities of Factor V remained essentially unchanged (16 ± 0.4 vs. 16 ± 0.4 and 17 ± 0.4), while Factor VII + X activity showed a moderate but statistically significant increase from 37 ± 1.5% to 47 ± 2.4% and 47 ± 4.7% after 30 and 60 minutes, respectively ($p < 0.05$).

The fibrinogen concentration demonstrated a slight, non-significant increase from 278 ± 18 mg% to 296 ± 6.6 mg% and 297 ± 8.1 mg%. Fibrinolytic activity was also affected, increasing from 77 ± 7 min to 86 ± 11 min at 30 minutes and decreasing to 68 ± 3 min at 60 minutes ($p <$ 0.05 compared with baseline).

Overall, Alai Mumiyo extract at 7.5 mg/kg induced a significant prolongation of major coagulation times and increased plasma tolerance to heparin, indicating a marked anticoagulant effect within 30 minutes of administration that persisted for at least 60 minutes.

Discussion

Administration of Alai Mumiyo extract at a dose of 7.5 mg/kg produced a marked anticoagulant effect in dogs, as shown by significant prolongation of blood clotting, plasma recalcification, and thrombin times. The pronounced increase in thrombin time suggests that the extract may inhibit thrombin activity or interfere with fibrin formation.

The elevated plasma tolerance to heparin indicates potentiation of natural anticoagulant mechanisms, possibly through enhancement of antithrombin activity. The slight rise in Factor VII + X activity may reflect a compensatory response to delayed coagulation, while Factor V activity remained unchanged, suggesting selective effects on the coagulation cascade.

Minor changes in fibrinogen levels and fibrinolytic activity point to additional but less pronounced modulation of the fibrinolytic system. Overall, these results demonstrate that Alai Mumiyo exerts a significant, time-dependent anticoagulant action likely involving multiple hemostatic pathways.

Conclusion

Alai Mumiyo extract at a dose of 7.5 mg/kg significantly prolongs blood clotting, plasma recalcification, and thrombin times in dogs, while enhancing plasma tolerance to heparin. These findings indicate a clear anticoagulant effect, likely associated with modulation of the intrinsic and common coagulation pathways.

The extract appears to act both on coagulation and fibrinolytic systems, producing a transient inhibition followed by partial normalization of fibrinolysis. Factor V activity remains unaffected, while Factor VII + X activity shows a modest increase.

Overall, the results suggest that Alai Mumiyo possesses biologically active components capable of influencing hemostatic balance. Further studies are needed to identify the specific compounds responsible for these effects, clarify the underlying mechanisms, and evaluate the potential therapeutic applications or safety profile of Alai Mumiyo in conditions requiring anticoagulant therapy.

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