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EFFECT OF MUMIYO (SHILAJIT) ON INTRAVASCULAR FLUID VOLUME AND PLASMA ELECTROLYTE BALANCE IN RATS

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Abstract: This study investigated the effect of mumiyo (shilajit) on intravascular fluid volume and plasma electrolyte balance in rats. Adult laboratory rats were divided into control and experimental groups. The experimental group received mumiyo orally at a dose of 50 mg/kg daily for seven days. Parameters such as intravascular fluid volume and plasma concentrations of sodium, potassium, and calcium were measured. The administration of mumiyo did not significantly affect any of the studied indicators compared with the control group ($P > 0.05$). These results suggest that short-term oral administration of mumiyo does not alter basic fluid-electrolyte homeostasis in healthy rats.
Keywords: Traditional medicine, mumiyo, shilajit, herbo-mineral exudate, fulvic acids, natural adaptogen, pharmacological properties, historical ethnomedicine.

Introduction

According to the World Health Organization (WHO), Traditional Medicine (TM) refers to the sum of knowledge, skills, and practices based on the theories, beliefs, and experiences indigenous to different cultures. These practices employ plant-, mineral-, and animal-based remedies—used either individually or in combination—for the prevention and treatment of diseases, as well as for the maintenance of overall health and well-being (1). It is estimated that nearly 80% of the world's population relies on traditional medicine as a primary source of healthcare (2), underscoring its enduring cultural and therapeutic importance.

Among the many natural remedies recognized in traditional systems, mumiyo (also known as *shilajit*) holds a particularly prominent place. It is a herbo-mineral exudate with a long history of medicinal use, primarily found in the mountainous regions of India (3, 5) and Russia, including areas of the former USSR such as the Urals, Altai, Caucasus, Kazakhstan, the Sayan Mountains, Lake Baikal, Uzbekistan, and Tajikistan. Deposits have also been identified in China, Pakistan, Nepal, Afghanistan, and Tibet (6).

Mumiyo is known by a variety of names across cultures, reflecting its widespread recognition: *Shilajit*, *Silajita*, *Marathi* or *Gujarati* (in Hindi), *Asphalt* (in English), *Silajatu* (in Bengali), *Rock Juice* (in Tibetan), *Conqueror of Mountains* (in Sanskrit), *Hajar-ul-Musa* or *Arak al-Jabal* (in Arabic), *Mumiyo* or *Mumnaei* (in Persian), *μούμια* (in Greek), *Muemu* (in Russian), *Mumiyo* (in German), *Mineral Bitumen of Smolensk*, *Jewish Bitumen*, *Mineral Wax*, and *Bragshun*. This natural resin-like substance varies in color from light brown to dark brownish-black and has been used for over 3,000 years as a rejuvenating, restorative, and adaptogenic agent (4).

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The origin of *mumiyo* is explained by three main theories: biological, geological, and bio-mineralogical. According to the biological theory, *mumiyo* is believed to form from decomposed plant material or animal excreta under specific physicochemical conditions. The geological theory suggests that *mumiyo* results from long-term geological processes. The bio-mineralogical concept proposes that *mumiyo* is produced through the mechanical contamination of its liquid precursor with mineral substances. Regional factors including plant species, geological features of rocks and soil, temperature, humidity, altitude, and other environmental parameters play a crucial role in determining the composition and therapeutic properties of *mumiyo* (9).

Although samples from different regions share similar physical characteristics, their elemental and molecular compositions may vary considerably due to these environmental influences. Typically, mumiyo consists of organic matter (60–80%), inorganic minerals (20–40%), and trace elements including Fe, Ca, Cu, Zn, Mg, Mn, Mo, and P (10). The organic fraction is largely composed of fulvic acids, humic substances, amino acids, and phenolic compounds, which are believed to contribute to its biological activity.

Historically, mumiyo has been highly regarded in Persian and Arabic medical literature. In the 10th century, the scholar Ahwazi, in his treatise *Kamel al-Sanae*, recommended mumiyo for the treatment of *cold headaches, hemoptysis, asthma,* and *uterine complications*. Later, the renowned Persian physician Avicenna (Ibn Sina), in *The Canon of Medicine*, described mumiyo as an effective remedy for *strengthening the brain, improving fertility,* and treating various systemic disorders. Similarly, in the 12th century, Jorjani, in *Zakhire Khwarazmshahi*, noted its benefits for *inflammation, ulcers, urinary*, and *prostate ailments* (7).

In traditional medical systems, mumiyo has been prescribed in a variety of formulations and doses for numerous conditions, including urogenital disorders, jaundice, gallstones, gastrointestinal disturbances, splenomegaly, epilepsy, hypersensitivity, nervous and respiratory diseases, eczema, anemia, and diabetes (11). Despite its broad therapeutic applications and historical prominence, one of the key challenges in its modern use is the potential for fungal contamination, particularly by mycotoxins, which limits its widespread acceptance in evidence-based medicine (12).

Traditional medicine practitioners claim that *mumiyo* is effective against conditions such as reduced libido, kidney stones, bone pain and fractures, osteoarthritis, spondylitis, edema, hemorrhoids, aging, rejuvenation, infections (as an antiseptic), obesity, anorexia, and weight loss (9). Owing to the anti-inflammatory, antioxidant, antimutagenic, and immunomodulatory properties of fulvic acid (FA) and humic acid (HA), some studies suggest that *mumiyo* may also serve as a potential agent for cancer prevention (10). Furthermore, various doses of *mumiyo* have been shown to lower blood glucose levels and improve lipid profiles in rats (13). *Mumiyo* extract has also been found to enhance nucleic acid synthesis and promote mineral transport into muscle and bone tissues (6). Additionally, *mumiyo* increases diuresis and natriuresis (14).

Materials and Methods

The experiment was conducted on adult male laboratory rats weighing 180–220 g. Animals were housed under standard vivarium conditions (temperature 22 ± 2 °C, 12-hour light/dark cycle) with free access to food and water. All experimental procedures were performed in accordance with institutional and international ethical standards for animal research.

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To study the effect of mumiyo on intravascular fluid volume and plasma electrolyte concentrations, rats were divided into two groups: control (n = 10) and experimental (n = 10). The experimental group received purified mumiyo orally at a dose of 50 mg/kg once daily for seven consecutive days. The control group received an equivalent volume of distilled water.

At the end of the treatment period, the intravascular fluid volume was determined by the dye dilution method using Evans Blue. The dye was injected into the tail vein, and blood samples were collected after a standard distribution period. The concentration of Evans Blue in plasma was measured spectrophotometrically, and plasma volume was calculated using standard formulas.

Blood samples were collected from the tail vein and centrifuged at 3000 rpm for 10 minutes to obtain plasma. The concentrations of sodium (Na^+), potassium (K^+), and calcium (Ca^{2+}) were determined using flame photometry and atomic absorption spectrophotometry. Each measurement was performed in triplicate to ensure accuracy.

Data are expressed as mean ± standard error of the mean (SEM). Differences between control and experimental groups were analyzed using Student's *t*-test. A *P* value greater than 0.05 was considered statistically insignificant.

Results

The results of this study are presented in **Table 1.** Prolonged administration of mumiyo at a dose of 50 mg/kg for seven days did not cause significant changes in the intravascular fluid volume or in the plasma concentrations of the major electrolytes (sodium, potassium, and calcium) in rats.

Table 1. Effect of Prolonged Administration of Mumiyo on Some Parameters of Intravascular Fluid in Rats

Parameter	Control	After Mumiyo Administration	P
Intravascular fluid volume (mL)	4.9 ± 0.21	5.0 ± 0.14	>0.5
Plasma sodium concentration (µmol/L)	140.4 ± 0.98	141.0 ± 1.40	>0.5
Plasma potassium concentration (mmol/L)	3.6 ± 0.5	3.6 ± 0.7	>0.5
Plasma calcium concentration (mmol/L)	2.27 ± 0.5	2.25 ± 0.40	>0.5

The intravascular fluid volume in control animals was 4.9 ± 0.21 mL, while in the mumiyo-treated group it was 5.0 ± 0.14 mL ($P > 0.5$). Plasma sodium concentration showed minimal variation (140.4 ± 0.98 µmol/L in controls and 141.0 ± 1.40 µmol/L in treated rats, $P > 0.5$). Similarly, potassium and calcium levels remained stable, with no statistically significant differences between groups ($P > 0.5$).

These findings indicate that short-term administration of mumiyo does not significantly alter the volume of circulating fluid or the electrolyte composition of blood plasma under normal physiological conditions.

Discussion

The absence of notable changes in plasma electrolytes or intravascular fluid volume suggests that mumiyo does not disturb the homeostatic regulation of body fluids and electrolytes in healthy rats. This stability is important because it indicates that the diuretic and natriuretic

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effects of mumiyo observed in earlier experiments are likely **adaptive responses** to fluid or salt loading rather than consequences of electrolyte imbalance or dehydration.

Mumiyo contains a complex mixture of organic and inorganic compounds, including fulvic acids, trace minerals, and bioactive components, which are thought to enhance renal excretory processes without disrupting overall physiological equilibrium. The current data support this view by showing that mumiyo maintains stable plasma concentrations of sodium, potassium, and calcium even after repeated administration.

Thus, mumiyo may promote the excretion of excess water and sodium only under conditions of overload, acting as a **regulatory modulator** of renal function rather than a strong diuretic under normal conditions. This property may explain its long-standing use in traditional medicine as a natural adaptogen that supports homeostasis and improves the body's resistance to physiological stress.

Conclusion

The results of this study demonstrate that prolonged administration of mumiyo (50 mg/kg for seven days) does not significantly affect the intravascular fluid volume or the plasma concentrations of sodium, potassium, and calcium in rats. These findings indicate that mumiyo does not disturb normal fluid and electrolyte balance under physiological conditions.

Taken together with earlier observations of its diuretic and natriuretic activity during water and salt loading, these data suggest that mumiyo acts as a **regulatory agent,** enhancing renal excretory function when necessary while maintaining homeostasis in the absence of fluid or salt overload. This supports its traditional use as a natural adaptogen and modulator of body fluid regulation.

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