Shilajit

The Ayurvedic Adaptogen for Anti-Aging and Immune Power

Wolfgang Windmann PhD

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The ancient secret of sound memory, healthy hormone levels, energy, anti-aging, strong immunity as well as bone and heart health, known and used in Ayurveda for many millenia, is now brought to you in this smart book, *Shilajit: The Ayurvedic Adaptogen for Anti-aging and Immune Power* by Wolfgang Windmann, PhD. This book is a bridge between the modern scientific information on Shilajit and the ancestral medicinal wisdom and knowledge from different traditions such as Ayurveda, Chinese Medicine, and Russian folk medicine.

Vatsala Sperling, MS, PhD, PDhom, CCH, RSHom,
author of *The Ayurvedic Reset Diet*

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Contents

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Preface to the 2005 edition

It was not until 1995, when Russian-German acquaintances of mine introduced me to Shilajit, that I first came across this natural substance. Since then, like so many others who have come under its spell, I have been fascinated by the great power inherent in this healing mineral. I began to use Shilajit discreetly to treat people around me for a whole range of diseases and the results were astonishing. This success persuaded me to investigate it in greater detail and, as befits a scientist, in a more structured way. Regardless of how open I was to the invisible behind the visible or to those things that can only be witnessed through experience, I do believe that careful scientific study will always prevail.

There is still so much to discover, often to our amazement, when modern scientific methods confirm traditional or folk knowledge that has been handed down to us over the generations. Once we have the scientific results of centuries of careful observation of different treatments and their effects, traditional folk medicine can be awarded the status it deserves.

This was precisely the case with Shilajit. Until the mid-1900s, people knew that Shilajit worked but did not know why. It is only now that its effects are gradually being decoded, proving that Nature, and not humans, boasts the greatest ingenuity. Over recent years increasing numbers of people have come to recognize the limits of the modern approach to medicine that views and indeed treats patients less and less holistically, as no more than the sum of their various parts. This “spare part” mentality might work in some situations, but where more complex processes define a disease, a mechanistic worldview regularly falls far short. This insight makes a strong case for returning to holistic methods, such as TCM (Traditional Chinese Medicine) or Ayurveda (the holistic healing system developed in India), with their vast treasure troves of experience and medical knowledge. The value and effectiveness of these holistic methods are being increasingly confirmed by analytical methods that have been significantly improved over the years.

However, not all traditional healing methods that were once commonplace deserve to survive in the modern world. And yet, a blanket refusal to embrace naturopathic forms of therapy, as is often encountered among orthodox medical practitioners, does as little justice to the opportunities offered by these special forms of therapy as a blanket acceptance that “everything that comes from Nature is good and does no harm.” It is important to draw a clear distinction and to work toward the delivery of the factual information that separates the wheat from the chaff, which is the precise intention of this book. I hope that reading it will help many people to appreciate the true value and significance of Shilajit, which we first encounter in its initial form as an unprepossessing lump of rock, and which gives up its secrets only gradually.

Preface to this 2023 edition

The German edition of this book is now in its fourth edition, but this is the first time it has appeared in English, benefiting from several relevant scientific insights published over recent years. I have tried to present and comment on these results in an accessible way rather than in the language of an academic treatise. However, it is not always possible to avoid technical terms.

As one of the few books on the topic when it first appeared in its original German version in 2005, it became and still is a starting point for many people's own work and a handbook on the subject. I have been surprised on a number of occasions to come across my own text, sometimes adopted verbatim and even complete with grammatical errors, in the work of others.

Updating the latest research for this 2023 edition took considerable time since there is now such a wealth of information and medical publications available on the internet. Many science authors should be thanked for their contributions to our understanding of the way Shilajit functions.

We should also not forget to thank contributors to YouTube for their film clips that make it possible for interested viewers to see examples of Shilajit in situ, along with hard-to-access historical material from television archives. (See the Further Information chapter for some examples.)

Shilajit and Mumijo are the two most familiar and common terms for the same substance, from two very different linguistic sources. We have chosen to mostly use the term Shilajit in order to maintain the flow of the text.

Fig. 1. Extraordinary diversity can flourish even on the most barren ground.

Introduction

Shilajit must be one of the most interesting natural remedies to come from Central Asia. It is certainly by far one of the least well known. That it has attracted so little attention does not reflect the enormous therapeutic potential of this pure, natural substance. Its profile has grown in the last few years, even in its homelands, as is evident in the increasing number of scientific studies being published. India, Pakistan, and Iran have all seen an increase in scientific efforts to explore the secrets of the effects of Shilajit. Attempts have been made through cutting-edge scientific methodology to pinpoint the healing powers attributed to it, but this natural substance is slow to surrender its secrets.

Shilajit has had a somewhat mythical reputation for many years; it was difficult to obtain and problematic to deal with, given its somewhat idiosyncratic properties. The lack of standards in terms of identity, purity, and content (which persist to this day), coupled with the commercial interests of previous generations and political systems, resulted in many fakes and less effective, poor-quality products appearing on the market, which ultimately undermined buyers' faith in its healing power over the long term.

We first learned about Shilajit in Western Europe in the 1990s as it made its way here via two routes: the great wave of immigration from the states of the former Soviet Union at the start of that decade, followed by the popularization of Ayurvedic alternative therapy treatments at the end of the 1990s.

Shilajit comes from the Sanskrit and means "rock-overpowering," while translated literally, Mumijo means "protecting the body from diseases," and in Old Persian *mum* meant wax.

The linguistic similarity of Mumijo to the word "mummy" has led to much confusion in Western Europe in particular. It has nothing to do with the infamous *mumia vera aegyptiaca*,[1,4,5] a powder made from the ground,

desiccated body parts of Egyptian mummies preserved with resin, asphalt, and extracts of cedar wood, used in traditional medicine to stop bleeding.

Mumijo/Shilajit goes by different names in different linguistic regions, but most are descriptive, pointing to its outward appearance. It is described literally as a kind of "sweat of the mountains." In India it is known as Shilajit or *silajatu*, and in Ayurvedic medicine[7,18] it has acquired the status of a *Rasayana*, an "elixir of life." According to Ayurvedic teaching, it energizes the vital juices, maintains youth, and revitalizes, featuring as an ingredient in remedies for boosting vitality and physical condition by helping to maintain the delicate balance between the body's various systems. In Myanmar it is known as *kao-tun,* the equivalent of "blood of the mountain," and in the Altai Mountains of southern Siberia as *barachgschin*, or "oil of the mountains," Tibet, Mongolia, and the Transbaikal region call it *brogschaun, or* "mountain juice," while Iran and Iraq have various names, including *arakul dshibal*, which translates as "mountain sweat." It is called Mumijo in Kazakhstan, Uzbekistan, Kyrgyzstan, and most of the Commonwealth of Independence States (CIS). In addition to Mumijo and Shilajit, the terms mineral pitch, bitumen, and asphalt are also widely used, with bitumen and asphalt having a secondary meaning as the petroleum products of the same name. In China and Tibet it is known as *zha-xun.*

In the countries of Central Asia, ancient lore tells of Shilajit's effective, if sometimes apparently mystical, healing power. Study of the scientific literature and ancient sources reveals that it was frequently combined with honey as a treatment, for both practical and therapeutic reasons. Honey is an effective way of masking its somewhat penetrating and aromatic flavor, and the therapeutic effects of honey itself are already well documented. This, of course, presumes that the finest quality honey is used, one that has not been heat-treated and is as natural as possible. The results for its use in combination with manuka honey, which is well known for its therapeutic properties, are particularly promising and are examined in greater detail (see here).

Historical and mythical tales of an ancient remedy

Ancient sources from Kyrgyzstan relate the following tale:

A rich Khan was riding with his retinue through the broad uplands of the country, hunting for tasty game. The hunters gave chase to an ibex and wounded it, although the animal escaped despite its injury. The approach of night made it more difficult to pick up the animal's trail, so the hunters decided to continue tracking it at sunrise. After several days of pursuit, the trail had led them to a large cave in a high region. They lit torches and penetrated ever deeper into the cave. After a short while, they found the injured ibex and observed from a distance how it was rubbing its wound hard against a black and brown stone. It paused at intervals to lick the stone. The hunters were also amazed to see that the animal was clearly recovering well despite its wounds.

A messenger hurried to the Khan and hastily told him what had happened. The Khan ordered the hunters to capture the animal alive and also commanded them to break off this "black and brown stone" and take it with them.

The mighty Khan's physicians now tested this mysterious stone and the tale relates how it cured many illnesses. The mountains were then scoured for sources of the stone, where it was collected and then stored in the Khan's treasury.

Over the course of time Shilajit found its way along the ancient trading routes of the Silk Road to the Near East and Greece, where the renowned ancient Greek philosopher and healer Aristotle examined its effects on patients in detail and recorded its various applications. Aristotle's pupil Alexander the Great, the ancient Greek king who went on to create a vast empire through military might, supported his teacher's work and together they worked on how to test if Shilajit was genuine.

Writing in the the 12th and 13th centuries, the renowned Persian physician and philosopher Avicenna describes Shilajit as a "perfect and complex remedy." He mixed it with various vegetable oils and used it for topical application to bruises and ulcers, and to treat inflammation of the ear

canal. Avicenna describes Shiljait as a remedy that “heals the stomach, awakens the emotions, and eases breathing.”

A second distinguished Persian doctor working in the 18th century, Mohammed Hussein Shirazi, examined the effects of Shilajit in his treasury of medicine *Makhzan-al-Adwiyah* (“drug treasures”), describing how Shilajit “has a positive effect on the nervous system, improves the function of the cardiac and circulatory system, and is particularly effective in treating the digestive tract; it is also excellent for hemorrhoids.” He also recorded its successful treatment of many gynecological conditions. According to his reports, it eased digestion and helped to combat physical trauma, in particular bone fractures, and he recommended dissolving it in honey, milk, or peach kernel oil before use and dripping the oil solution into suppurating ear infections to restore hearing.

The 12th-century physician Muhammed Tabib describes Shilajit as an effective medicine in his work *Lassatul Nisso*. He discovered that it boosted human sexual function and fertility in women when mixed with carrot juice, and even women previously considered unable to conceive could bear children with it, according to Tabib.

Shilajit is described as a remedy in many 17th-century texts originating in England, France, and Germany. In the second half of the 18th century (1776), the English physician Robert James described it as a “black, resin-like substance, with a sour and bitter taste and a particular and pleasant fragrance; to be used as a remedy for general regeneration, against inflammation, and toxicosis.”

To what extent such legends and traditions are scientifically valid is another matter, when bearing in mind that the tale of the Kyrgyz Khan exists in an almost identical form but featuring Fereydun, a mythical king in Persian literature. The cave site is even named Darabi, hence the ancient Persian name *Mumijo Darabi*. (It is now known there as *Momiai-faqurul-yahud*).[63] These stories often contain a crucial core observation but are accompanied by the kind of exaggerated claims that are dictated by their respective cultures in order to emphasize Shijalit’s value and significance. With the advent of modern science at the end of the 19th century and the significant shortage of resources in socialist systems, the study of indigenous folk remedies became the focus of academic study in the various

disciplines. The hunt for the factual, and separating it from the mythical, was on .

In the West, since the 1930s, there has been a host of scientific publications about the healing powers of Shilajit, but its scarcity means that they tend to be more of cultural-historical or academic interest. Similarity to the word “mummy,” as described earlier, and the widespread availability of chemical alternatives also meant that Shilajit (Mumijo) was not used as a curative treatment.

Things were different in the Soviet Union, where it was both available and well known and was accepted as a folk medicine. This broad acceptance meant that the chronically cash-strapped state did not have to spend valuable foreign currency on Western medicines. A large number of scientific studies have been published since the 1960s, and mention should be made in particular of the work of Professor Adyl Shakirov[2] (and later, in the 1980s, Professor Shibnath Ghosal in India),[21, 22, 23] whose work is closely reflected in this book. All the publications confirmed the findings of the physicians of centuries past and uncovered sometimes extremely surprising explanations. With the demise of the former Soviet Union and the unstable political situation in its successor states, from the 1990s the focal point of research increasingly shifted toward India, Pakistan, and Iran, and these countries now represent an essential center of academic research.

Fig. 2. Chiyrchik Pass, south of Osh, Kyrgyzstan.

1

Shilajit, the Substance

Properties

In its pure form, Shilajit is a homogeneously viscous yellow/black/brown mass with a singular, smoky, and aromatic fragrance that is slightly reminiscent of the oils from various species of juniper (of the botanical *Juniperus* genus, native to European shores). Red varieties also exist.

The surface is smooth and shiny, and its properties depend on the humidity in the atmosphere. As a powder, it is highly hygroscopic (attracts water) and in its deep-frozen state it resembles a glass-like, solidified, molten mass.

Shilajit is highly soluble in water, but will not dissolve in alcohol or acetone. It begins to soften and flow slowly at about 50°F (10°C), although it breaks down into indeterminable products above 280°F (140°C).

Formation and distribution

Significant finds have been made in the foothills of the Himalaya in Central Asia, the Altai Mountains, and certain mountainous regions of South Kazakhstan (now Turkistan). It is also found in Afghanistan, China, and Australia. There are reports of small-scale discoveries of substances similar to Shilajit in northern Scandinavia, although these are not of good quality and so are not recommended for therapeutic use. A fossil deposit was found during the GeoMaud Antarctic expeditions to Queen Maud Land in 1995 and 2005, and this was also classified as Shilajit, although its origins cast

some doubt on the accuracy of this classification.[14] Radiocarbon dating calculated its age at 3,000 years; Wikipedia provides a brief summary: “The Shilajit there is a waxy, petrified fossil deposit of stomach oil from the snow petrel, a species of bird that lives in East Antarctica. The snow petrels use this oil to defend themselves against predators, and deposits can be found up to 18 inches (50cm) in size.”[14a] Antarctic Shilajit is of interest to researchers as a paleoclimatic marker.

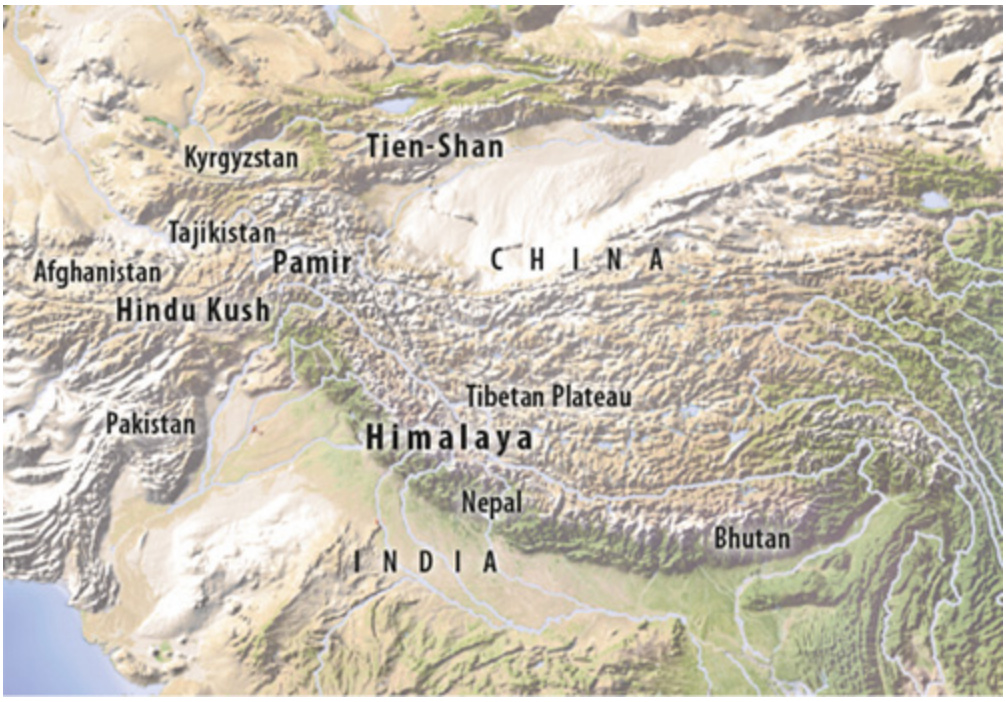


Fig. 3. Locations in which Shilajit is found.

There has been a resurgence of interest in Shilajit in those countries on whose territory it has been discovered, with a number of research institutions (some state-funded) recently addressing its origins and formation, along with its therapeutic uses. How it arises has yet to be wholly explained. It has a highly complex composition and appears in many forms. Despite the precise botanical and geological classification of deposits, no exact conclusions can be reached about its precise development, which can vary with the location. The minimum conditions required have been scientifically established: common to all the locations in which it is found is their exposure to long and intensive periods of sunshine and, importantly, clean air. It is almost exclusively found on the southern

elevations of mountains (never on northern slopes), and geologists have discovered that it only oozes out of rocks during months of intense heat, when temperatures result in a drop in its viscosity and therefore an increase in flow.[15] Certain types of plant and animal life support Shilajit's formation but do not necessarily have to be present. It is highly likely that they speed up its development, but this remains conjecture for the moment.

The lower limit at which Shilajit is found is approximately 3,300 ft (1,000 m) above sea level. Specially trained collectors find it at elevations of up to 13,000 ft (4,000 m) in the Tien-Shan mountain system in Central Asia, and there have been reports of discoveries at a height of 15,400 ft (4,700 m) in the Pamir Mountains in Central Asia. It has also been collected at an altitude of 16,400 ft (5,000 m) in Tibet. In such cases, raw Shilajit is found as pieces of porous rock hidden away in caves, niches, and cracks in the rock, sometimes on the floor or suspended from overhangs. With the rock spectrum in which it is discovered ranging from limestones to granite-like formations, the types of rock and the age of the mountains are clearly not of primary importance in the way it develops and matures. However, the different localities are reflected in the varying content of the minerals that it contains.

Fig. 4. Significant discoveries of Shilajit have been made in Central Asia, in the foothills of the Himalaya.

Depending on which origin theory is preferred, Shilajit is thought by scientists to take at least twenty years to mature, with some experts suggesting a much longer period. Again, there is no definitive proof of this timeframe, based as it is on assumptions and extrapolations that by their very nature are subject to statistical error. There is a possibility that Shilajit is a fossil substance and therefore much older, and that its "younger" elements were merely taken on or acquired in the particular location in which it is found. This would also explain the presence of euphorbia alkaloids (certain components of *Euphorbiaceae*, the spurge family) in the samples examined in India.

Researchers propose two basic theories for the origin of Shilajit, one based on a purely plant origin and the other on a purely animal origin.

Indian scientific publications frequently refer to humus (the organic material formed when plant and animal matter decays in soil), and the way Shilajit forms is not dissimilar to the process of composting. Advocates of a plant-based origin argue their case based on the presence in Shilajit of elements found only in plants, such as alkaloids, and its compact, rubber-like appearance, dotted with organic fibers, sand, and other soil components. The finding of microscopic deposits and Shilajit's physical appearance support this conclusion, and there is no known comparable substance in the animal kingdom that forms a gel of this kind and with such properties.

However, the chemical specifications of the aqueous solution equally suggest an animal origin, since both hippuric acid and albuminoid proteins (proteins with a particular, spherical structure) can be detected in this. If hippuric acid were to be created through the decay of plantbased proteins with no animal component, the protein levels found in Shilajit would have to be disproportionately much higher for a purely plant-based substance. By the same token, some of the author's experiments have determined a raw protein content of almost 28.5 percent, measured using the Kjeldahl method to analyze nitrogen. These results would in turn support a theory of plant origin.

The animal origin theory is simpler and bears similarities with the formation of guano (the accumulation of waste material from birds and bats). It assumes that Shilajit is formed of animal excrement that is washed out of the mountains by rain to be left as deposits in cracks and clefts in the rocks. Baked by the warmth of the sun, the result is a form of dried residue. One of the few recent publications in German[10] supports this theory.

However, the theory has also a few key weak points, including being largely contradicted by the locations in which Shilajit is found: due to the lack of suitable food at elevations in excess of 13,000–16,500 ft (4,000–5,000 m), there are simply too few animals living there to excrete such a large amount of dung.

Professor Michael Keusgen[10] from the Marburg University reported finding the presence of pika (small, rodent-like mammals) and other small rodents whose droppings had collected in crevices in the rock and dried out in situ. In order for this theory to be valid, further typical metabolic products occurring exclusively in animals would have to be present in significant amounts, which to the author's knowledge is not the case. Shilajit is not only picked up from or dug out of the floor in caves, where droppings from bats, hares, or small rodents are both possible and likely, but also scratched from the walls and ceilings. Some interesting film footage is available on the internet showing how it oozes from rock walls.[11]

The author suspects that contaminated samples were examined and the presence of some animal substances, despite being no more than residual traces, was thought to be naturally occurring. It is interesting to note that studies include very little reference to the taking of single-variety samples, extracted cleanly and following proper hygiene rules. This particular aspect of the procedure, difficult as it is to implement in practice, is not taken into account.

Yet another explanation is possible, although it entails reaching far back into the history of the Earth[12] when the continents began to drift, a time when the Tethys Ocean contained a host of living things and the climate was tropical. The collision of what was then the island of India with the Eurasian Plate pushed the sea floor down beneath the collision zone (now the Himalaya), and enclosed it. Additional microbiological activity linked with the decomposition of ammonites and increasing pressure from the rocks may have led to the formation of Shilajit[13] in much the same way as

coal, another fossil product, was formed in a previous era. A key difference lies in the presence of ammonites. High pressure in the rock, warmth from geothermic processes, and high temperatures allowed relatively fluid Shilajit to seep through cracks in the rock during summer, before it assumed its customary form through exposure to oxygen in the air and microbiological activity (figs. 5a–d).

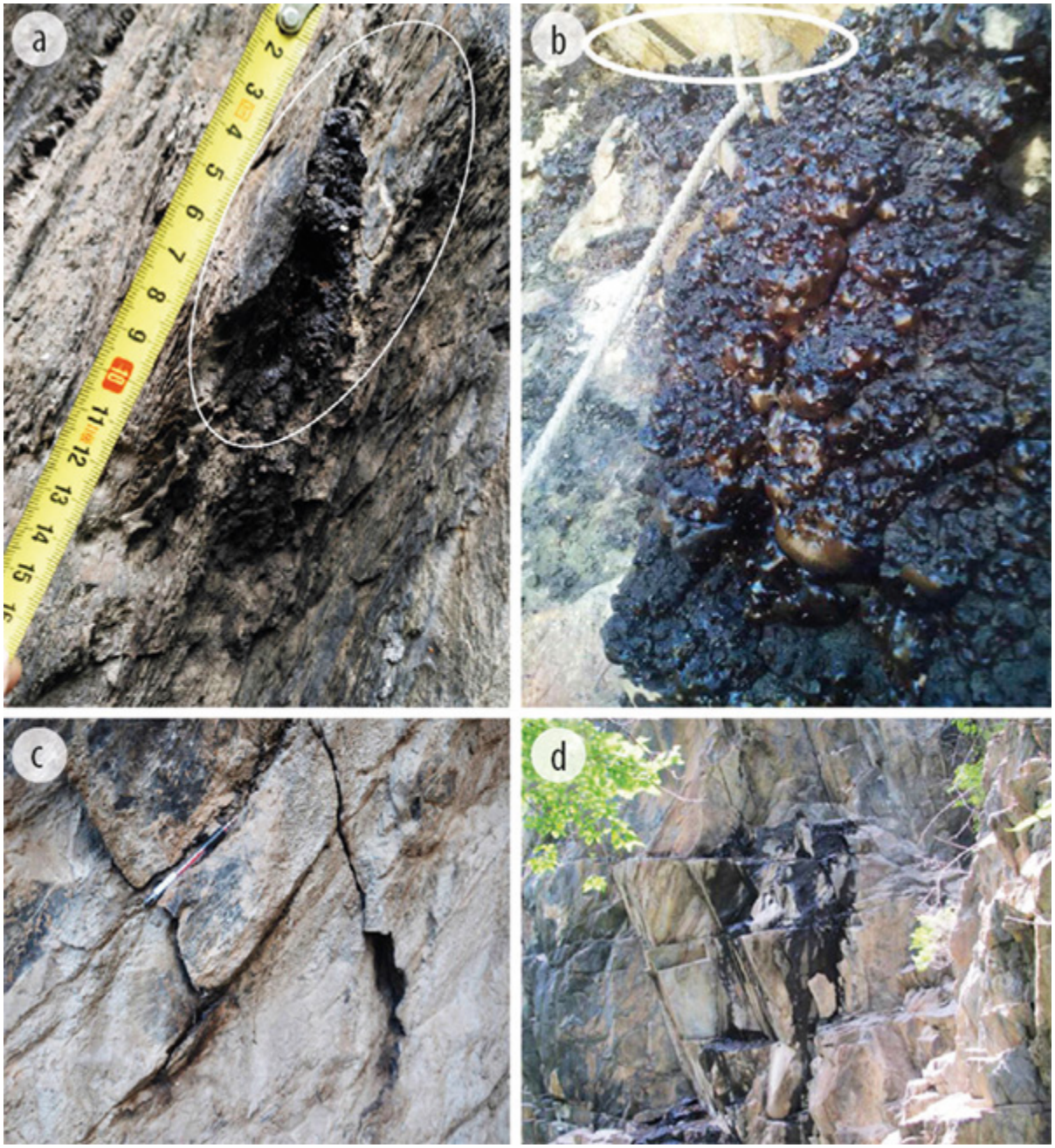


Fig. 5. Shilajit seeps through cracks in the rock.

This theory is entirely plausible, while at the same time providing a connection between the two other theories as to its origin and, importantly, explaining the relatively large size of the finds that otherwise represent one of the weaker aspects of these two theories. Larger amounts of hydrocarbons would normally also then be found, however, as in the case of crude oil. This anticipates the presence of humic and fulvic acids, which are discussed in Chapter 2 (see here); it feeds neatly into the "fossil model" and could well form part of it, making an additional theory as to the formation of Shilajit worth considering.

A group of Chinese researchers published a particularly interesting study[15] in the summer of 2020 of the mechanisms of Shilajit formation and exudation (excretion) in a region of Tibet, with reference to the pika droppings mentioned by Professor Keusgen. Their descriptions of the locations, along with the relevant photographs taken from this study, reveal how the theory probably draws a false conclusion from an obvious observation. The Chinese researchers established that the points at which Shilajit emerged from the rock were mainly located on steep cliffs (figs. 6a–b) that could not be washed through by rainwater. The cliffs were formed during the Triassic period; they are made up of sedimentary rock and granite-like stone and are 200 to 250 million years old. In terms of geology, the cliffs consist of shale, including shale containing hydrocarbons and sandy shale. Pore spaces, some of which have become enlarged, are a feature of the base background rock, along with a growing network of fissures. Organic matter is widely distributed throughout these pores and fissures (fig. 7a). The researchers observed that the substance flowed naturally out of the rock along the pores and the structural plane (figs. 8b and e) and collected on the surface of the rock through tectonic action. Fig. 8c shows a microscopic enlargement.

Fig. 6. Shiajit flowing out of a steep cliff face.

Of particular interest is one discovery in 2008—by Professor Ghosal, one of the world's leading researchers into the fundamental aspects of Shilajit-Mumijo—of the occurrence of certain chemical compounds known as fullerenes in meteorites, as well as in ammonites and Shilajit. This group of substances was detected under the ice of the comet 67P Churyumov–Gerasimenko after the spectacular landing of an orbiter (the Philae lander) on the comet in 2014. In this respect, the ancient religious notion of the origins of Shilajit as a substance "sent from heaven" is both quite plausible and fantastical at the same time.

D. D. Djenchorow's 1995 description of Shilajit as "a complex, macromolecular organic/mineral metabolic product of aerobic microorganisms, created through the decomposition process of plant matter, lichens, and resins"[17] seems to be a good compromise in terms of a summary, at least until new research can describe it more precisely and confirm a particular theory. Some sources report findings in Africa and the Near East, but it is highly likely that Shilajit reached these regions from Central Asia via the old overland trade routes, such as the Silk Road, and by sea. Currently, the highest quality Shilajit comes from the various regions of

Kyrgyzstan and is subject to monitoring by the state of both its quality and purity.

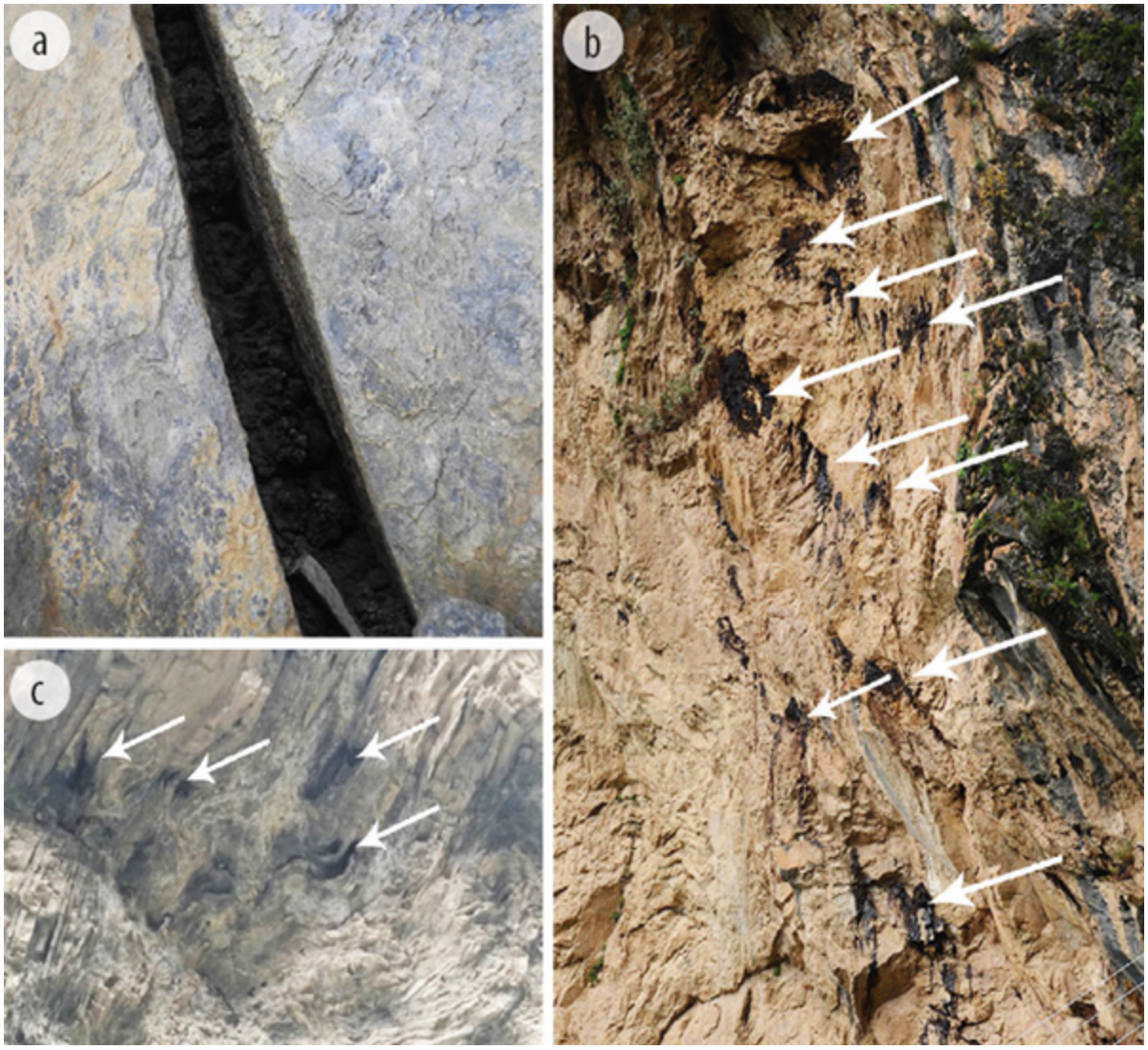


Fig. 7. Shilajit oozing out of the pores and cracks in the rock.

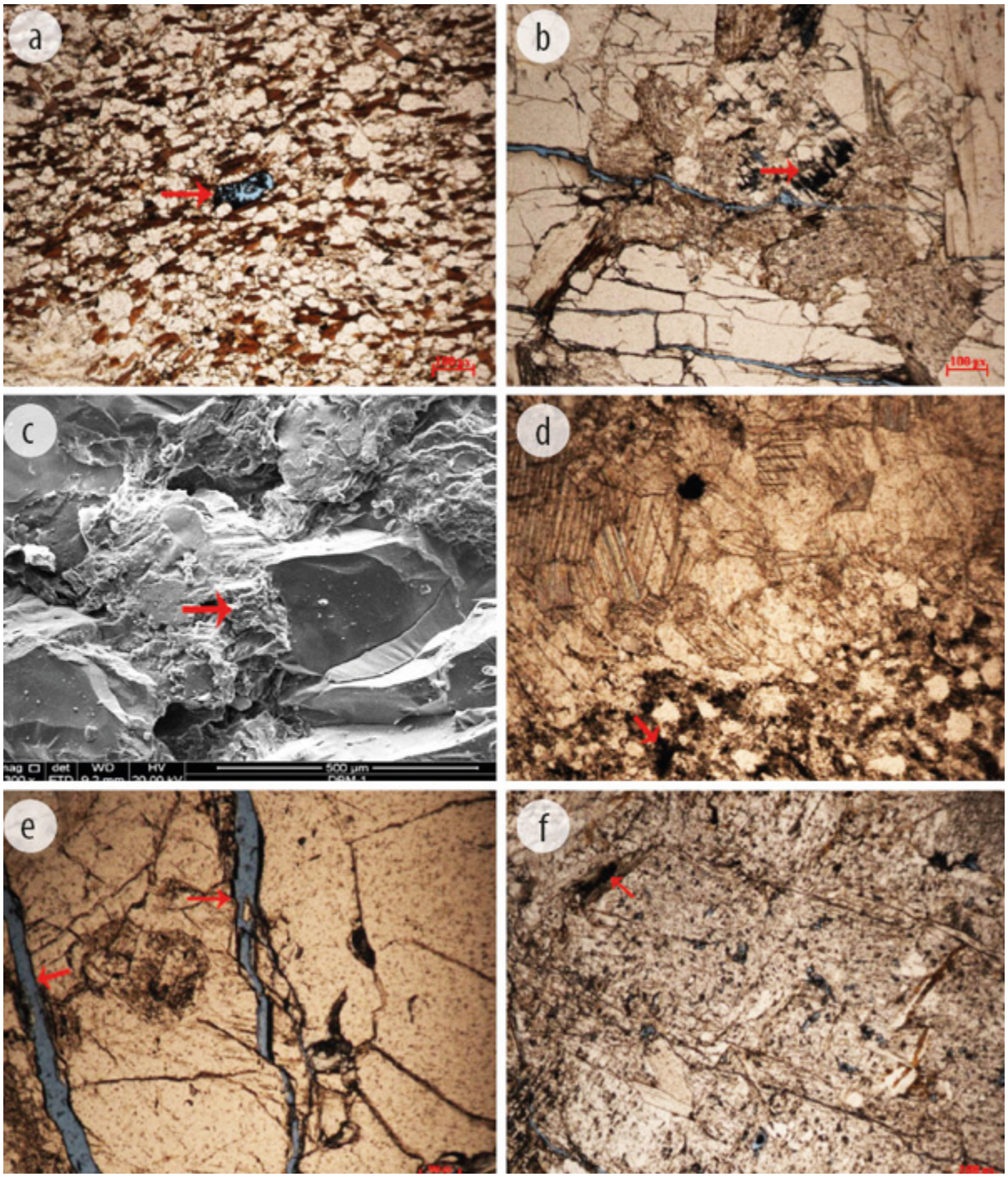


Fig. 8. Microscopic enlargement of pores and flow channels in cross-section.

Currently recognized varieties of Shilajit

1. Artscha Shilajit: a resin-like, black/brown mass with a characteristic aromatic scent of resin, found encrusted in cracks in rocks. This variety is sometimes also known as iron Shilajit (after the element). Another variety is known as red or gold Shilajit due to its reddish sheen. In the Indian languages, its name translates as the equivalent of blue or copper Shilajit, its color being the result of an increased copper content, but the author has no more details on this variety. Artscha Shilajit is the most common variety in terms of the amount that exists. The most recent research suggests that the coloration largely depends on the length of exposure to oxygen, and over time it darkens from a sandy hue to a darkish black/brown.

Fig. 9. Artscha Shilajit in its different forms.

2. Bitumen Shilajit: a fluid to waxy, dark mass often found emerging from cave walls and from crevices in rock. A wide range of natural root sap forms its basis, especially of species of juniper (from the botanical *Juniperus* family).

3. Honey-wax Shilajit: a brown or black mass, presumably a base product of wild bees, which hardens over time through natural chemical changes.
4. Mineral Shilajit: characterized by deposits at extreme heights. A black mass that recent theories suggest is formed by bacteria and a type of algae in conjunction with a large number of different minerals under intense exposure to UV light.
5. Lichen Mumijo: a metabolic product of lichens, with the formation of proteins and organic acids typical of lichens.

Fig. 10. Lichens only grow where the air is low in pollutants. Photograph taken in the Ala-Archa Nature Park, in the Tien-Shan mountains of Kyrgyzstan.

Production

Shilajit is collected in slow, laborious fashion by people specially trained to scratch or break it away by hand from cracks in the rocks and in caves in

the regions of Central Asia mentioned previously. See the images earlier in this chapter showing Shilajit seeping out of rock. The collectors often spend up to three weeks at a time traveling around regions in which there are no real transport links. The raw substance gathered on such expeditions must first be purified before it can be put to use.

Fig. 11. Raw Shilajit: Artscha Shilajit, stone form, 50 percent Shilajit content (based on the total mass). Found in the Tien-Shan mountains of Kyrgyzstan.

Purification

The purification process is a key part of the production of Shilajit, which is ultimately where its therapeutic value is generated. Shilajit consists of many different components (see Chapter 2), including heat-sensitive proteins.

The ideal is to collect a single variety of Shilajit. In practice, the purification process is adapted to suit the specific variety and is carried out to a greater or lesser degree of quality depending on the equipment available to the producer concerned. However, in recent years, in this respect, a great deal of pioneering work has been carried out in Kyrgyzstan in order to ensure consistently good quality.

In this respect, the Lawrenjuk finishing technology, developed by a company based in Kyrgyzstan, deserves special mention. It has led to various patents being taken out and is scientifically proven to deliver the best possible consistent quality available today. It avoids organic solvents and uses fresh spring water.

Fig. 12. Piece of Artscha Shilajit (70 per cent purity), intermediate stage.

In India and countries nearby, they take a different approach, frequently only using raw Shilajit for reasons of cost. It is ground up and then decanted into capsules. The active ingredient content is much lower as a result. Alternatively, the raw Shilajit is mixed and prepared with other herbal powders such as emblic (*Phyllantus emblica*, also known as *Emblica officinalis*, emblic myrobalan, from the *Euphorbiaceae* family; Sanskrit: *Amalaki*; Hindi: *Amla*).[18] In their manual, professor of Ayuverdic medicine Shive Narain Gupta[7] and Elmar Stapelfeldt, practitioner of Ayuverdic

medicine, cite a production method that involves adding a Triphala solution (according to this author's research, a 1:10 decoction of equal amounts of *Emblica officinalis*, *Terminalia chebula* and *Terminalia bellirica*, two species of myrobalan) to Shilajit for the purifying process, vaporizing this in iron bowls in sunlight, and then repeating the process several times. According to Ayurvedic teaching, the aim is also to remove any toxins that may be present. The combination with other herbal remedies allows Ayurvedic therapists the option of refining the effect to a certain extent in accordance with the individual patient's circumstances.

This kind of processing is not practiced north of the Himalaya, however. Here, the usual method involves purifying the raw substance and adding water so that the carrier rock may be separated and removed in a refining process to leave the concentrated Shilajit. This method attempts to concentrate its inherent active principles rather than resort to using additives or supplements.

In terms of the integrity of this natural substance as a remedy, the encasing rock containing unpurified, raw Shilajit is also of value, although it is not as effective without being purified and concentrated, and without the use of additives. There is also a risk of contamination from undesirable and impure substances.

Fig. 13. Undisturbed nature in the Osh region of Central Kyrgyzstan.

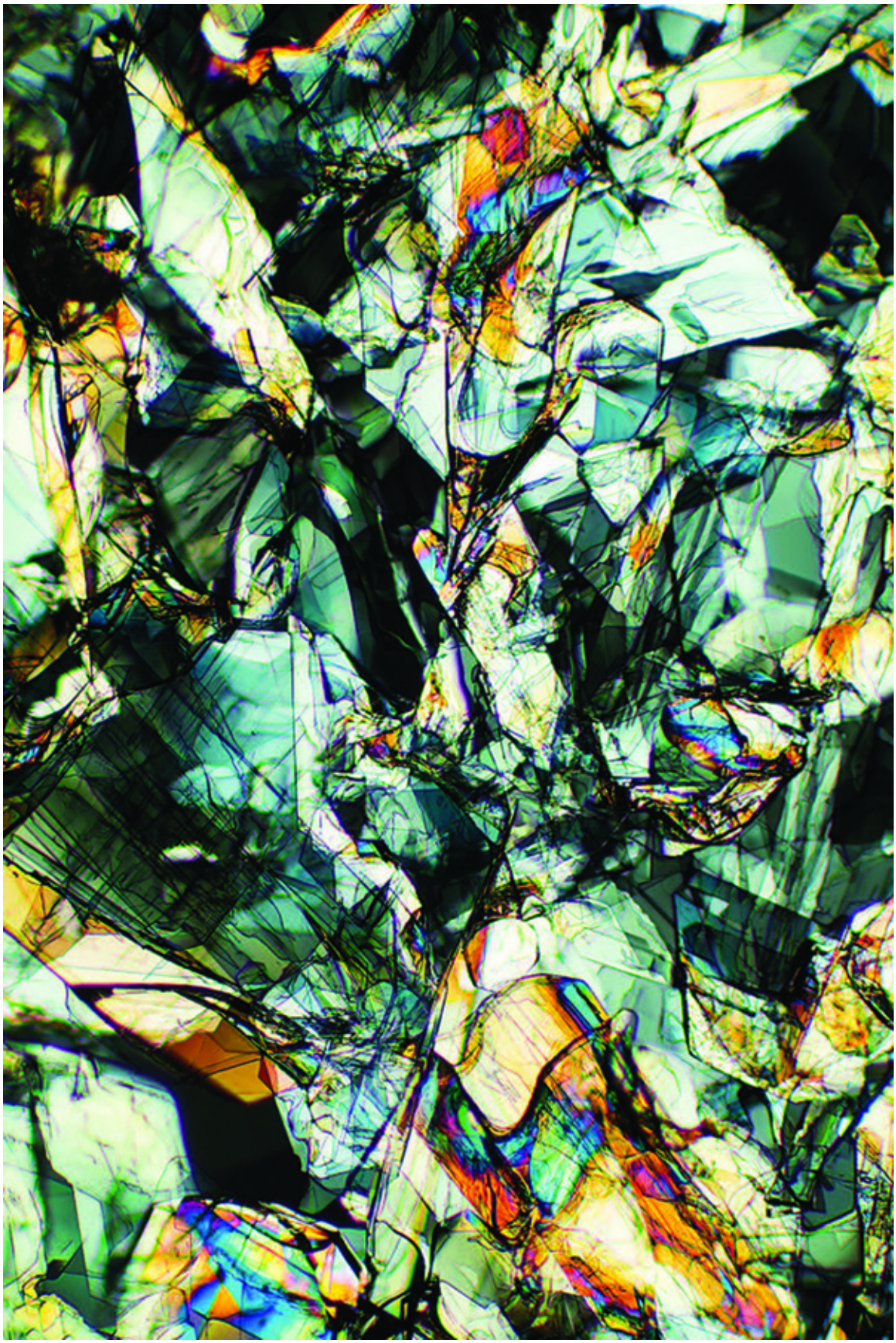


Fig. 14. Microscopic image of amino acid crystals, methionine.

2

Composition

Publications in the former Soviet Union and the states that succeeded it in the post-Soviet era put forward a number of suggestions about the chemical composition of Shilajit, and modern analytical processes now enable a more precise evaluation of its structure. Since the end of the 1980s, the group working with Professor Ghosal at the University of Benares in particular has been doing pioneering work in this respect and has analyzed relevant substances for their effects.[21] In essence, Shilajit comprises two different groups of components that are found throughout the natural world: minerals and carbonaceous substances, some of which may indicate plant origins.

Mineral compounds

A sample of Shilajit was tested by the Pascher Microanalytical Laboratory (in Remagen, Germany) in 1996 and tables 1 and 2 list the chemical elements found in their particular quantities.

Many readers will be aware that substances such as arsenic and cadmium are toxic, but of course these are not present in pure form in Shilajit. Instead, they are chemically compounded, for example in the crystal lattices of minerals. In this form they have very different properties from their free, unbound form. Oxygen is a useful example of this: in its free form as a gas it fuels fire, but when chemically tied in water, it extinguishes it.

The levels of the different minerals found in Shilajit, such as sulfur, iron, aluminum, calcium, potassium, magnesium, phosphorus, and in

particular strontium, are interesting, and their effects have been the subject of various medical studies in the Soviet Union. The levels of these constituent minerals vary depending on the particular location in which the Shilajit was found.

Amino acids

Amino acids are the building blocks of life. These are the substances that the body uses to produce all its important proteins. The structure of amino acids is stored as a blueprint in the genome. There are a number of amino acids that the body is unable to produce itself and must acquire through diet, known as essential amino acids. To date, twelve important amino acids have been identified in Shilajit, including some that are essential, such as leucine, methionine, and threonine. Other, nonessential amino acids, whose presence has also been detected, include aspartic acid, arginine, glutamine, histidine, glycine, proline, serine, and tyrosine. table 3 shows the results from seven samples of different origins.

Organic components

Thanks to the general improvement in analytical methods available to scientists, Shilajit's organic components became the focus of research. While in the 1950s and 1960s, it was the search for minerals, today it is the hunt for organic compounds with therapeutic benefits that occupies researchers. Since around 1975, and the first systematic investigations by Professor Ghosal,[21, 22, 23] studies have reported the medical benefits of using Shilajit almost exclusively in relation to its organic components and their effects on various bodily functions. In 1994 a group of Estonian researchers at Tallinn University's Department of Chemistry examined alcoholic extracts of Shilajit and were able to identify 65 organic compounds,[24] including 24 free fatty acids not previously detected.

The following have been confirmed as being present in Shilajit: carbohydrates, waxes, alkaloids, lipids, resins and balsams, polyphenols,

steroids, essential oils, and B vitamins.

Chemical element	*Content (mg/kg Shilajit)*
Aluminum	225
Antimony	0.6
Arsenic	0.8
Barium	15.5
Cadmium	<0.2
Calcium	27.000
Chrome	0.5
Cobalt	<0.2
Copper	2.7
Fluorine	0.03
Germanium	0.003
Iodine	1.5

Iron	173
Lead	<0.5
Magnesium	14.000
Manganese	24.4
Molybdenum	1.6
Nickel	2.5
Phosphorus	485
Potassium	60.000
Selenium	0.5
Sodium	4100
Strontium	145
Sulfur	6000
Tin	<0.4
Titanium	3.8
Vanadium	0.8

Zinc	71.8

Table 1. Levels of inorganic constituents identified in Shilajit.

Chemical element	*Content (mg/kg Shilajit)*
Lithium	1
Boron	23
Manganese	21
Rubidium	12

Table 2. Additional chemical elements identified.

Sample no.	1	2	3	4	5	6	7
Aspartic acid	0.2175	0.0095	0.0075	0.22	0.0293	0.0125	0.00666
Threonine	0.875	0.0325	0.0325	0.055	0.0528	0.025	0.0128
Serine	0.07	0.03	0.03	0.06	0.0375	0.0375	0.0168

Glutamine	0.43	0.11	0.011	0.2325	0.0725	0.0725	0.09
Glycine	1.3625	1.025	1.025	1.65	0.31	0.31	1.4
Valine	0.0725	0.05	0.05	0.0875	0.0055	0.0055	0.0575
Tyrosine	0.0525	0.0525	0.0525	0.195	0.0025	0.0025	0.2075
Lysine	0.155	0	0	0	0	0	0
Phenylalanine	0	0.035	0.035	0.054	0	0	0

Table 3. Amino acid content in different types of Shilajit measured in mg.

Humins, humic acids, and fulvic acids

One particular group of compounds within Shilajit's organic matter has caught the attention of researchers: humic substances, consisting of humins, humic acids, and fulvic acids. Present in considerable amounts, they lend Shilajit much more than its color. Which other effects can be ascribed to humic acids is now becoming increasingly clear. The background

information that follows may shed some light on the dimly understood origins of Shilajit, and the therapeutic properties of humic acids are discussed at greater length in Chapter 3.

Origins and formation of humic and fulvic acids

In terms of etymology, humin comes from the Latin word *humus*, meaning soil, and is also an indication of the material from which humic substances were first isolated at the end of the 18th century. It is now assumed that humins make up 60–80 percent of the organic carbon dissolved in bodies of water[25] and 70 percent of organic material overall.[26] A distinction should be drawn between humic substances formed in water and in the ground; the former derive from phytoplankton, while soil humic substances come from land-dwelling creatures. Although the original materials are very different, humic substances in the ground and those in marine sediments have a surprising amount in common.

The organic material in soil consists largely of the remains of dead foliage, roots, and wood, along with soil organisms and microorganisms. The main substances are celluloses and lignin, which is typically a component of wood. Marine humic substances are formed through the decomposition of dead marine organisms by bacteria, algae excretions (photosynthetic production), and plankton secretions. They do not contain lignin. Despite these differences, soil humins and marine humins are chemically very similar, as mentioned; irrespective of their origins, all humic substances consist of a network of highly ramified and ultrahighly ramified structures, in which residues of aromatic structures (a certain type of organic molecule) are embedded.[28] Their molecular sizes are not hugely different and lie somewhere between a few hundred and several hundred thousand g/mol.[27] (Mol as a unit represents the amount of a chemical substance that corresponds to its relative molecular weight in grams.)

Four models for the formation of humic substances are currently[31] under intense discussion, with each citing some proof or evidence for the theory, but equally each also having weaknesses. Without wishing to delve too deeply into biochemical detail at this juncture, the formation of humic

substances takes place as follows: the biopolymers of dead organisms, such as lipids, carbohydrates, proteins, lignin, or pigments, are broken down by microorganisms into smaller components, such as fatty acids, amino acids, aromatics, phenols, and organic acids. These smaller components then initially condense or polymerize to form fulvic acids. After further condensation and polymerization, humic acids and, ultimately, humins are also formed.[26] The molecular weight thus rises and a process of agglomeration takes place.

Another theory assumes the same starting point but takes a different route. In this case, algae and bacteria are the source of humins that are insoluble in water; these are broken down in ocean sediment by oxidation to form humic acids, which then become fulvic acids through the incorporation of plant metabolites of bacterial origin.[29] Condensation of the organic material is possible only after adsorption into the surfaces of minerals.[30]

The other theories are variants of these two basic processes. The outcome in all cases are yellow to brown substances that are very similar to Shilajit and invariably also contain components that have been identified in Shilajit.

Relevance for the formation of Shilajit

As discussed, the way Shilajit forms remains largely unexplained. Closer examination of humic substances will, however, reveal why its formation and description are so problematic, bearing in mind that no two humic acid molecules in a sample are identical. Fig. 18 is a highly schematized and simplified representation of a section of the basic structure of a humic acid molecule. We are dealing with a highly complex molecule that cannot be analyzed “as a whole,” however; only its components can be examined once they have been eluted (removed) from the molecule.

Evidence is increasingly coalescing around a fossil origin, even if it requires a good deal of imagination, in much the same way as it can be hard to try and visualize entire continents drifting apart or colliding, with giant mountain ranges (that are still moving to this day) rising up in the collision

zones. It is similarly challenging to grasp the amounts of sediment, often made up of the fossilized shells of sea creatures, that form entire mountain ranges, or coal beds at depths of up to 16,400 ft (5,000 m) that were once primeval forests, or crude oil deposits that are the fossil remnants of past life. Imagining and comprehending such vast dimensions and time spans is challenging, and yet it cannot be ruled out that Shilajit was formed in precisely this way and found its way to the surface in different geologically active regions, such as the Himalaya and surrounding mountain chains. It would also offer an explanation for the relatively large number of constituent elements that have been identified, which are relatively similar in all cases, even under very differing biological conditions.

Fig. 15. Shilajit powder and tablets.

3

Applications

A great deal of information was published about the effects of Shilajit as a treatment in Russian medical literature in the 1950s and 1960s. This was a period when shortfalls in pharmaceutical production, exclusion from international patents, and scarcity of foreign currency reserves meant that the Soviet Union returned more frequently to the remedies of traditional medicine, which were in any case popular with, and held in high regard by, the people.

A clear distinction must be drawn between this scientifically oriented literature and the idealistic, esoteric, pseudo medical writings that must sometimes be considered dangerous. As an example, if type 2 or even type 1 (insulin-dependent) diabetes were to be treated by self-medication and the exclusive administration of Shilajit, then the line beyond serious therapy would clearly have been crossed. Unfortunately, such cases are not rare. It is a different matter if treatment takes place under medical supervision; different approaches with an open-minded therapist with whom you know you are in responsible hands, and who knows when and where the limit is reached, can certainly be tried. Harm is generally caused not through incorrect dosage but through omissions rooted in ideology.

There has been renewed interest in Shilajit after the opening up of Soviet archives, which has solved a number of puzzles in the political arena and explained some of the secrets of the socialist era’s successes in sport or space travel, for example.

Alongside healthcare organisations that took an interest in Shilajit largely for its therapeutic properties, it was primarily the military that

became aware of its effects and covertly promoted and financed research. It was given to elite Soviet troops as a supplement to their diet, designed to increase mental and physical resilience and to boost their resistance to stress. Russian cosmonauts were also given Shilajit for the same reasons, although its (antioxidant) properties as a free radical scavenger played an additional role, since the cosmonauts were exposed to higher levels of radiation in space. The same problem applies to flight crews, which is why many airlines now include natural substances with antioxidant properties in their employees' meal plans to help prevent health issues caused by cosmic radiation.

For sports physicians, it was not only the increase in muscle mass and physical robustness of strength and endurances athletes undergoing a Shilajit treatment that made the case for a closer study, but also the noticeable increase in the speed of recovery from injury. Thanks to this natural substance, sport has a resource free of the side effects of mainstream medical remedies and of the problems that surround doping, inadvertent or otherwise. Shilajit is likely to play an important role in top-level and popular sport over the next few years.

Shilajit's antioxidant effect against highly reactive oxygen and its cell-protecting properties have earned it a reputation as a "fountain of youth"[7, 60, 61, 62, 63, 64] in India. Animal experiments focused on attention and learning in rats were able to demonstrate a deceleration in certain aging processes and a boost in mental capacities, and Shilajit is still popular in Russia administered as a tonic before serious operations in order to prepare the body for surgery. The Moscow clinic that treated former Russian President Boris Yeltsin ordered a course of treatment from a producer in Kyrgyzstan before his first heart bypass operation and went to great lengths to have it transported to the capital in secrecy.

Radical political change in Russia and a move to pivot toward the West also played a role in a noticeable decrease in the rate of publications in international scientific journals by Russian scientists, with research activity then being concentrated in the southern Himalaya (India, Pakistan, Nepal, Tibet, and Iran).

It is very interesting to note that treatments using traditional folk medicine, once dismissed as pseudo medical and/or irrelevant, are now suddenly acquiring scientifically plausible explanations, something that is also being discussed in scientific publications. It is also sobering to consider that previous generations were only able to establish the effectiveness of various remedies by simply watching what happened when a treatment was applied. It is a pity that an unfortunate combination of patchy documentation of such observations (especially in the Christian West) and the rise of the absolute power of the Christian church in the late Middle Ages resulted in the permanent loss of so much of this knowledge.

The next section of the book describes in detail treatments that have been scientifically proven. These have partly been taken from the publications and the dissertation produced by Professor Adyl Shakirov, who published a great deal in Russian during the 1960s and 1970s. Further research in the Russian State Library (formerly the Lenin Library) produced only scanty results; dissertations were only digitalized after around 1990. Unfortunately, Russian scientists did not publish in international journals during those decades but instead appeared in the so-called *Referatiwny schurnal*, a USSR-specific special publication containing summarized extracts from more extensive works. The originals could then be ordered from the institutions that had published them, hence the difficulty of obtaining the actual texts.

Professor Adyl Shakirov is seen as a pioneer of fundamental medical research into Shilajit in the former USSR. His scientific work in clinics in St Petersburg and the Institute for Traumatology and Orthopedics at the University of Tashkent allowed Shakirov and his colleagues to carry out and verify studies on traditional folk medicine treatments, in some cases on more than 2,500 test subjects. The author had access to handwritten German translations of these publications, complemented by copies of works by the Kyrgyz scientists Narbekov and Kortchubekov, who were commissioned by the Kyrgyz health ministry to document the progress of scientific knowledge and who hold a range of patents.[32] By far the greater proportion of current publications referenced in this book were sourced from various working groups based in India, Pakistan, Nepal, and Iran.

Fig. 16. Tibetan singing/healing bowl containing Shilajit.

Fig. 17. Alpine lake region of Osh, Kyrgyzstan.

Internal application

Applications described in publications that feature Shilajit as a treatment are discussed here in detail individually. Please note that the doses indicated have been taken from the relevant publications cited in each case and their effectiveness has not been checked by the author.

Shilajit can be used to treat all kinds of ailments including:

- allergies
- broken bones
- bronchial disease
- colds
- gastritis and enteritis
- hemorrhoids
- immunodeficiency
- impotence, infertility
- metabolizing mineral deficiency, especially iron, selenium, magnesium, zinc, iodine, potassium, calcium, sulfur, manganese, molybdenum, and copper
- osteoporosis
- periodontitis
- poor wound healing
- phlebitis

Immunostimulation

The frequency of various kinds of infections is on the increase in the West, and the incidence of certain types of cancer has also been rising in recent years.

We can assume that an increase in life expectancy has left us with diseases that are becoming harder to treat. The AIDS virus is one such example. One of the causes is a chronic weakening of our immune systems, which can no longer successfully fend off toxins that are in the environment as these become more complicated and, in the worst cases, derail the immune system to the point that it attacks the very body it is meant to protect.

Humans are naturally equipped with an extremely effective defense system that provides the body with a whole arsenal of mechanical, biological, and chemical defensive weapons.

phagocytes: surround and destroy foreign bodies and intruders

natural killer cells: attack tumor cells and viruses, in particular

T lymphocytes: destroy viruses, fungi, and certain bacteria

B lymphocytes: destroy pathogens in the blood by forming antibodies

memory B cells: “repositories” for defeated intruding pathogens such as viruses

cytokines: messenger cells that coordinate the interplay of immune responses

The following are some of the indicators of an immune deficiency:

- frequent colds
- taking time to recover from a cold
- sinuses that are frequently infected (sinusitis)
- frequent digestive problems (diarrhea or vomiting)
- feeling exhausted or washed out
- occurrence of bronchitis or ear infections more than three times a year

All these symptoms suggest that something may be amiss with a

person’s immune system. When experienced in combination with other factors such as stress, mental health problems, an incorrect or unbalanced diet, physical inactivity, and metabolic disorders or disease, the effects are compounded.

The healthy functioning of the immune system can be affected by a number of things:

- long-term stress
- an unbalanced lifestyle
- mental imbalance
- stimulants
- alcohol
- medication abuse

Our immune response also weakens as we age.

The best therapy is, of course, to avoid these negative influences where possible and instead to:

- get plenty of rest
- ensure there is variety in your life
- treat yourself to some down time
- exercise or play sports regularly
- take some fresh air every day, whatever the weather
- avoid overdoing things (with alcohol, food, and high-performance sports)

There is also much in nature that can help to support our immune systems. Shilajit’s immunostimulant properties have been known and documented for many years; [57, 58, 59] more recent publications[69, 70] have demonstrated its anitiviral and antibacterial powers along with its effect on the immune response in general. Scientific reports have also described the activation of T-cells and macrophages (phagocytes),[56] whose job it is to engulf and disable intruder viruses, bacteria, and similar infectious agents.

In the countries of Asia, Shilajit has been at the forefront in the treatment of respiratory and urinary tract infections, with Professor Shakirov establishing its antibiotic properties in the course of his doctoral dissertation in 1963;[65] in this case, a local, rather than a systemic, antibiotic effect may be assumed. A range of recent studies have shown direct antibiotic effects in animal experiments on both gram-positive and gram-negative bacteria.[66, 67]

Gastritis and enteritis can be treated on an antimicrobial level with Shilajit since the concentration is sufficiently high.

Our current understanding suggests that these immunostimulant properties indicate a multifaceted complex of effects that do more than merely boost the nonspecific immune system.

In order to infect the human body, the first barrier that a pathogen must negotiate is the skin (or the mucus membranes), where the first outposts of the immune system are located and which are activated by the pathogen's arrival. The more healthy the mucus membranes, the better this preliminary layer of protection will function; Shilajit has the effect of stabilizing the mucus membranes.

The following demonstrate Shilajit's immunostimulant effects:

- Susceptibility to infection of ear, nose, and throat is reduced.[2]
- Urinary tract infections are far less common.[7]
- Infections are less common in stressful situations, when the immune response is typically weakened.[7]
- People exposed to radiation after the nuclear reactor disaster at Chernobyl in Ukraine were treated with Shilajit, which confirmed the findings, published in 1968,[2] that changes in blood count caused by radiation (in particular a lowered lecocyte count) could be stabilized by administering Shilajit. Its protective properties against radiation were further confirmed using the zebrafish model in 2017.[68]

A broad-based study based on the above has shown that people who take a 120-tablet course of Shilajit treatment, two to three times a year, suffer from

infections on a far less regular basis.[2]

Russian doctors developed a treatment consisting of 2 percent (highly purified) Shilajit and 98 per cent honey that proved successful, as anticipated, for the treatment of gastritis and hemorrhoidal disorders, against a control group that took no Shilajit. This illustrated the advantages of combining Shilajit with honey, whose beneficial therapeutic properties are well documented (see here).

It is highly likely that Shilajit's levels of zinc and magnesium contribute to its immunostimulant properties. The effects of both elements on the immune system are well known and there has been considerable interest in zinc in recent years, with many investigative studies carried out. It is a component of more than seventy enzymes, has wound-healing properties (zinc plaster), stabilizes cell membranes (among other things), and plays a protective role (lymphocytes).[43,58] The usual Shilajit regimen of 200 mg taken three times a day would not result in a sufficiently high dosage of zinc according to these findings, but we should add that natural synergetic (boosting) effects are not taken into account, nor the synergetic effect of the ingredients. To date, there have been no findings that contradict the immunostimulant properties attributed to Shilajit. The strictly routine intake of zinc[7] recommended by dietitians coincides with the recommended intake of Shilajit. As with zinc,[7] Shilajit has to be taken on an empty stomach, before any food or drink.

Prescribing antibiotics

The use of antibiotics can often be impossible to avoid and indeed it would often be negligent not to use them. However, taking antibiotics for symptoms such as those typically presented by a cold is not advisable. A cold is a viral infection lasting only a few days and will not respond to antibiotics. Most cold-related diseases such as bronchitis or sinusitis arise through secondary bacterial infection, and antibiotics will destroy not only the "bad" bacteria in the body but also the "good." This means that coliform bacteria would also be destroyed, for example, which could result in digestive problems and intolerance reactions when a course of antibiotics is

taken, along with diarrhea and other unpleasant symptoms. On rare occasions doctors may additionally prescribe a probiotic, which will help to rebuild damaged gut flora.

Women taking a course of antibiotics are susceptible to contracting vaginal yeast infections when the natural bacterial balance of the vagina is upset and yeast develops in place of the good bacteria killed by the antibiotics; the yeast infection can then be very hard to remove. The additional prescription of lactic acid bacteria (for example) will help to restore the natural flora, although this is not always possible due to reasons of cost.

Recent studies addressing Shilajit's antiviral effects are of particular interest. In laboratory experiments in 2014, a group of Italian scientists investigating its antiviral properties[69] and associated mechanisms identified dose-related inhibitory activity against a range of herpes and RSV (respiratory syncytial viruses) that are the most common cause of respiratory infections in childhood; the mechanism is a combination of virus inactivation and disruption of viral attachment. Interestingly, Shilajit has no effect on rotaviruses or stomatitis viruses, and from a current perspective, it would be intriguing to find out whether it has any impact on Coronaviruses. There have been no studies at the time of writing. Since Shilajit affects several immune-related parameters (primary defense, in particular), a prophylactic (preventive) prescription is still recommended.

Fractures

In the mid-1960s, medics from the University of Tashkent[2] in Uzbekistan tested the use of Shilajit to treat bone fractures[79] (among other studies[65]) in over 2,500 cases. They prescribed a dose of 200 to 300 mg to be taken twice a day over the course of thirty days. For severe fractures, a break of ten days was prescribed after the first course of thirty days, followed by a second course, again of thirty days. The accompanying clinical and X-ray examination revealed that bone formation occurred up to thirteen to seventeen days more quickly than in a control group with no application of Shilajit. One possible cause for the acceleration in healing observed when Shilajit was prescribed may be its strontium content.

Strontium (chemical symbol: Sr) is a bivalent alkaline earth metal like calcium and occurs in nature as various isotopes.[1] The most common of these isotopes [*1] is ^{88}Sr, in addition to which are three others: ^{84}Sr, ^{86}Sr, and ^{87}Sr. Natural mineral deposits include celestine (strontium sulfate) and strontianite (strontium carbonate). Shilajit contains only natural strontium and so exhibits no increased radioactivity.

How strontium works

Strontium is chemically similar to both calcium and barium, but without the toxicity of barium. The scientific community has long been aware of the benefits of strontium in treating hunger osteopathy (diet-related bone disease). Strontium competes with calcium for deposition in bones, with one of its functions being as a “calcium carrier“ to remineralize bones, especially in calcification after fractures or treating osteoporosis.[79, 80, 81, 82] The mechanism is not entirely understood, but it is known that strontium compounds promote osteoblast function (bone formation) and inhibit osteoclast function (bone resorption).[81] Until 2017 medication containing strontium ranelate as an active ingredient was available and was often prescribed by osteoporosis specialists as a so-called reserve medication when other standard treatments were contraindicated. It was taken off the market because of the discussion about its side effects and the infrequency of its prescription.[88]

Healing bone

The healing of bone is a highly complex process that takes place in several phases.[87] A fracture is followed by inflammation and bleeding that release a cascade of biological repair processes in which specific stem cells differentiate to become tissue, cartilage, and bone. As the healing process progresses, cartilaginous (soft) calluses form to bridge the gap between the broken bone parts. This soft callus mineralizes before osteoblasts form, laying down bone tissue, and the bone solidifies.

A 2019 Iranian study[86] identified enhanced rates of cell division in such cases when Shilajit was taken as a treatment. It is possible that the substances contained in Shilajit (such as humins, fulvine, polyphenols,

strontium) have an acceleratory affect at various stages of the healing process and to varying degrees—Shilajit has certainly been associated with the treatment of fractures for centuries, in so doing presenting our ancestors with an existential problem. The author has witnessed the astonishing and speedy effect of Shilajit on fractures within his own circle of friends and family. It is a phenomenon that continues to amaze medical doctors.

Two particular cases of poor healing in hairline femur fractures have been studied. The fractures were repaired with surgery but did not heal. Mechanical stimulation of the breakage site, which normally results in healing, was unsuccessful, and the breaks continued to be visible via X-rays for some eight months. It was only when Shilajit was introduced into the treatment that the fractures healed completely and in around less than three weeks. Fasteners such as pins or screws that are normally removed painlessly under local anesthetic, had to be removed under a general anesthetic (!) because the bone had hardened so much. Two other cases of breaks to the upper arm and collarbone respectively, following cycling accidents, healed remarkably quickly, as did a complicated compound of the tibia, fibia, and ankle from a forklift accident, with strikingly rapid healing and little scarring. In the latter case, no further treatment was required after just eight weeks.

Osteoporosis

Osteoporosis (literally, “porous bone”) has become endemic and in some Western countries it is now the cause of more hospital admissions than heart attacks and strokes combined. Respected institutions have suggested that higher life expectancy means that in fifty years’ time at least twice as many people will be suffering from osteoporosis than today.

The disease is relatively simple to describe but has catastrophic consequences for those affected. More calcium is eliminated from the body’s bone structure than is deposited, resulting in a continuous calcium depletion. Bones become more porous and break more easily. The structural stability and robustness of bones is diminished.

Who is at particular risk?

Osteoporosis can affect anyone. Those at particular risk include preand post-menopausal women; the female sex hormones (estrogens) have a significant effect on the bone remodeling process, and a particular risk has been identified in women who have menstruated for fewer than thirty-five years.

It is advisable to be aware of the risk of osteoporosis and take action in good time in order to help prevent it, perhaps discussing it with your doctor, who will advise on your specific risks and measure your bone density if required. A bone density reading will indicate the degree of any calcium loss in your bones.

The table (see here) lists the amounts of calcium that people in each age group should take to ensure their body has sufficient levels.

Advice for preventing osteoporosis has changed considerably since the 2010s. Whereas taking calcium supplements on their own was previously advised, we now know much more about the vital role played by vitamin D3, which ensures that calcium is absorbed by the bones rather than being deposited in the body's tissue and vessels as excess. Of course, a calcium pill can be taken daily with food and is often recommended, particularly for those with a poor diet. Make sure that it is the right kind of calcium that the body can process—not everything labeled "calcium" actually is calcium. Calcium supplements bought from discount stores are often calcium carbonate, only 20 percent or so of which can be absorbed by the body, with the balance having to be excreted unused. On the other hand, some 90 percent of the calcium in calcium gluconate (from pharmacies) is easily absorbed by the body, for example. These tablets can be a little more expensive, but the calcium is considerably more accessible for the body, generally making it a better choice. Before opting to take a course of calcium gluconate, ask your doctor or pharmacist for up-to-date information, and particularly if you have a special condition/illness or if you are pregnant.

Taking calcium alone, however, is not sufficient, as the calcium must be absorbed to optimal effect, as indicated above. Vitamin D3 performs this role, therefore it is important to keep an eye on the levels of this vitamin as well.

Age	*Daily dose of calcium in mg*
4 to 6	700
7 to 9	800
10 to 12	900
13 to 14	1000
15 to 24	1200
25 to 50	900
from 51	800

Table 4. Recommended calcium intake for the body.

Increased requirement for:	
Nursing mothers	1300 mg
Pregnant women	1200 mg
Post-menopausal women who have had no hormone replacement therapy (HRT)	1500 mg

Table 5. Increased requirement for calcium.

Food	*Average calcium content per 100 g (3.5 oz)*
Whole (full-fat) milk 3.5%	100
Hard cheese	800
Camembert	500
Gouda, medium-aged	900
Alpine cheese 45%	1200
Emmental 45%	1020
Poppy seeds	1448
Sesame seeds	783
Soya beans	250
Snap peas (sugar snap peas)	310

Table 6. Calcium content of foods.

How can Shilajit help?

Shilajit's use in traditional folk medicine to prevent osteoporosis is based on the same principle as its use to help heal fractures, as described earlier (see here). Like vitamin D3, it helps with the deposition of calcium in bones.

Except for mineral deposits of strontium, Shilajit is the only natural substance we know of with appreciable levels of strontium. To help prevent osteoporosis, a dose of 0.2–0.5 g Shilajit taken twice a day is recommended.

The zinc present in Shilajit also has a valuable role to play in maintaining bone health. Zinc is an essential constituent of bone growth[90, 91] and zinc levels in bone decrease with age and postmenopause. Zinc has a wide range of properties, affecting such functions as the formation and mineralization of osteoblastic bones by promoting the differentiation of cells into osteoblastic (bone-forming) cells and inhibiting oesteoclastic (bone-resorption) function.

Gastrointestinal complaints

The body's gastrointestinal tract is also known as the digestive tract, but this describes only one of its several functions. The gastrointestinal tract is the pathway that leads from the mouth to the anus. One aspect of its function is to mechanically break down food and absorb it so that it is available in individual components that can be exploited by the body. However, it also has a protective role, ensuring harmful substances are not absorbed but excreted. The liver detoxifies the body via the intestine. A third function is fulfilled by the gut mucosa, a barrier between "inside" and "outside." It thus constitutes a large part of the immune system's first wave of defense.

Stomach ailments

Diseases and ailments of the stomach are generally related to problems with the gastric mucosa.

The stomach is often regarded as the mirror of the soul. The autonomic nervous system is closely connected to the stomach, which can become upset during times of mental stress. This is not bad in itself, although it can

be highly inconvenient. Serious disease is not normally the cause, which in no way is intended to downplay the symptoms. However, long-term stress can soon result in a stomach ulcer that will require urgent treatment.

The following symptoms are typical of a jittery (nervous) stomach:

- bloating
- nausea, often appearing when under stress
- vomiting
- belching, often associated with heartburn
- flatulence
- loss of appetite

People suffering from a jittery stomach are advised to take a look at their lifestyle and diet.

Indigestible, fatty dishes, and large amounts of food, especially in the evening, can soon trigger the symptoms described.

Gastritis

The distinction between a nervous, jittery stomach and gastritis can be quite fluid; the same symptoms occur but are just more severe.

The condition is usually the result of damage to the gastric mucosa, which may have a variety of causes, including:

- alcohol abuse
- prescribed medication, especially for rheumatism (Diclofenac, Indomethacin . . .)
- excessive consumption of hot, spicy food

Chronic gastritis

The symptoms of gastritis are generally not too severe for those who suffer from it. In most cases chronic gastritis is relatively pain-free, since there is

often no gastric hyperacidity (stomach acid). However, the absence of such symptoms should not mask the seriousness of the disease as chronic gastritis can often lead to stomach ulcers.

Stomach ulcers

A stomach ulcer is diagnosed by passing an endoscope (a thin, flexible tube with a camera attached) into the stomach. If an ulcer is present, it will show as a hole in the stomach wall.

These holes appear in places where the mucus membrane can no longer fulfil its protective function, and gastric acid attacks the tissue. It often leads to bleeding in the stomach, indicated by blood in the vomit or stool. A doctor should be consulted as soon as such symptoms appear, as they can cause serious blood loss.

Causes of changes in the mucus membranes:

- irritation of the membrane by digestive juices
- disruption of the movement of food, with chime (semifluid mass of partly digested food) spending too long in the stomach
- irritation caused by medication, nicotine, or alcohol

The healing powers of Shilajit in treating the gastrointestinal mucosa were already being described in ancient times by both Aristotle and the Persian physician Avicenna. It helps damaged tissue to regenerate. Patients with ulcers of the stomach and duodenum were treated at two St Petersburg clinics in the 1960s and 1970s. Symptoms include:

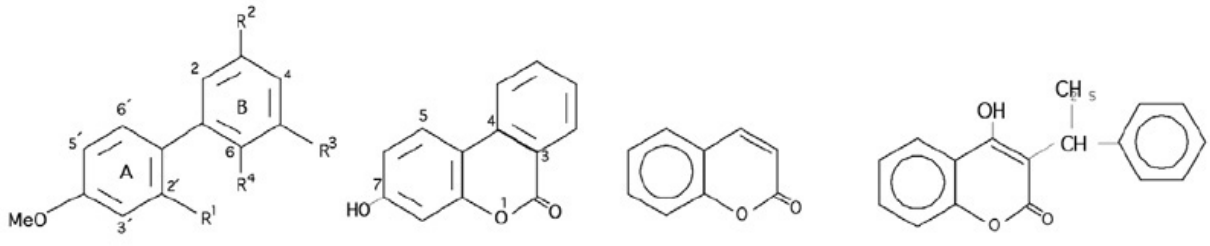
- extreme pain and/or
- nausea and/or
- vomiting at mealtimes

Around 60 percent of patients had been suffering for two to five years, while the other test subjects had experienced serious complaints for more than ten years. Over a period of twenty-six days, seventy-four patients were

given 200 mg of Shilajit dissolved in a teaspoon of tea or warm water, twice a day and approximately thirty minutes before meals. After a full course of treatment over two periods of twenty-six days, with a break of ten days in between, all patients were symptom-free and none reported any side effects.

This extraordinarily successful treatment can be attributed to Shilajit's particular composition. In 1988 Indian scientists identified a significant effect on volunteers in whom stomach ulcers had been induced on an experimental basis and were able to establish a direct link with the active ingredients of fulvic acids, a component of many humic substances in soil[92] (see here). This effect was boosted by the components and biochemical precursors (see fig. 16) (1) to (3) of coumarins (5), a very powerful drug class. These are hydroxydibenzo-α-pyrones (4), which primarily provide active ingredients (6) that thin the blood and are used to prevent heart attack, stroke, and thrombosis.

The scent of woodruff (*Galium odoratum*) is well known to keen gardeners, a fragrance produced by the chemical coumarin. An interesting side note is that Shilajit's effect of prolonging the time it takes for blood to clot thanks to these exact components had already been established back in the 1960s. Shilajit's complex composition makes it particularly useful since, alongside coumarin, other precursors have an effect against gastric complaints. It also has an antibacterial effect.[63, 64, 65, 66, 67] Another explanation of the successful treatment of gastritis can be seen in Shilajit's antimicrobial effect on the *Helicobacter pylori* bacterium, which according to recent findings is closely involved in inflammation of the stomach.



(4) (5) (6)

(1) $R^1 = R^4 = H, R^2 = R^3 = OMe$

(2) $R^1 = R^2 = R^3 = H, R^4 = CO_2Me$

(3) $R^1 = OMe, R^2 = R^3 = H, R^4 = CO_2Me$

Fig. 18. Chemical structure and/or molecular formulae of fulvic acids from Shilajit (1 to 4), odorant in woodruff (5), phenprocoumon (such as Marcoumar) (6).

When taken on an empty stomach, a high concentration of Shilajit, comparable with laboratory conditions, can be achieved. Laboratory experiments carried out in 1966[65] demonstrated the antibacterial properties of 2 to 5 percent solutions on, for example, diphtheria, dysentery, coliform bacteria, and typhus bacteria, as well as *Staphylococcus aureus*. Clinical studies at the Kazakhstan Tuberculosis Institute in Almaty on 300 test subjects suffering from pulmonary tuberculosis showed that recovery times were three to four times quicker when Shilajit was also administered rather than when taking a course of antibiotics alone.[94] This bactericidal effect was confirmed by the University of Heidelberg in Germany, which carried out a study in cooperation with the author at the end of the 1990s. Humic acids have a catalytic effect on the metabolism of carbohydrates and proteins by bacteria and inhibit their synthesis of folic acid.[93]

Russian scientists were already investigating the effects of Shilajit on gastric mucosa in animals as early as 1971[95] and the results have since been confirmed by other studies[92] the animals given Shilajit prophylactically were much less susceptible to stomach ulcers, and positive results were soon achieved in a group of sick rats once Shilajit was administered. Whether ulcers of the stomach, the esophagus, or the duodenum were involved was irrelevant. Shilajit's components greatly reduce the amount of gastric juices released into the stomach, which is another positive effect in the treatment of gastrointestinal ailments. The secretion of mucus is also affected so that the harmful effects of gastric acid are greatly reduced.

Zinc also has a positive effect on the mucus membranes of the gastrointestinal tract. Shilajit contains not inconsiderable quantities of this mineral that is so important to the body, as already mentioned.

The benzoic acid contained in Shilajit also has an antispasmodic effect, which explains its use in Indian Ayurvedic medicine as a remedy for colic and dyspepsia.

Hemorrhoids

Using Shilajit to treat hemorrhoids is one of its most basic applications in Russian traditional folk medicine.

Hemorrhoids are far more widespread than one may be tempted to think. They affect people worldwide but are prevalent in industrial countries in particular. Scientific estimates suggest that at least 60 percent of all those aged over 30 may be affected by the condition, which is the price we pay for an excessively sedentary lifestyle involving too little exercise and an incorrect diet. Our upright stance and gait also places pressure on the rectum, thereby encouraging the development of hemorrhoids. A genetic predisposition to weaknesses in connective tissue also plays a role in the likelihood of developing hemorrhoids. However, not all conditions affecting the rectum are genuine hemorrhoids, although non-professionals may view them as such.

How is the sphincter structured?

Anatomically, the lower rectum consists of several different functional units that work together to maintain tight control.

The anal sphincter is a group of muscles at the end of the rectum that controls the release of stools. It comprises the ring-shaped internal sphincter, which is controlled by the autonomic nervous system and so operates without any conscious effort on our part, and the similarly ring-shaped external sphincter, part of the pelvic-floor muscles, which we can control voluntarily.

What are hemorrhoids?

Hemorrhoids (or hemorrhoidal cushions) are not a disease but a part of the rectum responsible for sealing the bowel against moisture and gases. They are a pillow-like, spongy mass located about 4 inches (10 cm) behind the sphincter. They can be internal, when diagnosis can only be carried out by a doctor, or external. The condition commonly known as hemorrhoids develops when the veins become swollen. The primary symptom is pain-

free bleeding when the thin, insensitive membrane surface tears. Having reached a certain size, external hemorrhoids protrude beyond the sphincter.

Depending on size and condition, hemorrhoids are classified as four different grades:

- Grade I: swelling only, discomfort, itching.
- Grade II: bleeding in bowel movements, mucus secretion, itching, piercing pain when straining, prolapse (protrusion) of an anal vein that recedes by itself.
- Grade III: protrusion of an anal vein that can only be pushed back behind the sphincter by hand, sensation of pain.
- Grade IV: constant prolapse of an anal vein, which cannot be pushed back gently by hand, possible knobbly thickening as a result of thrombosis, highly painful and impedes mobility.

How are hemorrhoids caused?

The condition occurs when the hemorrhoid mass enlarges, which can cause vascular congestion. Before a bowel movement, the sphincter is closed and the hemorrhoids are filled with blood. The sphincter relaxes just before excretion and blood can flow out of the mass of veins.

If the stool is too hard, causing the person to strain too much to pass it, the sphincter will not completely relax and the blood collects in the pillow-like mass, causing the blood vessels to dilate. They become stretched and no longer close properly. It is a common misconception that hemorrhoids are similar to varicose veins. They result from an inflammatory process, whereas varicose veins involve a stretching of blood vessels arising from the faulty function of venous valves, which are not present in the bundle of veins in the rectum.

How are hemorrhoids identified?

The symptoms are varied and can be very painful, but they are fortunately generally harmless. The following symptoms may suggest the presence of hemorrhoids:

- light blood on toilet paper
- a feeling of dampness around the rectum
- an itchy rectum
- burning or soreness of the rectum
- a sense of pressure, or a desire to defecate with no subsequent bowel movement or after a bowel movement
- feeling a small knot or lump in the rectum
- occasional pain in the rectal area
- sensation of a foreign body in the rectal area

Consult a doctor in the event of any one of these symptoms in order to rule out diseases such as bowel cancer which, although relatively rare, can be very serious. You are advised to see a doctor urgently if you notice blood in your stool. Do not put off the potential diagnosis of anal disease, as such conditions have a tendency to get worse rather than better. Hemorrhoids can be treated simply, painlessly, and with no surgical intervention if caught early.

How are hemorrhoids treated?

Grade I hemorrhoids (and, in my opinion, also Grade II) are generally treated with suppositories or creams using an applicator. The products available on the market can be divided into different groups:

- Exclusively local anesthetic as a cream, with active ingredients that include benzocaine or polidocanol. The disadvantage here is that they only stop the pain, rather than treat its cause.
- Astringent substances such bismuth salts, tannins, or aluminum salts. These are styptic and reduce inflammation, and are effective up to a point against wetness. The disadvantage is that this involves a chemical change to the surface of the membrane, and the body should be stimulated to produce new mucus membrane.
- Anti-inflammatory remedies such as Bufexamac or azulene. These have anti-inflammatory and wound-healing properties.

- Cortisone. The risks/benefits of this hormone should be weighed up carefully beforehand. Since it is only available on prescription, a doctor will decide if it is necessary or not.

What does a hemorrhoid remedy do?

- stops bleeding
- reduces pain
- combats itching
- promotes the formation of mucosa
- prevents inflammation
- operates without side effects (ideally)
- supports the body's ability to heal

Shilajit is a natural remedy that combines all the advantages of the drug groups just mentioned with none of the disadvantages!

How does Shilajit treat hemorrhoids?

When applied as a suppository, Shilajit helps to stabilize the mucosa (as described in the section on gastrointestinal complaints), releases its anti-inflammatory properties, and builds up the mucus membranes. It works locally, as do some other conventional medicine suppositories.

In Asian countries the preferred method of taking Shilajit was via instillation (introducing liquid into the body drop-by-drop) due to costs and the lack of acceptable quality suppositories, but this method can be very complicated. It is also available as a homeopathic treatment in some countries.

In one of its publications on Shilajit, the Beyish Center of Traditional Medicine in Bishkek, Kyrgyzstan, recommends applying Shilajit externally in combination with honey, peach kernel oil, or butter, together with another dose of Shilajit taken orally at the same time. Shilajit's effects on the skin and the mucus membranes is undisputed. However, the external application for hemorrhoids is difficult and uncomfortable and we cite this an example only for information. We do not recommend self-treatment in this manner.

One solution is to use suppositories containing Shilajit, which have been available on the internet for some time now. Some contain Shilajit in a homeopathic dilution of D1 (not widely available), while others contain pure Shilajit active ingredient. These are available from pharmacists that actually manufacture them.

The efficacy of treatment with Shilajit, when correctly applied, is due to the properties we have already discussed. Its use for treating hemorrhoids derives from its anti-inflammatory, antipruritic (anti-itch), and astringent effects, and from its ability to strengthen mucus membranes. Its use for anal fissures completes the treatment picture, when an ointment containing 5 percent Shilajit or a solution of powdered Shilajit taken mixed with water (between 1 and 10 percent Shilajit per glass of water) is recommended.

Other options

A review of eating habits is strongly recommended; a diet low in fiber combined with a lack of exercise is the main cause of hemorrhoids. A lack of roughage means the rectum is insufficiently filled. Feces spend too long in the rectum, drying out and becoming more difficult to pass through natural bowel movements as a result.

Filling the rectum stimulates the bowel into activity. Dietary fiber binds water and keeps the stool supple, and as the fiber swells it creates more volume and bowel motions can take place without excessive straining. Excessive straining is another contributing factor in the development of hemorrhoids; the vessels surrounding the rectum gradually work free from the surrounding tissue and extend as described earlier to form anal knots (small lumps).

Excessive straining can cause hemorrhoidal obstruction, especially when a bowel movement is forced in the mistaken belief that the norm is to have at least one bowel motion per day. This misconception can have dire consequences, especially for someone on a diet. The change in eating habits disrupts the amount of dietary fiber consumed and the absorption of liquid is reduced. The rectum does not fill, as little food has been consumed, but thinking that a normal bowel motion frequency must still apply can lead to problems.

People often try to help matters with laxatives because they feel constipated. This creates a vicious circle, since most laxatives slow down the action of the bowel in the medium term and genuine constipation can then result.

A gentle way of regulating the digestion is with nonabsorbable lactose (such as lactulose*)*. Adding a small amount of wheat bran or linseed is recommended as a normal dietary supplement, and at least three and a half pints (two liters) of liquid should be drunk every day so that the dietary fiber can swell as it should.

Ways of helping the bowels

- Hygiene helps to avoid irritation. Wash the area with lukewarm water (but not using conventional soap) after each bowel movement. A bidet is ideal for this, and skin-friendly, pH neutral soaps cleanse both gently and well. Use soft bathroom tissue to dry the area
- (or terry towels) but not hard towels.
- Play sports regularly (swimming and cycling are particularly recommended).
- Strengthen the sphincter by squeezing and relaxing it 30 times at 3-second intervals, once a day.
- Avoid cakes and sweets.
- Take regular exercise.
- Take time out for bowel movements and don’t strain unnecessarily.
- Aim for a well-formed stool (not too hard, not too soft).

Deficiency in the metabolism of minerals

(Iron, selenium, magnesium, zinc, iodine, potassium, sulfur, manganese, molybdenum, copper.)

The human body needs a number of elements in order to grow and develop correctly. These can be divided into elements that occur in the body in large quantities and trace elements; sodium, potassium, calcium, iron, and iodine are important in this first group.

Trace elements are defined as those that occur in amounts of less than 0.01 percent of body mass and where a lack leads to signs of deficiency that can be reversed by administering supplements of the relevant element. However, many of these elements can be harmful to health in higher doses. Substances identified as trace elements include aluminum, bromine, chrome, copper, manganese, molybdenum, and zinc, while other elements of possible biochemical significance include cobalt, fluorine, silicon, vanadium, nickel, cadmium, and tin. Current indications are that metals such as arsenic and lead, which are highly toxic in large doses, may also be of importance as trace elements, although this awaits conclusive proof.

Trace elements, as far as metals are concerned, form key components of enzymes that play a part in metabolism and usually form part of the enzyme's active center. Enzymes are proteins and function as biological catalysts that trigger specific biochemical reactions. These include breaking food down into its smallest components so that it can be readily absorbed by the digestive tract. Trace elements can generally not be replaced in this role. Examples of metals present in such enzymes include iron in hemoglobin and cytochromes, copper in a whole series of oxidases, and zinc in carbonic anhydrase and carboxypeptidase. In many cases, however, the precise function and site of action of essential elements remains unknown. This is true of chromium for example, which plays a role in the so-called glucose tolerance factor and can boost the effects of insulin. Table 7 summarizes the elements and their biochemical significance.

In Russian folk medicine, Shilajit is taken as a preventive measure in case of a possible deficiency, such as in trace elements, for example. Its value in this respect is clearly supported by its composition and the length of time that it is present in different geological formations. The latter allows it to accumulate from the surrounding rock significant amounts of various active minerals (see the list of the elements identified in table 1). In principle, virtually every element in the chemical periodic table (except for rare earth elements) could be present in Shilajit.

Element	*Compound in which the element is active*	*Daily require*

		ment (in mg)
Iron	Hemoglobin, myoglobin cytochrome, catalase-peroxidase,flavoproteins	0.5 to 5
Zinc	Carboanhydrase, Carboxypeptidase, Alcohol dehydrogenase, Phosphoglycerinaldehyd-Dehydrogenase, Glutamate dehydrogenase, Lactate dehydrogenase,DNS polymerase, RNS polymerase (?)	0.4 to 6
Copper	Cytochrome oxidase, Diphenyl oxidase, Amino oxidases, Tyrosine hydroxylase, Uricase, Superoxide dismutase (cuprein), Flavoproteins, Ferroxidase	1 to 2.5
Manganese	Peptidases, Arginase, Glutamine synthetase, Pyruvatcarboxylase, Isocitrate dehydrogenase, Glycosyltransferases, Adenosine triphosphate (ATP)	2 to 5
Iodine	Thyroid hormones T3 and T4	0.1 to 0.2
Molybdenum	Aldehyde oxidase, Xanthine oxidase, Sulfite oxidase	0.045
Cobalt	Corrinoids (cobalamin), Glycylglycine dipeptidase,ß-hydroxybutyrate Dehydrogenase	<0.005

Chrome	Trypsin (?), Renin (?),Glucose tolerance factor, (composition?)	<0.005
Selenium	Glutathione peroxidase	0.05 to 0.1 (?)

Table 7. (Trace) elements and their presence in enzymes and compounds of biochemical importance. (?) indicates that the function of the trace element with this enzyme is still under discussion.

The presence of rare elements such as strontium is certainly of interest and its effects on bone are discussed (see here) .

Summary of effects

A microgram (mcg) is 1,000 times smaller than a milligram (mg). The word microgram is sometimes written with the Greek symbol μ followed by the letter g (μg).

For advice on the recommended daily intake of vitamins and minerals, consult the NIH (National Institute of Health) website: https://ods.od.nih.gov/factsheets/list-all. Readers in the UK may consult the NHS website: www.nhs.uk/conditions/vitamins-and-minerals/others.

If you are considering taking a supplement, consult a medical practitioner, since building up excessive amounts of these substances in the body may be harmful. Amounts recommended by US and UK health authorities sometimes differ but are generally in the same range.

Cobalt

Cobalt's most important role is as an integral part of the structure of vitamins. It is involved in the function of vitamins within the body, including the formation of red blood cells (erythrocytes). Whether this trace element has any physiological significance beyond the actions of vitamin B12 is yet to be conclusively determined. Like other bivalent metal salts

(manganese, magnesium, zinc, and copper), cobalt can play a role in the activation of enzymes. Deficiency is rare. Precisely how much cobalt the body requires is difficult to specify, but in the West it is estimated at 5 to 10 mcg (µg) per day, with the main intake coming from vitamin B12. This vitamin is extremely important for the body and is derived from animal sources; purely plant-based foods do not contain vitamin B12, which is a drawback of a wholly vegan diet, although vegans can rectify this deficit with yeast, for example.

Copper

Copper plays a role in electron transfer processes in the cell membrane and the mitochondria, the “powerhouse” of the cell. Along with iron, it is a key factor in the formation of red blood cells (erythrocytes) and has an even stronger influence on their maturation. Hemocuprein, a protein found in human red blood cells, contains large amounts of copper.

Many copper-dependent enzymes have been identified, including cytochrome oxidase, tyrosinase, uricase, ascorbate oxidase, monoamine oxidase, and phenoloxidase. The problem of copper’s absorption into the body is similar to that of iron, with the levels of gastric acid and the degree to which the stomach is filled playing their part. The metabolism of copper within the human body is regulated by the liver.

The body contains approximately 100 mg of copper, mostly compounded with proteins.

The logical consequences of copper deficiency include disruption of new blood cell formation and changes in blood count. Copper deficiency occurs if its normal absorption is disrupted or if a diet has little or no variety: for example, a diet largely based on highly processed food, fast food, or artificial nutrition. However, the amount of copper that is absorbed should not be too high, as excessive levels of copper can damage the gut flora and irritate the mucus membranes. The gentle preparation of food, such as steaming, is the best way to preserve its copper content. The recommended intake is 1–2.5 mg per day.

Iodine

The chemical element iodine is found almost exclusively in the thyroid gland, where it plays an important role in the production of T4, as the thyroid hormone thyroxine is known. The thyroid hormones are closely involved in the regulation of combustion processes in cell metabolism and regulate the rate at which the body generates energy.

The consequences of iodine deficiency have been known for some time, leading to the enlargement of the thyroid gland, which results in the development of a goiter. Long-term iodine deficiency can also lead to intellectual disability, although this is rather rare. The availability of salt that is iodized (iodine-enhanced) has resulted in considerable improvements in iodine intake.

Iodine and Shilajit

Shilajit contains very small amounts of iodine in mineral compound form as a natural ingredient. Some manufacturers supplement the existing iodine in line with the recommended intake. The amount that you need depends on your age. Healthy adults need around 140–150 mcg (µg) iodine a day and most people should be able to get this amount from a healthy and balanced diet. However, if suffering from thyroid imbalance or a thyroid disease such as Hashimoto's thyroiditis, it is important to consult your doctor before taking Shilajit.

Iron

The human body contains approximately 0.2 oz (5 g) of iron, with the largest amount contained in hemoglobin (an oxygen-carrying protein in red blood cells) and myoglobin (an oxygen-binding protein in muscles). Iron is essential for the oxidation and reduction processes within cells, and it plays a central role in the transportation of oxygen in more complex life forms. It is involved in the supply of oxygen and the extraction of carbon dioxide within the lungs before the latter's exhalation as a gas.

Iron also plays a part in other metabolic processes such as immune responses; the body always maintains a certain stored reserve of iron which it can call upon as required. The body's exact daily requirement of iron is hard to quantify and differs considerably between sources. The amount lies

somewhere between 0.5 mg and 5 mg, taking into account varying levels of absorption and bioavailability (the extent to which it is available). Pregnant women in particular require more iron.

Iron deficiency is generally diet-linked or the result of significant blood loss. Heavy menstrual bleeding, various injuries, or problems with its absorption can lead to the loss of larger quantities of iron. The symptoms of deficiency include fatigue, headache, weakness, irritability, vertigo, palpitations, shortness of breath, burning mouth syndrome, constipation, and brittle nails.

Magnesium

Magnesium is present throughout the body, with 99 percent of the total amount (around 1 oz/30 g) being found within cells. Magnesium performs a wide range of tasks. Much like calcium, it plays a critical role in building strong teeth and bones and is also essential to the activity of many enzymes. It is involved in the metabolism of carbohydrates and proteins in the body and in the metabolism of fat by stimulating various fat-splitting enzymes. Magnesium is also important for the nervous system where it moderates stimulation between nerves and muscles. Calcium has the effect of raising cholesterol levels, whereas magnesium lowers them. Experiments with rats have shown that magnesium deficiency compromises the immune system. Some scientists believe that magnesium is involved in at least 300 enzyme reactions.[43]

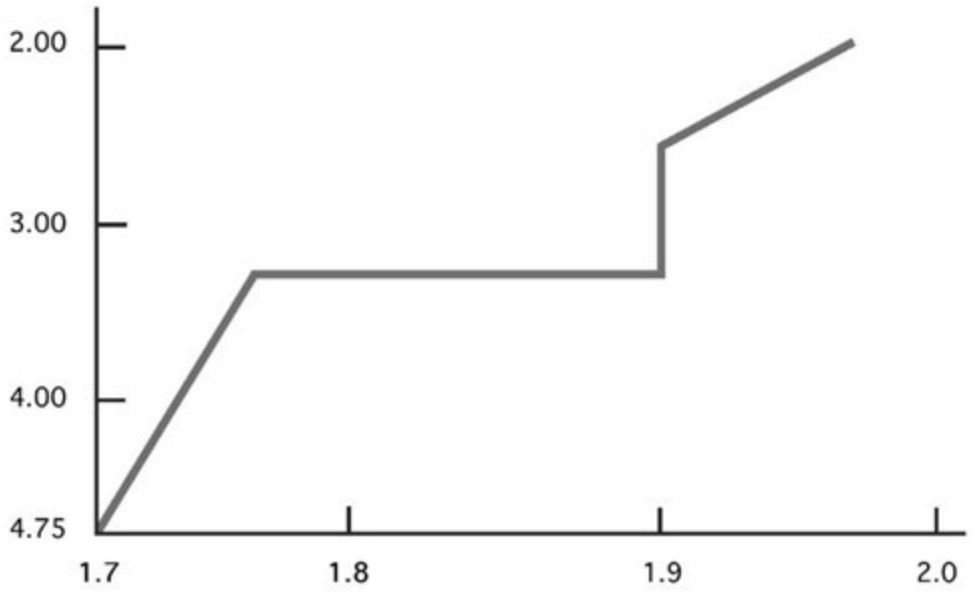


Fig. 19. Magnesium (horizontal axis) versus cholesterol (vertical axis) levels, in percentage of micrograms.

Higher levels of magnesium are found in whole wheat products, nuts, cocoa, and milk products. Its intake is greatly improved by vitamin D, a vitamin produced naturally in the parathyroid gland. The amount of magnesium needed by the body depends on your age and sex. The NIH recommends 310–320 mcg (µg) for adult women and 400–420 mcg (µg) for adult men, for example. Note that increased magnesium intake should be accompanied by that of calcium, as the two elements compete with each other.

Manganese

Manganese is essential for the metabolism of carbohydrates and a host of other biochemical processes in the human body. It plays a significant role in the development of the skeleton, cartilage, and gonads. It is also involved in the metabolism of cholesterol in the body as a counterbalance to the chemical element vanadium, which inhibits the synthesis of cholesterol. Manganese also plays a part in the metabolism of iron and copper.

The total amount of manganese in the body is estimated at 10–20 mg, with current daily intake recommendations hovering around the level of 2–5 mg. Plant-based foodstuffs contain large amounts of manganese.

As observed in animal experiments, manganese deficiency can lead to serious problems, including skeletal changes, paralysis, mobility issues, neurological conditions, sterility, and reduced glucose tolerance. A deficiency also inhibits activity in enzymes that contain manganese as a cofactor (where it is essential for the activity of the enzyme). No indications have been found to date to suggest that a normal diet cannot fulfil our daily manganese requirements. A certain synergetic effect with individual elements may be expected, so that no deficiency symptoms are observed even with a reduced intake.

Molybdenum

There has been relatively little research on the trace element molybdenum. As a component of various different enzymes, it is one of the key nutritional factors essential for life. Despite this, there has been very little literature on molybdenum published to date. The required daily intake is still a subject of debate among researchers, with recommendations of approximately 0.045 mg per day). Molybdenum is significant in the storage of fluorine and is therefore instrumental in preventing dental caries. It fulfils an important biochemical function as a cofactor of the enzyme xanthine oxidase.

Potassium

The chemical element potassium plays an integral role in cell function. It maintains a balance in our cells' sensitive regulation mechanisms and is one of the principal ions controlling the metabolism of water in the body. It is also involved in maintaining the acid-base balance as well as the electrical stabilization of cell membranes. Potassium stabilizes nerve and muscle function, and is involved in many basic biochemical processes, such as the citric acid cycle and in the metabolism of glycogen and proteins. As much as 98 percent of potassium is intracellular, found in cells, muscles, skin, and tissue, with only 2 percent being extracellular (located elsewhere in the body).

Transport mechanisms convey potassium ions into the cell and remove sodium ions. These mechanisms and their counteracting diffusion forces help manage the electrochemical functions of the cell and maintain the electric charges required. It is the 2 percent of potassium ions located

outside the cells that are the most important as they manage the entire metabolism of potassium. If potassium levels are high, potassium ions are pumped into the cells. If there is a shortfall, potassium is removed from the cell to the space outside the cell into the extracellular fluid. Potassium is also an important indicator in the development of cardiac failure.

Both human and animal metabolisms are poorly protected against potassium loss. Signs of deficiency are fairly common in kidney conditions, such as chronic tubular kidney damage, nephritis (inflammation), and nephrosclerosis (hardening of the walls of the small arteries of the kidneys). In addition, potassium deficiency can occur after heavy or chronic diarrhea, laxative misuse, and anorexia. Prolonged aldosterone or corticoid treatment can lead to deficiency, as can certain hormonal conditions such as those linked to the menopause. However, the most common cause is loss of potassium through the gastrointestinal tract in a number of diarrhea-like processes. The symptoms of potassium deficiency are often vague and may include muscle weakness, nausea, changes in cardiac activity, and lowered blood pressure.

The amount of potassium that your body needs per day depends upon your age and sex, but is around 2600 mg for women and 3400 mg for men. Most people should obtain the required amount by eating a healthy, balanced diet.

Selenium

Selenium’s role in protecting the human body against liver toxicity (hepatic necrosis) is of particular importance. The human body contains 10 to 25 mg of selenium, which boasts a very broad spectrum of effects. Rather like vitamin E, it is considered one of “Nature’s vaccines,” with acknowledged uses in the prevention of heart attacks and angina pectoris, and as a treatment for rheumatic/arthritic conditions, decreased fertility, and weakened immune response.

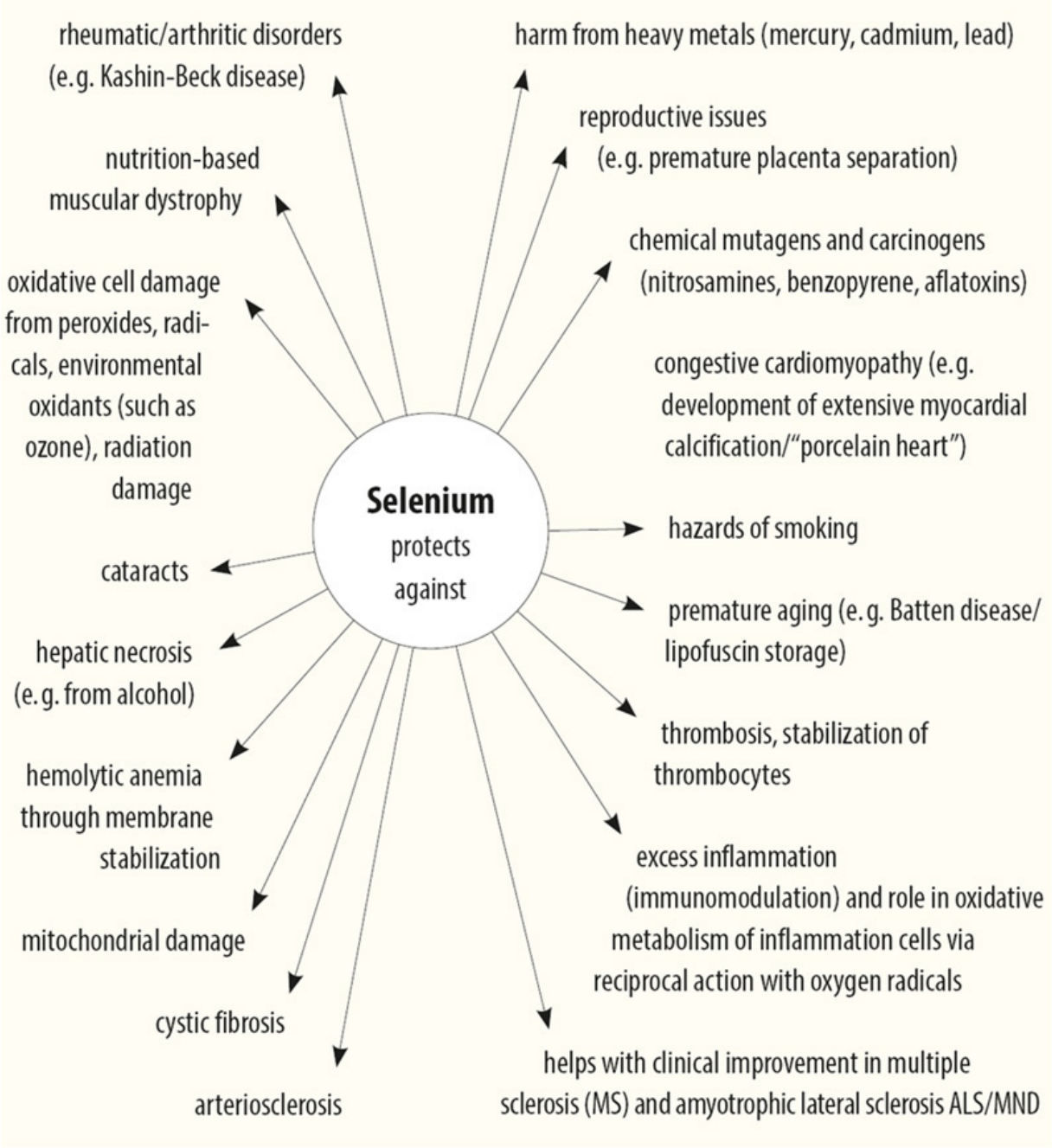


Fig. 20. Protective effects of selenium.

In combination with vitamin E, selenium seems to influence antibody formation, as demonstrated by experiments on rabbits. Immunological defenses are mobilized by selenium, with the activation of granulocyte phagocytosis and macrophages (phagocytes) playing a role (see here).

As selenium cysteine, selenium is a cofactor of gluthathione peroxidase, an antioxidant enzyme that, as a scavenger of free radicals, helps to reduce oxygen free radicals, among other things. It also combats heavy metal loads, significantly reducing levels of toxic heavy metals.

It is also interesting to note that the presence of vitamin E lowers the dosage of selenium required—there seems to be a synergetic effect between the two. Daily requirements are estimated at 0.05–0.1 mg.

Strontium

For the effects of strontium see fractures.

Sulfur

Sulfur is one of the most versatile chemical elements and plays a role in a host of different chemical compounds and reactions. As an important component of various amino acids, it is also highly significant. Certain oxidation states of sulfur can form disulfide bonds or bridges, whose bonding properties influence the effects of various substances produced by the body, such as insulin or plasminogen/plasmin. Sulfur is also involved in the formation of cartilage (as chondroitin sulfate).

Uptake in the body is generally via amino acids containing sulfur, but also through other sulfurous substances, such as preservatives, vitamins (B1) or mustard oils (garlic, onion). Sulfur deficiency leads to restricted growth of hair and nails and has also been discussed as a possible cause, among many, of arthrosis (degenerative joint disease). Significant progress in research is expected over the next few years given the public interest in establishing the causes of this disease.

Sulfur is present in Shilajit in almost all naturally occurring oxidation states. Sulfur’s principal forms are as sulfates and chemically bonded sulfides in organic substances.

Zinc

Increasing evidence has come to light in recent years of a close connection between zinc and the immune system—a disruption in the body’s immune

function is often associated with a zinc deficiency. As we age, our immune defenses diminish. Animal experiments and observation of humans on artificial diets have shown that selective zinc deficiency can reduce both the size and function of the thymus gland and also obstruct T-cell-dependent immune responses. This compromised immune function can often be mitigated with zinc substitution, and experiments have shown that low zinc concentrations can stimulate a range of functional parameters of immune cells, although higher concentrations of zinc are toxic to such cell populations.

According to the scientific literature published to date, the number of enzymatic effects varies greatly. As with magnesium, around 300 enzymatic reactions involve zinc, hence its key role in cellular and humoral (antibody-mediated) immunity. It performs particular tasks in the specific immune response, as well as in non-specific immune mechanisms that cannot be undertaken by any other trace element, making it quite unique.

Zinc's ability to heal wounds via a topical application has been known for some time, with zinc ointment having been used in the care of children and the elderly for decades. Some textbooks quote studies[102] that have identified lowered zinc serum levels, among other substances, in atopical eczema, for example, and in various kinds of hair loss (alopecia). Zinc supplements improved clinical results, but zinc has no effect on genetically determined hair loss. Zinc can also be very effective for those experiencing difficulty in conceiving (see here).

Zinc deficiency can be clinically identified through changes in the nails, lesions on mucus membranes, poor wound-healing, increased susceptibility to infection, and certain psychological issues such as apathy or lethargy.

Reduced zinc levels are quite common in pregnancy and skin complaints that start during pregnancy are often attributable to zinc deficiency, but these can be reversed with zinc supplements.

Bronchial diseases

The effects of benzoic acid, found in Shilajit, are described earlier (see here). It also has an impact on the bronchial system. In addition to its spasmolytic (antispasmodic) effects within the gastrointestinal tract, it has

anti-asthmatic properties. Its effect should not be overstated, however, and under no circumstances should any treatment with corticoids or beta blockers be halted in favor of Shilajit. As a supplementary treatment, Shilajit's role is justified through its dual effect in loosening mucus caused by stimulation of nerve pathways in the stomach. Indian medicine uses Shilajit for exactly these symptoms and for acute and chronic bronchitis.

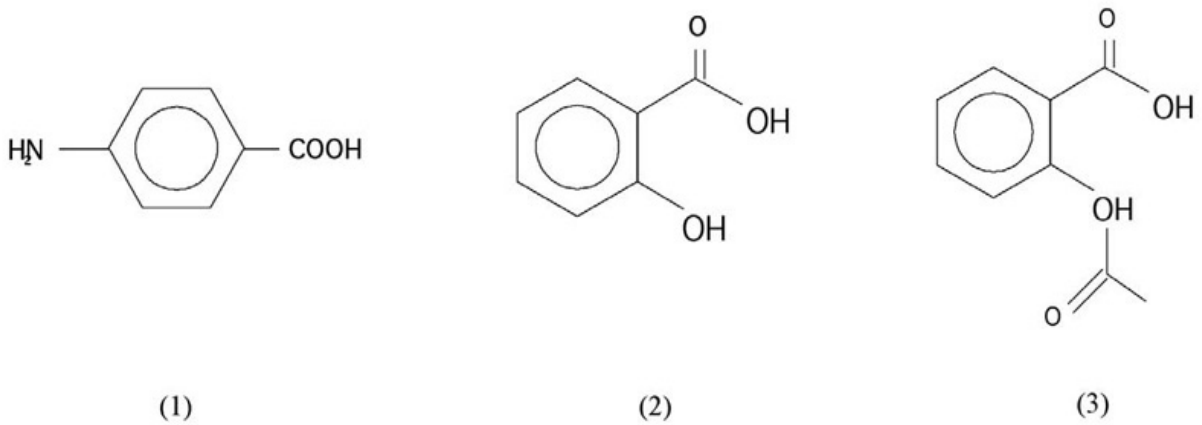


Fig. 21. Chemical structure of para-aminobenzoic acid (1), salicylic acid (2), acetylsalicylic acid (aspirin) (3).

Erectile dysfunction

Erectile dysfunction is a colloquial umbrella term for the limited ability of a male to have sexual intercourse. Erectile dysfunction (sometimes known as impotence) as a medical term is used to describe an inability to get and maintain an erection. This problem can have different causes.

A poorly functioning erection may have psychological causes, although it is becoming increasingly clear that this is not exclusively the case. There is often a physical cause, which, when allied with the mental stress of failing to "perform," develops into a vicious circle of anxiety.

This does not include short-term issues, resulting, for example, from heavy drinking or extreme psychological turmoil caused by stress, anxiety or other pressures.

The problem of erectile dysfunction is known to occur in those with diabetes, high blood pressure, and conditions of the central nervous system.

Doctors are now increasingly identifying a link with certain malfunctions in the body, such as disruption in the formation of hormones and messenger substances due to a lack of the required “building materials” or inadequate nutrition.

A distinction must be drawn here with conditions in which there is no lack of ability to have sex but the sperm are of low quality and do not lead to conception. Sterility, also called infertility, refers to this inability to produce or release sperm.

Links with various kinds of mineral deficiency are now increasingly being established. There is an interesting Iranian study from 2020 in this context, which addresses the dietary habits of Iranian men and their influence on fertility.[108] There is a clear indication of significantly higher fertility in men enjoying a traditional diet, comparable with a Western organic diet. The increased level of micronutrients no doubt plays an important role.

Oligospermia is the medical term for a low sperm count, and azoospermia for the absence of sperm. Aspermia is the absence of seminal fluid on ejaculation and rare except after deliberate surgical intervention.

Poor fertility is very often connected with hormone production, especially the formation of the male sex hormone, testosterone.

The metal zinc plays a key role in hormone production and its deficiency results in lower formation in males of the hormone gonadotropin, which controls testosterone formation, among other things. Too little zinc means less testosterone.

Zinc is essential for building proteins and it also plays a significant role in cell division. Low levels mean that mitosis cannot occur at normal biological levels, which principally affects cells with a high cell division rate, such as sperm.

Do note that very sexually active men should consider their zinc levels, as approximately 2mg of zinc is lost with every ejaculation.

How can Shilajit help?

Indian scientists at the University of West Bengal published a study in 2015[103] showing that overall testosterone levels in volunteer test subjects aged 45 to 55 rose significantly when 250 mg of Shilajit was taken twice daily for 90 days. These results also correlate with findings from experiments on mice.[104] This study was able to prove that testosterone levels rose with the dose, as did sperm production, quality, and concentration, along with libido and the male fertility index. One interesting side effect was that the infertility induced in laboratory experiments with cadmium was not just reversible with Shilajit but its humic substances also led in practice to the detoxification effect predictable in theory—the excretion of cadmium.[105] Another study using experiments on rats addressed the extent to which folk medicine's use of Shilajit as a fertility treatment might be substantiated.[106] In terms of sperm quantity, concentration, and quality, the results for male rats were identical to the studies on mice. An increase in the amount of semen-producing tissue was determined histologically.

The new aspect of this study is the impact of Shilajit upon fertility in female rats. After a 5-day course of Shilajit, ovulation could be induced in 7 of 9 animal test subjects, whereas this occurred in only 3 of 9 animals in the control group given a placebo. Given the very low number of animals used in the experiment, this is not proof, however, but merely a particular outcome.

In 2020 American scientists published a review study[107] that looked at the question of whether and how advertising claims for potency medication touted as so-called testosterone boosters were supported in the relevant scientific publications, or whether the claims should be viewed instead as poetic license. Some 109 different ingredients advertised as having potency-boosting properties were analyzed; only 27 were backed up by studies in the scientific literature, with only 17 of these having a clear data set. Shilajit is one such.

Medical literature from Asia features many accounts (and thousands of years of experience) on the subject of Shilajit's effect on erectile dysfunction and poor sperm quality, so it can indeed be assumed that folk medicine's use of the substance as a treatment for impotence is justified, even if it does cheerfully mix up the various aspects involved and draw insufficient distinction between erectile dysfunction, low fertility, libido

enhancement, and aphrodisiac effects. To what extent there is a connection between Shilajit and the boosting of libido (one's own and that of one's partner) is up for debate and has not been scientifically proven, but studies do suggest a link in cases of erectile dysfunction or low fertility due to testosterone deficiency. The psychological aspects of erectile dysfunction must never be underestimated and are subject to their own rules.

Exactly what lies behind these observable effects of Shilajit is not entirely clear and as such remains one of the closely guarded secrets of this natural substance.

Shilajit contains zinc. It also contains iron, which plays a role in male potency. Research into the significance of zinc remains in its infancy and is yet to make its mark in the scientific literature as a potential explanation of Shilajit's observable effects, although it has certainly sparked interest among researchers, as a survey of research literature shows.[109] A sufficient concentration of zinc in sperm plasma is required for normal spermatic function and conception. However, a high zinc concentration can have negative consequences on sperm quality, so it is a question of the correct balance. Zinc supplementation should be regarded as a good way of improving sperm quality, but it still remains to be proved that dietary supplements improve pregnancy rates in humans. As a general rule, the data that is currently available shows how important zinc is in male fertility.

Other factors must contribute, as zinc is present in Shilajit in what orthodox medicine would consider low quantities. However, an effect is clearly evident. A role may be played by other ingredients in enhancing the effect, a phenomenon also observed within the plant kingdom. Yet another secret that awaits explanation.

Folk medicine suggests combining Shilajt with sea buckthorn juice, blueberry juice, or carrot juice to improve sperm quality (see here).

Dosage for Erectile Dysfunction

0.3 g Shilajit taken once a day (in the morning) on an empty stomach, or 0.3 g taken twice a day (mornings on an empty stomach and evenings). The beneficial effects can be enhanced by taking it with an egg yolk mixed with the fruit or vegetable juice

mentioned. It is suggested that sperm quality will improve after 6 or 7 days of treatment, and the course should last 25 to 28 days.

Anti-allergic properties

Shilajit's anti-allergic properties have been known for some time, based on the stabilization of mucus membranes by its fulvic acid components 4-Methoxy-6-carbomethoxybiphenyl and 3.8-dihydroxypyrone. Their effect on stabilizing mast cells has been investigated.[110] Shilajit, and various combinations of its components, significantly supported the protection of mast cells against the depletion and release of histamine. This would explain the preventive use of Shilajit in folk medicine for hay fever.

Antioxidant properties

The substances responsible for Shilajit's anti-allergic properties have multiple effects. Thanks to these substances, Shilajit has been proved to have an antioxidant effect at a cellular level[110,111,112,113] and it also combats oxidative stress.[114, 115]

Anabolic, performance-enhancing, and fortifying properties

By the 1960s Shilajit was already being used as a treatment to enhance performance in sport, and in particular by the military and in space travel.[116] In preparation for the 1998 Olympic Games, the Soviet government provided its national sports committee with USD 6.5 million for research into Shilajit's use in sport.[121] Russian special forces, among them the elite unit Spetsnaz, also made use of it for its strengthening and invigorating properties.

Shilajit's anabolic properties are not comparable with those of hormones, although they do lead to 10 percent more muscle mass,[121] longer muscle performance,[117] and increased tolerance of oxygen deficiency at high

altitudes.[118] This is in addition to greater resilience in stressful situations, without any of the side effects associated with anabolic hormones. Shorter recovery times have also been reported.[121] Shilajit stimulates the metabolism at a cellular level,[119] and its effects on chronic fatigue have been demonstrated in animal-based experiments.[120]

Dosage for Performance Enhancement

0.3 g Shilajit on an empty stomach twice a day (mornings and evenings) for 10 to 12 days. The beneficial effects can be enhanced by mixing the Shilajit with sea buckthorn juice, blueberry juice, or carrot juice, plus an egg yolk, according to taste.

Alzheimer's disease and dementia

Alzheimer's disease/dementia is a brain disease most commonly found in those over 65 years of age. It is characterized by an increasing loss of mental faculties. Dementia is a general term and should be understood as a symptom, whereas Alzheimer's is the disease underlying dementia symptoms and probably the most common cause. There is general agreement that at least 60 percent of all dementia-related disease is linked to Alzheimer's. Equating the terms Alzheimer's disease and dementia is incorrect since they refer to the cause and its effects respectively.

The typical feature of Alzheimer's disease is the deposit of certain tangled protein plaques in the brain. Tau proteins lodge in the axons of nerve pathways and are unable to return to cells, causing abnormal neurofibrillary "tau tangles" inside neurons that in turn lead to the death of brain cells. The long-term consequence is a decrease in mental performance, and about 20 percent of 85-year-olds exhibit symptoms of the disease. The possible cause is hotly debated in scientific circles. Some studies suggest that infections may be the trigger, but in fact a whole range of things could be the cause, from environmental toxins and fine particulate pollution to ozone, and from prions (disordered proteins) to aluminum.

How can Shilajit help?

The disease itself is incurable. The only treatment option currently available is prescribed medication for slowing its course, improving memory performance, and enhancing quality of life. Experts agree that diet plays a significant role. Several studies on Shilajit for Alzheimer's disease have appeared in recent years, [122, 123, 124, 125, 126, 127] with interest principally focusing on the properties of fulvine, and its polyphenol (antioxidant) content. Animal experiments have shown an improvement in memory performance in rats and mice along with a prevention of the tangling of proteins, which may contribute to the prevention of Alzheimer's. The effects of Shilajit on the metabolism of neuronal messenger substances and enzymes have been demonstrated in rat brains,[128] but it is too early to derive any concrete potential uses from this.[122] It is more realistic to assume that Shilajit's contribution to Alzheimer's disease is due to its effects at a cellular level (only recorded incompletely so far) and its invigorating, antioxidant properties. This chimes with Shilajit's Ayurvedic classification as a Rasayana (see here.

Uses in Ayurveda described to date

Ayurvedic medicine has its roots in Asia, and in the Indian subcontinent in particular. Its continued popularity in Europe is largely due to its holistic approach, which differs greatly from the rather mechanistic view of disease in orthodox Western medicine. The latter acknowledges the circumstances in which a disease develops but does not fully appreciate the significance. With Ayurveda, the focus is on the person as a whole, not just on the heart or kidneys, for example. It also emphasizes the diversity and uniqueness of each human being and how humans cannot be standardized, while at the same time acknowledging a judicious amount of empiricism, as perhaps is the case with homeopathy. In India Ayurveda is part of basic healthcare provision and initial training takes almost six years; it is taught at more than 300 institutions and universities. Naturally, there is also an infrastructure of companies producing Ayurvedic products. Reservations in the West about this 3,000-year-old, holistic medical approach meet with astonishment and incomprehension in India. Discussing this medical system in depth is beyond the scope of this book, but a variety of publications on the subject are available for further research.

In Ayuverdic medicine, Shilajit/Mumijo has the status of Rasayana, a specific branch of Ayurveda in which treatments and preparations are designed to boost the immune system, support our resilience to harmful effects of the environment, and help to preserve youth and reverse the aging process in particular. Shilajit is firmly established in Ayurvedic thinking as a cleansing agent for urinary tract infections, while in the cardiovascular system it is seen has having a “scouring” function useful in the treatment of arteriosclerotic plaques, sometimes in combination with wild honey. In terms of the hormonal system, Shilajit is used to treat diabetes and diseases of the thyroid gland, and to combat obesity.

It should be noted at this point that there are no recommended doses, since this would contradict the Ayurvedic approach, which involves gaining an understanding of the person before treatment, including their life, their relationship with themselves and the environment, and with their own heaven and Earth. Prescribing a recommended dose would be like hanging an Ayurvedic label on conventional medical thinking.

Other uses described in publications and reports but not scientifically guaranteed

Diseases of the upper airways

Shilajit has been used successfully in Asia to treat diseases of the upper airways such as rhinitis, tonsillitis, and laryngitis. Gargling with Shilajit dissolved in water and sucking Shilajit tablets are recommended for a sore throat. This is where Shilajit’s anti-inflammatory properties prove useful, as well as its stabilizing and disinfecting effects on the mucosa.

The usual treatment consists of tablets (or capsules) to boost the immune system, with a simultaneous local application such as a mouth rinse, which you can make yourself from a capsule or tablet. This combination should alleviate symptoms quickly.

Dosage for Diseases of the Upper Airways

0.2–0.3 g Shilajit in tablet or capsule form, twice a day. In addition, suck Shilajit tablets as required and/or dissolve a tablet in water (a 10 percent solution: 10 g Shilajit in 1/3 cup/ 90 ml of water) and gargle.

Suppurative otitis media

Suppurative ear infections such as otitis media are caused by bacteria migrating from the throat to the middle ear via the Eustachian tubes of the middle ear.

Conditions here are favorable for the bacteria and can cause painful inflammation. Middle ear infections often occur during a cold, when the Eustachian tubes are swollen and air cannot escape properly.

A cold generally leads to a weakening of the immune system and a severe deficiency of the natural bacterial flora of the mucus membranes, making it easy for harmful bacteria to cause problems.

Ear infection –important note

A visit to the doctor is essential, especially for children, to ensure that pressure on the eardrum does not cause damage within the ear.

Application for Ear Infections

To prepare ear drops, dissolve 0.4 g (2 tablets or 2 capsules) in a teaspoon (5 ml) of water and drip into the ear several times a day. A 10-day course of treatment is recommended. In addition, take 0.2–0.3 g of Shilajit (1 tablet or capsule) twice a day over a period of 25 days.

Atrophy of the vaginal mucosa and the cervix

Inflammation in the female genital area is not uncommon. During the reproductive years, the mucosa of the womb is subject to constant change due to the action of the corresponding hormones.

Estrogen deficiency after menopause can cause regression and atrophy of the mucus membranes, known as erosion. The cervix is particularly affected, with a tendency to tearing and scar formation following infection, often accompanied by discharge.

How can Shilajit help?

As described (see here), the main focus is on Shilajit's effects on the mucus membranes and its role in inflammation inhibition, wound healing, and protection of the mucosa and the formation of new mucus membranes.

The practice of douching with an irrigator (available from pharmacies) is common in Asia but has fallen out of fashion in the West. A douche solution is introduced into the vagina via a tube and is applied several times a day. Vaginal suppositories containing Shilajit would be more effective but are not widely available and may need to be custommade. Please check with your pharmacy.

Tampons soaked in Shilajit are an alternative for a longer application.

> **Application for Restoring Mucus Membranes**
>
> Take 0.2 g (1 tablet) Shilajit once a day for a period of 14 to 21 days. In addition, apply a 4 percent solution via a tampon. Internal use will shorten the duration of treatment. Administer at night ideally and refrain from sexual intercourse during the course of treatment. Note that a single tampon should never be worn for more than 8 hours in order to avoid risk of infection.

Venous disease/deep-vein thrombophlebitis

Venous disease, particularly in the form of varicose veins, is common and has a number of very varied causes. Modern lifestyles facilitate, rather than cause, the development of venous complaints, including lack of exercise, obesity, smoking, and sedentary behavior, but genetic predisposition also plays a role. Venous disorders are easy to deal with if they are approached in a disciplined manner and if programs aimed at preventing problems such as deep vein thrombosis are followed consistently, making the condition

easier to treat. For further information consult the relevant publications and seek appropriate advice from healthcare professionals.

The circulatory system is a self-contained network of tubes holding around 10.5 US pints (5 liters) of blood, which is pumped around the body by the heart. The blood transports oxygen and nutrients around the body to the cells and removes waste products and carbon dioxide on its return journey.

The right side of the heart pumps blood to the lungs, which release carbon dioxide, and oxygen-rich blood flows from the lungs to the left side of the heart, and returns to the central circulation.

When a person stands up, blood must be pumped “uphill,” against gravity, on its way back from the legs to the heart. Veins are the blood vessels responsible for transporting the recirculated blood. They hold about 80 percent of the blood volume and act as a kind of reservoir.

The walls of veins are relatively thin in comparison with those of arteries. A special feature are the valves, which work like non-return, or check, valves; this means that the blood can only ever flow in one direction, rather like a bicycle tire valve. Once the heart completes a pumping movement, the blood is not able to “fall back” and collect at the lowest point.

Arteries and muscles have a far more important function in the return of blood (by veins) to the heart. As the pulse (heartbeat) expands the artery wall, the adjacent vein is compressed and the blood inside is pushed forward. The vein in or beside a muscle is also compressed by muscular action, driving the blood forward.

As discussed, veins transport blood against gravity and so are under great pressure. It is easy to see how they can become susceptible to congestive conditions, especially if the valves stop working properly. Additional complications such as thrombosis may occur.

	%	*Liters*	*Pints (US)*
Arterial system	**1**	**0.8**	**1.70**

	5		
major arteries	6	0.3	0.64
arterioles	9	0.5	1.06
Low-pressure system	**85**	**4.6**	**9.75**
capillaries (systemic circulation)	6	0.3	0.64
veins (systemic circulation)	61	3.3	7
lung circulation	11	0.6	1.27
heart cavities (diastole)	7	0.4	0.84
	100	**5.4**	**11.50**

Table 8. Distribution of the total volume of blood through the various parts of the circulatory system.

Thrombosis

Thrombosis occurs when a blood clot develops and becomes stuck in a blood vessel. In its correct place, a blood clot’s normal and natural function is to seal and close up injured tissue. A clot can form with particular ease

when the speed of blood flow drops, if there is tissue damage, or when the blood's coagulating function is compromised ("thick blood").

If the blood flows too slowly through an inflamed vein wall, a thrombosis can form. These develop into a problem when the clots become so large that they block a blood vessel or separate from the vessel wall and become displaced. This can cause a heart attack, pulmonary embolism, or stroke. As this is a very serious risk, this is an important and explicit reminder that thrombosis must always be treated by a doctor!

A thrombosis can also form when a patient is bedridden, has had surgery or has given birth, hence the prescription of compression stockings in hospitals. Thromboses may also occur after long-haul flights.

The inflammation of a vein (phlebitis/superficial thrombophlebitis) is identified by the characteristic symptoms of inflammation, such as reddening, heat, swelling, and pain. The inflammation causes a blockage that restricts the drainage of lymphatic fluid and an edema (excess fluid that accumulates in the body's tissues) forms.

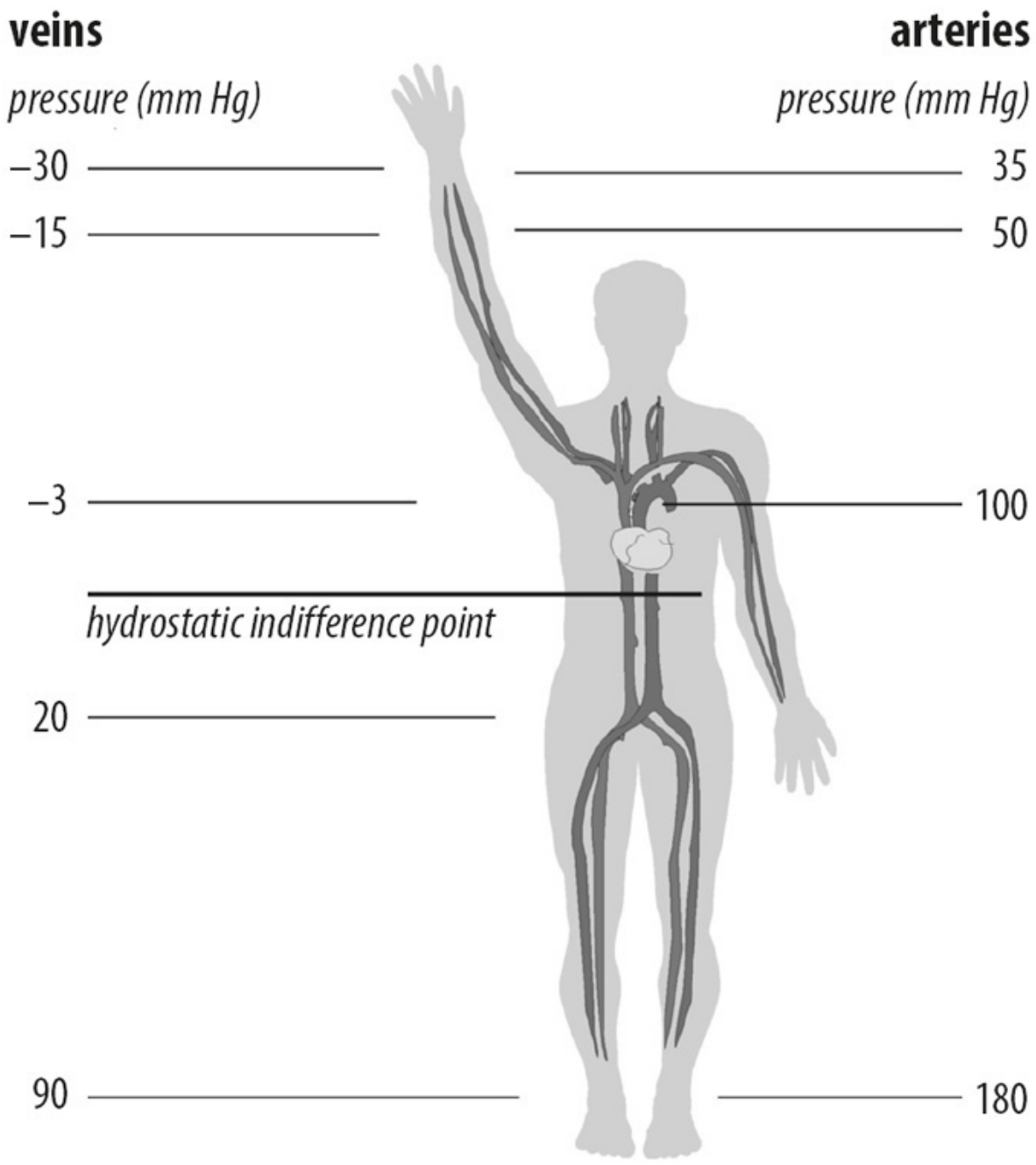


Fig. 22. Central arterial and venous pressure in a person standing at ease.

How can Shilajit help?

Doctors in Russia experimented widely with Shilajit and used it to treat deep-vein thrombophlebitis in the lower limbs, prescribing a dose of 0.2 g

twice a day over a course of 10 days. Patients would receive no other medication alongside Shilajit and the results of the clinical and biochemical tests and the bloodwork revealed interesting results.

Swelling reduced significantly after the treatment had been applied for 3 to 6 days. After 8 to 10 days, skin temperature would normalize and symptoms of the condition disappear. The hemoglobin content and levels of erythrocytes and leucocytes would also return to normal.

A description of this treatment is included here in the interests of providing a rounded look at the subject, but you are strongly advised against self-medication for thrombosis.

DO NOT SELF-MEDICATE

External application

The skin is the body's largest organ and accounts for about a sixth of its overall weight. The skin's thickness varies (from the thin eyelids to the much thicker heels of the feet), but it is on average around 0.1–0.15 inches (3–4 mm) thick. It has a protective function and is the body's defensive barrier against the outside world.

The skin performs many other functions. It regulates body temperature and maintains electrolyte and water balance. It is also a sensory organ, containing numerous tactile corpuscles (touch receptors) that pass on sensory impressions, and it helps to excrete toxins and metabolic waste. Recent findings indicate that the skin is also a location for the maturation of T-cells, blood cells that play a role in the body's immune defenses. However, the skin's principal role remains simple physical protection against foreign bodies.

This protective function has evolved as the human body itself has evolved over time through a series of complicated mechanisms. However, when skin is broken or pierced through injury, it must be dealt with quickly.

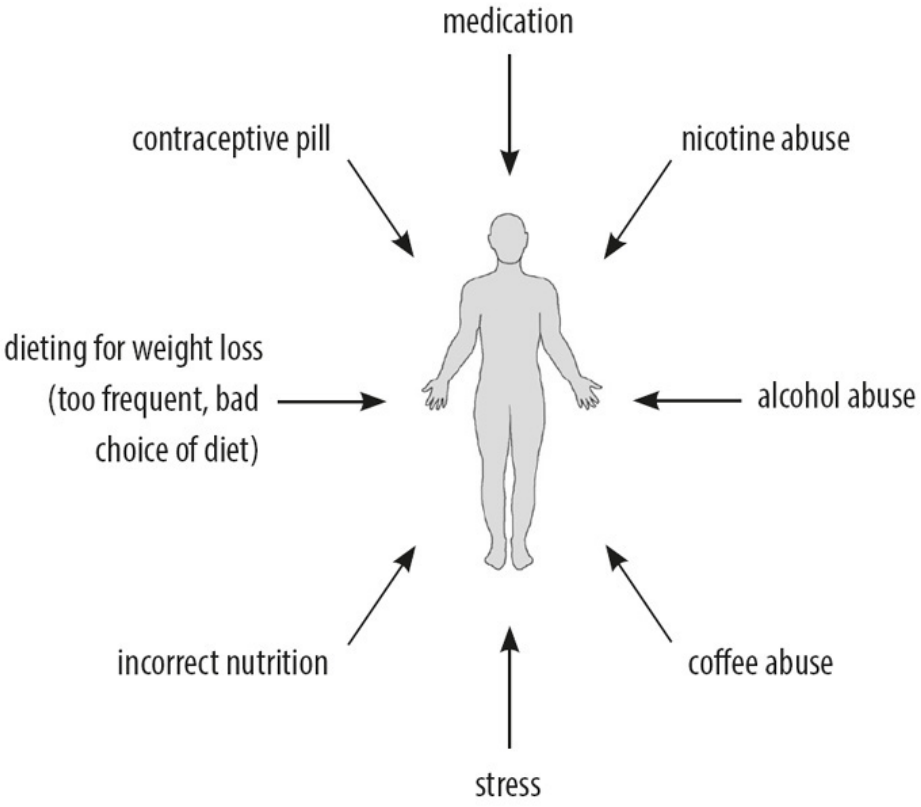
The body repairs the skin in three stages: first inflammation, followed by repair, and finally scar formation, the remodeling phase.

Applying Shilajit to skin injuries such as cracks and grazes helps the process of wound healing and the formation of a protective barrier against new problems with the skin. With its anti-inflammatory and antibiotic properties, Shilajit plays a role in the first phase, while its support in scab formation can help accelerate the whole healing process. [129, 130, 131, 132, 133, 134, 135, 136]

An Iranian study[129] features comprehensive reports of Shilajit's ability to heal wounds, even bed sores, which can be slow to heal.

For the best effects, Shilajit should also be taken internally. Due to its natural pigmentation, take care during any form of application to avoid staining clothing.

Impressive results have been produced using a combination of Shilajit with sea buckthorn fruit or sea buckthorn oil, which have extremely good skin-repairing properties in their own right.


medication
contraceptive pill
nicotine abuse
dieting for weight loss
(too frequent, bad
choice of diet)
alcohol abuse
incorrect nutrition
coffee abuse
stress

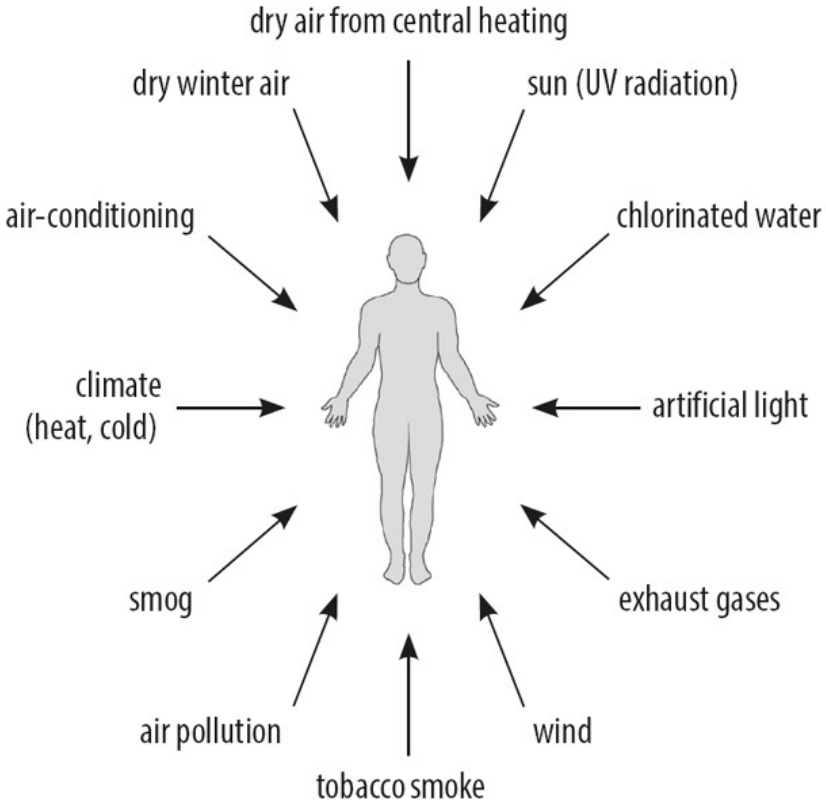

dry air from central heating
dry winter air
sun (UV radiation)
air-conditioning
chlorinated water
climate
(heat, cold)
artificial light
smog
exhaust gases
air pollution
wind
tobacco smoke

Fig. 23. Behaviors affecting the skin (above) and environmental effects on the skin (below).

Shilajit can be used externally for:

- grazes
- weeping and infected wounds
- burns
- eczema
- neurodermatitis

> **Application for Skin Care, Infections, and Injuries**
>
> Apply a 2 to 10 percent solution of Shilajit (depending on the severity of the disorder or problem) with a brush to the affected area. Alternatively, rub it onto the affected area sparingly as a cream/salve.

Therapeutic dosage, toxicity data

Since 1967 a number of Russian and Indian scientists have been studying the effects of different size doses of Shilajit. They began by attempting to determine the limit for toxicity to the human body through experiments with rats.[137,138,139,140,141] The latter proved impossible, as the degree to which the rats' stomachs filled limited the experiment. However, it was established that it caused no genetic harm or fetal damage, nor was it harmful to heart, kidneys, or liver.

The author has summed up the data on Shilajit (taken from animal experiments) as follows:

1. It can be taken in a daily dose of between 50 mg and 800 mg without harmful effects.
2. A dose of 200 mg per application is ideal.

3. The dosage schedule is variable and depends on the disease. The standard recommended dosage is 1 dose, 2 or 3 times per day (see the dosage schedule, fig. 24).
4. Shilajit encourages bile secretion at a dosage of 200 mg.
5. In a dose of up to 10,000 mg/kg (2.2 lb) of body weight in rats, Shilajit is not acutely toxic.
6. In a dose of 50–200 mg/70 kg (154 lb) of body weight, it boosts the effects of cortisol, one of the key hormones produced by the body.
7. In longer treatments of up to 60 days without a break and taken in a daily dose of 0.2–0.4 g, it causes no toxic side effects.
8. The following side effects are described in the scientific literature:

- Patients with broken bones very occasionally felt a burning sensation at the fracture point.
- Patients with colitis ulcerosa experienced short-term heat, a burning sensation, weakness, and sweating 40–60 minutes after administration of the dose.
- Higher doses (1–1.5 g/day or 0.03–0.05 oz/day) may raise the body temperature slightly to 99.5°F (37.5°C), or cause headaches or sweating. These effects may last between 20 minutes and 2 hours.
- The author has also heard reports from patients of brief episodes of flatulence a few hours after the first dose, which then settled after a couple of days.

Recommended Dosage and Application for Preventive Use

For children up to the age of 10, a dose of around 1.5–2 mg of Shilajit per kilogram (2.2 lb) of body weight is recommended. A child weighing 20 kg (44 lb) should receive 30–40 mg of Shilajit per single dose, twice a day. Children up to 14 are given a half dose and the adult dose is administered from the age of 14. Shilajit's rather unusual taste can prove a problem with children, some of whom will refuse it as a result, but mixing with honey disguises the flavor.

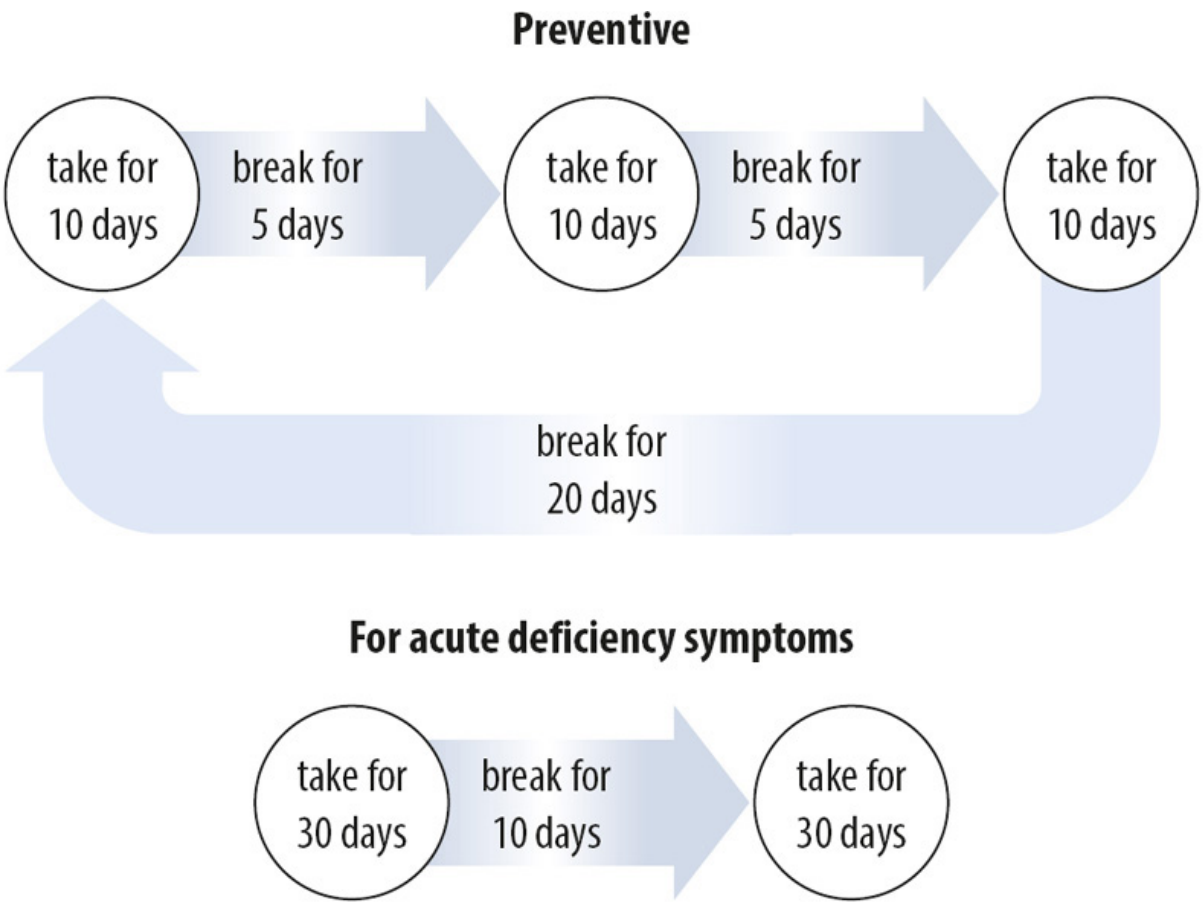


Fig. 24. Optimal Shilajit dosage schedule.

Fig. 25. Shilajit in different raw forms and capsules.

4

Preparations

Preparations or pharmaceutical forms of Shilajit are available as solids, semi-solids, and liquids. The solid options include tablets, lozenges, capsules, pills, and powders; the semi-solid group comprises salves, gels, and emulsions; and the liquid forms are as syrups, solutions, and suspensions, although there is also some overlap in the last two groups. Shilajit has proved its worth as a tablet or capsule, as a suppository (including vaginal suppository), and as a salve/cream for external application, although suppositories tend to be less popular. Pharmacies in some countries, including Germany, stock the suppositories or will make them up in advance/on demand (and sometimes ship). Given the hygroscopic properties of the basic substance, the preparation of suppositories poses certain professional challenges for pharmacists.

By the same token, the limited shelf life of exclusively water-based Shilajit solution presents a problem for manufacturers of it in liquid form. Some basic groundwork remains to be done in this respect, in particular in documenting and scientifically evaluating empirical data so that patients can be offered effective products of consistently high quality.

The legal perspective

All tablets, capsules, lozenges, and solutions taken orally represent dietary supplements, despite appearing to be medicines. Approval of Shilajit as a drug would require a comprehensive licensing procedure involving clinical

studies, animal experiments, and a raft of tests and evaluations that are unaffordable today, even for larger companies.

There is a reason why the choice of companies has been narrowed down so much over the last twenty years, and it is not simply the result of profit-focused corporate goals. It is also a symptom of a very different development: only a handful of drug companies find themselves in a position to manage the immense costs of research and development, which is worrying, given the considerable bottlenecks in the supply of more familiar generic drugs.

Of even greater concern is that refinancing considerations have forced essential but less profitable product areas such as antibiotic research to play second fiddle at best. It is important to be aware that the development of a new active ingredient up to the point where it appears in its box ready for sale on pharmacy shelves requires an investment of three to six billion dollars.

From a legal perspective, dietary supplements are a foodstuff and as such subject to the same requirements as a food. These also include the proviso that health-related statements, or so-called health claims, can only be made in very limited circumstances. Most manufacturers prefer to make no statements of this kind in order to avoid running the risk of simultaneously breaching drug laws and food legislation, which would automatically attract investigation by the state and could have legal consequences. This kind of offence is no longer regarded as minor, and the regulatory authorities focus on several aspects:

1. Is the product a food?
2. Have any health claims been made?
3. Does the nature of its ingredients make the product saleable under the terms of food legislation?
4. Is it a new food?

There are several reasons for discussing the legal side in such detail here. The sale of dietary supplements in the age of the internet is not just carried out in physical stores, where things are usually above board, but also via e-commerce. It is relatively simple and speedy to establish and operate an

online store, with easy payment options. Service providers are often not reachable if the sales outlets are based abroad, and any violations are relatively risk-free for them as such, since globalized trade is now the legal reality, even if international law is upheld at a national level (we have never really abandoned the idea of the small state). The laws are in place but are often not enforceable beyond national borders, which is not always a satisfactory state of affairs as far as consumer protection is concerned.

With regard to Shilajit in particular, sellers in recent decades have clearly not been entirely aware of the legal consequences of marketing the substance, or have completely ignored them, and they are still selling their products to this day. It should be noted that the sale of an imported, packaged food from a non-EU state, such as the Shilajit blister packs typically sold nowadays, with their black, licorice-style products that look like tablets, is legally prohibited as the product is not saleable in the EU in such a form. Points 1 and 3 of the list of criteria above have definitely not been fulfilled.

In addition, the declaration is usually completely inadequate. The legal definition of a dietary supplement across the EU dictates that a product must contain only vitamins, minerals, amino acids, and secondary plant compounds. The nature of a nutritional supplement, as the name might suggest, is to supplement food with elements from the groups listed above that may be missing. The courts are unanimous in holding that it is legally sufficient if the recommended daily dose of the product supplements the food with at least 15 percent of its promised component. Beyond that level, it can be classed as a nutritional supplement and herein lies the problem: Shilajit contains a wide variety of components, all of which are present in sub-therapeutic doses considered by legislators to be insufficient.

Reputable manufacturers generally add to Shilajit an ingredient that it already contains, such as iodine, B vitamins, magnesium, and calcium, thereby solving the problem and making it legally watertight. Many consumers may have wondered why, aside from “it can’t hurt,” so many dietary supplement products feature wording such as “plus C” or “plus B12.” It is often for reasons of legal certainty; the additives are, of course, often therapeutically justified but are legally copper-bottomed as a secondary product.

As a corollary, if something has been added by a company registered in the EU, then the product has been manufactured within the EU. The Shilajit used is a raw material/ingredient and no longer the finished product. Companies and traders selling the blister packs are obliged to feature at least an analysis of each product with information about contamination with heavy metals, pesticides, toxins, and radioactivity. This is a prerequisite for fulfilment of their duty of care as set out in food regulations.

Such obligations are perceived by some as chicanery, but they have only one aim: to protect the consumer from such dirty tricks, as it is the public's health that is at risk. Those who operate honestly and keep to the rules have nothing to fear.

Note: The legal perspective detailed in the book is based on EU laws as known to the author to date. Much of it will probably also apply to the United States and other countries with food and drug regulations. Please understand that the author is only able to provide information for his own area of activity. For specific and regional information, you should consult the laws in your own country of residence.

Solid preparations with Shilajit as the main active ingredient

Examination of the relevant databases in pharmacies will reveal a whole host of products that might be classified as "solids," and there are various reasons for this. They are more widely accepted by consumers, and their solid form deals neatly with the issue of shelf life mentioned earlier. Solids are generally easier to take. Whether in the form of tablets or capsules, provided the dose is identical, the effect is the same, but consumer acceptance does vary; in terms of Shilajit, tablets are for the more robust consumer, as the taste is undoubtedly an acquired one and is best described as "exactly what one might expect." The flavor and smell of Shilajit are immediately recognizable, even for those who have not come across it for years. It is not unpleasant, but it is penetrating and does little to charm the senses. "Smokey/resiny" and "hot" are the kind of adjectives that might be

applied, and in tablet form, the full force of the flavor is immediately apparent. Human taste buds are spared the full taste experience by the shell of a capsule, however, which make taking Shilajit this way less of an ordeal.

Capsules

Capsules can be opened by gently twisting off the top half, so that the powder inside can be consumed as is (or perhaps stirred into yogurt, if preferred). Capsules are made of cellulose nowadays and are therefore vegan. The use of gelatin, the standard capsule material, is rare in the dietary supplement sector, since many consumers wish to avoid animal products. Manufacturers usually market cellulose capsules as “veggie caps.” The shell itself has no therapeutic properties and acts simply as a container for the powder and as a dose measurement, while at the same time keeping the contents dry for as long as possible.

Capsule and tablet additives

From a technical point of view, the capsules used to administer medicines are also a measure of volume, with the bottom half of the capsule being the section that is filled. Since capsules are filled by machine and the dose needs to be consistent across all capsules, the Shilajit powder must be able to flow, which in turn means additives (with no therapeutic properties) also have to be used. Around 0.1–0.3 percent of additive is included to improve the flow, generally consisting of non-crystalline silica, which is chemically identical to silica sand but in a different form. About 1 percent of the releasing agent and lubricant magnesium stearate is also used, about which there has been much of the usual unqualified online discussion in the past.

As the active ingredients and additives together barely fill 50 percent of the lower half of a typical capsule, a neutral filler is added. This is generally made of cellulose, lactose, starch, or another substance, although lactose is not usually used as a precaution because of lactose intolerance, although this is often only suspected.

Tablets have a very similar composition, generally containing special starches (in addition to silicates and cellulose) that allow water to penetrate the tablet (in its form as a compact pellet) and burst it open as it swells. These are also known as disintegrants.

One of Shilajit's properties mentioned earlier presents a technical challenge: purified Shilajit is a licorice-like mass that is usually dark brown to black. It contains about 15 percent water. In this form it cannot be reduced to a powder at room temperature and so cannot be processed into capsules or tablets. It grows harder the more it dries, ultimately becoming glass-like.

It is easy to grind up in this form, and it can be mixed with other powders to make capsules or tablets. The dried and ground powder is different and lighter in color, but it has one great disadvantage in that the drier it becomes, the more atmospheric humidity it attracts, becoming darker and stickier until it reaches a water content of 15 percent, at which point it stabilizes. No one knows why this happens. As the water content rises, the substance loses its ability to flow as a powder and clumps together. In order to prevent this, or at least slow the process down appreciably, additives are required.

For the reasons discussed, it is clear that for a capsule to be viable for sale, it needs several technical additives. Combining Shilajit would be feasible with a finely ground plant powder, such as *Emblica officinalis* (Indian gooseberry) or turmeric plus silica. This herbal powder would have therapeutic properties while acting as a filler at the same time, but this would be a combination product.

In the past people encountering Shilajit products in countries other than their own would wonder if the capsules and tablets were fake because, although the powder smelt the same, it did not look as brown as the Shilajit they knew from home. These misconceptions came in part from a lack of awareness that the discoloration is due to the drying process, but adding a drop of water to the powder would soon rectify matters. People were equally unaware that the "tablets" purchased in traditional stores at home, which they regarded as "genuine Shilajit," were not tablets in the pharmaceutical sense, but instead simply molded shapes that had been stamped out with a hole punch from a 0.2–0.3-inch (5–8 mm) thick, semi-solid sheet of Shilajit, placed into blister packs, and then sealed.

Suppositories

Shilajit suppositories are used to treat hemorrhoids (see here) and are pharmacy-only treatments, as is the case with vaginal suppositories (see here,) which in some countries can be manufactured on demand or ordered as a homeopathic remedy at a D1 dilution. Vaginal suppositories feature a half-dose load. Alternatively, a Shilajit hemorrhoid suppository can be carefully cut in half with a warmed knife.

Semi-solid preparations

Shilajit cream is legally a cosmetic and is mainly used for skin care and for healing wounds. (See here) and for (see here) therapeutic uses.

The cream is very oily and the color of cocoa, and can be used to dress wounds. It has a high Shilajit content of over 10 percent. Other cosmetic (beauty) creams are available but with such a minimal Shilajit content that their effects have to be deemed entirely cosmetic.

Liquid preparations

As mentioned briefly, few liquid preparations are available, despite the fact that Shilajit is readily soluble in water. The reasons for this include the lack of applications for a liquid solution and the issue of shelf life. Water-based solutions without preservatives do not last long, which limits options.

Enhanced Shilajit capsules

Four interesting, new, high-quality combinations of Shilajit with other active ingredients and additives appeared on the market in 2020/21. From the author's point of view, these represent some progress in enhancing Shilajit's therapeutic effects. (See here.)

Shilajit with vitamins D and K2, turmeric, omega-3 fatty acids, and magnesium

This capsule mixture combines the hitherto less well-known effects of vitamins D and K2 with omega-3 fatty acids, magnesium, turmeric, and Shilajit. The objective is to deliver a kind of “body matrix effect” generally targeting bone health, mobility, osteoporosis prevention, chronic pain, and arthrosis.

Vitamin D

Almost everyone has taken vitamin D at some point during their life, no doubt as a child (older readers will be familiar with it in cod liver oil). The aim of this broadly prophylactic dosage was to prevent rickets, a condition that was once common due to vitamin D deficiency and caused bone deformity. Fortunately, it is now largely a thing of the past. There is currently considerable hype surrounding vitamin D, however, and according to the world’s leading medical database *PubMed* ®, there were 88,303 publications on the topic between 1922 and 2021, with 21,524 appearing between 2015 and 2020 alone. Interest skyrocketed in 2015, with the number of contributions multiplying tenfold within a year. A quarter of all published findings have been made in the last five years.

What is vitamin D?

The underlying chemical structure of vitamin D is based on cholesterol. Cholesterol is the starting material from which the body synthesizes many hormones, such as the stress hormone cortisol (hydrocortisone) and all of the substances derived from it. In this respect, the body’s own vitamin D is essentially more of a hormone-like substance, which would also explain the very low quantities required. The daily dose of 2,000 IU (international units) now often recommended corresponds to a physical amount of 50 mcg (µg), which would be barely visible on a spoon.

Sources

Vitamin D is most often found in animal-based foods, in particular in oily fish. Cod liver oil is well known, but vitamin D is also found in some lichens and fungi. Today the term “vitamin D” is usually used to describe colecalciferol, which is extracted from lanolin. It is converted in the liver into vitamin D (in its transportable and storable form calcidiol) before being activated as calcitriol in the kidneys.

Functions of vitamin D

This vitamin plays a key role in metabolizing calcium in the body. The intermediate stages describe the factors necessary for the uptake of calcium. It is easy to understand why it is known as the “bone vitamin,” but its effect in preventing rickets does not tell the whole story. Many studies show that vitamin D receptors are located within almost every organ and cell, especially in nerve, muscle, and immune cells.[43] The human body is an efficient functional unit so we can assume that there is a reason (as yet not fully ascertained) for the high numbers of receptors. There are indications, however, that vitamin D is involved in the risk of multiple sclerosis (MS), Alzheimer’s disease, schizophrenia,[41] and Parkinson’s disease, while lowering the risk of heart attack, cancer, and diabetes, and also boosting the immune system. Describing its effects in detail is beyond the scope of this book, but further information is available in Professor Michael F. Holick’s books on vitamin D,[41] also available in the English language.

liver and kidney + calcium
colecalciferol ▶ calcidiol ▶ calcitriol
▶ bones

Requirements

Vitamin D is obtained from exposure of the skin to sunlight and a small number of foods (oily fish, red meat, liver, egg yolks). According to the NIH, children from age 1 to adults of 70 years require 15 mcg (µg) per day, and over 71 years 20 mcg (µg). In the UK the recommendation is 10 mcg

(µg) and a supplement is only recommended during the less sunny months between October and March. (Remember that exposure to ultraviolet radiation from the sun can also cause skin cancer.)

Expert opinion

The discussion of many of vitamin D's effects is fraught with controversy in expert circles, and there has been enormous scientific interest. Hundreds of so-called metastudies (scientific investigations that evaluate several existing studies using statistical methods and filter results from these) indicate a host of effects, although one should be cautious about drawing conclusions, as many studies are constrained by methodological shortcomings or have test subject groups that are too small. In 2011 the German Nutrition Society (DGE) published a position paper on vitamin D[44] that examined the scholarship and drew rather conservative conclusions about individual associations. Even in 2011, however, it all suggested there was "compelling evidence" for its effects relating to bones and mobility, and that further indications were "probable."

Unfortunately, these conclusions have not yet been brought up to date, which would be necessary given the number of publications in the last five years alone. Now, ten years later, the applications that were considered "insufficiently proven" or "possible" in 2011 are moving into the "probable" zone and have become textbook knowledge. Accordingly, intake of vitamin D at a dose of 2,000–4,000 IU (international units, 50–100 mcg/µg) is highly recommended in the West.

Vitamin K

Most people have barely heard of vitamin K. Only those obliged to take anticoagulant medication are probably aware of it as an antidote to anticoagulant overdose, or as an emergency medication if rat poison has been accidentally ingested, with the former hinting at its name: K for *Koagulation* (Danish for coagulation). This property was discovered in 1929 by a group of scientists, two of whom went on to win the Nobel Prize in Physiology or Medicine in 1943. Carl Peter Henrik Dam from Denmark

won the prize for the initial discovery of vitamin K and Edward Doisy from America for the discovery of its structure.

What is vitamin K?

Vitamin K is not a single unified substance but rather a group of substances, the individual components of which are similar in chemical structure but can produce widely differing effects. Vitamin K3 is also known as menadione and is the basis for all vitamin K substances, although it does not occur in this pure form in nature. Vitamins K1 and K2 play important roles; Vitamin K1 is also known as phylloquinone and is primarily found in the green parts of plants, while vitamin K2 is also known as menaquinone (MK-7 or menachinon) and is either produced in the body by gut bacteria or is of animal origin. It is created, for example, in the fermentation process in which bacteria convert milk into yogurt or cheese. MK represents menaquinone, while the number 7 represents the length of the side chain on the base molecule; the higher the number, the more fat-soluble the vitamin.

Functions of vitamin K1 and vitamin K2

Vitamin K1 has a slightly different function in the body from Vitamin K2. It is an essential factor in blood coagulation, while vitamin K2 plays a significant role in balancing calcium levels but a subordinate one in clotting. There has been a great deal of hype concerning vitamin K2 since the end of the 2010s due to various studies identifying a range of different positive properties with regard to osteoporosis/bone health, dental health, and arteriosclerosis (see the bibliography at the back of the book). Of the 4,849 publications recorded since 1946, a total of 3,794 are from the last decade (as of 12.31.2020). Vitamin K2 has been shown to activate two proteins: the enzyme osteocalcin and the matrix Gla protein MGP. Osteocalcin selectively builds calcium into the bones while MGP prevents the incorporation of calcium into the walls of blood vessels.

The subtle interplay between vitamins D and K2 is also becoming better understood, since the sole administration of calcium in large quantities only leads to it being deposited in blood vessel walls and other tissue, but not necessarily where it is wanted. The finding that postmenopausal women with arteriosclerosis have 7 percent less bone mass[42] supports this

assumption. There is clearly a mistake in the "blueprint," resulting in an imbalance. The two proteins osteocalcin and MGP are vitamin K2-dependent: if levels are too low, both proteins are less active and the delicate balance in a healthy individual between calcium breakdown and remodeling can gradually become skewed, resulting in osteoporosis. Women are not alone in being affected by this disease; a third of all men over 70 years suffer from it too (for more information on osteoporosis.)

Vitamin K2 also influences calcium deposits in teeth; osteocalcin and MGP are both involved in this and are triggered by vitamin K2. The American dentist and nutritional scientist Weston Price (1870 –1948) observed the connection between a diet of processed food and dental caries but without recognizing the mechanism at work. Activator X, a fat-soluble nutrient whose existence was proposed by Weston Price and through which decay could be treated without use of the drill, was not finally identified until 2007 as a combination of vitamins K2 and D.

Requirements

The amount of vitamin K that your body requires depends on your age and sex. The NIH recommends 90 mcg (µg) for adult women over the age of 19 and 120 mcg (µg) for men over 19 years. In the UK the recommendation is 1 mcg (µg) per 1 kg (2.2 lb) of body weight, therefore 65 mcg (µg) for someone weighing 65 kg (143 lb).

Expert opinion

Vitamin K2 is likely to be of therapeutic use for osteoporosis, as studies can demonstrate. It may also be helpful for arteriosclerosis, but this awaits definitive proof. The same applies to mucoviscidosis, Alzheimer's disease, organ transplants, wrinkles, varicose veins, and rheumatoid arthritis.

Readers wishing to explore this vitamin in greater depth are directed to Joseph Pies' book (available in German) *Vitamin K2: vielseitiger Schutz vor chronischen Krankheiten.*[40] Or see the National Library of Medicine: www.ncbi.nlm.nih.gov/pmc/articles/PMC5026413/.

Turmeric

Botanical origins of turmeric

Turmeric is the name of the root (more precisely, the rhizome) of a flowering plant (botanical name *Curcuma longa*) from the ginger family (*Zingiberaceae*). Turmeric contains up to 5 percent essential oils and a maximum 3 percent curcumin. Mainly grown in India, it is principally used as a spice and is one of the ingredients in curry.

Effects of turmeric

The medical effects of turmeric have attracted increasing attention over recent decades, although it has been part of Indian Ayurvedic medicine for 4,000 years. There have been various medical investigations into and studies of curcumin, one of its constituents, and of 16,200 relevant publications currently available in the *PubMed*® medical database, 13,000 appeared in the last ten years.

Its effects on the flow of bile and on liver activity have been known for some time, and it also has an impact on inflammation and arthrosis. There is controversy within expert debate on its efficacy against various kinds of cancer, inflammation, arthrosis, and Alzheimer's disease, and on its antioxidant properties. Different professional societies are often critical and refuse to be drawn on the subject. Numerous animal experiments and tests on isolated cells have returned promising results, however, suggesting a potential effect. The years ahead will reveal the extent to which what are sometimes euphoric expectations will be met. Many other substances, such as omega fatty acids, were thought to have no therapeutic value when research first began, yet now the medical evidence is no longer in doubt.

Expert opinion

The use of turmeric and/or curcumin and their properties is a subject of heated debate among experts. It is true that the bioavailability of curcumin is not high and is dependent on the presence of a fat, requiring high doses that generally cannot be achieved with nutritional supplements. Pepper extracts increase absorption but come with risks of their own. Published

studies and metastudies are yet to establish any significant effect, particularly in relation to cancer.[50]

Magnesium

What is magnesium?

Magnesium is a shiny, silver, combustible alkaline earth metal that does not occur in pure form in nature because of its high reactivity. It is about a third lighter than aluminum.

Sources

Magnesium forms minerals and is chiefly found as a carbonate, silicate, chloride, and sulfate. It is one of the most common chemical elements and, in the form of dolomite, is even a constituent of mountains, as the Dolomite range in Italy suggests—dolomite, a type of limestone, is rich in magnesium. When combined with calcium in soluble form, it causes so-called water "hardness." There is more than 1kg of the metal in every cubic meter of seawater, while chlorophyll, which gives green plants their color, is made up of about 2 percent magnesium. It forms the central atom of this molecule.

Functions of magnesium

Magnesium plays an essential role in the process of metabolism in the body, being responsible for activating some 600 enzymes. Magnesium is involved in about 80 percent of all known metabolic processes.[41] The mitochondria, the powerhouses of a cell, need magnesium for energy metabolism. It also plays a part in the transmission of impulses from nerves and muscles (cramp in the calf is a typical symptom of magnesium deficiency). For vitamin D to be effective, magnesium must also be present, playing an important role in converting the transportable form of vitamin D into its active form (see here). Vitamin D and magnesium support one another in many metabolic processes.

Magnesium is mostly present in compound form in the body, with the total amount being around 20–25 g[43] (under an ounce). By way of comparison, our calcium content is around 1 kg (2.2 lb). Up to 50–70 percent of this calcium is contained in the bones, 29–49 percent in the organs, and only about 1 percent in blood serum. Magnesium is involved in bone density. The body stores magnesium in the skeleton; when supplies run low, it releases magnesium from the bones, which can result in a loss of bone density. Magnesium supplements are therefore also always beneficial in cases of osteoporosis.

Requirements

The recommended intake for an adult is about 300–350 mg/day. Recent studies have shown that the administration of magnesium as an organic salt in the form of aspartic acid, gluconate, or citrate, for example, does not lead to an increase in the amount that is absorbed, it is merely the rate of absorption that is increased. The amount absorbed is principally dependent on the magnesium-transporting proteins.

Expert opinion

As the usual serum tests are relatively imprecise, magnesium deficiency is often overlooked. This is compounded by the fact that the symptoms of a deficiency tend to be non-specific and might indicate a host of other conditions. Taking magnesium as a preventive measure is therefore beneficial but not in high doses, as the absorption rate will then drop.

Omega fatty acids

Fat is a fixed component of diet and is nigh on essential as an energy source. Practically no other kind of food retains so much energy per unit of weight as fat; 2.1 pints (1 liter) of edible fat contains around 9,000 kcal, with protein and carbohydrates containing about half that.

What are omega fatty acids?

Chemically, a fat is made up of a molecule of glycerol and three molecules of fatty acid. These fatty acids, along with their properties and their role in the metabolism, have been studied by dieticians for years, with one fundamental question as a starting point: Why do Inuits not suffer from significantly more diseases relating to their high consumption of fat, unlike those with a so-called Western lifestyle?

Fatty acids are long chain carbohydrates with 8 to 24 carbon atoms whose length always increases in twos. This is because the basic building block *Acetyl-CoA* (Acetyl coenzyme A) consists of two carbon atoms: the *AcetylCoA* molecules string together like a chain of pearls when fatty acids are formed. Fatty acids exist in unsaturated and saturated forms, which means that there are different kinds of chemical bonds between the carbon atoms that may be single (saturated) or double (unsaturated) bonds. The double bonds are chemically highly reactive and are intended as a kind of "predetermined breaking point" in the chain. The position of the first double bond in the chain is designated with a number and the end of the chain is indicated with the Greek letter omega (ω). Omega-3 means that the double bond is located on the third carbon atom, counting from the end.

Essential and non-essential fatty acids

In this context "essential" designates a substance that the body cannot produce itself and therefore must consume. Omega-3 and omega-6 fatty acids are essential, although omega-9 fatty acids are not. The important omega-3 fatty acids are docosahexaenoic acid (DHA) and eicosapentaenoic acid (EPA), along with gamma-Linolenic acid, an omega-6 fatty acid.

Sources

The aforementioned omega-3 fatty acids DHA and EPA are principally found in fatty (oily) fish, with herbal alpha-Linolenic acid (ALA) occurring in linseed oil, and gamma-Linolenic acid in borage seed oil and evening primrose oil. A small proportion of alpha-Linolenic acid can be transformed into EPA but also has other effects. EPA and DHA are found in a few species of algae, useful for a vegan alternative. Our typical modern diet contains many more omega-6 fatty acids than omega-3 fatty acids.

Effects of omega-3 fatty acids

Omega-3 fatty acids have a wide range of functions in the metabolism: they form part of the cell membrane, are involved in immune reactions, and are particularly well known for their anti-inflammatory properties. An important factor in inflammation is the omega-6 fatty acid arachidonic acid, which is metabolized to form the inflammatory mediators prostaglandin and leukotrienes. If the enzyme that forms arachidonic acid is taken up with very similar omega-3 fatty acids, no arachidonic acid can be created and inflammation is therefore reduced. Their ability to inhibit the aggregation of thrombocytes and their effects on cardiac arrhythmia, in addition to a reduction in sudden cardiac death, are also undisputed. These fatty acids also support bone formation, bolster skin structure, and protect against arteriosclerosis. Health claims legislation even permit health-related assertions about immune system modulation and the protection of the vascular system and the nervous system, as well as the memory.

Effects of omega-6 fatty acids

Omega-6 fatty acids regulate inflammation, forming substances that both inhibit and encourage it; arachidonic acid, vitally important in immune responses, is formed from these substances (see above).

Requirements

There is no officially recommended dose for omega-3 fatty acids, but around 2 g per day is considered sufficient.

Expert opinion

The effectiveness of omega-3 fatty acids in cardiac arrhythmia and the reduction of sudden cardiac death is persuasive, and there is ample evidence of their antidepressant and antianxiety effects. With a sufficiently high dosage and a long course of treatment (more than 1 year), rheumatic patients have been able to reduce their pain medication by up to 40 percent. The effects observed when it is taken as a preventive measure are becoming

increasingly apparent, so it is difficult to understand why omega-3 fatty acids are still not standard treatments in cardiology.

Shilajit with zinc and glacial milk

At first sight, Shilajit and glacial milk make an unusual combination. Glacial milk is the name given to the microscopically fine powdered granite sand contained in the milky-looking meltwater from mountain glaciers. This “ancient stone powder” is said to have very special, even energetic, properties. It is a very fine powder with a large surface area and correspondingly good adsorption and ion exchange properties. Gastric acid dissolves chemically bonded substances from the silicate matrix and is thus itself bonded or neutralized. The remaining “empty” silicates can then bond to toxins in the gut. The Shilajit/glacial milk combination also influences the microbiome and therefore benefits the immune system in all kinds of ways.

This combination is enhanced by zinc, whose cellular effects on the immune system and bone formation have already been outlined in (see , here) Chapter 3. These three substances therefore work well together and are perfectly suited in combination in what would otherwise appear to be an unusual mix.

Shilajit syrup based on xylitol

One innovative product in which a xylitol syrup replaces honey is a modern take on the classic Shilajit honey therapy (see here). The latter can be problematic for diabetics if poor quality honey is used. Xylitol is a so-called polyvalent sugar alcohol that barely increases blood sugar levels and is low in calories. It contains only about half the calories of table sugar and has been used for decades as a tooth-friendly ingredient in chewing gum and sugar-free foods.

The xylitol (a sweetener) provides a syrupy consistency and ensures a long shelf life by inhibiting the growth of bacteria and fungi. There is also the well-known antioxidant protection of the so-called body matrix by vitamin E, which in this combination protects the body from oxidative stress and the ingredients from oxidative decay. The great advantage over a

standard Shilajit capsule is the highly accurate and variable dosage for both humans and animals, made possible by the use of a dosing syringe. An additional benefit is that xylitol, in combination with various organic flavors, can mask the challenging taste of Shilajit. Its uses match those of classic Shilajit therapy and have been successfully tested on some 1,300 volunteers.[45]

Shilajit with manuka honey

Another very useful and high-quality combination is Shilajit mixed with manuka honey from New Zealand, making the most of this honey's unique properties—a new take on the classic Shilajit honey therapy.

Manuka honey

The Maoris have used manuka honey for generations to treat gastrointestinal conditions, colds, bladder complaints, skin complaints, and injuries to the skin. There has been considerable hype around manuka honey in recent years, with almost legendary properties being ascribed to it.

Botanical origins of manuka

The manuka tree (*Leptospermum scoparium*, of the *Myrtaceae* or myrtle family) is also known as the New Zealand tea tree or broom tea tree. A shrub about 20–26 ft (6–8 m) in height, it prefers low-nutrient soils on open slopes, riverbanks, and forest edges. In botanical terms, it is a close relative of the tea tree, a plant found throughout New Zealand and Southern Australia. The manuka contains an essential oil (manuka oil) that has similar antibacterial and antiseptic properties to tea tree oil.[46]

Harvesting

The honey is produced from nectar from the manuka flower collected by bees. Manuka honey is unique among honeys for a special characteristic discovered somewhat by chance by researchers at the University of Dresden in Germany.

Manuka honey's special characteristic

Honey is generally composed of 20–45 percent each of glucose and fructose, approximately 20 percent water, and about 7 percent disaccharides such as saccharose or maltose (this may vary greatly depending on the food available to the bees). It also contains pollen, minerals, proteins and enzymes, free amino acids, colorants, and aromatics, depending on the bees' diet. The antibiotic properties of standard honey are to some extent a result of its high sugar content; the osmotic pressure has a bactericidal effect.[48]

In addition to the physical properties described earlier, manuka honey has one special feature: as the nectar is digested, the bacterium *Gluconobacter* contained in the bowel of the bees turns the sugar (via several intermediary stages) into methylglyoxal (MGO), a highly bacteriostatic and bactericidal substance. It forms in concentrations of 700–1000 mg per kg of honey, an incredibly high level (an MGO content of 2–20 mg/kg is usual in a very few foods). Why this process occurs only in manuka honey and to this particular extent is yet to be explained.

MGO has cytotoxic properties and also combats fungi, yeasts, and isolated cancer cells. Interestingly, there are indications[51, 52] that manuka honey is effective against *Helicobacter*, a bacterium causing gastritis that is currently treated with antibiotics.

Combining with Shilajit

There is considerable overlap in the uses of manuka honey and Shilajit in folk medicine. When the two are combined, they make a useful addition to the popular folk medicine arsenal, in particular because of Shilajit's anti-inflammatory and antibacterial properties, alongside its protection of the mucosa. While Shilajit can be difficult to dissolve in honey and its dehydrating properties tend to encourage the formation of crystals, adding a little energized mountain spring water will help to solve this, ensuring the viscous solution can be properly and safely measured and administered using a dose dispenser.

Fig. 26. Shilajit is also found at very high altitudes.

Fig. 27. National park, Osh region.

Epilogue

I hope that this book will help to bring Shilajit, a substance that has wide applications in folk medicine, to the attention of interested readers, and that the information contained here will help justify its medical uses. Having finished work on this edition, I must confess to being surprised and pleased at the extent to which scientific investigation of Shilajit has progressed, and at the enormous advances that have been made over the last fifteen years. Yet it is also surprising just how many fundamental questions still await clarification, including the origins and creation of Shilajit itself. It is a classic example of how much knowledge can be gathered about something and yet how much there is still to learn. It is like an enormous puzzle.

I am excited about what the next few years will bring forth, and I will continue to add my observations!

Source references

Please note that there are some inconsistencies in the numbering of references as well as the order of the chapters as a result of two decades of updating and improving this book.

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Additional Research of Interest

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Footnote

*1 The radioactive isotope ^{90}Sr achieved unfortunate fame when it fell in highly enriched form across Europe in the fallout following the 1986 Chernobyl disaster, with a half-life of 28 years. The danger here resides in the absorption and slow decay of radioactive Sr in bone tissue. ^{90}Sr and ^{85}Sr occur only in uncontrolled nuclear fission and are not elements that occur regularly in nature.

Further information

These links are to films clips in the relevant local language, showing how Shilajit is exuded from cracks in the rock, and is then collected and processed.

https://www.youtube.com/watch?v=snHuiH1ZTlM The channel is called “Shilajit Mumio.”

https://www.youtube.com/watch?v=9xZIgt_50aQ As above, but in more detail.

https://www.youtube.com/watch?v=99Cy8crmfj4 Pakistan, extensive images of the search for Shilajit.

https://www.youtube.com/watch?v=o-_pf4votGc Shilajit in a cave.

https://www.youtube.com/watch?v=xJQJvNonUn0 Educational film about Shilajit in Russian.

https://www.youtube.com/watch?v=tMOc6LE7CZM Images of Shilajit production.

https://www.youtube.com/watch?v=qxgMLSq_X0Q Television show on Rossija 1 (in Russian).

https://www.youtube.com/watch?v=vA8r65mPKlk Shilajit exuded from rock walls (from 1:27).

https://www.youtube.com/watch?v=KiFL0zTXTSY Images of Shilajit from Pakistan, showing how it is exuded from rocks.

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About the author

Wolfgang Windmann, PhD, studied Chemistry before switching to Pharmaceutics and qualifying as a pharmacist. This was followed by three years of academic study at the University of Würzburg in Germany, leading to a doctorate in Natural Sciences. He has been interested in Shilajit since 1994, and two journeys in 1998 and 1999 took him to Central Asia, where he familiarized himself with the origins and extraction of Shilajit before writing his first book on the topic.

He now runs his own pharmaceutical manufacturing business in Ihrhove/Ostfriesland in Germany, while also working as a freelance author and product developer, specializing in natural materials.

The author in front of the presidential yurt in the Ala Archa National Park, Kyrgyzstan.

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