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The worldwide incidence of urolithiasis is high. In spite of tremendous advances in pharmaceutical medicine, stone patients still need to mainly rely on surgery. Indigenous traditional medical systems of different cultures have been known to offer a vast array of medicinal solutions for the treatment of urolithiasis throughout history.

In recent years, such anti-urolithic formulae have also been the object of several scientific studies. Some herbal formulae (eg. *Cystone*) from traditional Indian medicine have been evaluated for their effects on experimentally induced urolithiasis. The effects of some traditional Chinese herbal formulae (eg. *Wulingsan*) on renal stone prevention have been investigated as well.

This research aims to determine the traditional formulae used in Anatolia and the Middle East for the treatment of urolithiasis by searching through sources based on the well-respected high medieval medical texts such as “*Al-Qānūn fī at-Ṭibb*” by Avicenna, “*At-Tadhkira*” by Dawūd al-Antākī, as well as later texts such as “*Kitāb al-Muntakhab fī at-Ṭibb*” by al-Mardani, and “*Yadigar*” by Ibn Sharif. The use of such formulae has been the first choice of treatment for urolithiasis among the people of these regions for centuries. However, their pharmacodynamics has not been studied completely to date.

High incidence

The worldwide incidence of urolithiasis is high. The region around the Mediterranean is one of the places where the problem of renal stones has been known since ancient times. Throughout history, many plants have been used to treat stone problems in that region and those traditional applications are quite well documented.

Whilst there are a number of effective modern treatments for urolithiasis none of these treatment modalities is without risks. Therefore, the prospect of conventional drug therapy for the “prevention” and “treatment” of kidney stones is welcome. Herbal therapies and the knowledge derived thereof could help in this regard.

Few animal studies have been performed on traditional medicine against urolithiasis in India, Japan, Brasil, Mexico, Morocco and China. Some traditional formulae have been the object of scientific studies.

The present review identifies such traditional anti-urolithic formulae, used in Anatolia and Middle East for centuries, based on well-respected historic medical texts. It tries to identify its pharmacological effect and modern chemical analysis where possible and known.

Reviewing mediaeval prescriptions

We review anti-urolithic traditional prescriptions based on medieval medical texts such as “*Al-Qānūn fī at-Ṭibb*” by Ibn Sina (XIth century), also known as Avicenna in the Western world, and “*At-Tadhkira*” by

Dawūd al-Antākī (XVth century), as well as the Turkish books “*Kitāb al-Muntakhab fī at-Ṭibb*” by al-Mardani (XVth century) and “*Yadigar*” by Ibn Sharif (XVth century). Furthermore, an extensive literature research was carried out on all identified plant species with regard to pharmacology, anti-lithic effects and scientific studies on these compounds.

Ibn-Sina in the *Al-Qānūn fī at-Ṭibb* that greatly influenced the European mediaeval schools of medicine well into the 18th century mentioned more than 60 plants as beneficial drugs for destructing, expelling and preventing kidney calculi. The most common and important ones that we researched for this study are listed in Table 1.

Apium graveolens	Matricaria chamomilla
Artemisia absinthum	Mentha piperita
Asparagus racemosus	Piper nigrum
Cicer arietinum	Piper cubeba
Cinnamomum aromaticum	Pistacia vera
Citrullus vulgaris	Prunus amygdalus
Cucumis sativus	Punica granatum
Cynara scolymus	Raphanus sativus
Juniperus drupacea	Rubus fruticosus
Laurus nobilis	Tribulus terrestris

Table 1: Some common medicinal anti-urolithic plants described by Ibn Sina (Avicenna) in the 11th century AD

According to Ibn Sina these can be combined into effective anti-urolithic mixtures as listed in Table 2.

Cicer arietinum + Prunus amygdalus + Raphanus sativus
Apium graveolens + Mentha piperita + Artemisia absinthum
Cucumis sativus + Cynara scolymus + Raphanus sativus
Pistacia vera + Citrullus vulgaris + Piper nigrum + Cinnamomum aromaticum

Table 2: Anti-urolithic combinations according to Ibn Sina

“Throughout history, many plants have been used to treat stone problems in that region and those traditional applications are quite well documented.”

In his book *At-Tadhkira*, written 400 years later, Dawūd al-Antākī prescribed many plant medicines to stone patients². They are listed in Table 3.

Aloe vera	Agropyron repens
Brassica rapa subsp	Bunium paucifolium
Chlamydotis undulata	Croton tiglium
Cucurbita moschata	Daucus carota
Ficedula sp.	Foeniculum vulgare
Gummi Olibanum	Laburnum anagyroides
Lamphyrus nerusa	Laurus nobilis
Nigella sativa	Prunus domestica
Raphanus sativus	

Table 3: Some common medicinal anti-urolithic plants described by Dawūd-Al-Antaki in 15th century AD

According to Dawūd-Al-Antaki, these can be combined into effective anti-urolithic mixtures as listed in Table 4.

Brassica rapa subsp rapa + Daucus carota
Gummi Olibanum + Foeniculum vulgare + Prunus domestica
Brassica rapa subsp rapa + Raphanus sativus

Table 4: Anti-urolithic combinations according to Dawūd-Al-Antaki

Together with the two above-mentioned books, the 15th century Turkish books “*Kitāb al-Muntakhab fī at-Ṭibb*” by al-Mardani³, and “*Yadigar*” by Ibn Sharif⁴ belong to the important classical medicinal text which not only describe the treatments of their time but also are part of the foundations of modern medicine. In these two books, a number of plants with anti-urolithic properties have been listed (Table 5).

Adiantum capillus-veneris	Apium graveolens
Commiphora opobalsamum	Cucumis melo
Cuminum cyminum	Cyperus rotundus
Paliurus Aculeatus	Pimpinella anisum
Prunus amygdalus	Prunus amygdalus var. amara
Raphanus sativus	Radish
Raphanus sativus	Tribulus terrestris

Table 5: Some common medicinal anti-urolithic plants in the Turkish literature of the 15th century AD

Combinations recommended in those books are listed in Table 6.

Raphanus sativus + Prunus amygdalus
Commiphora opobalsamum + Cucumis melo
Cucum+ Cuminum cyminum + Pimpinella anisum + Cyperus rotundus + Apium graveolens + Raphanus sativus + Adiantum capillus-veneris + Prunus amygdalus var.amara

Table 6: Anti-urolithic combinations according to Turkish literature of the 15th century AD

Combination therapies

Although there are no studies on most of the traditional combination therapies, some *in vivo* studies have been done on some plant compounds listed above.

From what we know today of modern drugs administered to stone patients, an effective herbal medicine for stone disease may prophylactically inhibit nucleation, growth or aggregation of crystals, or might help with expulsion of small crystals through an effect on urothelial adherence. It may act symptomatically by facilitating stone passage by diuresis or ureteral relaxation, or it may alleviate stone symptoms such as pain and lower urinary tract symptoms.

Asparagus racemosus Willd. was evaluated for its inhibitory potential on lithiasis. The ionic chemistry of urine was altered by ethylene glycol, which elevated the urinary concentration of crucial ions viz. calcium, oxalate, and phosphate, thereby initiating renal stone formation. The plant extract, however, significantly reduced the level of these ions in urine. Also, it elevated the urinary concentration of magnesium, which is considered as one of the inhibitors of crystallization.

The high serum creatinine level observed in ethylene glycol-treated rats was also reduced following treatment with the extract. The histopathological findings confirmed parenchymal improvement after treatment with the plant extract. *Asparagus racemosus Willd.*, therefore, seems to be an effective inhibitor of stone formation.

Punica granatum has been shown to have a protective effect on crystal deposition in renal tubules of rat kidneys.

Water extracts

The aqueous extract of the bark of *Raphanus sativus* was tested for its antiurolithic and diuretic activity. The urolithiasis was experimentally induced by implantation of zinc discs in the urinary bladder of rats. A significant decrease in the weight of stones was observed after treatment in animals which received the aqueous extract in comparison with control groups.

Water extracts of both, *Carum carvi* and *Tanacetum vulgare*, have strong diuretic action confirming their ethnopharmacological use. From the pattern of excretion of water, sodium and potassium, it may be deduced that there are at least two types of active principals present in these extracts, one having a furosemide-like activity and the other a thiazide-like activity.

Nigella sativa L seeds could lower the urine concentration of calcium oxalate and showed a beneficial effect on calcium oxalate deposition in the rat kidney.

Tribulus terrestris has long been used empirically to excrete urinary stones. The diuretic and contractile effects of *T. terrestris* indicate that it has the potential of propelling urinary stones. The plant showed significant dose dependent protection against uroliths. It also prevented leucocytosis and elevation in serum urea levels.

Apium graveolens showed a significant diuretic effect that accentuates the excretion of urinary calcium. Daily oral treatment with *Trigonella foenum-graecum* significantly decreased the quantity of calcium oxalate deposited in rat kidneys. The effect of *Cynodon* aqueous extract as a preventive and curative agent in experimentally induced nephrolithiasis was evaluated in a rat model and concluded that *C. dactylon* extract has beneficial effect in preventing and eliminating CaOx deposition into kidneys.

The antiurolithic activity of *Pinus eldarica* fruit was evaluated on induced calcium oxalate nephrolithiasis in rats and the study indicated that *P. eldarica* fruit extract may prevent calcium oxalate deposition, without producing diuresis.

As shown above on a number of traditionally used plants in the treatment of urolithiasis, the ones tested have indeed an effect on the bio-physiological processes that we today deem responsible for stone formation. More remarkably, the stone community agrees that to date there is no effective pharmacological prevention for the majority of stone formers, namely the ones without proven metabolic imbalances. The exception may be citrate substitution which is commonly recognized as effective, albeit questionable in patients with normal citrate levels.

In-depth studies

The centuries old knowledge of traditional medicines, although being part of the foundations of modern medicine, has been ignored. Yet, in many countries outside the so-called Western world their use remains common and effects are seen daily. Perhaps it is time to reflect on ancient knowledge and think outside the box of modern school medicine, especially in the field of stone prevention where research – some may say – has largely remained stagnant for decades now.

We hope our work will generate an interest for more comprehensive and in- depth studies in this field.

References

1. “*Al-Qānūn fī at-Ṭibb*” by Ibn Sina; Ataturk Kultur Merkezi Yayınları (Turkish Interpretation)
2. “*At-Tadhkira*” by Dawūd al-Antaki; Encyclopedia of Salutory Herbs (Turkish Interpretation)
3. “*Kitābul-’l- Mūntehab Fi’-t- Ṭib’-’l- Abdūlvēhab Bin Yusuf Inb- i Ahmed el- Mardini; Merkez Efendi Geleneksel Tıp Derneği*
4. “*Yadigar*”- Ibn Sharif, Merkez Efendi Geleneksel Tıp Derneği

Note: The authors will be happy to provide interested readers with a full list of references.



Matricaria chamomilla