**URINARY SYSTEM**

**SCOPE**

Apart from their use to provide non-specific support for recuperation and repair, specific phytotherapeutic strategies include the following.

Treatment of:
- urinary infections
- functional disturbances of micturition

Management of:
- interstitial cystitis;
- urinary stones;
- oedema with renal involvement;
- benign prostatic hypertrophy;
- moderate autoimmune kidney disease

Because of its use of secondary plant products, extreme caution is necessary in applying phytotherapy in cases of:
- renal failure;
- urinary obstruction;
- severe glomerulonephritis.

**ORIENTATION**

**Herbal diuretics**

Plants have been used as diuretic remedies throughout history (Pliny the Elder mentions that many plants have diuretic properties in his *Naturalis Historia*). However, the early indications for such use were often different – urinary stones, nephritis, cystitis, stranguary, urinary retention and incontinence – with severe oedema associated with dropsy, ascites and lymphatic disease quite often encountered and hypertension being quite unknown. The excruciating pain of urinary stones would of course be well known and would have driven many urgent treatments. Because of the severity of such conditions, diuretic remedies would have been more drastic than nowadays. Remedies would have been given in much higher doses, for shorter duration. The diuretic effects of purgatives were well understood (this reputation is supported by observations that anthraquinone derivatives induce experimental diuresis associated with the inhibition of ATPases in the kidney medulla) and these may well have been used in desperate attempts to relieve the symptoms of ascites in advanced liver failure (a not uncommon condition given the frequency of hepatitis). Indeed, the drastic treatment, in at least one case, of dropsy forms the basis of one of medicine's best historical stories. When William Withering found that the active principle of one effective remedy for dropsy was the cardioactive foxglove, he initiated a whole new medical tradition as well as confirming that dropsy was a symptom of heart failure rather than of the kidneys.

Inducing appreciable consistent diuresis does actually involve relatively drastic pharmacological activity and modern diuretic drugs are powerful agents. Examples of plants with direct diuretic effects producing consistent activity in controlled conditions in the literature are rare, and there are some studies that specifically show a negative effect in these circumstances. Examples where a diuretic effect has been observed experimentally include a study showing significant increase in 24-hour urine volume, urine and serum sodium levels in nine mild hypertensives administered a whole-plant preparation of *Phylyanthus amarus*. In another study, *Aerva lanata* flowers at doses of 10 g induced significant diuresis in 70% of subjects in uncontrolled clinical conditions. A study on a product based on asparagus and parsley root has also shown limited diuretic effect in the management of congestive heart failure. The benefits of the Indian remedy *Terminalia arjuna* bark extract at 500 mg every 8 hours, as adjuvant therapy to conventional medications, have been attested in a double-blind crossover trial on 12 patients with chronic congestive heart failure.

There is some evidence of diuretic effects of various popular diuretics in experimental animals but only at very high doses (40 ml/kg) and 1 g/kg at levels far outside any therapeutic range. Other plants with experimental diuretic effects in animals have been observed at various dosages include *Taraxacum* (dandelion), members of the *Equisetum* family, *Orthosiphon* leaf, and *Orthosiphon*, various *Solidago* species, *Agrimonia eupatoria* (agrimony), *Lactuca virosa* (wild lettuce) and *Parietaria* (pallitory). Diuretic activity (including renal vasodilation and urinary sodium excretion) has been observed in experimental studies on *Clerodendron trichotomum*, and *Rehmannia radix*. However, studies on *Alpinia speciosa* and *Polygonum punctatum* showed no diuretic properties in spite of other pronounced pharmacological activities and the main effect in rats of administering oral doses of *Opuntia ficus-indica* infusions was a marked loss of potassium, with only modest diuresis and sodium loss at lower concentrations.

The modest research evidence apart, the experience of even mild herbal prescriptions having sometimes dramatic diuretic effects is well known to practitioners
Herbal approaches to system dysfunctions

and this is one of the most common reactions to treatment that patients report. One conclusion that can be drawn is that diuretic responses are variable, perhaps reflecting other indeterminate susceptibilities in the individual patient.

Aquaretics and diuretic depuratives

Two variations on the diuretic theme have emerged from earlier Western traditions. In German practice, the concept of ‘aquaretic’ has been used to describe diuretic agents that excrete water from the body, most probably associated with potassium, but not other electrolyte, excretion. They may exert their effect due to increased bloodflow to the kidney. Most herbal diuretics in tradition are likely to be of this class. They are thus not easily comparable with modern diuretics that interfere with resorption at the distal tubule of the nephron, leading to wider electrolyte elimination, and thus may be less effective in treating hypertension and oedematous conditions.

In the case of hypertension the main benefit of herbal aquaretics may be in replacing the potassium lost through the use of modern diuretic prescriptions. High potassium levels relative to sodium has been shown to be a feature of herbal drugs with traditional diuretic activity. Compared to a ratio in the average diet of 2:1, herbal remedies like Urtica (nettle tops), Equisetum (horsetail), Betula (birch), Sambucus (elder), Agrimonia (agrimony), Phaseolus vulgaris (bean pods), Matricaria (chamomile) and tilia (lime flowers) had ratios greater than 150:1 potassium to sodium, especially in decoction form. It is difficult with current information to link high potassium levels to any aquaretic or diuretic effect but given that diuresis is almost by definition accompanied by potassium loss, then to have an effective potassium supplement seems convenient.

In the case of oedema, phytotherapeutic strategies should emphasize activity on other body functions (see below) rather than any diuretic impact. A second concept of ‘diuretic depurative’ is more compatible with the general meaning of diuretics in Western herbal tradition; it implies that the remedy removes metabolites and waste products as well as water, that is, as an aid to excretion.

There is one very gentle diuretic mechanism that may underlie the effect of many plants.

Osmotic diuresis

The principle of osmotic diuresis has been established since the end of the 19th century when Ustimowitsch, Falck and Richet stressed the influence of urinary solutes on urine flow, although over a century earlier Segalas and Wohler observed that an extra load of urea, or any other substance that is excreted by the kidney, causes a diuresis.

The osmotic plant-based diuretic mannitol is used, by intravenous injection, in acute oliguric renal failure. Mannitol is found in some plants, including the popular diuretic Agropyron repens (couch grass); however, its absorption from the gut wall is limited and it is unlikely to play a significant role in the effect of couch grass. Nevertheless, a number of similar sugar molecules may account for a gentle diuretic effect of many herbal remedies, as well as, more generally, fruits and vegetables. For example, the plant starch inulin is used in commercial preparations to measure glomerular filtration rate and in experiments of kidney microperfusion as a marker of tubular water reabsorption. A number of plant extracts of inulin have been shown to have a comparable effect.

The kidneys and oedema

Although clearly active in the elimination of water from the body and the control of fluid levels within the tissues, the impact of the kidneys in oedema is not always obvious, compared with a failing heart, a cirrhotic liver or lymphatic or venous insufficiency in their relevant syndromes. Nevertheless, in all such cases prescription of conventional diuretic drugs is commonplace and it is widely assumed that the kidney is centrally involved in most cases.

This assumption has mixed support in the scientific literature. For example, renal complications of liver cirrhosis are certainly implicated in the development of ascites. These complications include inadequate renal prostaglandin production and the negative effect on the kidney of raised nitric oxide production. Such complications may actually reduce the effect of diuretics but they remain indicated in the treatment of ascites as long as they are effective. In phytotherapy, however, the main effort now would be on using hepatics and other treatments for the liver (see p.190).

Although undoubtedly effective symptomatically, the value of diuretics used alone for congestive heart failure in the long term has been challenged, because of their possible excitation of the renin-angiotensin system. Concomitant prescription of ACE inhibitors has been proposed and positively evaluated, because they suppress this excitation. As seen below, herbal diuretics are unlikely to raise the same concerns but may be only second-tier treatments compared to the cardioactive glycosides.
The localized oedema of lymphatic and venous insufficiency is treated in phytotherapy with particular remedies said to act on the vessel walls. These may have incidental diuretic effects (see p.31).

In phytotherapy, there are few traditional strategies that are likely to bear directly on the kidney cortex itself, with emphasis placed instead on activity lower down the urinary system. Nevertheless, little is known about the full impact of plant constituents on this organ and although there are very few cases where actual nephrotoxicity occurs, a general caution in using herbal treatments is advisable where the kidneys are already damaged.36

Beneficial effects of plant remedies on the kidney

Kidney disease such as glomerulonephritis and cystic disease presents awesome and possibly overwhelming odds for the phytotherapist. By definition the kidney in such cases, especially where the basement membrane is involved, is vulnerable to further damage with any new active metabolite and the practitioner needs to proceed with extreme caution. Nevertheless, there is experimental evidence, mainly from China and Japan, suggesting that some herbal remedies might have beneficial effects in such cases, including such conditions as nephrotic syndrome (Chinese herbs Astragalus and Angelica), diabetic nephropathy (Abemoschus manihot) and other kidney diseases. Andrographis paniculata has shown experimental ability to reduce pyuria and haematuria as complications of urinary stone destruction and magnesium lithospermate B, a component of Lycopus and Lithospermum species, has shown potential as a new therapeutic agent for inhibiting the progression of renal dysfunction. The use of various Chinese bitter ('cooling and drying') herbs has been shown to improve biochemical markers associated with free radical damage in patients with chronic glomerulonephritis compared with matched controls.

Other plant materials have shown apparent antinephrotoxic activity and may provide the basis for strategies following the adverse effects of heavy metals, antibiotics, analgesic and other prescription drugs, Amanita mushroom and aflatoxins and industrial agents. Protective effects of Arctostaphylos uva-ursi, Orthosiphon staminus and Polygonum arunculare have been noted against the nephrotoxic effects of mercuric chloride and beneficial effects against the nephrotoxin aminoglycoside in elderly patients have also been noted in controlled studies for Cordyceps sinensis. Aqueous rhubarb extract (at 150 mg/day) reduced proteinuria and glomerulosclerosis in rats exposed to experimental chronic renal fibrosis in controlled trials.49

DIURETICS (AQUARETICS AND DIURETIC DEPURATIVES)

Note: Most plants used primarily for their effects on the urinary system are collectively referred to as 'diuretics' in many texts. Nevertheless, this covers a broad range of traditional activities and probably very variable actual diuretic effects and the terms 'aquaretics' and 'diuretic depuratives' (see above) may be more accurate. However, the conventional terminology will be used here, as demarcation between the two categories is inadequate.

Plant remedies traditionally used as diuretics

Lupatorium purpureum (gravel root), Agropyron repens (couch grass), Eryngium maritimum (sea holly), Zea mays (corn silk), Aplum arvensis (parsley piert), Daucus carota (wild carrot), Parietaria diffusa (pellitory), Taraxacum officinale (dandelion), Apium graveolens (celery).

Indications for diuretics

- Dysuria and oliguria linked to urinary infections or stones
- Heart failure (as an adjunct to cardioactive glycosides)
- Ascites (combined with hepatic remedies)
- Nocturnal enuresis and other functional disturbances of micturition
- Urinary stones

Other traditional indications for diuretics

- Haematuria
- Arthritis and skin disorders

Contraindications in the use of diuretics

The use of diuretic herbs may be inappropriate and possibly even contraindicated in the following:

- renal failure;
- diabetes.

Other traditional therapeutic insights into the use of diuretics

The traditional treatment of arthritic disease often involved using herbs that were otherwise considered diuretics. There is a more modern tradition that
Herbal approaches to system dysfunctions

suggests these act to increase the elimination of metabolic acid wastes, like uric acid, factors popularly associated with arthritic disease. The precise explanation for the apparent efficacy of remedies like birch, celery seed and nettle leaf in arthritic diseases may be more complex.

This tradition is a reminder of the wider assumption that diuretics were among the eliminative strategies applied to a range of toxic conditions associated especially with inflammatory diseases and persistent or recurrent infections (see p.140). Any hint of fluid retention accompanying such conditions would be a traditional indication for diuretics.

Application

Diuretics, when prescribed overtly as such, are best taken in relatively high quantities at any time relative to eating. However, dramatic diuresis in some cases may follow quite small doses of many herbs, perhaps directed to other ends.

Phased treatments may be appropriate, for example, early morning and lunchtime dosages as part of a strategy for treating nocturnal enuresis.

Long-term therapy with many diuretics is quite acceptable.

Advanced phytotherapeutics

Diuretics may also be usefully applied in some cases (depending on other factors) of:

- osteoarthritis;
- dermatitis;
- other chronic inflammatory diseases accompanied by fluid retention;
- premenstrual syndrome.

URINARY ANTISEP'TICS

Plant remedies traditionally used as urinary antiseptics

Arctostaphylos uva-ursi (bearberry), Barosma betulina (buchu), Juniperus communis (juniper), Berberis vulgaris (barberry), Hydrastis canadensis (golden seal), Piper cubeba (cubeb).

Indications for urinary antiseptics

- Urinary infections or stones
- Prostatitis
- Interstitial cystitis

Contraindications in the use of urinary antiseptics

The use of urinary antiseptic herbs may be inappropriate and possibly even contraindicated in the following:

- kidney disease;
- renal failure;
- pregnancy.

Application

Urinary antiseptics may be taken before or with meals. It may be found that taking whole ground preparations in capsule form may be more effective than tinctures, but this is not a critical matter. Long-term therapy with many urinary antiseptics is not advisable.

PHYTOTHERAPY FOR URINARY CONDITIONS

Urinary stones

A theme that emerges from recent research is the complexity of mineral and electrolyte disturbance, involving other body systems, that can underlie urinary stone formation. For example, the pathogenesis of renal calculi may involve relative changes in concentrations of other urinary trace elements, notably copper and phosphorus, that clearly reflect wider metabolic changes.

Oxalate stone formation may be associated with a high oxalate:calcium ratio in the urine and may be linked to low dietary calcium intake or defects in oxalate transport mechanisms in the gut or kidney. Gut factors may be particularly important, as evidenced by the hyperoxaluria, low urine volume, low urinary ionic strength, lower urinary citrate levels and increased incidence of oxalate stones seen with extensive disease in or resection of the small intestine. In practice, phytotherapists are more productively directed to applying their array of digestive remedies for oxalate stones than focusing solely on the urinary tract.

There is also substantial evidence of interaction between urinary urates and oxalates so that higher urinary levels of the former, following disturbances of purine metabolism including gout, can lead to 'salting out' of calcium oxalate stones; drugs like allopurinol, that reduce urinary urates, also reduce oxalate stones. This calls into question the use, in the case of incipient or actual oxalate calculi (for example, in cases of severe small intestinal disease as above), of some plants, like...
the seeds of Apium graveolens (celery) and Petroselinum crispum (parsley), Eupatorium purpureum (gravel root), Betula spp (birch) and Urtica dioica (nettle leaf), that are considered to increase urinary excretion of urates.

Other studies suggest that urate stones themselves may be linked to low blood urate levels following enhanced tubular secretion of urate within the kidney. In such cases agents increasing urate excretion would be clearly contraindicated and alkalinization of urine may be the most effective treatment.53

In pregnancy, hyperuricuria and hypercalciuria, changes in metabolic inhibitors of lithiasis formation, urinary stasis, relative dehydration and the presence of infection all increase the likelihood of stone formation.54

Haematuria in children may be a sign of relative hypercalciuria and hyperuricuria, although the long-term implications of this are not clear.55

Herbal remedies and urinary stones

In seven plants (Verbena officinalis, Lithospermum officinale, Taraxacum officinale, Arctostaphylos uva-ursi, Arctium lappa and Silene saxifraga) studied for their effects on experimental risk factors for urinary stones (citraturia, calciuria, phosphaturia, pH and diuresis), moderate solvent action on uric stones was linked to the alkalinizing capacity of the herb infusions and to possible urinary antiseptic activity.56

Other Asiatic herbal products have been shown to reduce experimental renal stone formation.57,58,59 In Ayurveda, Crataeva nurvala is highly acclaimed for its use in the management of urinary tract disorders, especially kidney stones. Research has demonstrated a range of activity on urinary structures, including improved performance in clinical studies of benign prostate hyperplasia60 and with urinary stones61,62 and in reducing oxalate stone formation,63 with the steroid lupeol being a possible active constituent.64 A pharmacological study found that Crataeva influenced small intestinal Na, K-ATPase which in turn influenced the transport of minerals.65 This is a reminder that oxalate problems may well originate from the digestive tract (see above).

Herbal teas in general have been recommended as alternatives to the usual black tea consumption because of the latter's association with increased risk of formation of calcium oxalate stones but this is unlikely to reflect a general benefit of plant extractives as such.66

Urinary infections

Lower urinary tract infections are one of the most amenable indications for phytotherapy, although there are some difficult exceptions. Several plant constituents have at least theoretical antiseptic effects when eliminated in the urinary tract (including simple fructose itself) and a number of plants have firm clinical reputations for long-term efficacy in uncomplicated urethritis and cystitis, especially when caused by Gram-negative bacteria like Escherichia coli (accounting for 80% of adult cases), Staphylococcus saprophyticus, Klebsiella and Proteus.

It is also possible to treat higher tract infections, pyelonephritis with or without ureteritis and, in the case of men, bacterial prostatis, although in such cases complications may make progress more difficult and in chronic pyelonephritis, involvement of the kidney parenchyma may lead to the dangers of kidney damage.

When urinary tract infections are complicated by pregnancy, diabetes, immunosuppression or other abnormalities, prudence will determine that these are addressed before simple urinary antiseptics are applied. Except in pregnancy and severe kidney disease, however, the treatments are rarely contraindicated. They may also show effectiveness in urinary tract conditions linked to fungal (e.g. Candida) and parasitic infections (e.g. following malaria, leishmaniasis, trichomoniasis and bilharziasis) and for those without obvious infective cause. In the latter case at least alkalinization of the urine is a helpful accompaniment, conventionally with half a teaspoon of sodium bicarbonate in water every 3-4 hours but also with increased consumption of fruit juice (and vegetable juice especially).

Urinary infection probably requires adhesion of the bacteria to the otherwise glassy surface of the urinary tract and those usually responsible have mechanisms to do this. Constituents of berries of the heather family, notably Vaccinium macrocarpon (cranberry), and V. myrtillus (blueberry, bilberry), appear at least in vitro to interfere with this adhesion mechanism.67 An antibacteriuric effect of cranberry juice has been demonstrated in a double-blind controlled clinical study in elderly women.68 Another plant constituent with clinical antiadhesive properties, at least in the gut and in synthetic form, is berberine (from the Berberis genus and golden seal used traditionally for cystitis).69

It is also possible that herbs may help in the condition known as interstitial cystitis. This difficult condition, marked by inflammatory infiltration in the bladder wall but no obvious infection, is generally
thought to be an autoimmune disorder. However, an infective cause has not been ruled out, and in spite of its name, it appears that there is no increased bladder permeability. There do appear to be changes in neurotransmitter sensitivity (increasing resistance to atropine and histamine and a switch towards purinergic transmission in parasympathetic nerve terminals) and impairment of bladder perfusion in patients has also been observed, especially when the bladder was full. It is for these reasons that in herbal treatments urinary antiseptics are often combined with other agents with an apparent benefit on the bladder wall (e.g. Equisetum, Crataeva nurvala and Althaea).

Benign prostatic hyperplasia

Another popular application of herbal remedies is to the symptoms of benign prostatic hyperplasia. The early association of the symptoms of prostatic enlargement (urinary frequency, retention and diminished flow) with ageing in men led to the inevitable association of remedies that reduced these symptoms with rejuvenating male tonics and promoters of male potency. Given the eternal demand for such agents, it is not surprising that they feature in most traditions. In the early association of the symptoms of prostatic enlargement with ageing in men led to the inevitable association of remedies that reduced these symptoms with rejuvenating male tonics and promoters of male potency. It is possible that plant constituents could reduce the conversion of testosterone in the prostate in similar ways to the modern alpha-reductase inhibitors or could interact with relevant receptors or have other antiinflammatory effects in the organ. The evidence so far for these two remedies is reviewed in their monographs (see pp.490 and 523). The African remedy Pygeum africanum has been beneficial in clinical trials and is very popular in France. However, it has been classified as an endangered species. Crataeva nurvala (see above) improves bladder tone and decreases bladder emptying and is a useful symptomatic treatment for urinary obstruction including that linked to prostatic enlargement.

References


Herbal approaches to system dysfunctions