

Mechanisms of diuretic plants: an overview

Ongoing research suggests several molecular mechanisms that were correlated with acute or prolonged diuretic activity of different natural products. So, it is not surprising that research on this subject is at the forefront of research on the diuretic effects of many natural products. Many well-established mechanisms (water channels, renal carriers, nitric oxide-cGMP and prostaglandin-cAMP pathways, RAAS, KKS, carbonic anhydrase, and osmotic effects), along with other newly identified targets, are connected to the diuretic activity of many natural products. Currently, one of the greatest challenges is still featuring a standard pharmaceutical preparation, which can be effective in controlled clinical trials.

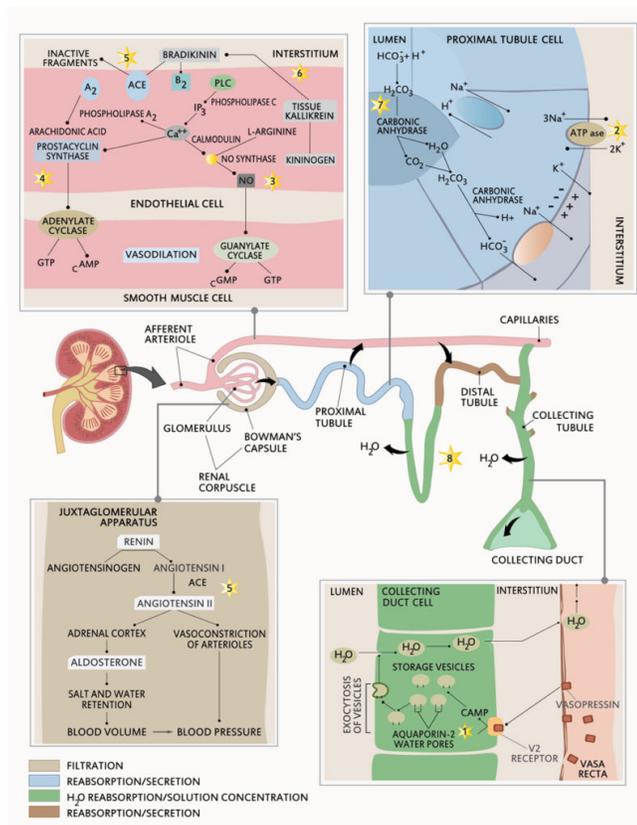


Fig. 1. Cellular and Molecular Mechanisms of Diuretic Plants. Cellular and molecular mechanisms responsible for the diuretic activity of several medicinal plants and their secondary metabolites may be divided into at least eight types. Yellow stars indicate natural products targets. 1: Effects on renal water channels (aquaporins); 2: Effects on renal carriers; 3: Effects on nitric oxide-cGMP pathway; 4: Effects on prostaglandin-cAMP pathway; 5: Effects on the renin-angiotensin-aldosterone system (RAAS); 6: Effects on the kinin–kallikrein system (KKS); 7: Effects on carbonic anhydrase; 8: Osmotic effects on kidneys.

Even if preclinical studies present strong evidence of the effectiveness of these natural products as new diuretic drugs, information on its effectiveness in human patients is still very restricted. Based on the above, we discuss some issues that need to be addressed. Can these natural products be effective in humans? Much of the current literature suggests that pre-clinical effects of different natural products are certainly reproducible in controlled clinical trials. However, the clinical relevance of these findings is often questioned due to the lack of confirmatory evidence. These observations can create reliable limitations on the prescription of many of these agents. Can natural products act on alternative targets for drugs already available for clinical use? The classic diuretic therapy, although highly effective, proved to cause several important side effects such as electrolyte disturbances, arrhythmia and impaired glucose tolerance. In this regard, natural products appear to be promising alternatives, because many of these agents have important natriuretic effects without significantly changing the renal potassium and calcium excretion. Moreover, unlike classical diuretic drugs that often have a unique therapeutic target, natural products seem to work seamlessly across multiple channels. In fact, this can be a considerable advantage as it allows for additional therapeutic effects such as antioxidant activity, antiplatelet and cardioprotective. However, the central path responsible for the activity of these agents remains unclear. Further studies may help clarifying the central role of each of these pathways in the pleiotropic response of these agents.

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