P.O. Box 144345 Austin, TX 78714-4345 ▪ 512.926.4900 ▪ Fax: 512.926.2345 ▪ www.herbalgram.org

HerbClip™

File: ■ Tarragon (*Artemisia dracunculus*)
■ Pharmacology
■ Safety

HC 111164-443

Date: February 29, 2012

RE: Critical Review of Tarragon's Traditional Use, Chemical Composition, Pharmacology, and Safety

Obolskiy D, Pischel I, Feistel B, Glotov N, Heinrich M. *Artemisia dracunculus* L. (tarragon): a critical review of its traditional use, chemical composition, pharmacology, and safety. *J Agric Food Chem*. 2011;59(21):11367-11384.

Tarragon (*Artemisia dracunculus*) has been widely used traditionally as both a spice and medicinal plant. This species is a small, aromatic shrub endemic to North America, Europe, and Asia with cultivation occurring in Europe, Russia, and the United States. Tarragon is described in ancient texts for the flavoring of foods as well as for treating scurvy, arthritis, and urogenital problems. This review aims to critically evaluate current data on the phytochemical content and bioactivity of tarragon with a focus on potential future uses of this plant.

Despite the broad, traditional uses of tarragon, different varieties, mainly the French (*A. dracunculus*) and Russian (*A. dracunculus* syn. *A. dracunculoides*) cultivars, vary in their phytochemical composition, bioactivity, and chromosome count. The review assesses the considerable taxonomic confusion at the subspecies level. Thus, rigorously identifying original material is important in future tarragon research. The French and Russian varieties of tarragon taste different; the former is thought to be sweeter and more "delicate" than the latter, more "bitter and harsh" flavored counterpart. The species is used in many foods, from meat and fish flavoring to vinegars and drinks. Medicinally, people in the Middle East have used tarragon for insomnia, while those in Asia and Russia applied it for various skin ailments. People in India treated fevers with tarragon; and Native Americans used it for labor assistance, mosquito repellent, and treating cuts. In areas throughout the former Soviet Union, tarragon was used for nervous problems, as an anti-inflammatory, and to treat bacterial infections. French tarragon is considered of more economic importance than Russian, given its pleasing culinary properties. In Europe, it is one of the 20 most commonly cultivated herbs.

The prominent compounds in tarragon have been found to be coumarins, flavonoids, and phenolic acids. A large focus of phytochemical research of tarragon has been on the essential oil. The oil content is variable depending on geographical location and is

produced mostly during budding and initial flowering. The essential oil primarily contains acetylene chemicals, isocoumarin derivatives, fatty acids, and the specific compounds methyleugenol, estragole, elemicin, and terpinolene. Russian tarragon mainly contains terpinen-4-ol, sabinene, and elemicin, while French tarragon contains higher amounts of estragole than the Russian cultivar. An extensive table that details the components of the essential oils in tarragon is included.

Multiple bioactivities of tarragon have been reported in vitro. Tarragon chloroform, acetone, methanol, and water extracts have been found to be active against a variety of bacteria including *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Shigella*, *Bacillus subtilis*, *Listeria monocytogenes*, and *Helicobacter pylori*. In addition, the essential oil was active against several fungal species, including those that infect plants. In vitro studies also reported that tarragon leaf extract showed activity against platelet adhesion and aggregation.

In vivo work on the bioactivity of tarragon explores a variety of targets. Ethanol extracts were found to be anti-inflammatory and reduced rat edemas by 80%. This extract also reduced hepatitis-induced necrosis in rats by more than 30%. The suspected mechanisms of action involve beneficial effects on hepatocyte cell membranes and compensatory mechanisms. Many animal studies show decreased glucose concentrations; these results were also observed with an oral glucose tolerance test, adrenaline-induced elevated glucose, and alloxan or streptozotocin models. Mechanisms of hypoglycemic activity of tarragon include kinase stimulation, the increase of GLP-1 (glucagon-like peptide 1) binding, the inhibition of gluconeogenesis (internal synthesis of glucose), and the amplification of endogenous insulin. Tarragon has also been found to have antioxidant activity. A study found evidence that tarragon extract lessened lipid peroxidation, and the essential oil was reported to have "moderate" in vitro scavenging activity. Additionally, ethanol, but not water extracts, lessened death from anoxia (oxygen deprivation) in rats.

Tarragon showed a very strong effect on the gastrointestinal system with the ethanol extracts stimulating gastric juice secretion and preventing induced ulcers in rats. The dried extract and infusion of tarragon was reported to decrease hepatic transaminase activity (high levels of which can indicate liver damage or illness), and extracts were found to lessen liver necrosis.

The neurotropic activity of tarragon has also been explored. In rats, a preliminary investigation of tarragon extract was found to lengthen thiopental-induced sleep, and water/alcohol extracts had beneficial effects on orientation, emotional lability, and decreased exploratory behavior. Tarragon extract was also reported to have analgesic effects. Anticonvulsant activity was reported with the distilled essential oil, but as the active dosage was not much lower than the lethal dose, questions arose concerning toxicity of the oil. An extensive table outlines the studies on the physiological effects of tarragon, including the compound used, its origin, the model it was tested in, the dose used, and the outcome.

In terms of the safety profile of tarragon, investigative focus has concentrated on the prevalent compounds estragole and methyleugenol. Estragole has been found to cause tumors in rodent models, as well as cancer in specific animals and tissues. Later studies have pointed to cancer-causing metabolites of estragole as opposed to the compound itself. The metabolism of compounds can differ from animals to humans, and it is

currently thought that the risk of estragole acting as a carcinogen in humans is small. Methyleugenol is a widely active carcinogen and has been reported to consistently cause tumors in multiple rodent models and tissues. Despite the carcinogenic activity of these 2 compounds, water, water/alcohol, and ethanol extracts which contain very low amounts of estragole and methyleugenol have shown neither mutagenic nor toxic activity in rodents. Overall, such extracts can, therefore, be considered to be safe.

This review includes a large number of Russian and Soviet studies that contribute to extensive investigation of tarragon bioactivity. Many of the pharmacological activities described are worthy of further research using taxonomically and phytochemcially fully characterized material, not the least of which is the hypoglycemic activity. It is emphasized that proper identification of tarragon cultivars is crucial in assessing its bioactivity. Although strong carcinogenic activity is reported for isolated compounds, the use of water extracts of tarragon as a tea or spice is considered to be safe due to the low content or absence of estragole and methyleugenol. Future robust clinical investigations into the use of tarragon for treating a variety of diseases are recommended.

—Amy C. Keller, PhD