Chapter 3

Ginkgo biloba

Timothy S. Tracy

Summary

Controlled studies suggest that administration of Ginkgo biloba (GB) extract has limited effectiveness in improving memory and cognition, either in elderly subjects with dementia or healthy subjects. GB administration does seem to reverse sudden hearing loss in patients with mild cases of this disorder. Additionally, GB administration may blunt the rise in blood pressure in response to stress and may blunt the glycemic response after an oral glucose tolerance test. Despite the lack of evidence of effects on coagulation in vivo, a number of case reports of excessive bleeding in patients taking GB have been reported. Finally, GB does not appear to be prone to causing drug interactions, except for agents metabolized by cytochrome P450 2C19 (in which case, induction is observed).

Key Words: Ginkgolides; dementia; memory; diabetes; bleeding disorders.

1. History

The ginkgo tree, Ginkgo biloba (GB) L., is the last remaining member of the Ginkgoaceae family, which once included many species (1). It has survived unchanged in China for more than 200 million years, and was brought to Europe in 1730 and to America in 1784. Since then, it has become a popular ornamental tree worldwide. Individual trees may live as long as 1000 years, and grow to a height of approx 125 feet (2). GB fruits and seeds have been used in China for their medicinal properties since 2800 BCE (1). Traditional Chinese physicians used GB leaves to treat asthma and chilblains (swelling of the hands and feet from exposure to damp cold) (2). The ancient Chinese
and Japanese ate roasted GB seeds as a digestive aid and to prevent drunkenness (2). GB use had spread to Europe by the 1960s.

2. **Current Promoted Use**

GB is sold as a dietary supplement in the United States. It is purported to improve blood flow to the brain and to improve peripheral circulation. It is promoted mainly to sharpen mental focus in otherwise healthy adults as well as in those with dementia. Other conditions for which it is currently used are diabetes-related circulatory disorders, impotence, and vertigo.

3. **Products Available**

An acetone-water mixture is used to extract the dried and milled leaves (1). After the solvent is removed, the *Ginkgo biloba* extract (GBE) is dried and standardized. Most commercially prepared dosage forms contain 40 mg of GBE (1), and are standardized to contain approx 24% flavonoids (mostly flavone glycosides, or ginkgoflavone glycosides) and 6% terpenes (ginkgolides and bilobalide) (3–5). There are a more than 500 GB preparations on the market, in a number of dosage forms.

4. **Pharmacological/Toxicological Effects**

The effects of GB are attributed to several chemical constituents of the whole plant rather than to any one individual component. These chemicals include many flavonoids (also called flavonol, flavone, or flavonoid glycosides, ginkgo flavone glycosides, dimeric bioflavones), and the terpene lactones (also called terpenoids, diterpenes, terpenes), including the ginkgolides and bilobalide (2,5–7).

4.1. **Nervous System Effects**

The pharmacological basis of the effects of GBE on brain function has been addressed in a number of studies. One study (6) showed that dietary GBE 761 (prepared by the Henri Baefour Institute) protected striatal dopaminergic neurons of male Sprague-Dawley rats from damage caused by N-methyl-4-phenyl-1,2,3,6-tetrahydropyridine (MPTP). MPTP, which has caused Parkinsonism in young drug abusers, is thought to damage these neurons through formation of free radicals. The mechanism of GBE’s protective effect was attributed to an antioxidant action, rather than to prevention of neuronal uptake of MPTP. Whether chronic GBE ingestion could prevent development of idiopathic Parkinson’s disease in humans remains to be seen.