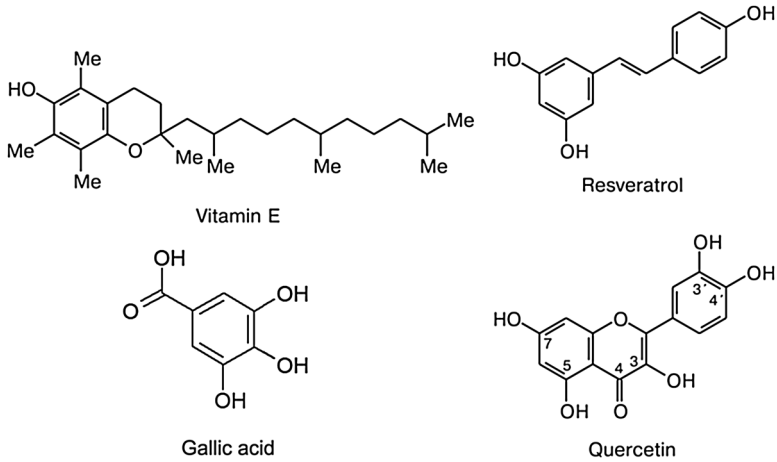

Scheme 8.2 Natural antioxidants α-tocopherol (vitamin E), resveratrol (3,5,4′-trihydroxy-stilbene), garlic acid, quercetin.

especially abundant in grapes and red wine. Some of the natural antioxidants are depicted in Scheme 8.2.

With appropriate dosage, natural and synthetic antioxidants exert various favorable therapeutic effects and therefore they have been long used with success in medical practice. For example, BHT is used to treat burns, gunshot wounds, trophic ulcers, and bladder cancer. Mexidol (2-ethyl-3-hydroxy-6-methylpyridine succinate) is used to treat brain circulation disorders, and Emoxipine (hydrochloride of the same pyridine derivative) is used in ophthalmology (see ref. 38). The same synthetic antioxidants have proved to be effective geroprotectors, *i.e.*, compounds that extend the life span of laboratory animals when added to food or drinking water on a regular basis. By adding BHT to food, it was possible in some cases to extend the lives of some lines of mice and fruit flies by 25 and 30%.[44,45] Emoxipine when added to drinking water extends the average life spans of fruit flies and mice by 24 and 38%, respectively (see ref. 8 and 40). The mitochondria-targeted Mito-Vit E and Mito-Q had beneficial effects for treating sepsis.[41] Similar compounds based on plastoquinone (SkQ) were applied profitably against age pathologies in animals, in particular, for treating a number of cardiovascular and ocular diseases and even as geroprotectors in experiments on mice or other animal species.[42] The remarkable geroprotective effects were found for resveratrol (3,5,4′-trihydroxy-stilbene) in experiments with *Drosophil*a flies, mice, yeasts, nematodes and fish. The extension of the average life span by 30% in experiments with mice fed on a fatty diet and the extension of the maximum life span by 59% in experiments on fishes were revealed.[46–48] However, the classical natural antioxidant, α-tocopherol, appears to be of comparatively low efficiency in analogous biomedical testing.[49]

The results of analysis of the rate constants and actual concentrations of antioxidants also raise doubts in the fact that antioxidants operate *in vivo* in