Lecture 10

Medicinal Plant

Dr. Hebba Al-Lami

Antioxidant activity

Antioxidants deactivate free radicals and other oxidants, rendering them harmless. Free radicals are highly unstable molecules, present in the body both from external sources (e.g. pollution, smoking, carcinogens in the environment) and internal sources, the result of normal physiological processes. If left uncontrolled, free radicals can damage cell components, interfering with major life processes. For example, they may damage DNA, leading to cancer, or oxidise fats in the blood, contributing to atherosclerosis and heart disease. Although the body produces its own antioxidants and has other defence mechanisms, it is thought that antioxidants from the diet also have an important role.

Anti-inflammatory activity

Although inflammation is part of the body's defences and has a vital role in fighting infection and the repair of damaged tissue, chronic inflammation is also now believed to be implicated in the development of many major lifestyle diseases, including cancer, cardiovascular disease and Alzheimer's disease. There are anti-inflammatory compounds in herbs, including flavonoids and phenolic acids, carnosol, and thymol. Epidemiological evidence suggests that populations with diets containing high levels of phenolic compounds have lower incidences of inflammatory disease.

Cardiovascular disease

Apart from studies involving garlic, there have been few clinical trials on the effects of herb consumption on cardiovascular disease. An early study found that the consumption of lemon grass oil lowered cholesterol in a group of high-cholesterol subjects, although that study had only a small number of participants (18) and had a major flaw in that there was no control group (Elson et al. 1989). Extracts of parsley and thyme were found to have anti-thrombotic effects in an animal study (Yamamoto et al. 2005).

Cancer

As with cardiovascular disease, it is thought that antioxidants help prevent and moderate the cascade of events that lead to cancer, and as discussed above, many herbs contain high concentrations of antioxidant compounds. There is a similar lack of clinical research on the effects of herbs on cancer in humans, though there are a number of *in vitro* and animal studies showing promising results. Because cancer is a multi-factorial disease, there are many ways in which herbs are able to exert a protective effect. Some, such as wasabi, horseradish, sage and fennel have been shown to stimulate the activity of endogenous protective enzymes, which have major antioxidant or detoxifying roles. Others, such as thyme, protect the structural integrity of DNA from free radical damage. Radical scavenging, metal chelating and protecting lipids from peroxidation can also prevent steps in the cascade of events that lead to cancer. As will be discussed more fully later, most herbs show varying degrees of antioxidant activity *in vitro*, but their precise effects *in vivo* have not been established.

Brain infection

The events leading to neurodegenerative diseases, including Alzheimer's disease, have not been unequivocally identified, but are believed to include inflammatory processes, free radical formation after the activation of glial cells, and organelle dysfunction, leading to neuronal death (Martin et al. 2002; Staehelin 2005; Mandel et al. 2006). The fact that neurodegeneration

Brain infection

In order to have an effect upon brain function, potential dietary protectants need to be non-toxic, brain-permeable (or able to influence brain biochemistry in some other way such as affecting glucose supply) and have properties such as antioxidant (transition metal chelating, radical scavenging ability) and anti-inflammatory activity (Mandel et al. 2006). These characteristics have been demonstrated in a number of herbs. Besides the ethnic remedies such as gingko and St John's wort which are now being investigated scientifically in regard to their effects upon brain function, there are also some culinary herbs that have shown promise, including thyme, salad burnet and sage.

Anti-microbial activity

Although there has been much interest in and evidence for the anti-microbial properties of various herbs (Elgayyar et al. 2001; Burt 2004; Angelini et al. 2006; Rasooli et al. 2006), the relevance of this to human health has not been examined directly. Rather, research has focused on these properties in relation to food safety and extending shelf life.

Other health problems

Herbs and herb components have shown promising properties for various other health problems, such as osteoporosis (wasabi, a powdered rosemary, sage and thyme mixture, rosemary and sage essential oils and their constituent monoterpenes) (Muhlbauer et al. 2003; Yamaguchi 2006), inhibiting HIV-1 integrase and reverse transcriptase (rosmarinic acid) (Kobayashi et al. 2000; Hooker et al. 2001) and assisting diabetes management (tarragon) (Swanston-Flatt et al. 1991). However, results are preliminary and a number of human trials would be necessary before conclusions could be drawn. It is quite possible that there could in fact be several health disorders which could benefit from herbs, but at present there is a lack of research data.



THANKS
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LISTENING