

Can Herbs Protect Against Radiation Damage?

by Kerry Bone

After the Fukushima nuclear disaster I was asked by many patients and colleagues if there are herbs that can protect against the damaging effect of ionizing radiation. While this is a valid concern, it is worth considering that we are exposed to high energy radiation in a number of ways other than nuclear accidents. A significant exposure comes from background radiation, due to radioactive elements in the earth and cosmic rays from space. According to the US EPA, about 8% of our annual radiation exposure comes from outer space, depending on the altitude where we live. When we fly on commercial airplanes for 4 to 5 hours we receive between 2 and 5 millirems of radiation (typical background exposure is around 360 millirems). Hence, you can substantially increase your radiation exposure compared to background levels by flying.

Another major source of ionizing radiation is from medical techniques. Computed tomography (CT) scanners are now routinely used in medical practice with a consequent substantial increase in radiation exposure compared to normal x-rays. For example, a chest CT scan typically delivers more than 100 times the radiation dose of a routine front and lateral chest x-ray.¹ A multiphase abdomen and pelvis CT scan can deliver a radiation dose of 3100 millirems, almost 10 times the annual background exposure.¹ The Institute of Medicine found evidence to recently conclude that the two environmental factors most strongly associated with breast cancer were ionizing radiation and postmenopausal hormone therapy,² and a recent editorial in *American Family Physician* called for a reduction in the number of CT scans ordered, “which are clearly being used more often than is clinically necessary”³

Given these concerns, can we offer our patients herbs with a proven ability to mitigate the harmful effects of ionizing radiation? The radioprotective activity of herbs is certainly an active area of research, with most studies conducted using animal models. Such research can only be regarded as preliminary in nature; hence the focus in this article will be on human studies. Here we have two very promising leads: the standardised extract of *Ginkgo biloba* and the phytochemical berberine, which can be provided through a variety of herbal extracts.

According to legend, several Ginkgo trees growing within one mile of the Hiroshima atomic bomb blast were among the few living things to survive and are flourishing to this day (see Wikipedia). Perhaps radiation survival is an in-built property of the Ginkgo tree, since the species is a living fossil dating back more than 200 million years to a time when background radiation exposure on earth was substantially higher. Whatever the case, clinical studies do support its radioprotective activity

Ginkgo neutralized genetic damage induced by radioiodine treatment in Graves' disease patients (120 mg/day; randomised controlled trial)²⁷⁸ and in Chernobyl accident recovery workers (120 mg/day; uncontrolled trial).⁴The former trial assessed the effect of standardised Ginkgo extract on the appearance of micronuclei (MN) in lymphocytes from patients with Graves' disease after radioactive iodine therapy.⁵ Twenty-five patients were randomly assigned to receive Ginkgo extract (120 mg/day) or placebo from 3 days before and up to 30 days after iodine therapy. The peak increase of MN and the average increase of MN were significantly higher in the placebo group than in Ginkgo-treated patients. An early and sustained MN increase was observed in the placebo group, but in Ginkgo-treated patients the increase never reached statistical significance. The protective effect of Ginkgo extract was still present after correcting the data for age, gender, thyroid hormone profile and bone marrow dose. Administration of Ginkgo did not have any adverse effect on the efficacy of the radiotherapy.

A follow-up study also confirmed this radioprotective activity in radioiodine therapy. A double-blind trial evaluated the effect of Ginkgo on the appearance of clastogenic factors (CFs), which have chromosome-damaging properties, in the plasma, and micronuclei in lymphocytes of patients with thyroid cancer after receiving their first dose of radioactive iodine. Twenty-three patients were randomised to receive standardised Ginkgo extract (120 mg/day) or placebo from 3 days before and up to 30 days after radioiodine treatment.⁶

The following results were obtained. MN in blood lymphocytes increased significantly after radioiodine treatment in the placebo group, peaking at the 7th day and slowly declining thereafter. In patients treated with Ginkgo, there were no significant increases in peripheral blood lymphocyte MN at any time point after radioiodine treatment.

Only the placebo group showed a significant, progressive increase in CFs. This peaked at the 14th day with a slight decrease thereafter but never returned to baseline values. In contrast, in Ginkgo-treated patients the activity of CFs was negligible at each time point. The differences in the change in lymphocyte MN and CFs activity between the placebo and Ginkgo-treated groups were significant ($p < 0.01$ and $p < 0.05$, respectively). After radioiodine treatment, thyroid function tests were similar in both groups. No clinically-relevant side effects were observed from Ginkgo treatment.

There is extensive research on the health properties of the remarkable phytochemical berberine. In addition, it also has radioprotective activity according to clinical trials. Given the traditional role of berberine-containing herbs in China for the treatment of diarrhoea, the impact of berberine on radiation-induced acute intestinal syndrome (RAIS) was explored in a clinical study.⁷ RAIS includes side effects such as nausea, vomiting, abdominal pain, loss of appetite, diarrhoea, colitis and proctitis. Thirty-six patients with seminoma (a type of testicular cancer) or lymphoma, and another 42 with cervical cancer, were randomly administered either berberine (900 mg/day) or a placebo for 4 and 5 weeks, respectively. The berberine was given just prior to and during abdominal or pelvic radiotherapy. Berberine had significantly improved the incidence and severity of RAIS in both patient groups by the end of the trial ($p < 0.05$), and reduced existing RAIS in a separate group of 8 patients. The treatment was well tolerated.

In a prior randomised, double blind, placebo-controlled study, the effect of 6 weeks of berberine (20 mg/kg/day) on radiation-induced lung injury (RILI) was assessed in 90 patients undergoing treatment for non-small cell lung cancer.⁸ The incidence of RILI was significantly lower in the berberine group compared with the placebo group at 6 weeks and at a 6-month follow-up (45.2% vs 72.1% and 35.7% vs 65.1%, respectively, both $p < 0.05$). Two measures of radiation-induced lung tissue damage (soluble intercellular adhesion molecule-1 and transforming growth factor beta 1) were also significantly reduced at 6 weeks compared with the placebo ($p < 0.01$ for both) and two measures of lung function were significantly improved at 6 months.

We can take some positive action with these herbal extracts to minimise radiation damage, and the studies show that they certainly do no harm. Next time you or a patient are taking a long flight or having a CT scan, think of Ginkgo and berberine. Best to start about one week

before the exposure and continue for a week after. With radiation therapy for cancer, I recommend that Ginkgo is not taken in a 24-hour window either side of treatments to avoid any risk of interference.

References

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