# HERBAL MEDICINE and MUTAGENICITY

A mutagen is an environmental, physical or chemical agent that induces a genetic mutation or increases the mutation rate.

I have heard on the grapevine that a media campaign is said to be in preparation that is to instil fear in people who use over-the-counter medicinal herbs. Media publicity is to suggest systematically and repeatedly that herbal preparations may have a mutagenic effect especially if they are taken during the early stages of pregnancy, that is to say, when parents do not yet know that there has been a conception.

I have looked at the research concerning this, and am here providing a summary of the published, peer-reviewed findings for guidance on this topic (I have included botanical medicines that, in some countries, may not be available over-the-counter).

Studies of 8 herbs where there may be some evidence of mutagenicity:

**Arctostaphylos uva-ursi** (bearberry): An extract of the leaf prepared using boiling water or methanol showed no mutagenic activity [**Yakugaku Zasshi**, 1982, **102:**596-601; and **Mutation Research**, 1982, **97:**81-102]; an additional assay with *Bacillus subtilis* a methanolic extract of the leaf showed no mutagenicity, whereas a water extract did [**Mutation Research**, 1982, **97:**81-102].

**Astragalus membranaceus** (milk vetch): In a bone marrow-chromosomal and a bone marrow-micronucleus assay in an inbred strain of mice of both sexes, modest evidence of mutagenicity was found from a dose of the extract (1 g/kg body weight) injected into the peritoneum. However, it remains to be established whether any mutagenic effects are found when it is administered in the traditional herbalists', the oral route [**Mutation Research**, 1991, **260:**73-82].

**Capsicum annuum** (chilli or Cayenne pepper): A major constituent hereof is *capsaicin*, which has shown some mutagenic activities in the laboratory in the mammalian system, in V79 cell strains [**Cancer Letters**, 1989, **48:**109-113].

**Matricaria recutita** (German chamomile): An extract of chamomile flowers prepared as an infusion with boiling water produced a relatively high degree of mutagenicity [**Yakugaku Zasshi**, 1982, **102:**596-601]; however, this was shown to be the

result of photo-activation of *coumarins* present in the extract [**Fitoterapia**, 1992, **63:**387-394].

**Schisandra sphenanthera** (magnolia vine): An increase in mutagenicity was noted in an *in vitro* study, but the researchers mentioned that these *in vitro* results probably represent a greater exposure to the toxins than would occur *in vivo*, and that the increased mutagenicity appears to result from a small number of constituents in *Schisandra* which affect mono-oxygenase activities [**Food and Chemical Toxicology**, 1986, **24:**903-912].

**Uncaria guianensis** (cat's claw): The lyophilized root bark showed no mutagenicity in five different organic strains (tests were conducted with the extracts in concentrations of 50, 500, 1500 and 5000 mg/plate). Six fractions and five extracts of the chloroform-ethanol extract in the mammalian-microsome test also showed no mutagenicity. The same extracts tested in TA 102 with or without 8-methoxypsoralen and treatment with UVA irradiation produced no mutagenicity [**J Ethnopharmacology**, 1993, **38:**63-77]. In yeast assays for DNA damage, pteropodine and isopteropodine showed only very weak activity; the effects of an ethanolic extract of *Uncaria guianensis* bark was even weaker [**Planta Medica**, 1999, **65:**759 ff].

**Valeriana officinalis** (valerian or allheal): Two constituents, *baldrinal* and *homobaldrinal*, caused mutations in *Escherichia coli* and *Salmonella typhimurium*. It is not known whether these potential effects are relevant in humans, but if they are, the main sites of possible injury would be the liver and gastro-intestinal tract [***Adverse Effects of Herbal Drugs***, vol 3, New York: Springer- Verlag, 1997, pp 165-180]. The *baldrinals* undergo rapid metabolism in the human body and the metabolites, *baldrinal gluccoronides* display no mutagenicity. Nevertheless, the best precautionary choice, until there is total clarity, is for *valerian* products devoid of *baldrinals* and *valepotriates* to be used (e.g. tinctures stored for two months or longer) [**Phytomedicine**, 1998, **5:**219-225].

**Zingiber officinale** (ginger): A review of mutagenic studies of ginger and ginger constituents noted that whereas in one study an ethanolic extract of the root showed mutagenic activity without metabolic activation, another found no mutagenic activity from ginger extract, and a third found that genotoxicity produced by a number of carcinogens became suppressed by ginger extract, both in mammalian and bacterial cells [**J Environmental Pathology, Toxicology & Oncology**, 1999, **18:**131-139].

<u>13 Medicinal Herbs in which studies found no evidence of mutagenicity:</u>

**Actæa racemosa** (black cohosh): [**Advances in Therapy**, 1998, **15:**45-53].

**Allium sativum** (garlic): [**Mutation Research**, 1984, **136:**85-88; and ***Herbal Medicines: A Guide for Healthcare Professionals***, London: The Pharmaceutical Press, 1996, pp129-133].
**Angelica polymorpha** (dong quai): [**Yakugaku Zasshi,** 1982, **102:**596-601].
**Carduus marianus** or **Silybum Marianum** (milk thistle): [**Mutation Research**, 1994, **307:**395-410].
**Cordyceps sinensis** (caterpillar fungus): [**J Alt Compl Med**, 1998, **4:** (Part II) 429-457].
**Cratægus oxyacantha** (hawthorn): [**J Am College of Toxicology**, 1994, **13:**103-111].
**Echinacea purpurea** (purple coneflower): [**Eur J Herbal Medicine**, 1997, **3:**20-22; and **Arzneimittelforschung**, 1991, **41:**1076-1081].
**Ginkgo biloba** (maidenhair tree): [***Adverse Effects of Herbal Drugs***, vol 3, New York: Springer-Verlag, 1997, pp 51-66].
**Glycyrrhiza glabra** (liquorice): [**Planta Medica**, 1993, **59:**502-507].
**Hypericum perforatum** (Saint John's wort): [**Phytomedicine**, 1996, **3(Suppl. 1):**104 ff; and ***American Herbal Pharmacopœia and Therapeutic Compendium***, *HerbalGram (40): Hypericum Perforatum*, 1997, Summer: 32 pp insert].
**Tanacetum parthenium** (feverfew): [**Human Toxicology**, 1988, **7:**145-152; and **Human Toxicology**, 1987, **6:**533-534].
**Vaccinium myrtillus** (bilberry): [**Australian Journal of Medical Herbalism**, 1993, **5:**81-85].
**Vitis Vinifera** (grape seed): [**Archives of Biochemistry & Biophysics**, 1999, **369:**42-58].

Harald C Gaier
Registered Naturopath, Osteopath, Master Herbalist,
Homœopath and Acupuncturist
Telephone: 079 1766 2042
Web-site: www.drgaier.com

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