Diverse compounds from many different chemical classes are currently targeted in preclinical analyses for their ability to act as both chemopreventative and chemotherapeutic agents. Phenolic phytochemicals from *Rhodiola crenulata* (Hook. f. & Thom.) H. Ohba has such potential. This *Rhodiola* species is a perennial plant that grows in the Tundra, Siberia, and high-elevation regions of Tibet. The phenolic secondary metabolites isolated from *Rhodiola crenulata* were recently analyzed in a preclinical setting for their ability to treat lymphosarcomas and superficial bladder cancers. However, the effects of *R. crenulata* have yet to be examined for its implications in breast cancer prevention or for its chemotherapeutic abilities. Therefore, the scientists at University of Massachusetts, Amherst investigated the effects of this herb on breast cancer both *in vivo* and *in vitro*. Experiments using aggressive human-derived MDA-MB-231 and mouse-derived V14 breast cancer cell lines demonstrated that phenolic-enriched *R. crenulata* extract was capable of inhibiting the proliferation, motility and invasion of these cells. In addition, the extracts induced autophagic-like vesicles in all cell lines, eventually leading to death of the tumour cell lines but not the immortal or normal human mammary epithelial cells. Finally, an *in vivo* experiment showed that phenolic-enriched dietary *R. crenulata* is effective in preventing the initiation of tumours and slowing down the tumour growth in mice bearing tumour grafts, thereby further demonstrating its possible potential for treatment of breast cancer progression and metastasis [Yifan Tu, Louis Roberts, Kalidas Shetty and Sallie Smith Schneider, *Rhodiola crenulata* Induces Death and Inhibits Growth of Breast Cancer Cell Lines, *J Med Food*, 2008, 11(3), 413-423].

### Protective effects of *Chlorella vulgaris* Beijer on liver toxicity in cadmium-administered rats

The scientists at Korea investigated the biochemical mechanisms of *Chlorella vulgaris* Beijer protection against cadmium (Cd)-induced liver toxicity in male Sprague-Dawley rats (5 weeks of age, weighing 90-110 g). Forty rats were randomly divided into one control and three groups treated with 10 ppm Cd: one Cd without *Chlorella* (Cd-0C), one Cd with 5% *Chlorella* (Cd-5C), and one Cd with 10% *Chlorella* (Cd-10C) groups. The rats had free access to water and diet for 8 weeks. Body weight gain and relative liver weight were significantly lower in the Cd-0C group than in Cd-5C and Cd-10C groups. Rats in the Cd-0C group had significantly higher hepatic concentrations of Cd and metallothioneins (MTs) than in the Cd-5C or Cd-10C group. The hepatic MT I/II mRNA was expressed in all experimental rats. MT II was more expressed in the Cd-5C and Cd-10C groups than in the Cd-0C group. Morphologically, a higher level of congestion and vacuolation was observed in the livers of the Cd-0C group compared to those of the Cd-5C and Cd-10C groups. Therefore, this study suggests that *C. vulgaris* has a protective effect against Cd-induced liver damage by reducing Cd accumulation and stimulating the expression of MT II in liver. However, the details of the mechanism of alga on liver toxicity remains to be clarified by further studies [Shim Jae-Young, Shin Hye-seoung, Han Jae-Gab, Park Hyeung-Suk, Lim Byung-Lak, Chung Kyung-Won and Om Ae-Son, Protective effects of *Chlorella vulgaris* Beijer. on liver toxicity in cadmium-administered rats, *J Med Food*, 2008, 11(3), 479-485].

### *Rhodiola crenulata* (Hook.f. & Thom.) H. Ohba induces death and inhibits growth of breast cancer

Diverse compounds from many different chemical classes are currently targeted in preclinical analyses for their ability to act as both chemopreventative and chemotherapeutic agents. Phenolic phytochemicals from *R. crenulata* (Hook. f. & Thom.) H. Ohba has such potential. This *Rhodiola* species is a perennial plant that grows in the Tundra, Siberia, and high-elevation regions of Tibet. The phenolic secondary metabolites isolated from *R. crenulata* were recently analyzed in a preclinical setting for their ability to treat lymphosarcomas and superficial bladder cancers. However, the effects of *R. crenulata* have yet to be examined for its implications in breast cancer prevention or for its chemotherapeutic abilities. Therefore, the scientists at University of Massachusetts, Amherst investigated the effects of this herb on breast cancer both *in vivo* and *in vitro*. Experiments using aggressive human-derived MDA-MB-231 and mouse-derived V14 breast cancer cell lines demonstrated that phenolic-enriched *R. crenulata* extract was capable of inhibiting the proliferation, motility and invasion of these cells. In addition, the extracts induced autophagic-like vesicles in all cell lines, eventually leading to death of the tumour cell lines but not the immortal or normal human mammary epithelial cells. Finally, an *in vivo* experiment showed that phenolic-enriched dietary *R. crenulata* is effective in preventing the initiation of tumours and slowing down the tumour growth in mice bearing tumour grafts, thereby further demonstrating its possible potential for treatment of breast cancer progression and metastasis [Yifan Tu, Louis Roberts, Kalidas Shetty and Sallie Smith Schneider, *Rhodiola crenulata* Induces Death and Inhibits Growth of Breast Cancer Cell Lines, *J Med Food*, 2008, 11(3), 413-423].
Hypoglycaemic effects of a sesquiterpene glycoside isolated from leaves of loquat (Eriobotrya japonica (Thunb.) Lindl.)

The scientists at Jiangsu Province and Chinese Academy of Sciences, Nanjing, China isolated sesquiterpene glycoside, nerolidol-3-O-α-L-rhamnopyranosyl(1→4)-α-L-rhamnopyranosyl(1→2)-[α-L-rhamnopyranosyl(1→6)]-β-D-glucopyranoside from dried leaves of loquat [E. japonica (Thunb.) Lindl., Family-Rosaceae]. Hypoglycaemic effects of this natural product were assessed in normal and alloxan-diabetic mice model.

Animals received orally administered sesquiterpene glycoside in dose of 25 and 75mg/kg. The anti-hypoglycaemic effect was compared with gliclazide's. The dose of 25 and 75mg/kg both exerted a significant (P<0.05) hypoglycaemic effect in alloxan-diabetic mice throughout the test and a slight effect in normal mice [Chen J, Li WL, Wu JL, Ren BR and Zhang HQ, Hypoglycaemic effects of a sesquiterpene glycoside isolated from leaves of loquat (Eriobotrya japonica (Thunb.) Lindl.), Phytomedicine, 2008, 15(1-2), 98-102].

Antiviral activity and mode of action of a peptide isolated from Sorghum bicolor Linn.

The scientists at Brazil described the purification of an antiviral peptide from seeds of Sorghum bicolor Linn. by a procedure that included gel filtration, ion exchange and high-performance liquid chromatography (HPLC) in a reversed-phase column. Its molecular weight, determined by chromatographic mobility on the Shim-pack DIOL-150 gel permeation column in HPLC, was found to be 2000 Da. The peptide designated 2kD peptide strongly inhibited the replication of herpes simplex virus type 1 (HSV-1), dose-dependently, at 40-90% of the control level, after incubation with 10-50µM of the peptide, with EC50 and EC90 values of 6.25 and 15.25µM, respectively. Similar results were observed when the 2kD peptide was assayed against bovine herpes virus (BHV), an enveloped virus like HSV-1. On the other hand, the 2kD peptide showed weak activity against poliovirus type 1, a non-enveloped virus. Taken together, these results indicate that the 2kD peptide was able not only to inhibit the initiation and the spread of infection, but also had an in vitro prophylactic effect against HSV-1 infection [Camargo Filho I, Cortez DAG, Ueda-Nakamura T, Nakamura CV and Dias Filho BP, Antiviral activity and mode of action of a peptide isolated from Sorghum bicolor Linn., Phytomedicine, 2008, 15(3), 202-208].
Antidiabetic effect of ethanolic extract of walnut leaves

Walnut (Juglans regia Linn.) is one of the medicinal plants used in traditional Iranian medicine as a treatment for diabetes, but little scientific documentation supports its antidiabetic action. The scientists at Isfahan University, Isfahan, Iran evaluated the antidiabetic effect of ethanolic walnut leaf extract. During experiment twenty-four male Wistar rats were divided into four groups: nondiabetic rats, alloxan-induced diabetic rats with no treatment, alloxan-induced diabetic rats treated with ethanolic extracts of walnut (200 mg/kg), and alloxan-induced diabetic rats treated with glibenclamide (0.6 mg/kg). Fasting blood sugar decreased meaningfully in diabetic rats treated with walnut leaves and diabetic rats treated with glibenclamide. Insulin level increased and glycosylated haemoglobin decreased significantly in diabetic groups receiving either glibenclamide or J. regia compared with the diabetic group with no treatment. The histological study revealed that the size of islets of Langerhans enlarged consequentially as compared with diabetic rats with no treatment. Effects of administering glibenclamide or extract of walnut on all parameters discussed above showed no difference and both tended to bring the values to near normal. Thus, the ethanolic extract from leaves of this plant has a dramatic antidiabetic effect on diabetes-induced rats [Asgary Sedigheh, Parkhideh Sahar, Solhpour Amirreza, Madani Hossein, Mahzouni Parvin and Rahimi Parivash, Effect of Ethanolic Extract of Juglans regia L. on Blood Sugar in Diabetes-Induced Rats, J Med Food, 2008, 11(3), 533-538].

The antioxidant activity and free radical scavenging potential of extracts of Camellia sinensis (Linn.) O. Kuntz, Ficus benghalensis Linn. and Ficus racemosa Linn.

The stem bark and fruits of Ficus benghalensis Linn. and F. racemosa Linn. are used in India for the treatment of diabetes and a number of other diseases. Since these effects may be correlated with the presence of antioxidant compounds, methanol and 70% acetone extracts of F. benghalensis (aerial root) and F. racemosa (stem bark) were evaluated by researchers at India for their antioxidant activity and radical scavenging capacity in comparison with Camellia sinensis (Linn.) O. Kuntz (green tea). Methanol extracts of green tea and F. benghalensis and 70% acetone extract of F. racemosa contained relatively higher levels of total phenolics than the other extracts. The antioxidant potential of the extracts were assessed by employing different in vitro assays. Though all the extracts exhibited dose dependent reducing power activity, methanol extracts of all the samples were found to have more hydrogen donating ability. Similar line of dose dependent activity has been maintained in all the samples in DPPH and OH scavenging systems. All the extracts exhibited antioxidant activity against the linoleic acid emulsion system (34-38%). The potential of multiple antioxidant activity was evident as it possessed antihemolytic activity and metal ion chelating potency [Manian Rajesh, Anusuya Nagarajan, Siddhuraju Perumal and Manian Sellamuthu, The antioxidant activity and free radical scavenging potential of two different solvent extracts of Camellia sinensis (L.) O. Kuntz, Ficus bengalensis L. and Ficus racemosa L., Food Chem, 2008, 107(3), 1000-1007].
Hypoglycaemic effect of *Lentinus strigosus* (Schwein.) Fr. crude exopolysaccharide

The scientists at Eskisehir Osmangazi University, Eskisehir, Turkey have reported the hypoglycaemic effects of the crude exopolysaccharide (EPS) produced from submerged mycelial culture of *Lentinus strigosus* (Schwein.) Fr. (Family-Polyporaceae) in streptozotocin (STZ)-induced diabetic rats. In a dose-dependent study, diabetic rats were treated with EPS at doses of 50-150 mg/kg of body weight for 7 days. Serum glucose and plasma insulin levels were measured in normal, STZ-induced diabetic and EPS-treated diabetic rats. Following oral administration of EPS dosages for 7 days, the serum glucose levels in the STZ-induced diabetic rats were reduced up to 21.1% at the dose of 150 mg/kg of body weight. The results revealed that orally administered *L. strigosus* EPS, at the dose of 150 mg/kg, exhibited a considerable hypoglycaemic effect in STZ-induced diabetic rats. Plasma insulin levels of STZ-induced diabetic rats decreased as compared to control group rats (*P*<0.05). Although insulin levels slightly increased in the EPS-treated groups the increase was not statistically significant. The hypoglycaemic potential of the EPS was further supported by histological observations of pancreatic islets of Langerhans. [Yamac Mustafa, Kanbak Gungor, Zeytinoglu Melih, Bayramoglu Golhan, Senturk Hakan and Uyanoglu Mustafa, Hypoglycaemic Effect of *Lentinus strigosus* (Schwein.) Fr. Crude Exopolysaccharide in Streptozotocin-Induced Diabetic Rats, *J Med Food, 2008, 11*(3), 513-517].

Antioxidant potential of low-grade coffee beans

Low-grade coffee beans (tria) are widely known to adversely affect the beverage quality. These represent about 15-20% of coffee production on weight basis and attempts are being explored for their utilization. These beans were evaluated by scientists working at Central Food Technological Research Institute, CSIR, Mysuru, India for the physico-chemical characteristics and subjected to soxhlet extraction using the solvents (viz. hexane, chloroform, acetone and methanol successively). The extracts were evaluated for antioxidant potential through *in vitro* models such as radical scavenging activity (α, α-diphenyl-β-picrylhydrazyl radical), antioxidant activity (β-carotene-linoleate model system), reducing power (iron reducing activity) and antioxidant capacity (phosphomolybdenum complex). Highest yield of extract (12%) was obtained with methanol followed by hexane (8%) and chloroform (1.5%). Lowest was obtained with acetone (<1%). Also, it was observed that methanol extract was found to exhibit maximum radical scavenging activity (92.5%) followed by extracts obtained with acetone (81%) and chloroform (25%) at 100 ppm concentration. Further, the methanol extract showed antioxidant activity (58%) at 100 ppm concentration, while the other extracts, viz. acetone, chloroform and hexane exhibited 44, 28 and 14%, respectively, at the same concentration. The antioxidant capacity of the methanol extract and propyl gallate showed 1367±54.17 and 5098±34.08 µmol/g (as equivalents to ascorbic acid).

Reducing power of the extract and standard compounds is in the following order ascorbic acid>chlorogenic acid>BHA>methanol extract. The methanol extract was found to contain total phenolics (21.90±0.50%), chlorogenic acid (34.16±0.27%) and caffeine (8.25±0.36%). The high antioxidant potential of the methanol extract of low-grade coffee beans is due to the presence of phenolic compounds including chlorogenic acids, which make them more suitable as a source of natural antioxidant and their utility can be explored in food industry. [Ramalakshmi K, Rahath Kubra I and Jagan Mohan Rao L, Antioxidant potential of low-grade coffee beans, *Food Res Int, 2008, 41*(1), 96-103].
Protective effect of *Opuntia dillenii* Haw. fruit against LDL peroxidation

The antioxidant activity and inhibitory effect of extracts from *Opuntia dillenii* Haw. fruit (ODHF) and its active compounds on low-density lipoprotein (LDL) peroxidation were investigated by researchers at Taiwan. The results indicated that the antioxidant activity of methanolic extracts of ODHF in Trolox equivalent antioxidant capacity and oxygen-radical absorbance capacity assays were in the order of seed > peel > pulp. The lag time of conjugated diene formation in Cu²⁺-induced LDL oxidation was increased by incubation of LDL with various methanolic extracts of ODHF. The methanolic extracts from seed, peel and pulp prolonged the lag time compared to control (154.1 min) to 514.8, 163.9 and 190.2 min, respectively, at a concentration of 10 µg/ml. Among the extracts, seed extracts of ODHF (10 µg/ml) possessed the highest inhibitory effect on the formation of thiobarbituric acid reactive substances and relative electrophoretic mobility. The results also demonstrated that seeds of ODHF contained the highest amounts of polyphenols and flavonoids (212.8 and 144.1 mg/100 g fresh seed, respectively), such as gallic acid, catechin, sinapinic acid, epicatechin, p-coumaric acid, quercetin and ferulic acid, but no betanin, isobetanin and ascorbic acid as determined by HPLC. However, the peel and pulp contained high amounts of betanin, isobetanin and ascorbic acid, but with lower contents of phenolics and flavonoids as compared to the seed. These findings suggest that phenolics and flavonoids may directly contribute to the antioxidant activity of the seeds of ODHF [Chang Su-Feng, Hsieh Chiu-Lan and Yen Gow-Chin, The protective effect of *Opuntia dillenii* Haw. fruit against low-density lipoprotein peroxidation and its active compounds, *Food Chem*, 2008, 106(2), 569-575].

A non-toxic antitumour compound from the leaves of *Bauhinia scandens* Linn.

The researchers working at Department of Botany, University of Kalyani, Kalyani, India extracted and identified a nontoxic antitumour compound from the dried leaves of *Bauhinia scandens* Linn. Fifty per cent aqueous ethanolic extract of the plant at room temperature was fractionated over petroleum ether and diethyl ether. The diethyl ether soluble fraction showed positive bioactivity in Brine Shrimp bioassay. Isolation and purification of the active principle was subsequently done from diethyl ether fraction. The diethyl ether fraction was separated into acidic and neutral part. The acid free fraction was screened to be positive in Brine Shrimp bioassay. The NMR spectra (in CDCl₃) indicated the probability of its lipoidal nature. The total lipid fraction was resolved into neutral, glyco and phospho-lipids by column chromatography. Only the neutral fraction showed positive response to Brine Shrimp toxicity test, out of which again a Brine Shrimp positive fraction was separated by thin layer chromatography and identified as 1- O-alkyl glycerol. The results demonstrated that the work may be cited as a nonhazardous and nonchemical management of therapeutic importance [Hazra Asish Ghosh and Chatterjee Padma, A nontoxic antitumour compound from the leaves of *Bauhinia scandens* characterized as 1-O-alkyl glycerol by gas-liquid chromatography and evaluation of its antitumour property by Brine Shrimp bioassay, *Ind Crops Prod*, 2008, 27(1), 39-43].

Antidiabetic potential of *Phyllanthus reticulatus* Poir.

*Phyllanthus reticulatus* Poir. is a large straggling or climbing shrub growing from 2.40 to 3 m in height. The plant is used for a variety of ailments, including smallpox, syphilis, asthma, diarrhoea and bleeding from gums. Moreover, it is claimed to have antidiabetic activity in tribal area. To validate the tribal claim, the petroleum ether and ethanolic extracts of leaves were orally tested at 500 and 1000mg/kg for hypoglycaemic effect in alloxan induces
diabetic mice by researchers working in India and USA. It shows antidiabetic activity at the dose of 1000 mg/kg. The phytochemical screening of the residues revealed the presence of terpenoids glycosides, protein, carbohydrates and absence of alkaloids and steroids [Kumar S, Kumar D, Deshmukh RR, Lokhande PD, More SN and Rangari VD, Antidiabetic potential of Phyllanthus reticulatus in alloxan-induced diabetic mice, Fitoterapia, 2008, 79(1), 21-23].

### Modulation of cholesterol metabolism by Ginkgo biloba Linn. nuts and their extract

*Ginkgo biloba* Linn. is among the oldest species of trees on earth. Various parts of the tree have a history of use in prevention of cardiovascular and neurodegenerative diseases. However, most of the current scientific research is focused on the Ginkgo leaf extract. Thus, scientists working at Department of Food Science, University of Massachusetts, Amherst, United States tested the effect of Ginkgo nuts on lipid metabolism as a therapeutic for cardiovascular diseases.

Four preparations of Ginkgo nuts (whole nuts, their methanol extract and its lipid and water soluble fractions) were tested using Human Hepatoma cells (Hep G2) and *in vivo* mouse feeding study. Ginkgo nut preparation may modulate serum cholesterol levels by modulating Apolipoprotein B secretion as well as low-density lipoprotein receptor in the liver. From mouse feeding trial, Ginkgo nut supplementation, as whole nuts, reduced the levels of hepatic cholesterol while increasing serum cholesterol compared to control. The lipid soluble fraction was responsible for decreased hepatic cholesterol, while the water soluble fraction may contribute to increased serum cholesterol. The lipid soluble fraction of Ginkgo nut may have potential to be used for the purpose of prevention of cardiovascular diseases [Mahadevan Swetha, Park Yooheon and Park Yeonhwa, Modulation of cholesterol metabolism by *Ginkgo biloba* L. nuts and their extract, Food Res Int, 2008, 41(1), 89-95].

### Antimicrobial activity of a protein purified from the latex of Hevea brasiliensis (H.B. & K.) Muell.-Arg.

The scientists at Prince of Songkla University, Hat Yai, Songkhla, Thailand aimed at screening for antimicrobial activity present in the non-rubber constituents of rubber latex of *H. brasiliensis* (H.B. & K.) Muell.-Arg. against various microbial strains. An antimicrobial protein, hevein was extracted from the bottom fraction after centrifugation and purified by acetone fractionation and anion exchange chromatography on a DEAE-Sepharose Fast Flow column. This procedure was more efficient and rapid than the previously described procedures. The studies revealed that hevein, a small (4.7 kDa) cysteine-rich protein, had strong antimicrobial activity, especially against *Candida* spp. including *Candida albicans*, *Candida tropicalis* and *Candida krusei*. The MIC80 value for hevein was as low as 12 µg/ml with *C. tropicalis* ATCC 750. Higher MIC80 values were obtained for *C. albicans* ATCC 10231 (95 µg/ml) and *C. krusei* ATCC 6258 (190 µg/ml). To confirm the antifungal activity, hevein also inhibited the growth of those fungi in a disk diffusion assay and its inhibition was enhanced when a Hevea latex protease inhibitor was also included. Hevein at a concentration of 30 µg/ml also caused a Ca2+-dependent aggregation of *C. tropicalis* yeast cells. These data indicate that hevein can inhibit the growth of certain potential oral fungal pathogens [Kanokwiroon K, Teanpaisan R, Wititsuwannakul D, Hooper AB and Wititsuwannakul R, Antimicrobial activity of a protein purified from the latex of *Hevea brasiliensis* on oral microorganisms, Mycoses, 2008, 51(4), 301-307].