

## CHEMOTHERAPY AND CHEMO-SUPPORT

This issue is dedicated to the discussion of chemotherapy for cancer and the application of the remedy Chemo-Support designed to lessen the side-effects of this treatment. Chemo-Support is gaining recognition as an effective remedy to lessen the side-effects and toxicity of chemotherapeutic agents and, for this reason, its application is presented here with a more detailed explanation of its protocol and dosage.

The purpose of treating cancer cells with chemotherapy is to prevent them from dividing, invading and metastasizing. Most chemotherapeutic agents exert their effect on cell multiplication: obviously, since multiplication is a characteristic of many normal cells, chemotherapeutic agents will inevitably affect also normal cells and especially those with a rapid rate of multiplication and turnover such as those of the hair, intestinal mucosa, blood and bone marrow. This explains the common toxic effect of chemotherapy on the hair (hair loss), the intestines (vomiting and diarrhoea), the blood (affecting blood counts) and bone marrow (affecting the immune system).

Inhibition of cell multiplication can take place at several levels within the cell:

- Macromolecular synthesis and function
- Cytoplasmic organization
- Cell membrane synthesis function
- Environment of cancer cell growth

Most agents have their primary effect on either macromolecular synthesis or function. They interfere with the synthesis of DNA, RNA or proteins or with the appropriate functioning of the molecule. When interference with macromolecular synthesis or function of the neoplastic cells is sufficiently great, a proportion of the cells die. Because only a proportion of the cells die as a result of a given treatment, repeated doses of chemotherapy must be used to continue to reduce their number.

Neoplastic cell death may not take place at the time of exposure to the chemotherapeutic agent. Often the cell must undergo several divisions before the lethal event that took place earlier results in death of the cell. This means that the effect of chemotherapy may last for several weeks after the end of the treatment: likewise with its toxic effects on normal cells. This has important implication for our protocols with Chemo-Support as it means that we need to continue tonifying Qi and Blood for some time after the end of the treatment (see below).

### TOXICITY

The toxicity of chemotherapeutic agents (and also of other drugs) is not a fixed entity but it varies according to several factors:

- Toxicity of specific agent
- Dose
- Schedule of administration
- Route of administration
- Predisposing factors of the patient which may be known or unknown before the start of the treatment
- Sex (women tend to develop toxicity at a lower dose than men)

### COMMON TOXICITIES

Some toxicities are relatively common among chemotherapeutic agents. Common acute toxicities include:

- Myelo-suppression with leukopenia, thrombocytopenia and anaemia
- Nausea and vomiting
- Mucous membrane ulceration
- Alopecia

Apart from nausea and vomiting, these toxicities occur because of the cytotoxic effect of chemotherapy on rapidly-dividing normal cells in the bone marrow, mucous membranes and hair.

The side-effects of chemotherapy vary greatly according to the agent used. Agents may be broadly classified into four groups:

- Alkylating agents damage the programs that control growth in the chromosomes of the tumour cells. Example: busulfan, carboplatin, carmustine, chlorambucil, cisplatin, cyclophosphamide, dacarbazine, doxorubicin, estramustine, ifosfamide, lomustine, mechlorethamine, melphalan, semustine, thiotepa.
- Antimetabolites interfere with the manufacture of nucleotides, the substances that make up the DNA. Example: azacitidine, capecitabin, cladribine, floxuridine, fludarabine, 5-fluorouracil, gemcitabine, mercaptopurine, methotrexate, pentostatin, raltitrexed, thioguanine, trimetrexate.
- Natural products interfere with cell structure and cell division. Example: asparaginase, bleomycin, dactinomycin, daunorubicin, docetaxel, doxorubicin, epirubicin, etoposide, idarubicin, irinotecan, plicamycin, mitomycin, mitoxantrone, taxol, teniposide, topotecan, vincristine, vinblastine.
- Hormones block the effect of oestrogen by acting on the oestrogen-receptors. Example: aminoglutethimide, anastrozole, bicalutamide, dexamethasone, diethylstilbestrol, fluoxymesterone, flutamide, goserelin, leuprolide, letrozole, nilutamide, raloxifen, tamoxifen, torenufen.
- Miscellaneous agents: altretamine, amifostine, amsacrine, dexrazoxane, hydroxyurea, mitotane, pamidronate, porfimer, procarbazine.
- Biologic agents
  - Monoclonal antibodies: rituximab, trastuzumab.
  - Interferons: interferon- $\alpha_{2a}$  and interferon- $\alpha_{2b}$ .
  - Interleukins: aldesleukin, oprelvekin.
  - Myeloid- and erythroid-stimulating factors: erythropoietin, filgrastim, sargramostim.

## SHORT-TERM SIDE-EFFECTS OF CYTOTOXIC DRUGS

Short-term side-effects of cytotoxic drugs include:

- Loss of appetite
- Nausea
- Vomiting
- Stomatitis
- Malaise
- Flu-like feeling, fever
- Cystitis
- Haematuria
- Constipation
- Diarrhoea

## LONG-TERM SIDE-EFFECTS OF CYTOTOXIC DRUGS

Long-term side-effects of cytotoxic drugs include:

- Cardiac toxicity (usually from high doses of doxorubicin or daunorubicin). Doxorubicin is widely used for breast carcinoma. If radiation is administered to the chest, the cardiac toxicity (in the form of congestive cardiac failure) may occur at lower doses. This particular long-term side-effect may occur even several years after the administration of chemotherapy.
- Pulmonary toxicity (pulmonary fibrosis) is associated with high doses of bleomycin but also with alkylating agents and methotrexate.
- Haematologic impairment. Alkylating agents may cause cytopenia.
- Immunologic impairment and myelo-suppression. Fludarabine, cladribine and pentostatin cause profound suppression of CD4 and CD8 lymphocytes and render patients treated susceptible to opportunistic infections. There may be a fall in white blood cells and platelets counts.
- Skin reactions (rash, inflammation, pigmentation, photosensitivity)
- Liver toxicity.
- Nephrotoxicity. This is typically caused by cisplatin, oxaliplatin, methotrexate and nitrosoureas). This toxicity may be acute or chronic and in severe cases it may require haemodialysis.
- Neurotoxicity (peripheral neuropathy) is typically caused by vinca alkaloids, cisplatin, oxaliplatin, epipodophyllotoxins and paclitaxel.
- CNS toxicity (lethargy, fatigue, depression, headaches, poor memory and concentration)
- Premature menopause may occur in women who have received certain chemotherapeutic agents such as alkylating agents or procarbazine.

#### SIDE-EFFECTS OF INDIVIDUAL CYTOTOXIC DRUGS

Adriamycin	Heart muscle damage, haematuria, hair loss, nausea, vomiting, mouth ulcers.
Anthracyclines	Cardiomyopathy.
Asparaginase	Anaphylaxis (allergic reaction), fever, malaise.
Bleomycin (or Blenoxane)	Alopecia, stomatitis, fever, skin reactions, nail ridging, pulmonary toxicity.
Carboplatin (or Paraplatin)	Nausea, vomiting, bone-marrow suppression, nephrotoxicity, liver function abnormalities, diarrhoea.
Chlorambucil	Myelo-suppression, amenorrhoea, azoospermia, CNS effects at high doses.
Cisplatin	Nausea, vomiting, diarrhoea, bone-marrow suppression, renal toxicity, neurotoxicity, ototoxicity, severe electrolyte abnormalities (hyponatremia, hypomagnesemia, hypocalcemia, hypokalemia), peripheral neuropathy.
Cladribine	May cause profound suppression of CD4 and CD8 lymphocytes, nausea, skin rash, fever, headache, myalgia, arthralgia.
Cyclophosphamide	Bone-marrow suppression, hair loss, nausea, vomiting, cystitis, haematuria.
Dacarbazine	Severe nausea and vomiting, flu-like feeling, malaise, diarrhoea, bone-marrow suppression.
Daunorubicin	Myelo-suppression, cardiac toxicity, nausea, vomiting, alopecia.
Doxorubicin	Nausea, vomiting, stomatitis, hair loss, bone-marrow suppression.
Epipodophyllotoxins	Neuro-toxicity (peripheral neuropathy).
Etoposide	Nausea, vomiting, hair loss, bone-marrow suppression.
Fludarabine	May cause profound suppression of CD4 and CD8 lymphocytes, nausea, vomiting.
5-Fluorouracil	Diarrhoea, mild nausea, stomatitis, bone-marrow suppression, painful, erythematous desquamation and fissures of palms and

	soles.
Ifosfamide	Bone-marrow suppression, nausea, vomiting, cystitis, renal toxicity.
Melphalan	Renal toxicity, nausea, vomiting, diarrhoea, hair loss, stomatitis, bone-marrow suppression, depression.
Methotrexate	Bone-marrow suppression, nausea, stomatitis, skin reactions.
Methotrexate (high dose)	Mouth ulcers, stomach ulcers, nausea, vomiting, bone-marrow suppression, renal toxicity.
Mitomycin-C	Nephrotoxicity, bone-marrow suppression.
Mitoxantrone	Mild nausea and vomiting, loss of appetite, mild hair loss, bone-marrow suppression.
Paclitaxel	Neuro-toxicity (peripheral neuropathy), myelo-suppression, nausea, vomiting, alopecia.
Pentostatin	May cause profound suppression of CD4 and CD8 lymphocytes.
Procarbazine	Food and drug interactions (it has a MAOI activity and patient should avoid beer, wine, fermented cheese, chocolate, fava beans and yeast extracts), myelo-suppression, nausea, vomiting, rash, hives, photosensitivity.
Taxol	Bone-marrow suppression, allergic reaction, neurological damage, nausea, vomiting, diarrhoea.
Thiotepa	Fatigue, nausea, vomiting, cystitis, dizziness.
Vincristine	Constipation, numbness, tingling, paraesthesia of hands and feet.

## CHEMOTHERAPY SIDE-EFFECTS FROM THE POINT OF VIEW OF CHINESE MEDICINE

If we analyze the above side-effects, there are important differences between various cytotoxic drugs and one could conceivably formulate an individual Chinese herbal formula for each. However, one can identify common characteristics among the above side-effects. We can attempt to group the side-effects according to the Chinese pathological pattern induced by the various cytotoxic drugs. Looking at the side-effects of each drug, four patterns in particular stand out:

- DEFICIENCY OF QI, BLOOD AND YIN  
Hair loss, diarrhoea, nail ridging, bone-marrow suppression, malaise, fatigue, depression, loss of appetite, neurological damage, dizziness, constipation, numbness, tingling, paraesthesia of hands and feet.
- ST-QI REBELLING UPWARDS  
Nausea, vomiting.
- STOMACH HEAT  
Mouth ulcers, stomatitis, stomach ulcers.
- BLOOD HEAT  
Haematuria, fever, skin reactions, cystitis.

Thus, we can deduce from the analysis of the above patterns that cytotoxic drugs cause the following:

- Qi, Blood and Yin deficiency (of Stomach, Lungs, Liver and Kidneys)
- Stomach-Qi rebelling upwards
- Stomach Heat
- Blood Heat.

The treatment principles to adopt are therefore (the herbs used are indicated in brackets):

- Tonify Qi, Blood and Yin (Huang Qi Radix Astragali, Ren Shen Radix Ginseng, Ling Zhi Ganoderma, Xi Yang Shen Radix Panacis quinquefolii, Mai Men Dong Radix Ophiopogonis, Dang Gui Radix Angelicae sinensis, Nu Zhen Zi Fructus Ligustri lucidi, Huang Jing Rhizoma Polygonati)
- Subdue rebellious Stomach-Qi (Lu Gen Rhizoma Phragmitis, Ban Xia Rhizoma Pinelliae preparatum, Sha Ren Fructus Amomi)
- Clear Stomach Heat (Lu Gen Rhizoma Phragmitis, Zhi Mu Radix Anemarrhenae)
- Cool Blood (Mu Dan Pi Cortex Moutan)

## ANALYSIS OF INDIVIDUAL HERBS IN CHEMO-SUPPORT

Huang Qi Radix Astragali: tonify Qi and raise immune response.

Ren Shen Radix Ginseng: tonify Qi.

Ling Zhi Ganoderma: tonify Qi and Blood and raise the immune response.

Xi Yang Shen Radix Panacis quinquefolii: tonify Qi and Yin.

Mu Dan Pi Cortex Moutan: cool Blood.

Zhi Mu Radix Anemarrhenae: clear Heat.

Fu Ling Poria: resolve Dampness.

Chen Pi Pericarpium Citri reticulatae: resolve Dampness, stop nausea.

Mai Men Dong Radix Ophiopogonis : nourish Yin.

Dang Gui Radix Angelicae sinensis: nourish Blood

Ban Xia Rhizoma Pinelliae preparatum: resolve Phlegm, subdue rebellious Stomach-Qi, stop nausea and vomiting.

Lu Gen Rhizoma Phragmitis: clear Stomach-Heat, stop vomiting.

Nu Zhen Zi Fructus Ligustri lucidi

Sha Ren Fructus Amomi: move Qi, resolve Dampness, stop nausea.

Huang Jing Rhizoma Polygonati: tonify Qi, nourish Yin and Jing.

Gan Cao Radix Glycyrrhizae uralensis: harmonize.

## PHARMACOLOGY OF CHEMO-SUPPORT INGREDIENTS

I shall report only the pharmacology of the above plants that is relevant to chemotherapy, immune function, inflammation, digestion or carcinoma. Thus, for each plant, there are many other pharmacological actions not reported below. These data are not available for all of Chemo-Support's ingredients.

It should also be noted that such data are reported for reference only as they reflect a reductionist view of the action of herbs that is at variance with the Chinese medicine view. Some of the research studies reported present a doubly-reductionist view: firstly, they use single herbs and secondly, many of them use single constituents of a herb. By contrast, Chinese medicine uses only formulae composed of several herbs. It is a well-know fact that first of all, the action of a herb is more than the sum-total of the actions of its individual constituents and secondly, the synergistic action of the herbs within a formula is more than the sum-total of its individual herbs.

Furthermore, many of the studies reported are based on animal experiments which could be criticized on ethical grounds.

### HUANG QI Radix Astragali

#### Constituents

2'4'-dihydroxy-5,6-dimethoxyisoflavone, kumatakenin, choline, betaine, polysaccharides, glucuronic acid, folic acid.

## Pharmacology

- Enhancement of immune function

The decoction given to mice increased the phagocytic activity of the reticuloendothelial system. Oral administration or nasal spray of Huang Qi offered protection against the common cold. Intraperitoneal administration of the polysaccharides from the root of *Astragalus membranaceus* antagonized the atrophy of immune tissues such as spleen, thymus and intestinal lymph nodes as well as leukopenia caused by immunosuppressant prednisolone in mice. Intraperitoneal administration of the homogeneous fraction of the polysaccharides astragalin I and II increased the weight and cell number of mouse spleen. Two months of oral treatment with the herb in subjects susceptible to common cold greatly increased the levels of IgA and IgG in the nasal secretion.

- Antibacterial effect

In vitro, Huang Qi was effective against *Shigella shigae*, *Bacillus anthracis*, *Streptococcus hemolyticus*, *Corynebacterium diphtheriae*, *Diplococcus pneumoniae*, *Staphylococcus aureus*.

- Prevention of renal toxicity in chemotherapy

A double-blind trial of 49 patients undergoing chemotherapy showed that the decoction of Huang Qi Radix Astragali and Fu Ling Poriae markedly reduced the incidence of renal toxicity. Rats with experimentally-induced glomerulonephritis, when treated with Huang Qi had significantly less proteinuria than control groups as well as milder pathological tissue changes.

- Effect on endurance

Decoction of Huang Qi given to mice significantly increased their endurance in swimming tests.

- Endocrine effect in patients undergoing radiotherapy

In a randomized clinical trial, the plasma hydrocortisone level in stage II carcinoma of the cervix was observed. The average level in 18 patients before and after irradiation were 8.0 and 6.1 Fg/100ml, whereas the before and after levels were 9.5 and 9.1 Fg/100ml in patients who received a decoction of Huang Qi Radix Astragali and Nu Zhen Zi Fructus *Ligustri lucidi* for two months.

- Anti-inflammatory effect

Intravenous dose of 5 mg/Kg or oral dose of 50 mg/Kg of astramembranin I inhibited the increase in vascular permeability induced by serotonin or histamine in rats.

- Hepatoprotective effect

Intravenous administration of 10 mg/Kg of astramembranin I induced accumulation of cAMP in rabbit plasma.

## REN SHEN Radix Ginseng

### Constituents

Triterpene saponins, aglycone protopanaxadiol, aglycone protopanaxatriol, aglycone oleanolic acid, water-soluble polysaccharides, polyynes.

### Pharmacology

- Endocrine effect

Animal tests proved that ginseng stimulates the pituitary gland to increase the secretion of ACTH, which in turn stimulates the adrenal gland.

- Effect on endurance

Mice administered a single extract of ginseng recorded a 132% increase in duration of swimming compared with a 179% increase in mice given the extract for 7 days.

- Immunologic effect

Ginseng increases the function of the reticuloendothelial system. Administration to guinea pigs promoted antibody production against leptospira and influenza virus. The percentage

of tumour-bearing mice and weight of the tumour decreased in mice bearing sarcoma S<sub>180</sub> and ARS following dosages of ginseng. Ginseng may also increase the activity and reduce the toxicity of other anti-tumour agents.

- Haematologic effect

Ginseng extract demonstrated protective and stimulant actions on bone marrow, increasing red and white blood cell numbers, and also hemoglobin in normal and anemic animals.

- Effects on the nervous system

An intraperitoneal injection of 50mg/kg of Ren Shen for 5 days has a stimulating effect as it increases the amounts of dopamine and norepinephrine in the brain stem. However, Ren Shen solution 40% taken orally reacts as a sedative. Therefore, due to its dual effective nature, Ren Shen provides an adaptogenic effect for the body suffering various stresses.

## LING ZHI Ganoderma

### Constituents

Ergosterol, lysozyme, acid protease, amino-acids, polypeptides, saccharides, sterols, lactones, alkaloids and polysaccharides.

### Pharmacology

- Cardiotoxic action

The tincture had a significant cardiotoxic action on the isolated frog heart.

- Action on coronary circulation

Injection of an extract given to dogs rapidly increased the coronary flow by 44%.

- Regulation of immune function and inhibition of allergic reaction

Ling Zhi accelerated the clearance of I-labelled protein in the blood of albino mice, indicating its ability to enhance the phagocytic action of the reticuloendothelial system.

The polysaccharide fraction of Ling Zhi markedly increased the phagocytic ability of abdominal macrophages of mice against chicken erythrocytes. These facts suggest that the polysaccharides can increase non-specific immunologic function of the body.

## MU DAN PI Cortex Moutan

### Constituents

Paenol, paenoside, pasenolide, paeniflorin, volatile oil and phytoesterol.

### Pharmacology

- Antimicrobial action

The decoction of the root showed strong antibacterial action in vitro against, *Bacillus subtilis*, *Escherichia coli*, *Salmonella typhi*, *Salmonella paratyphi*, *Proteus vulgaris*, *Staphylococcus aureus*, *Streptococcus haemolyticus*, *Diphtheria pneumoniae* and *Vibrio cholerae*.

- Anti-inflammatory action

Paenol given intragastrically inhibited swelling of rat paws induced by dextran. Paenol inhibited the increase of intra-abdominal capillary permeability of mice and cutaneous capillary permeability of guinea pigs caused by acetic acid. The methanolic extract, the glycosidic fraction and paenol inhibited blood platelet aggregation.

- Hypotensive effect

The blood pressure of dogs with essential or renal hypertension was significantly reduced after oral administration of 5 g/Kg of the decoction of the root bark for 5 days and 10 g/Kg for two more days.

- CNS effects

Intraperitoneal or oral administration of paenol decreased the spontaneous activity of mice, antagonized caffeine-induced hyperactivity and prolonged cyclobarbitol-induced sleep.

## FU LING *Poria*

### Constituents

Paenol, paenoside, pasenolide, paeniflorin, volatile oil and phytoesterol.

### Pharmacology

- Antineoplastic effect  
Pachymaran produced an inhibition rate of 96.88% against sarcoma in rats. Topical application of the methanolic extract of the herb (2 mg/100  $\mu$ l) significantly reduced the percentage of tumour-bearing mice and the number of tumours per mouse induced by DMBA plus TPA.
- Effect on immune function  
Oral administration increased phytohemagglutinin-induced lymphocyte transformation rate and increased serum IgG.
- Effect of digestive system  
The herb inhibited gastric ulcer provoked by pylorus-ligation and decreased gastric secretion and free acidity in rats. The herbs also protected rats against CCl<sub>4</sub>-induced hepatotoxicity, reducing GPT activity and preventing necrosis of hepatocytes.

## CHEN PI *Pericarpium Citri reticulatae*

### Constituents

Dlimonene, citral, hesperidin, neohesperidin, tangeretin, nobiletin, citromitin, 5-O-desmethylcitromitin, inositol, vitamin B1.

### Pharmacology

- Actions on the gastro-intestinal smooth muscles  
The herb decoction inhibited the motility of the isolated small intestines of mice and rabbits.
- Action against gastric ulcers  
Daily injections of methylhesperidin for 6 days markedly reduced the incidence of ulcers and inhibited gastric secretions.
- Anti-inflammatory action  
Both hesperidin and methylhesperidin had vitamin P-like actions. Hesperidin inhibited the inflammatory reaction of croton oil granulation in rats. Intraperitoneal dose of 10 mg/Kg of hesperidin inhibited increased permeability caused by histamine in mice.

## MAI MEN DONG *Radix Ophiopogonis*

### Constituents

Ophiopogonins A, B, C, and D (steroid saponins), beta-sitosterol, amino-acids.

### Pharmacology

- Antibacterial action  
The herb inhibits *Staphylococcus albus*, *Bacillus subtilis*, *Escherichia coli* and *Salmonella typhi*.
- Immunologic effect  
Intraperitoneal administration of 12.5 g/Kg of the herb to mice significantly increased the weight of the spleen and phagocytosis of the macrophages; it also counteracted the reduction in white cells due to cyclophosphamide.
- Effects on blood glucose  
Intramuscular administration of 1 ml/Kg of the 50% decoction of the herb increased blood glucose level in rabbits.

## DANG GUI Radix Angelicae sinensis

### Constituents

Ligustilide, n-butyridene phthalide, palmitic acid, beta-sitosterol, beta-sitosteryl palmitate, sucrose, vitamin B12, nicotinic acid, folic acid, folinic acid, biotin, vitamin A and E.

### Pharmacology

- Effect on coronary flow  
Perfusion of the 2% fluid extract into the isolated heart of guinea pigs significantly dilated the coronary vessels and increased coronary flow.
- Effect on platelet aggregation  
The aqueous extract of the root and its ingredient ferulic acid inhibited rat platelet aggregation and serotonin release.
- Effect on immune system  
The herb enhanced the phagocytic function of abdominal macrophages of animals.
- Anti-inflammatory effect  
The aqueous extract of the root decreased vascular permeability. The inhibitory activity in mice by oral administration was comparable to that of aspirin; like aspirin, it also inhibited the release of 5-HT and other inflammatory substances.

## BAN XIA Rhizoma Pinelliae preparatum

### Constituents

Methionine, glycine, beta- and gamma-aminobutyric acids, alkaloids 1-ephedrine and trigonelline, phytosterol, glucuronic acid.

### Pharmacology

- Anti-emetic action  
The stir-fried tuber had an anti-emetic action in emesis induced by morphine or digitalis. The decoction of the herb prevented early vomiting caused by deslanoside as well as emesis caused by orally-administered copper sulfate.
- Anti-neoplastic action  
The aqueous extract had a marked inhibitory action on animal tumours such as sarcoma, liver carcinoma and cervical carcinoma.
- Anti-inflammatory action  
The tuber has a PAF-antagonism effect due to the lignans.

## SHA REN Fructus Amomi

### Constituents

Essential oils, saponins, zinc, copper, iron.

### Pharmacology

- Gastrointestinal effect  
A low-level decoction of Sha Ren has been proved to stimulate the intestines of rats and rabbits. Sha Ren helps to relieve bloating, spasms and pains, and diarrhea
- Effect on nausea  
11 patients suffering from nausea were given 2 grams of powdered Sha Ren orally 3 times a day with good results.

Patients appetites have also been improved with Sha Ren

## LU GEN Rhizoma Phragmitis

### Constituents

Coixol, tricin, asparamide, D-xylose, L-arabinose, D-glucose, D-galactose, vitamins B1, B2 and C.

### Pharmacology

- Antibiotic effect  
Decoctions of Lu Gen have shown an in vitro antimicrobial effect against beta-hemolytic Streptococcus.

### ZHI MU Radix Anemarrhenae

#### Constituents

Timosaponin, mangiferin, sarsasapogenin, markogenin, neogitogenin, anemarns.

#### Pharmacology

- Antipyretic effect  
Subcutaneous injection of the aqueous extract of the rhizome (4g/kg) decreased the body temperature of rabbits inoculated with Escherichia coli.

### ZHI MU Radix Anemarrhenae

#### Constituents

Timosaponin, mangiferin, sarsasapogenin, markogenin, neogitogenin, anemarns.

#### Pharmacology

- Incremental effect on white blood cells  
The fruit increased white blood cells in leukopenia due to chemotherapy or radiotherapy in mice.
- Effect on immune function  
The fruit promoted lymphoblast transformation and increased the number of cells with haemolytic plaques. The in vitro restorative effect of the aqueous extract of the herb was studied in cancer patients and in normal healthy donors. Using the local graft versus host (GvH) reaction as a test assay for T-cell function, the extract affected an immune restoration in 9 of 13 cancer patients with an increase in local GvH reaction from 32.3 / 36.1 mm<sup>3</sup> to 118 / 104.9 mm<sup>3</sup>; these results suggest the herb contains powerful immune stimulants.
- Antineoplastic action  
The extract given by intragastric administration to mice gave a 49% inhibition rate against cervical cancer. The extract of the herb has been found to reverse tumour-associated macrophage suppression; these data suggest that the herb has cancer chemopreventive properties.
- Effect on leukopenia  
The injection of an extract of the fruit given once or twice daily could be used in cancer patients to prevent and treat leukopenia caused by chemotherapy.
- Anti-inflammatory effect  
Paw oedema in rats was inhibited by oral administration of 12.5 or 25 g/Kg of the decoction of the herb for 5 days.

### HUANG JING Rhizoma Polygonati

#### Constituents

Flavonoid glycosides, cardiac glycosides, alkaloids, amino-acids, resin.

## Pharmacology

- Antibacterial effect  
The decoction inhibited *Staphylococcus aureus* in vitro.
- Effect on blood glucose  
Oral administration of the extract of the herb to rabbits gradually increased blood glucose level but decreased it afterwards.

## GAN CAO Radix Glycyrrhizae uralensis

### Constituents

Triterpenes glycyrrhizin, flavonoids berniarin, umbelliferone, ferulic acid, sinapic acid, amino-acids, biotin, beta-sitosterol.

### Pharmacology

- Glucocorticoid-like action  
Injection of glycyrrhizin in healthy subjects increased free cortisol levels in the blood. Intraperitoneal administration of a low dose of glycyrrhizin to rats caused atrophy of the thymus gland and increased weight of the adrenal gland suggesting a cortico-tropin-like action; in patients with mild Addison's disease requiring daily intramuscular injection of 12.5 mg of cortisone, concurrent daily intramuscular dose of glycyrrhizin increased urinary free 17-hydroxycorticosterone and decreased the conjugated 17-hydroxycorticosterone.
- Mineralocorticoid-like action  
The extract reduced the urinary volume and sodium excretion and increased potassium excretion in various animal species.
- Anti-inflammatory action  
The anti-inflammatory effect of the herb resembles that of butazone or hydrocortisone; cotton pledget-induced granulation, formaldehyde-induced paw swelling and subcutaneous granulomatous inflammation in rats were all inhibited by glycyrrhetic acid.
- Effect on the immune system  
Glycyrrhizin inhibited egg-white-induced allergic reaction in guinea pigs. Glycyrrhizin inhibited the degranulation of mast cells elicited by the histamine liberation agent, Compound 48/80, so that it suppressed the release of the allergy mediators.
- Anti-ulcer action  
Injection of the herb extract produced significant inhibition of ulcers in albino rats, together with marked reduction in gastric juice and free acid. In many clinical studies on the use of Gan Cao for ulcers, the effectiveness was usually around 90%.
- Anti-neoplastic action  
Glycyrrhetic acid inhibited the transplanted Oberling-Guerin myeloma in rats.
- Effect on lipid metabolism  
In rats with atherosclerosis, Gan Cao lowered cholesterol levels and stopped the progression of the lesions.
- Antihepatotoxic effect  
Oral administration of the extract of the herb showed hepatoprotective effects against carbon tetrachloride-induced cytotoxicity in rats; it markedly abated hepatic degeneration and necrosis, promoted the recovery of hepatocellular glycogen and ribonucleic acid and also lowered serum glutamic pyruvic transaminase. Glycyrrhizin and glycyrrhetic acid are able to prevent the development of cirrhosis.

## DOSAGE AND PROTOCOL

Chemo-Support works better if it is started some time before the beginning of chemotherapy and continued for about two weeks after the end. It is important to note that "during the

treatment" means during the course of treatment, i.e. also in the days of break from the treatment. The dosage is as follows:

- Two weeks before start of treatment: 2 tablets a day
- Four days before the start of treatment: 2 tablets twice a day
- During the treatment: 3 tablets three times a day
- After the end of the treatment for about 4 weeks: 2 tablets twice a day

It is best to take the tablets away from meals, i.e. about 1 hour before or after a meal, swallowed with hot water. The tablets should also be taken separately from other medication, at least 1 hour away. If the patient feels very nauseous and finds it difficult to swallow the tablets, these could be crushed and powdered, immersed in a small amount of hot water with three slices of fresh ginger and the water sipped slowly.

The dosage during treatment indicated above should be adjusted according to the severity of the side-effects and the above dosage could be reduced or increased.

If the patient is receiving both chemo- and radio-therapy and is taking both Chemo-Support and Radio-Support, the dosage of each should be reduced. Adjustments can be made according to the patient's side-effects and timing of therapies in this situation by using a higher ratio of Chemo-Support during the days surrounding chemotherapy or when its side-effects are heightened. Similarly, the dosage of Radio-Support can be increased if the side-effects experienced from radiotherapy are more severe, or during the days surrounding the administration of radiotherapy.

Chemo-Support should be discontinued approximately four weeks after the end of the treatment when the condition should be reassessed and a different formula given. By contrast, Radio-Support should be continued for at least 6 weeks after the end of radiotherapy.

## ACUPUNCTURE TREATMENT OF CHEMOTHERAPY SIDE EFFECTS

Acupuncture can be used to great effect, in conjunction with Chemo-Support to reduce the side-effects of chemotherapy. Indeed, acupuncture can complement the use of Chemo-Support by tailoring the treatment to the specific side-effects suffered by the patient. The following are suggested point combinations for specific symptoms and signs.

Fatigue	Ren-12 Zhongwan, ST-36 Zusanli, SP-6 Sanyinjiao, BL-20 Pishu, BL-21 Weishu.
Nausea, vomiting	Ren-13 Shangwan, P-6 Neiguan, ST-34 Liangqiu, ST-36 Zusanli. In addition to acupuncture, the following massage technique is very effective to combat nausea and vomiting: apply a massage oil liberally to the lower legs, make a loose fist with your hands, starting from ST-36, massage downwards along the Stomach channel using the knuckles of the index fingers all the way down to the ankle and then massage upwards along the Spleen channel using your thumbs. This technique harmonizes the ascending and descending of Stomach- and Spleen-Qi, stimulating Stomach-Qi to descend and Spleen-Qi to ascend..
Alopecia	BL-17 Geshu (with direct moxa cones), ST-36 Zusanli, SP-6 Sanyinjiao, LIV-8 Ququan, BL-20 Pishu, BL-23 Shenshu. Add Shou Wu Pian or Glorious Sea to Chemo-Support.
Myelo-suppression	BL-17 Geshu (with direct moxa cones), BL-11 Dashu (with direct moxa cones), BL-20 Pishu, BL-23 Shenshu.

Stomatitis, mouth ulcers ST-44 Neiting, L.I.-4 Hegu, L.I.-11 Quchi.  
Cystitis Ren-3 Zhongji, BL-63 Jinmen, BL-28 Pangguangshu, BL-32  
Ciliao, SP-9 Yinlingquan.  
Fever L.I.-11 Quchi, KI-2 Rangu, Du-14 Dazhui.  
Skin rash L.I.-11 Quchi, SP-10 Xuehai.  
Diarrhoea ST-25 Tianshu, ST-37 Shangjuxu.

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