Mem. Inst. Oswaldo Cruz, Rio de Janeiro, Vol. *86*, Suppl. II, 165-167, 1991

THE RESEARCH ON RADIOPROTECTIVE AGENTS IN CHINESE MATERIA MEDICA

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A series of studies has been carried out in the field of traditional medicine for searching radioprotective agents. According to the theory of traditional Chinese medicine, many prescriptions were tested with experimental animals. Some of them could raise the survival rate of dogs irradiated with lethal dose of γ-rays by 30-40%. Some symptoms of radiation sickness could be improved.

More than one thousand kinds of Chinese herbs were screened. Some of them have pronounced radioprotective activities. A series of bioactive components were isolated from these herbs.

The mechanism of radiation protection were studied. Having the capability of hemopoietic system and immune system may be the characteristics of these Chinese herbs.

Key words: radiation – protection – Chinese herb – traditional medicine – polysaccharide

With the rapid development of the nuclear industry and the peaceful use of the atomic energy in power plants, medicine and other fields, protection from radiation injury in human beings and the treatment of radiation sickness have become important medical problems. Scientists of many countries have paid attention to these problems and have made great efforts to solve them.

As early as the 1950s, the Chinese scientists began to search for the radioprotective agents in traditional Chinese medicine. With collaboration of pharmacologists, chemists, pathologists and physicians a series of research studies have been conducted in this field.

EXPERIMENTAL STUDIES

A lot of research work has been done on classical prescriptions of traditional Chinese medicine in China as well as in Japan, for instance, Xiao chaihu decoction, Shiquandabu decoction, Siwu decoction etc. Based on the classical theory of Chinese medicine, some new prescriptions were composed and tested in China. Many prescriptions were tested on experimental animals. Some of them could raise the survival rate of lethally irradiated animals by 30-40%. A series of symptoms of radiation sickness could be improved.

EXTENSIVE SCREENING OF CHINESE HERBS

More than one thousand kinds of Chinese herbs have been screened among them, 55 herbs were found to have different degrees of radioprotective activity. Thirty-four of them have been studied in detail (Table I).

STUDY OF RADIOPROTECTIVE COMPONENTS IN CHINESE HERBS

A series of components with radioprotective activity have been isolated from Chinese herbs by modern laboratory techniques and tested with mice irradiated by sublethal dose of γ-rays (Table II).

Among the active principles of Chinese herbs, polysaccharides have received specific attention (Table III).

The mechanism of radiation protection of Chinese herbs is far from clear, but some experimental results showed that all the preparations individual herbs or their active components could protect the hemopoietic system and promote the proliferation and differentiation of hemopoietic cells. Some of the radioprotective agents might have an effect on the endocrine system and the immune system. Therefore, having the capability of protection of hemopoietic system, modulation of endocrine and immune function might be the specific features of some radioprotective Chinese herbs.

TABLE I

Radioprotective activity of some Chinese herbs

Popular name	Scientific name	Degree of radioprotection
Radix Ginseng	*Panax ginseng* C. A. Meyer	+ +
Cortex Acanthopanacis	*Acanthopanax senticosus* (Rupr. et Maxim.) Harms	+ +
Radix Codonopsis Pilosulae	*Codonopsis pilosula* (Franche) N.	+
Radix Rubia Cordifolia	*Rubia cordifolia* L.	+ +
Radix Angelicae Sinensis	*Angelica sinensis* (Oliver) Diels	+ + +
Radix Bupleuri	*Bupleurum chinense* DC.	+ + +
Radix Actinidia Chinensis	*Actinidia chinensis* Planch	+ +
Radix Sophorae Flavescens	*Sophora flavescens* Ait	+ +
Fructifocatio Tremellae	*Tremella fuciformis* Berk	+ +
Fructifocatio	*Ganoderma Lucidum* (Leys. ex Fr.) Karst	+ +
Hydnum	*Hericium Erinaceus* (Bull ex Fr.) Pers.	+ + +
Armillaria Mellea	*Armillaria Mellea* (Vahl ex Fr.) Quel	+ + +
Myceliae Armillariellae Tabescens	*Armillariella Tabescens* (Scop. ex Fr) Sing	+ +

+ Low radioprotective activity; + + Moderate radioprotective activity; + + + High radioprotective activity.

TABLE II

The radioprotective activity of some compounts with low molecular weights from Chinese herbs

Compound	Plant	Irradiation dose (GY)	Increase of survival ratio%	Reference
Piperine	*Piper nigrum* L.	8.5	40-50	
Oxymatrine	*Sophora flavescens* Ait	8.5	40	Wang et al., 1984
Irisquinone	*Iris pallasii* Fischer	7.0	25	Wang et al., 1981
Thermopsine	*Thermopsis lanceolata* R. Brown	9.0	27-42	Song et al., 1983
Total alkaloids	*Corydalis humaso* Migo	8.0	30	Wei, 1982

Owing to the ability of protection of the hemopoietic system and the enhancement of immune function, some of these preparations have been used clinically for treatment of leucopenia induced by radiotherapy or chemotherapy in cancer patients.

The preparations of Ginseng (Xue, 1986), Cortex Acanthopanax (Surgery Department, Guangxi Medical College, 1978), *Fructificatio tremellae* (Chen, 1984) and *Radix sophorae flavescentis* (Institute of Radiation Medicine, 1977) could produce marked therapeutic effects.

TABLE III

The Radioprotective activity of some polysaccharides from Chinese herbs on mice irradiated with γ-rays

Polysaccharides	Plant	T[a]	Irradiation dose (GY)	Increase of survival ratio %	Reference
HEPS	*Hericium erinaceus* (Bull. ex Fr.) Pers	b[b]	9.0	90	Wang et al., 1989
		a[c]	9.0	35	
LHPS	*Lycopodium hameltonii* Spring vor Fordii (Bak)	b	9.0	55	
AMPS	*Armillaria mellea* (Vahl ex Fr.) Quel	b	9.0	87	
		a	9.0	59	
BCPS	*Bupleurum chinense* DC.	b	8.5	86.5	
FTPS	*Tremella fuciformis* Berk	b	8.5	20-40	Xu et al., 1978
ASPS	*Angelica sinensis* (Oliver) Diel	b	8.5	42	Mei et al., 1986
ATPS	*Armillariella tabecens* (Scop. ex Fr.) Sing	b	9.0	47	Xu et al., 1985
PTPS	*Parmelia tinctorum* DesPr.	b	9.0	22.5-55	Song et al., 1984

a: Time of administration; *b:* before irradiation; *c:* after irradiation.

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