Inhibition of the Promotion Stage of Carcinogenesis by Decoctions and Expressed Juices from Philippine Medicinal Plants

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When dimethybenzanthracene was used as the initiator and croton oil as the promoter, 67% of the experimental mice developed skin tumors, 50% had liver tumors, and 33% had colon tumors. These were observed after 20 weeks.

Complete inhibition of formation of all types of tumors was exhibited by decoction from mango bark and expressed juices from leaves of guava, sulasi, *kalatsutsi, yerba buena, pandan, kinchay, sabila, damong Maria,* mayana and flowers of *santan pula* and *santan dilaw.*

Partial inhibition of tumor formation was exhibited by expressed juice from garlic bulbs, leaves of *alagaw,* flowers from *gumamela* and decoction from *kogon* roots and leaves of romero. Expressed juice from onion bulbs inhibited the development of liver tumors but not skin tumors.

It is possible that the test medicinal plants contain constituents that can inhibit the promotion stage of carcinogenesis.

Key words: promotion, carcinogenesis, decoctions, medicinal plants

The multistage model of carcinogenesis has been proposed recently (1), as shown below:

INITIATION ➡ PROMOTION ➡ CONVERSION ➡ PROGRESSION ➡ PROGRESSION

At the initiation stage, the carcinogen reacts with DNA, the genetic substance of the living cell. At the promotion stage there is clonal expansion of initiated cells. At the conversion and progression stages, specific chromosomal changes are involved.

The medicinal plants selected in this study are those that have been shown to inhibit the initiation stage of carcinogenesis. It would be of great interest if it can be shown if they inhibit the second stage, the promotion stage of carcinogenesis.

MATERIALS AND METHODS

Dimethylbenzanthracene and croton oil were obtained from Sigma Chemical Company, St. Louis, Missouri, U.S.A.

Swiss Webster Mice were furnished by the College of Veterinary Medicine, University of the Philippines, Diliman, Quezon City.

A modification of the skin tumor promotion test by Fujiki (2) was used. The experimental mice were shaved at the back, three days before the application of the initiator, dimethylbenzanthracene. Three days after, the promoter, croton oil was applied on the shaved area and thirty minutes after, the decoctions or expressed juices of the medicinal plants were brushed on the same shaven area. This application of the promoter and the plant extracts was repeated three times a week for 20 weeks. The appearance of skin tumors was noted and at the end of 20 weeks, the animals were dissected and examined for organ tumors.

RESULTS AND DISCUSSION

Table 1 indicates the scientific names and the parts of plants whose decoctions were used in the study.

Table 2 shows the scientific names and parts of the plants whose expressed juices were used as test systems.

The tumor promoting activity of croton oil with dimethylbenzanthracene as the initiator is shown in Table 3. Croton oil alone or dimethylbenzanthracene alone (DMBA) did not induce the formation of tumors. Although DMBA, a carcinogen, alkylates DNA after metabolic activation, a promoter is needed to induce clonal expansion of initiated cells. Croton oil alone, without the initiator, will not have initiated cells whose clonal expansion it can induce.

Table 1: Scientific Names of Plants Whose Decoctions* Were Used.

	Scientific names	Parts used
Ipil-Ipil	*Mimosa glauca* Linn	seeds
Kogon	*Imperata koenigil* Beauv.	roots
Mango	*Mangifera indica* Linn.	bark
Romero	*Rosmarinus officinaiis* Linn.	leaves
Tsaang gubat	*Ehretia mollis* Merr.	leaves

* 15% decoctions were made of each

Table 2: Scientific Names of Plants Whose Expressed Juices Were Used

	Scientific Name	Parts Used
Alagaw	*Premna nauseosa* Blanco	leaves
Damong Maria	*Artemesia vulgaris* Linn	leaves
Garlic	*Allium sativum* Linn	bulb
Guava	*Psidium guajava* Linn	leaves
Gumamela	*Hibiscus rosasinensis* Linn.	flowers
Kalatsutsi	*Plumiera acuminata* Air.	leaves
Kinchay	*Apium graveolens* Linn.	leaves
Mayana	*Coleus blumei* Benth.	leaves
Onion	*Allium cepa* Linn.	bulb
Pandan	*Pandanus odoratissimus* Linn.	leaves
Sabila	*Aloe vera* Linn.	leaves
Santan dilaw	*Ixora chinensis* Linn.	flowers
Santan pula	*Ixora coccinea* Linn.	flowers
Sulasi	*Ocimium Sanctum* Linn.	leaves
Yerba buena	*Mentha cordifolia* Linn.	leaves

Table 3: Tumor Promoting Activity of Croton Oil with DMBA

	% Skin tumors	% Organ tumors
Croton Oil + DMBA	67%	50% (liver) 30% (colon) 16% (oral)
Croton oil alone	0	0
DMBA alone	0	0

The antitumor promoting activity of decoctions from five plants are shown in Table 4. Complete inhibition of skin and organ tumors was shown by decoctions from leaves of tsaang gubat, and bark from mango. Decoctions from seeds of ipil-ipil inhibited completely the formation of skin tumors and reduced the development of organ tumors to a significant extent. Decoctions from roots of kogon and leaves of romero inhibited completely the development of organ tumors and reduced to a significant the formation of skin tumors.

Table 5 shows the antitumor promoting activity of expressed juices from fifteen medicinal plants. Expressed juices from leaves of guava, *sulasi, kalatsutsi, yerba buena, pandan, kinchay, sabila, damong maria,* and *mayana* inhibited completely the formation of skin and organ tumors. This was also shown by the expressed juices from red and yellow flowers from santan. Partial but significant reduction of formation of skin tumors was shown by expressed juice from garlic bulbs, from alagaw leaves and from flowers of gumamela. Expressed juice from onion bulbs reduced the extent of liver tumor formation but did not inhibit skin tumor development.

These results suggest that for most of the plants used, they possess constituents which can inhibit the promotion stage of carcinogenesis.

Table 4: Antitumor Promoting Activity of Decoctions

	% skin tumors	% organ tumors
DMBA + croton oil	67%	50% (liver)
plus ipil-ipil	0	14%
plus kogon	14%	0
plus mango	0	0
plus romero	14%	0
plus tsaang gubat	0	0

Table 5: Antitumor Promoting Activity of Expressed Juices

	% Skin tumors	% Organ tumors
DMBA + croton oil	67%	50% (liver)
plus alagaw	12%	0
plus damong Maria	0	0
plus garlic	33%	0
plus guava	0	0
plus gumamela	12%	0
plus kalatsutsi	0	0
plus kinchay	0	0
plus mayana	0	0
plus onion	67%	33%
plus pandan	0	0
plus sabila	0	0
plus santan dilaw	0	0
plus santan pula	0	0
plus sulasi	0	0
plus yerba buena	0	0

Of the plants studied only expressed juice from onion bulbs did not inhibit skin tumor formation. All others showed either complete inhibition or partial inhibition of skin tumor formation. Except for decoction from ipil-ipil and expressed juice from onion bulbs, all other preparations from the test plants showed complete inhibition of organ tumors. Only partial inhibition was shown by decoction from ipil-ipil seeds and expressed juice from onion bulbs.

LITERATURE CITED

1. Sylianco, C.Y. Lim, 1993. Molecular Biochemistry, National Academy of Science and Technology

2. Fujiki, H., M. Sugamuna, H. Sugari, S. Yoshizawa, K. Takagi, M. Hirota, T. Sassa, V. Richter, N. Uda, M. Suttajit, V. Wongchai, and T. Sugimura. 1991. Tumor promoters and antitumor promoters. Environmental Mutagens, Carcinogens and Teratogens. pp 209-230.