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# Membrane Glycolipids Content Variety in Gastrointestinal Tumors and Transplantable Hepatomas in Mice

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Data Collection B  
Statistical Analysis C  
Data Interpretation D  
Manuscript Preparation E  
Literature Search F  
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**Background:** The aim of this study was to investigate the variety of plasma contents of membrane glycolipids in 65 gastrointestinal tumors and 31 transplant hepatomas in mice.

**Material/Methods:** The experimental model was a transplantable murine hepatoma. Experimental mice were divided into 3 groups.

**Results:** The LSA and TSA content in the 2 groups were significantly difference ( $p < 0.01$ ), and were significantly lower in the therapeutic group than in the control group ( $p < 0.01$ ).

**Conclusions:** These results indicate that membrane glycolipids index LSA and TSA are sensitive markers in gastrointestinal tumors. In the transplanted hepatomas in mice, they may be considered as ancillary indicators for judging the therapeutic effect of hepatoma.

**MeSH Keywords:** **G(M3) Ganglioside • Intestinal Neoplasms • Membrane Glycoproteins • Stomach Neoplasms**

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## Background

Gangliosides contain sialic acid [1], and are a family of acetylated derivatives of neuraminic acid [2]. The possible role of ganglioside in cancer has been reported [3]. Ganglioside may influence growth and cell-to-cell interactions may be of importance in the development of malignancy [4,5]. In the present study, we used a transplantable murine hepatoma as the experimental model, and treated the animals with 5-fluorouracil (5-Fu) as the active therapeutic drug to determine the membrane glycolipids content variety.

## Material and Methods

We used 35 gastric carcinomas and 30 malignant intestinal tumors in our research.

### Experiment animal and tumor inoculation

Kunming mice (normal mice) were obtained from the Animal Center at Fu-dan University Shanghai Medical College. Mice containing the ascites-form transplantable hepatoma were obtained from the Cancer Institute of Jiangsu Province. The ascites was drawn from the transplantable hepatoma mice by a sterilized injector and placed into bacteria-free 0.9% NaCl for dilution (1/3, v/v). Subsequently, the normal mice were inoculated with 0.2 ml of diluted cells under the skin in the foreleg and armpit regions. The tumors were allowed to grow for 13 days. Usually, solid tumors weighing 1–2 g were found afterwards.

### Animal groups

Mice inoculated with transplantable hepatoma were divided into 2 group. In the therapeutic group the animals were

injected with 5-Fu (0.2 mg/0.2 ml/day) i.p. at 48 h after tumor cell transplant. In the control group the animals were injected with a sterilized solution of 0.2 ml of 0.9% NaCl instead of 5-Fu. A third group of animals, raised without hepatoma transplant or any other form of treatment, was used as the normal group. After the administration of 5-Fu or saline, the animals were sacrificed, and tissue and blood samples were collected for examination.

### Measurement of gangliosides, TSA, LSA, and R-SA

Based on the method of Sevenerholom [6], the contents of ganglioside, TSA LSA, and R-SA were determined.

### Statistical analysis

SPSS 13.0 software was used for data analysis. One-way ANOVA was conducted to compare the biochemistry index of membrane glycolipids between the 2 groups. P less than 0.05 was statistically significant.

## Results

In evaluating the ability of antimetabolic drug 5-Fu to inhibit tumor growth, we found that the weight of tumors was significantly different between the 2 groups ( $p < 0.05$ ) (Table 1).

Table 2 shows the ganglioside contents of the 3 animal groups. Ganglioside content in hepatoma tissue was significantly different among the 3 groups ( $p < 0.01$ ), and those in the therapeutic group were significantly lower than in the control group ( $p < 0.01$ ).

**Table 1.** Comparison of membrane glycolipid levels among subjects with gastric carcinoma and chronic gastritis.

Group	N	TSA ( $\mu\text{g/ml}$ )	LSA ( $\mu\text{g/ml}$ )	R-SA ( $\mu\text{g/ml}$ )	p-value
Gastric carcinoma	35	1124.69 $\pm$ 158.89	346.77 $\pm$ 61.59	26.94 $\pm$ 5.11	<0.05
Chronic gastritis	20	928.65 $\pm$ 125.30	263.3 $\pm$ 56.2	21.76 $\pm$ 4.39	>0.05
Normal control group	50	934.04 $\pm$ 132.91	266.45 $\pm$ 57.43	22.11 $\pm$ 4.37	

**Table 2.** Membrane glycolipids level compare of benign and malignant intestinal tumors.

Group	N	TSA ( $\mu\text{g/ml}$ )	LSA ( $\mu\text{g/ml}$ )	R-SA ( $\mu\text{g/ml}$ )	p-value
Intestine malignant tumor	30	1131.2 $\pm$ 156.3	370.12 $\pm$ 62.51	28.13 $\pm$ 5.35	<0.05
Intestine benign tumor	18	950.16 $\pm$ 20.84	272.36 $\pm$ 59.32	22.21 $\pm$ 4.98	>0.05
Normal control group	50	934.04 $\pm$ 132.91	266.45 $\pm$ 7.43	22.11 $\pm$ 4.37	

**Table 3.** Membrane glycolipid level of transplanted hepatoma in mice.

Group	N	TSA (µg/ml)	LSA (µg/ml)	R-SA (µg/ml)
Transplanted hepatoma	14	1092.83±256.10	178.39±47.62	28.04±6.35
Normal control group	21	596.20±85.83	89.54±25.43	21.23±6.04
p-value		<0.05	<0.05	>0.05

**Table 4.** The effect of 5-flurouracil on transplanted hepatoma in mice.

Group	N	Weight of tumor (g)	% Inhibition
Therapeutic group	17	0.5753±0.2996**	59
Control group	14	1.4057±0.7100	

% inhibition was calculated from the following equation: [(tumor weight of control group – tumor weight of the therapeutic group)/ tumor weight of the control group] ×100%. \*\*  $p<0.05$ .

**Table 5.** Membrane glycolipids contents in the liver and transplantable hepatoma tissues.

Group	N	Hepatoma gangliosides (µg/g wet tissues)	Liver gangliosides (µg/g wet tissues)
I Therapeuti group	17	52.10±11.22	33.32±6.86
II Control group	14	64.69±12.19	45.55±9.59
III Normal group	21	28.20±6.51	28.20±6.50
I/II		$P<0.01$	$p<0.05$
II/III		$P<0.05$	$P<0.05$

**Table 6.** Membrane glycolipids contents of blood between animal group.

Group	N	TSA (µg/ml)	LSA (µg/ml)	R-SA (µg/ml)
I Therapeuti group	17	751.40±95.30	97.36±25.31	25.98±9.95
II Control group	14	1092.83±256.10	178.39±47.62	28.04±6.34
III Normal group	21	596.20±85.83	89.54±25.43	21.23±6.04
I/II		$P<0.05$	$P<0.05$	$p>0.2$
II/III		$P<0.05$	$P<0.05$	$P>0.05$

In the plasma of the hepatoma mice, the TSA and LSA contents were higher in in the control group than in the normal group ( $p<0.05$ ), but the TSA and LSA content in the therapeutic group was lower than in the control group (Table 3). The TSA and LSA contents in the plasma of the hepatoma mice were higher in the control group than in the therapeutic and normal groups ( $p<0.05$ ). No significant difference was found in the R-SA between the therapeutic and control groups. Percent inhibition was calculated from the following equation: [(tumor weight of control group – tumor weight of the therapeutic group)/tumor weight of the control group] ×100%. \*\*  $p<0.05$ .

To observe the ability of antimetabolism drug 5-Fu in the inhibition of tumor growth are showed in Table 4, the transplanted hepatoma group weight of tumor was significance higher than that of normal control group ( $p<0.05$ ).

Table 5 showed the ganglioside contents of 3 animal groups. Therapeutic group, control group and normal group membrane content variety the ganglioside content in hepatoma tissue from the control group was significantly higher than that in normal mouse liver ( $p<0.01$ ), whereas those in the therapeutic group was significantly lower than in the control group ( $p<0.01$ ).

In the plasma of the hepatoma mouse, the TSA and LSA content was significantly higher in the control group than the normal group ( $p < 0.05$ ), and the therapeutic group was significantly lower than the control group (Table 6).

## Discussion

The ability to produce transplantable hepatoma and the effect of 5-Fluorouracil (5-Fu) in the inhibition of tumor growth are depicted in Table 4. Our data reconfirm the ability of 5-Fu to inhibit the proliferation of tumor cells by competitive inhibition of the synthesis of thymidine monophosphate. The ganglioside contents of the 3 animal groups are depicted in Table 5.

These results show that the ganglioside contents in transplantable hepatomas were significantly increased. After treatment with 5-Fu, the LSA and TSA contents were significantly lower. The mechanism could involve sialic acid, a family of acylated derivatives of neuraminic acid, which usually occurs as a

terminal component at the nonreducing end of carbohydrate chains of glycolipids [7,8].

Cell surface and membrane components play a vital role in neoplastic behavior [9]. Increasing concentrations of sialic acid are common on the tumor cell surfaces of neoplasms. The carbohydrate moiety may have an influence on growth, as well as cell-to-cell interaction and the development of malignancy [10,11].

## Conclusions

The biochemistry index of membrane glycolipids may be considered as an ancillary indicator for judging therapy effect in transplanted hepatomas in mice.

## Conflict of interest

None.

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