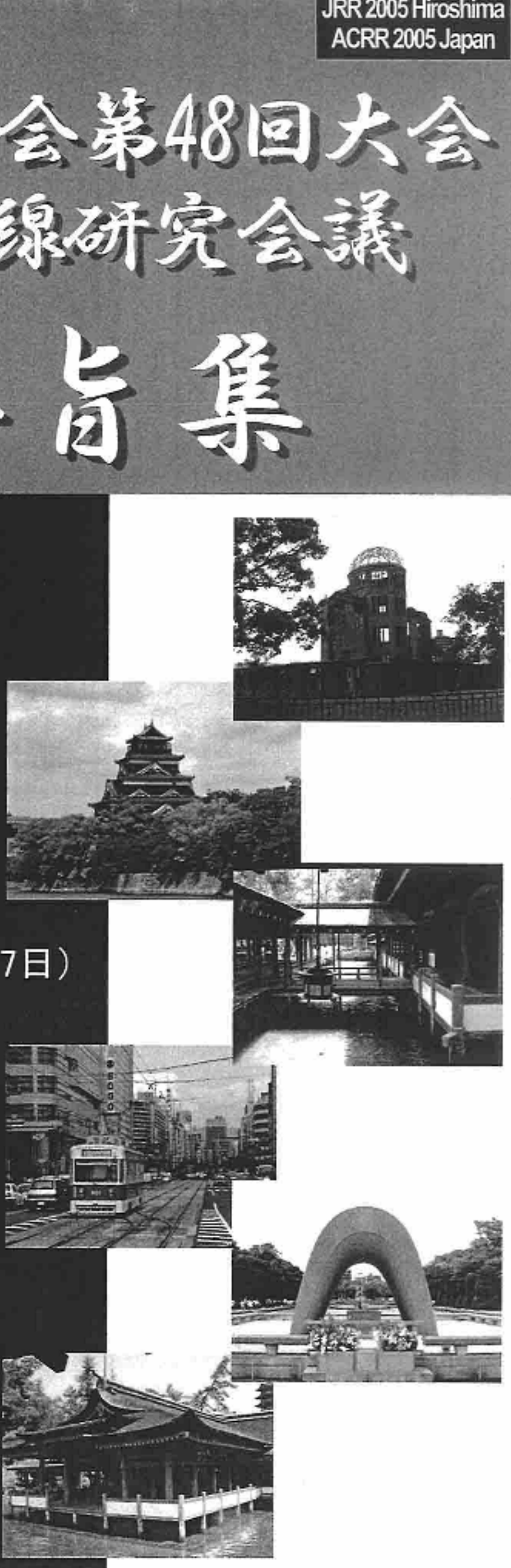
JRR 2005 Hiroshima
ACRR 2005 Japan

日本放射線影響学会第48回大会
第1回アジア放射線研究会議
講演要旨集



2005年11月15日(火)-17日(木)
(第1回アジア放射線研究会議:11月16日・17日)
広島国際会議場

広島大学原爆放射線医科学研究所

HIROSHIMA 2005

supra-physiological blood levels, its present regimen proves effective and appropriate against radiation-induced changes in the levels of MDA, GSH, GSSG, GSH-Px and phosphatase activities. Radiation induced depletion in the level of reduced glutathione (GSH), as well as, glutathione peroxidase (GSH-Px) and alkaline phosphatase activities were inhibited significantly by melatonin administration. Regression analysis of survival data yielded LD50/30 as 7.16 and 11Gy for control (irradiation alone) and experimental (melatonin treated irradiated) mice, respectively, with a DRF=1.53. Results also show an appreciable amelioration of radiation induced tissue damage indicating its therapeutic and prophylactic application. It is hypothesized that regulation of AOE gene expression is likely to be receptor mediated, because 15 days treatment with MLT results in the sustenance same response for 30 days in mice. The melatonin influence on both SODs and GPx mRNA appears to be mediated by a de novo synthesized protein.

P-B-084 ACRR Study on Pre-treatment of Linseed oil (Linum usitatisimum) against radiation induced oxidative stress in Swiss albino mice

○Sharma Avadhesh 、Gaur Ajay 、Sharma Antim Lata 、Patni Shikha 、Priyanka、Sisodia Rashmi 、Bhatia A.L.(RADIATION BIOLOGY LABORATORY, UNIVERSITY OF RAJASTHAN, JAIPUR-302004; INDIA)

Linseed or flaxseed (Linum usitatisimum), an annual herbaceous plant of lineacea family present all over the world is widely used for edible oil in many parts of India. Present study evaluates antioxidant potential of flaxseed oil (FO). The determined optimum dose of flaxseed oil against lethal dose of radiation was 4ml/kg body weight. Swiss albino mice (6-8 weeks old) weighing 22±3 gm selected from an inbred colony were administered orally FO for 15 consecutive days once daily and exposed to single dose of 5 Gy of gamma radiation at a dose rate of 1.07 gy/min. LPO, reduced glutathione in the brain liver, spleen, testes, jejunum and phosphatase activities in serum were assessed. Radiation induced augmentation in the levels of lipid peroxidation and acid phosphatase was significantly ameliorated by flaxseed oil pretreatment. Radiation–induced depletion in the level of reduced glutathione (GSH) and alkaline phosphatase activities was checked significantly by flaxseed oil administration. Statically analyzed survival data yielded LD50/30 as 7.1 and 10 Gy for control (irradiation alone) and experimental (Flaxseed oil treated) mice, respectively and produced a dose reduction factor (DRF)=1.40. Radiation induced deficit in the body and organ weight also inhibited significantly in the flaxseed oil pretreated mice. The histological and biochemical protection may be attributed by the content present in the flaxseed oil; omega3EFA, poly unsaturated fatty acid and lignan, a phytoestrogen appear to play an important role in free radical scavenger and singlet oxygen quencher.

P-B-085 ACRR Radioprotective effects of a novel herbal composition (HemoHIM) on the immune system in mice

○Jo Sung-Kee[1]、Park Hae-Ran[1]、Jung Uhee[1]、Kim Sung-Ho[2]、Yee Sung-Tae[3] ([1]Radiation Food and Biotechnology Team, Korea Atomic Energy Research Institute、[2]College of Veterinary Medicine, Cheonnam National University、[3]Department of Biology, Sunchon National University)

As the utilization of radiation in medicine and industry increases, the protection against radiation damage has become an important issue. In our previous study, a new herbal preparation, HemoHIM, was developed as a functional food for radioprotection. HemoHIM was made up with an addition of an ethanol-insoluble fraction to the total water extract of Angelica Radix, Cnidii Rhizoma and Paeonia Radix. In this study, we evaluated the effect of HemoHIM on the protection and recovery of hematopoietic organs and the immune system against radiation damage. The administration of HemoHIM increased the formation of the endogenous spleen colony and the regeneration of the blood leukocytes, lymphocytes and splenic lymphocytes in whole-body irradiated mice, which indicated that HemoHIM protected the hematopoietic stem cells and enhanced the recovery of the immune cells. Also, the administration of HemoHIM increased the function of the helper T cells that assist the B cells in making the antibody against a protein antigen in the irradiated mice. The NK activity was augmented by HemoHIM in the irradiated mice. Finally, the administration of HemoHIM prolonged the survival of the irradiated mice. This study showed that HemoHIM protected the hematopoietic system and effectively recovered the function of the immune cells. In conclusion, HemoHIM, a novel herbal composition, might be an ideal radioprotector.

P-B-086 ACRR Radioprotective and antioxidative effects of Artemisia capillaris extract

○Jung Uhee、Jeong Ill-Yun、Lee Yoon-Ah、Jeon So-Young、Bae Mun-Hyoung 、Jo Sung-Kee (Radiation Food and Biotechnology Team, Korea Atomic Energy Research Institute)

Plants and herbs are known to have a great repertoire of bio-active compounds. Therefore, many studies have been focused on medicinal herbs and herbal formulations as radioprotective agents during the past decade. In this study, we investigated the *in vitro* radioprotective and antioxidative effects of *Artemisia capillaris* extract (AC extract). It was observed that AC extract protected DNA from oxidative damage induced by irradiation. Single-cell gel electrophoresis showed that DNA strand breaks in γ-irradiated lymphocytes were significantly reduced by AC extract (25-100 μg/ml). At these concentrations, AC extract also decreased micronuclei formation in γ-irradiated CHO cells and HGPRT mutation in UV-irradiated V79 cells. Then we investigated *in vitro* antioxidative activities of AC extract. AC extract showed radical scavenging activity against DPPH radical (IC_{50} = 25 μg/ml) and superoxide anion (IC_{50} = 50 μg/ml). It was also observed that ROS production and NF-κB activation in TPA-treated cells was greatly reduced by AC extract (IC_{50} = 50-100 μg/ml). Two active antioxidant compounds were isolated from the ethyl acetate fraction of AC extract by a silica gel column chromatography and identified as chlorogenic acid and caffeic acid. These compounds showed strong radioprotection and antioxidative effects in a single-cell gel electrophoresis and a radical scavenging assay. These results suggest that AC extract may be used a good radioprotective and antioxidative agent.

P-B-087 EF2001 の放射線防護効果と免疫増強効果に関する研究

○前田 佳彦[1]、山下 剛範[3]、長谷川 武夫、佐野 幹夫[1]、岩佐 広行、具 然和[3] ([1]医療法人豊田会 刈谷総合病院、[2](株) 日本 BRM 中央研究所、[3]鈴鹿医療大 院 保健衛生)

EF2001 は Enterococcus Faecalis から作られた乳酸球菌死菌体である。本研究では、EF2001 に対する放射線防護効果および免疫増強効果の有無について検討を行った。SCC-7 の腫瘍 (2 x 10 万個) を C3H マウスの右大腿部に移植した。実験群は、X線単独照射群と EF2001 の腹腔内投与+X線照射群に分けた。照射 3 日の後に対照群と比較し、投与群においての体重変化は EF2001 群で体重減少抑制が認められた。また、延命効果についてもX線単独照射群と EF2001 投与+X線照射群において延命効果が明らかにされた。放射線照射による腸の粘膜の損害については、EF 2001:12mg と EF 2001:24mg 投与による投与量的相関関係が明らかにされた。NK 細胞の活性は、EF2001：12mg 投与群で 1.46 倍、EF2001：24mg 投与による投与量 1.94 倍と強化された。EF2001 菌壁の多糖類栄養成分の吸収は腸管免疫上、重要であり、整腸作用による免疫増強だけでなく、多糖類の吸収によってマクロファージを還した NK 細胞の活性により抗腫瘍作用も期待できる。さらに、免疫増強作用により、放射線防護効果も考えられる。

P-B-088 ACRR calcium antagonists : Novel avenues in chemical radiation protection

○ GOYAL PRADEEP KUMAR (Dept. of Zoology, Radiation & Cancer Biology Laboratory, Rajasthan University)

Diltiazem, a calcium antagonist, used widely in cardio-vascular therapy, protected mice from the deleterious effects of radiation. Administration of such compound, intraperitoneally at the dose

Enhancement of anti-tumor effects, immune-activity and radiation protection after injection of *EF 2001*

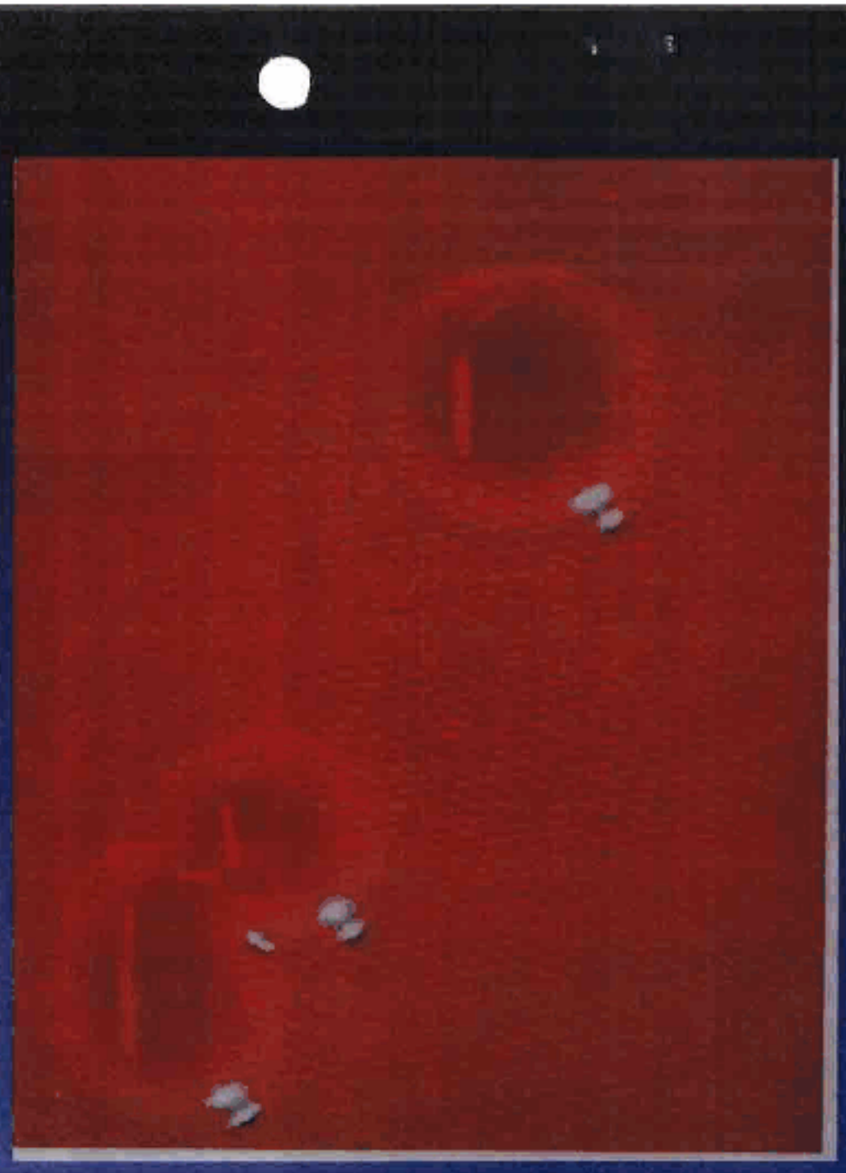
Yoshihiko Maeda2, Takenori Yamashita1, Takeo Hasegawa1, Mikio Sano2, Hiroyuki Iwasa3 and Yeunhwa Gu1

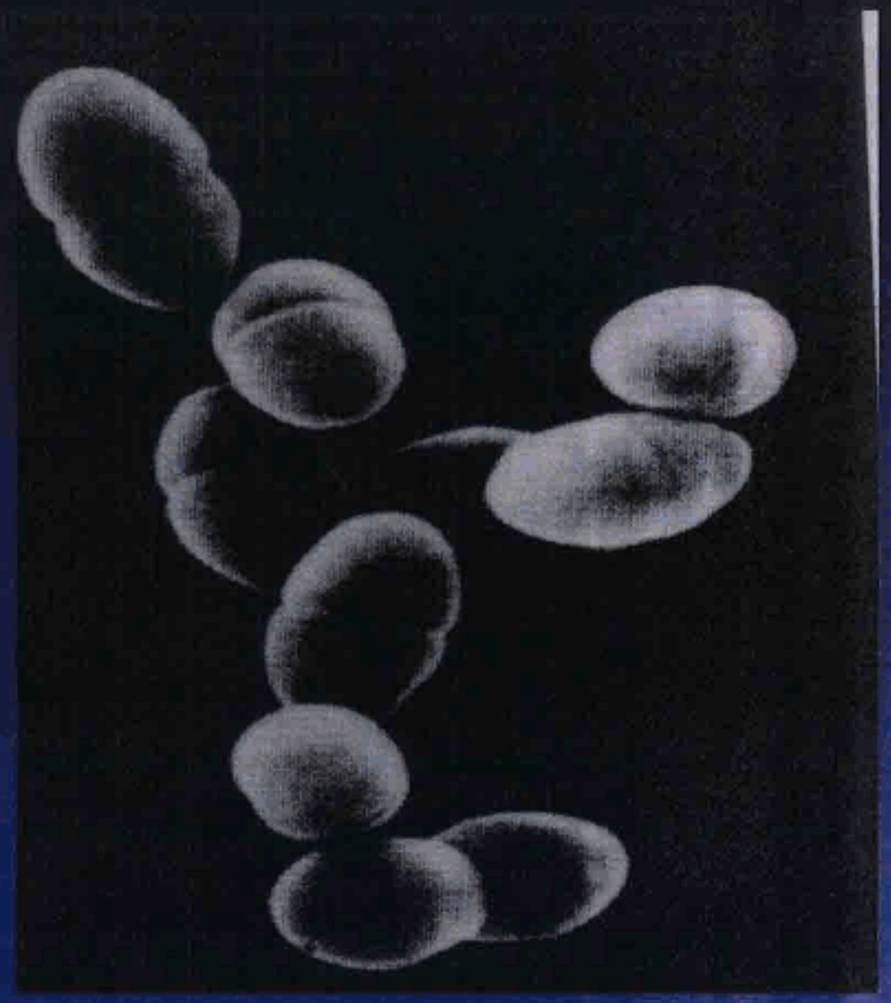
1Faculty of Health Science, Suzuka University of Medical Science

2Nihon BRM Co., Ltd. Res. Cent.

3Toyota Medi. Co. Kariya Gen. Hosp.

GU Lab





Enterococcus Faecalis under microscope (left) ×20、
(right) ×12900

Gu Lab

Material & Methods1

- **Anti-cancer effects**
  - **Seven-weeks-old male ICR (Crj) mice**
  - **Cancer cells: sarcoma 180 (2×10^6)**
  - **EF 2001 5mg/kg of heat-killed EF2001 (EF2001) were injected interpretational(endoceliac) each for 2 weeks every other day**
  - **Statistical methods: t- test**

GU Lab

Materials and Methods2

1.Radiation protection effects

Seven-weeks-old male C3H mice

12mg/Kg 24mg/Kg of heat-killed EF2001 (EF2001) were injected interpretational each for 2 weeks every other day

⇩

8Gy of whole body irradiation (Philips co. 200kV)

⇩

Change of body weight Survival after irradiation

⇩

Sections of the large and small intestines with a microscope

Gu Lab

2. Assay of NK cell activity by ^{51}Cr label YAC-1 cells

Injection of the EF2001, in the same condition using the examination of radiation protection effect.

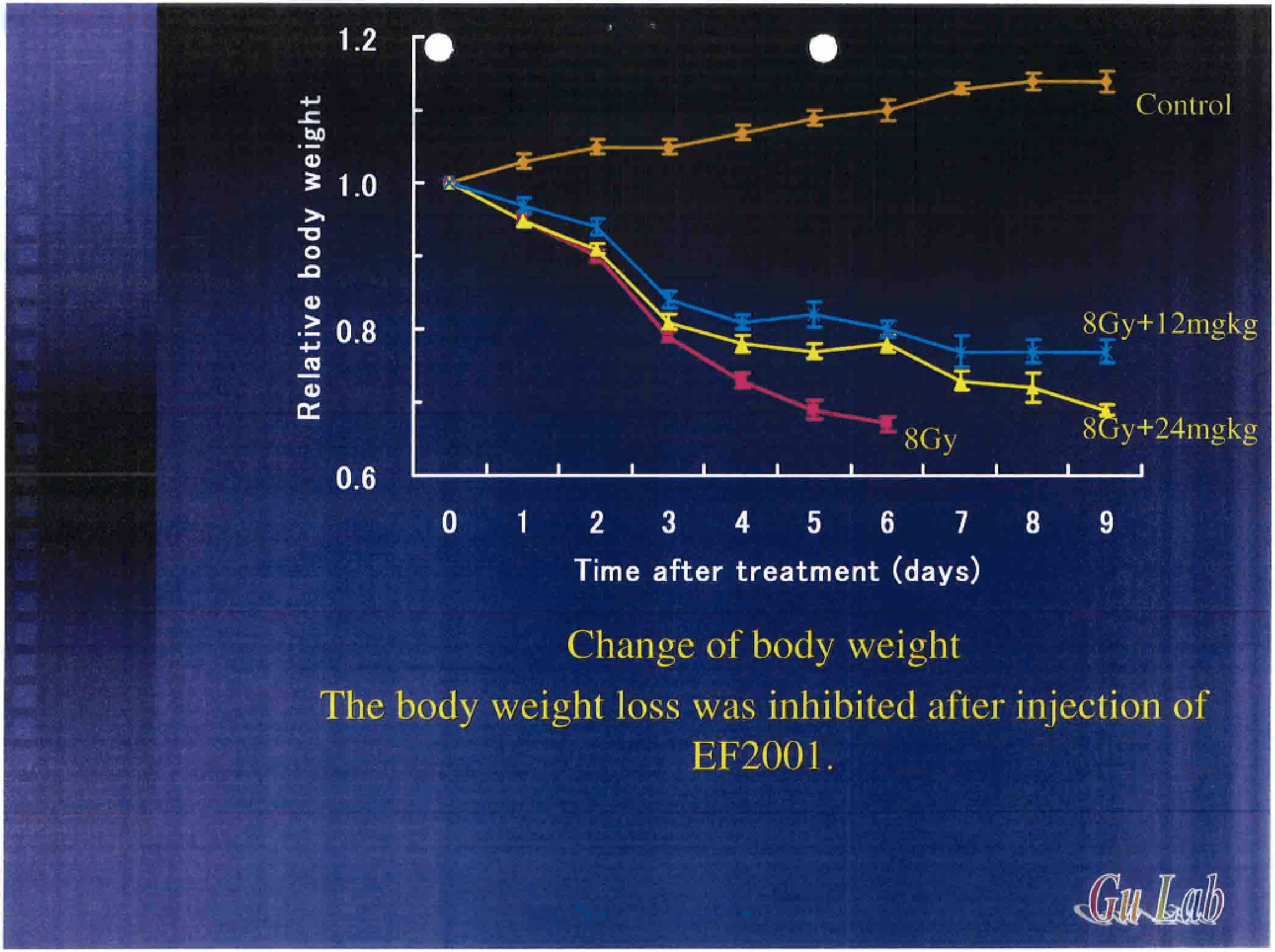
The mice was scarified and the spleen was extracted.

The spleen was smashed with stainless steel mesh, and then mixed PBS and the suspect ion was centrifuged three times.

The concentration of the spleen cells was adjusted to be 2×10^7 cells/ ml. Then, 1.25×10^6, 2.5×10^6, 5.0×10^6, 10.0×10^6, $20.0 \times 10^6$of the spleen cells were added to 1×10^4 of YAC-1 cell which labeled ^{51}Cr of 1mCi and incubated 96 hole plate for 6 hours.

Only liquid component in each hole measured with liquid scintillation.

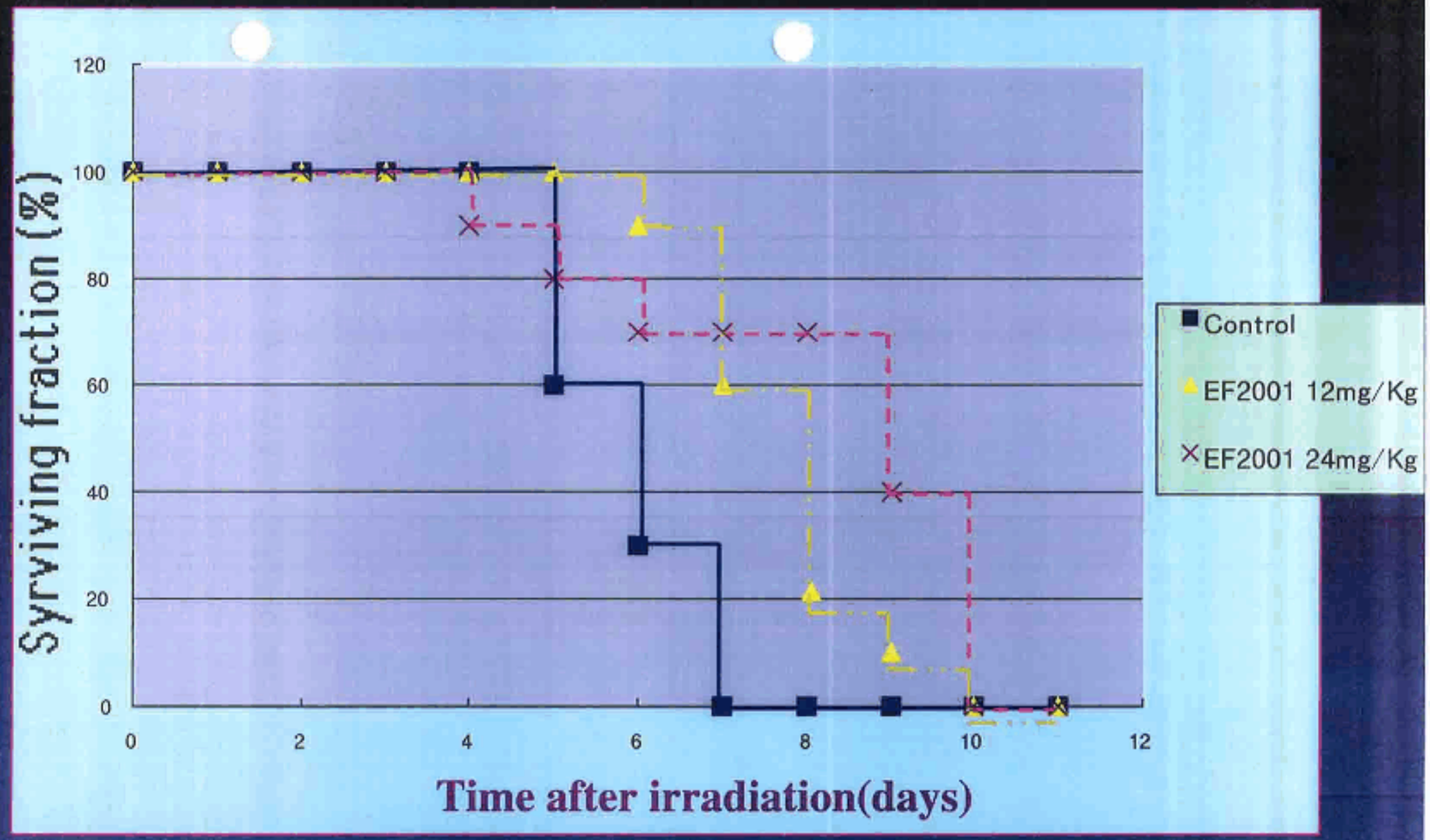
Gu Lab



Change of body weight

The body weight loss was inhibited after injection of EF2001.

Gu Lab



Survival after irradiation

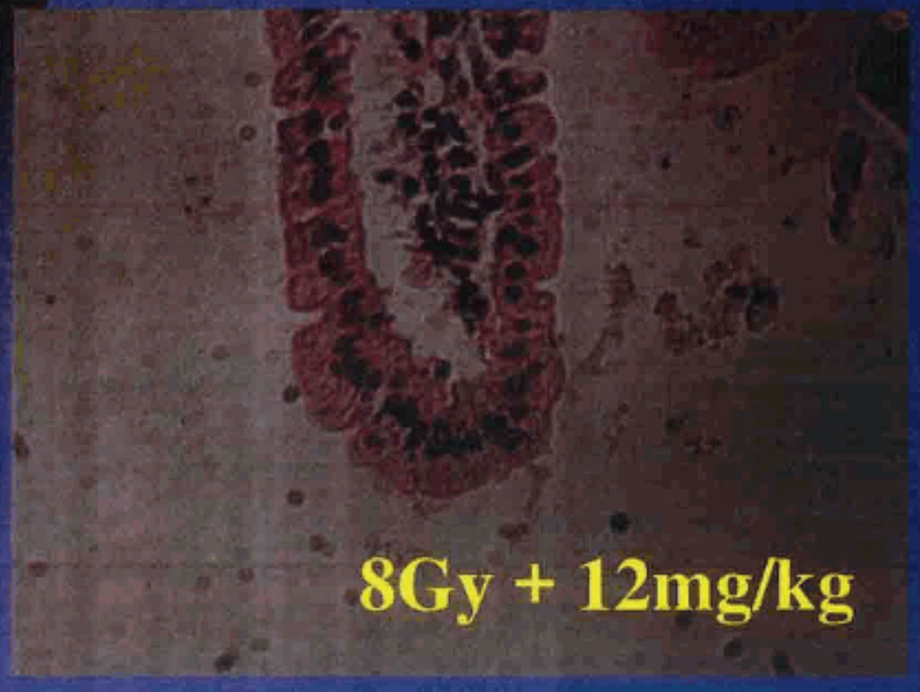
Surviving fraction was increased after injection of EF2001.

Gu Lab

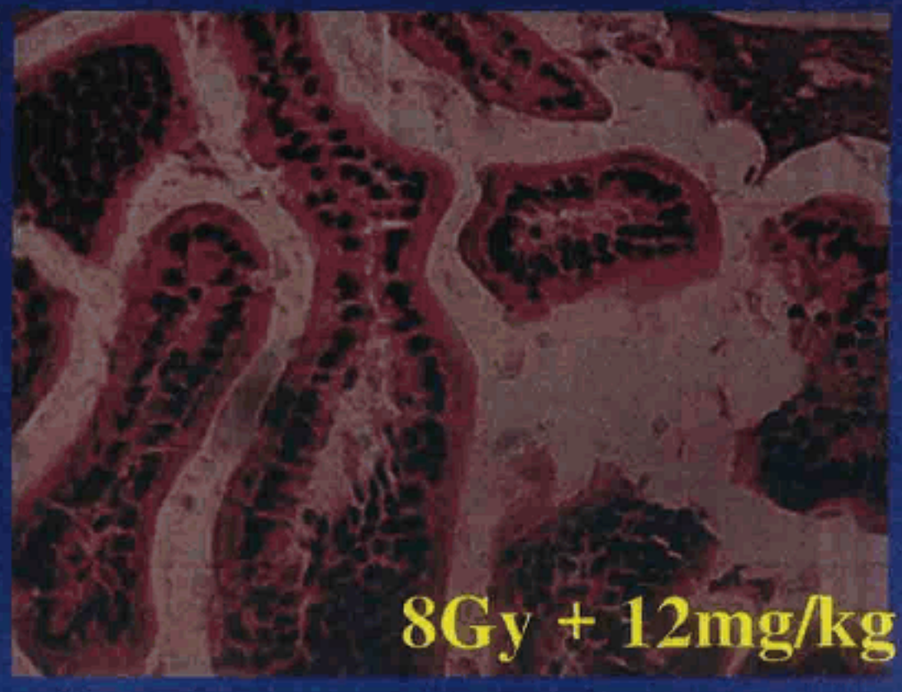
Small intestines with a microscope

Control

8Gy



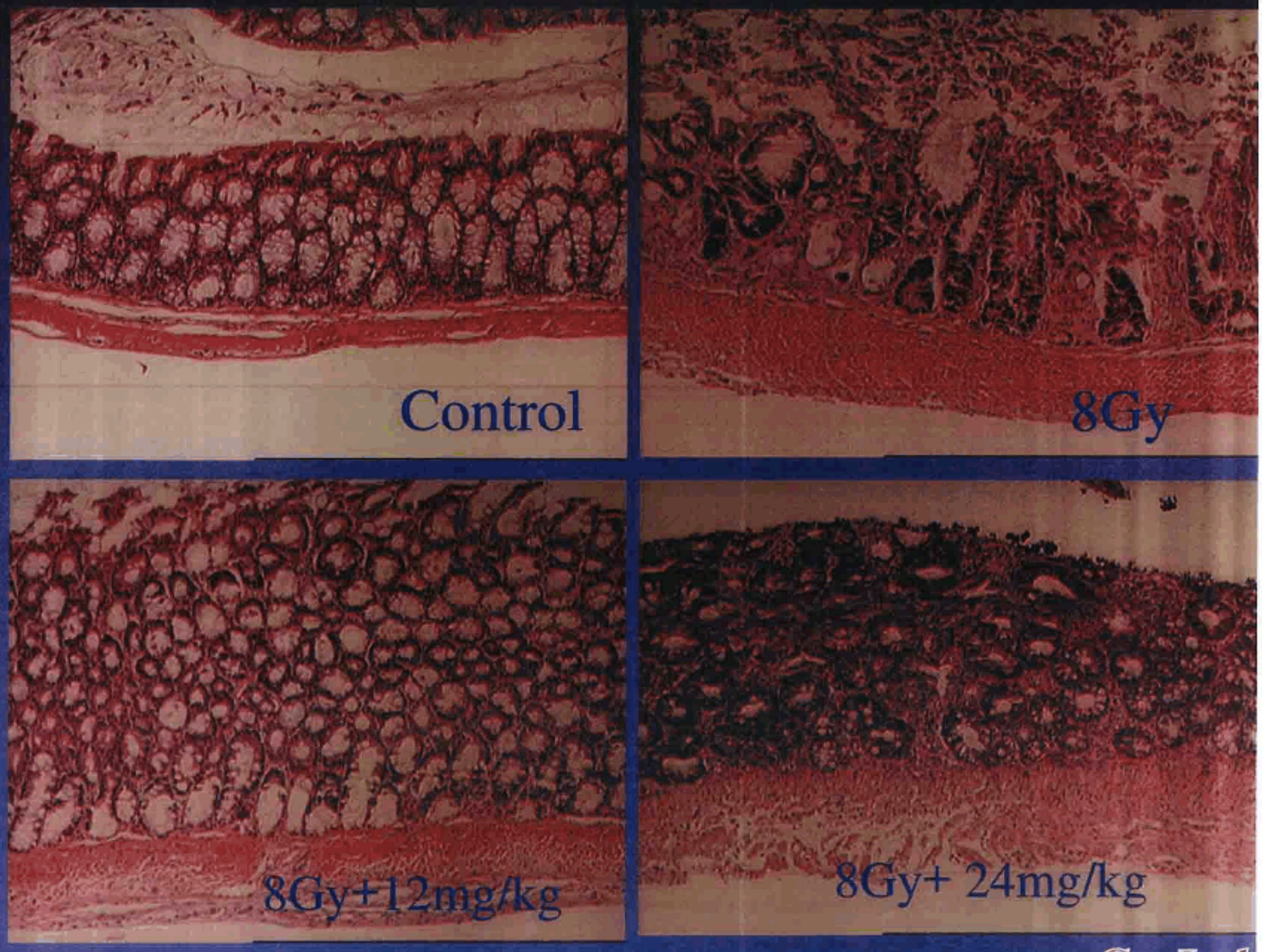
8Gy + 12mg/kg



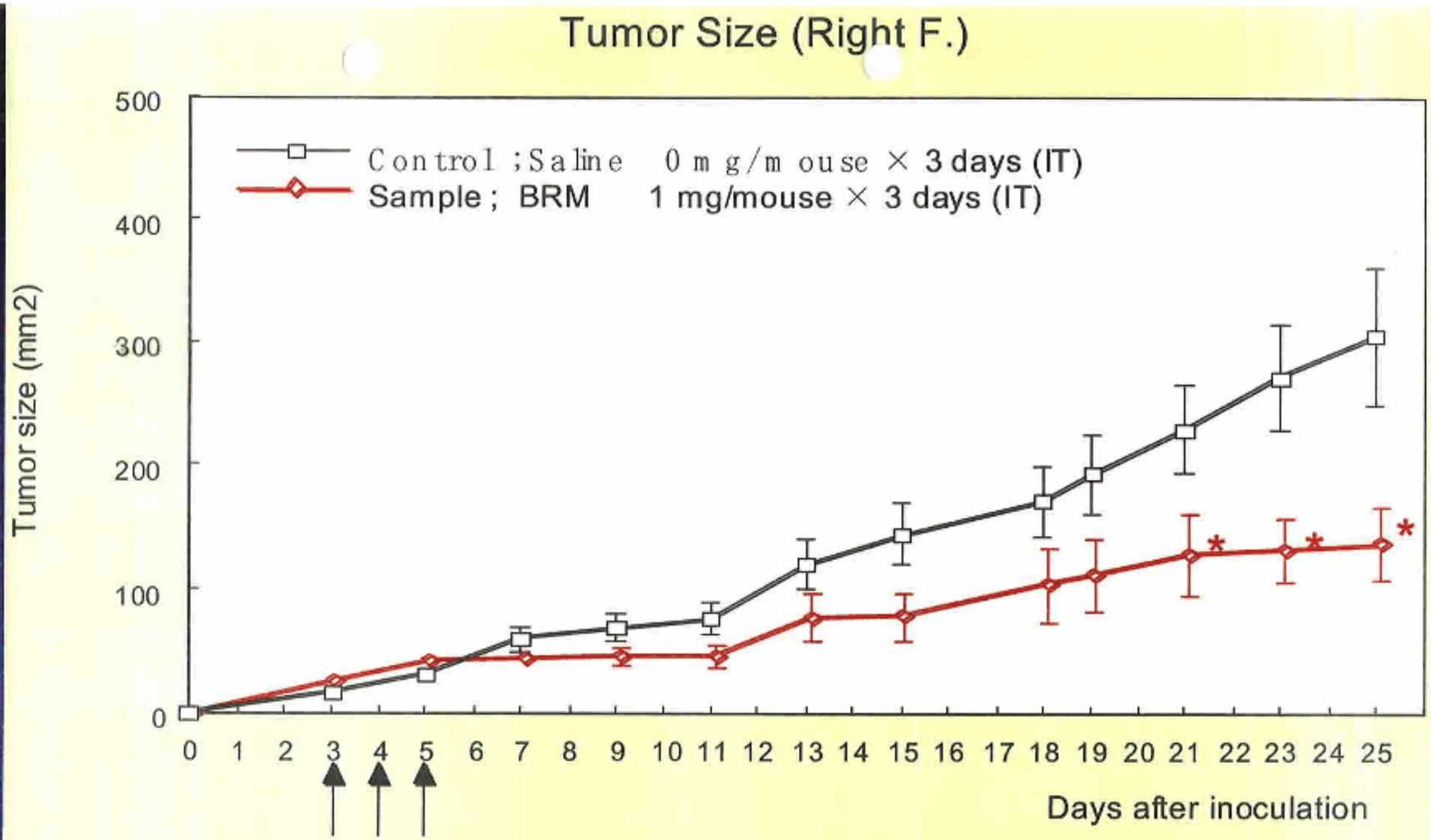
8Gy + 12mg/kg

Gu Lab

Large intestines with a microscope



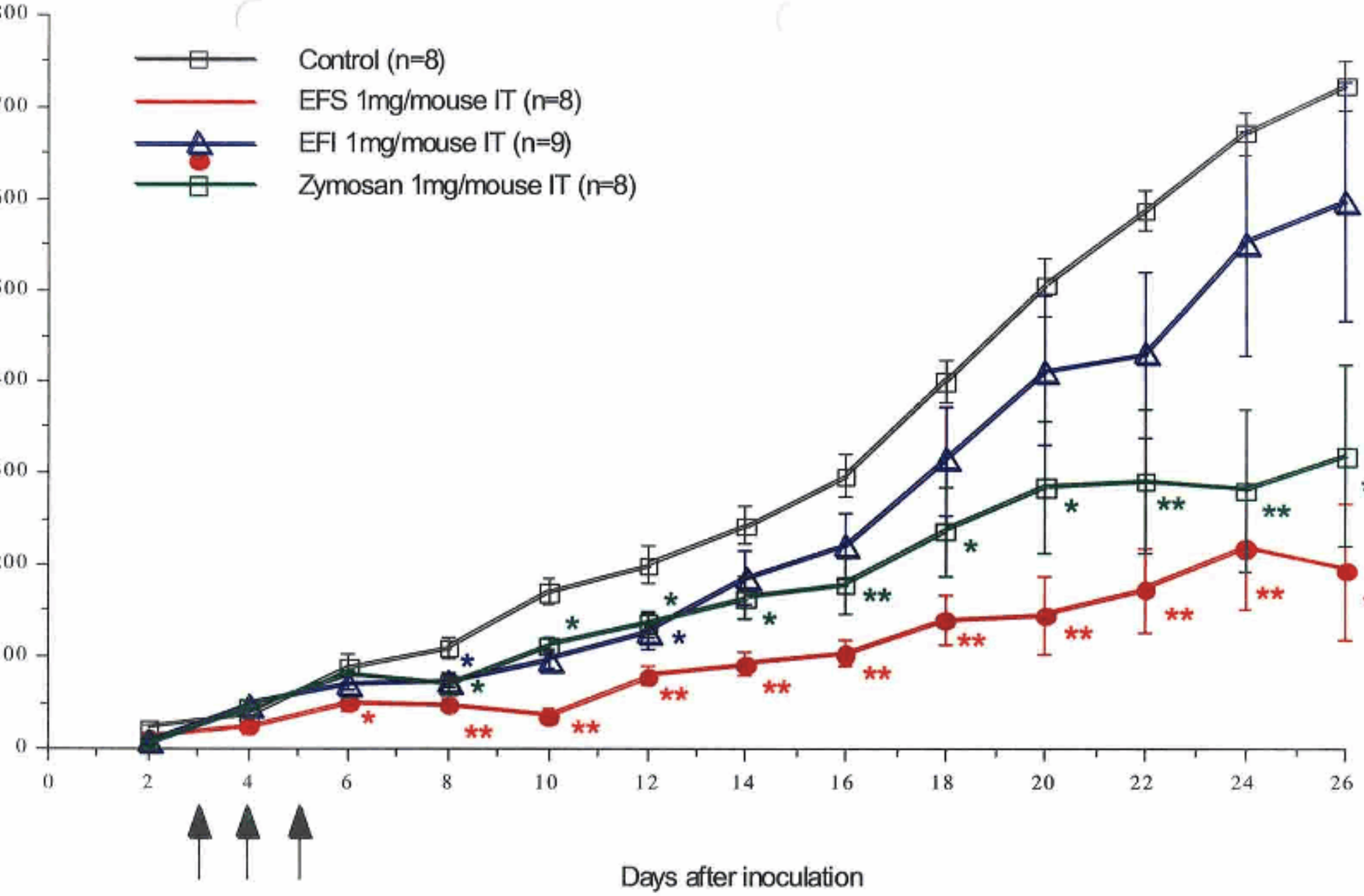
Gu Lab



Anti-tumor effect of BRM on Meth A fibrosarcoma (solid type) in BALB/c mice

* $p<0.05$ vs Control

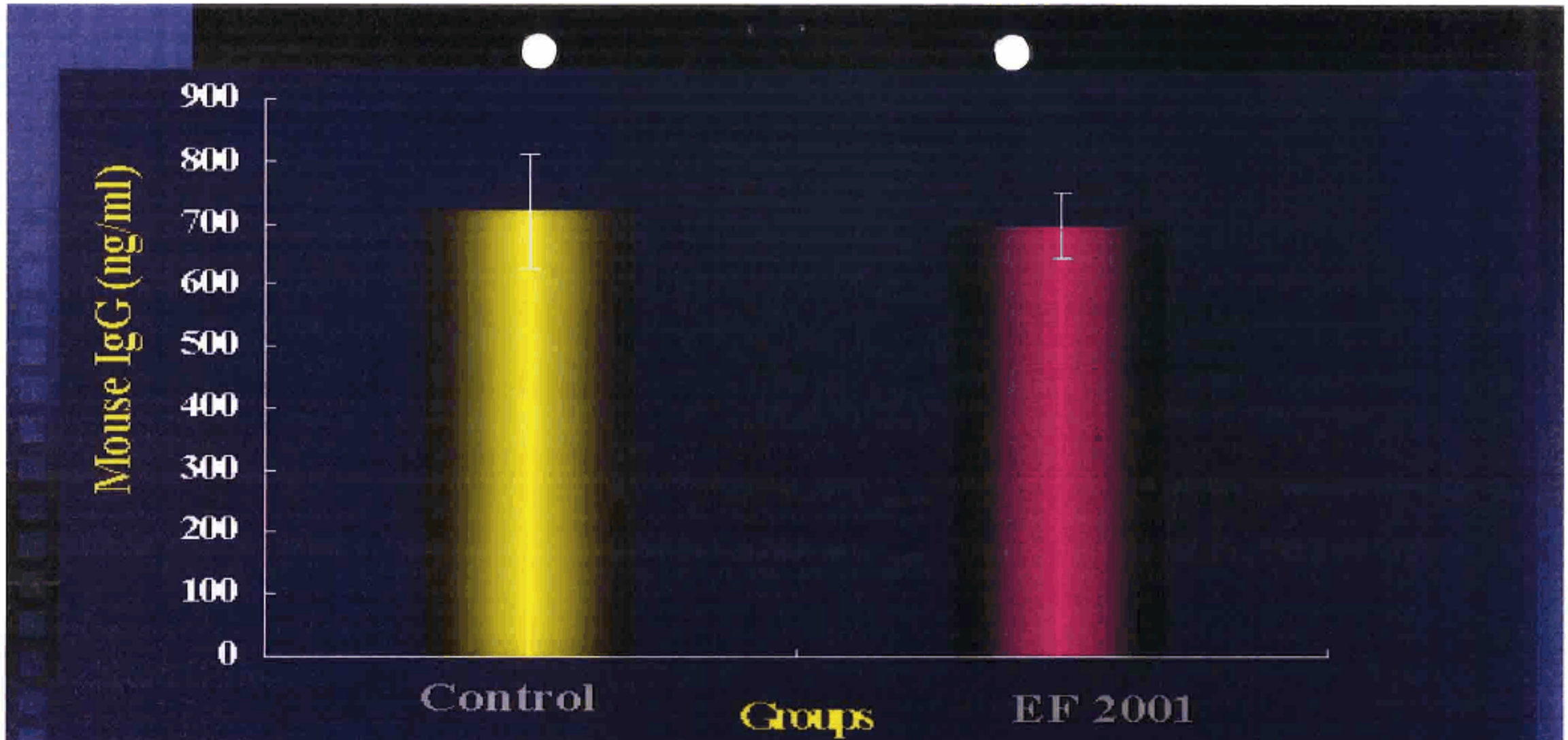
Gu Lab



Anti-tumor effect of EF-2001 on S-180 in ICR mice

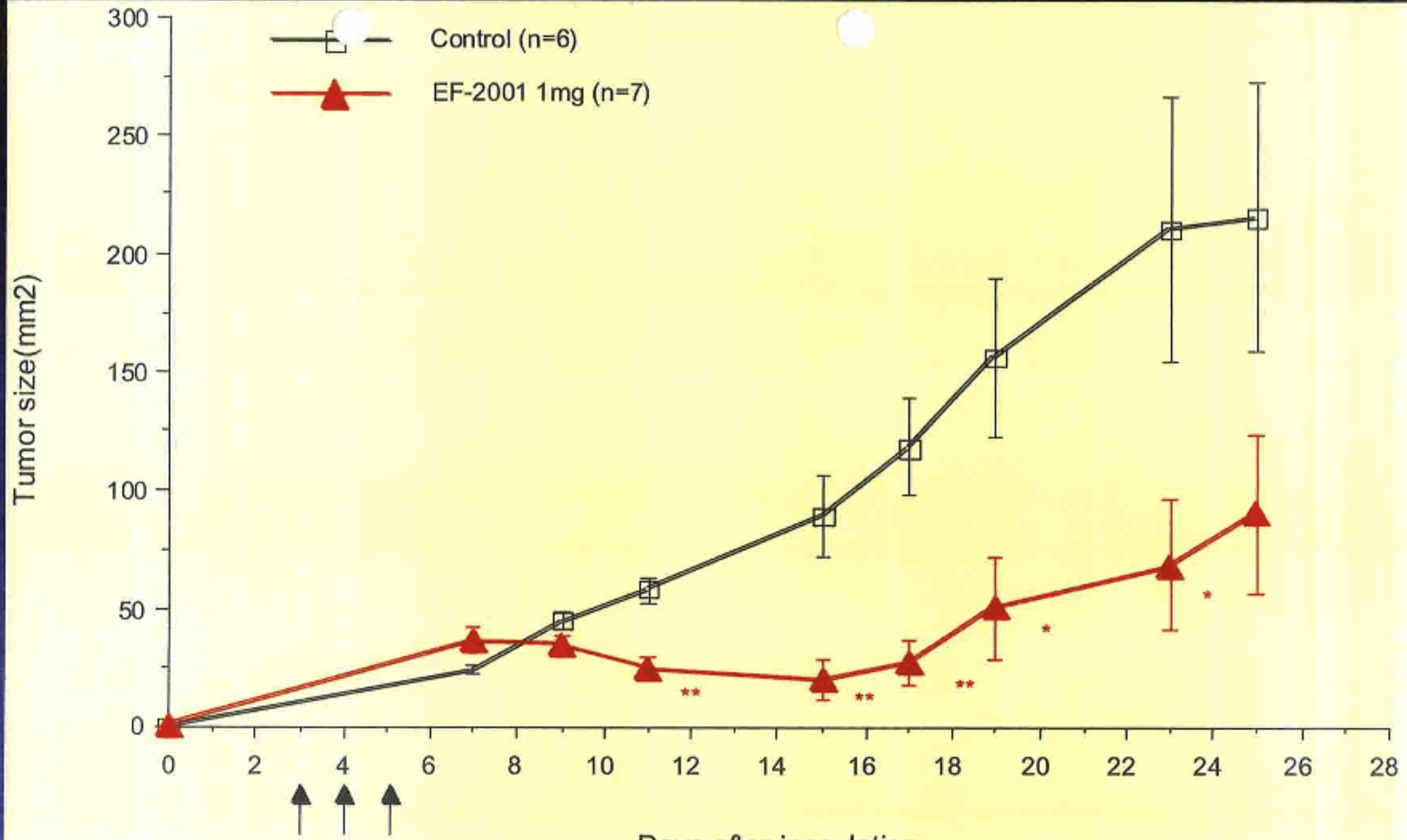
**P<0.01 *P<0.05 vs Control group

Gu Lab



C3H mice of IgG in the blood. Each histogram represents the mean value ±SE for 10 mice IgG (M). Significantly different *p<0.05 Control vs. EF2001.

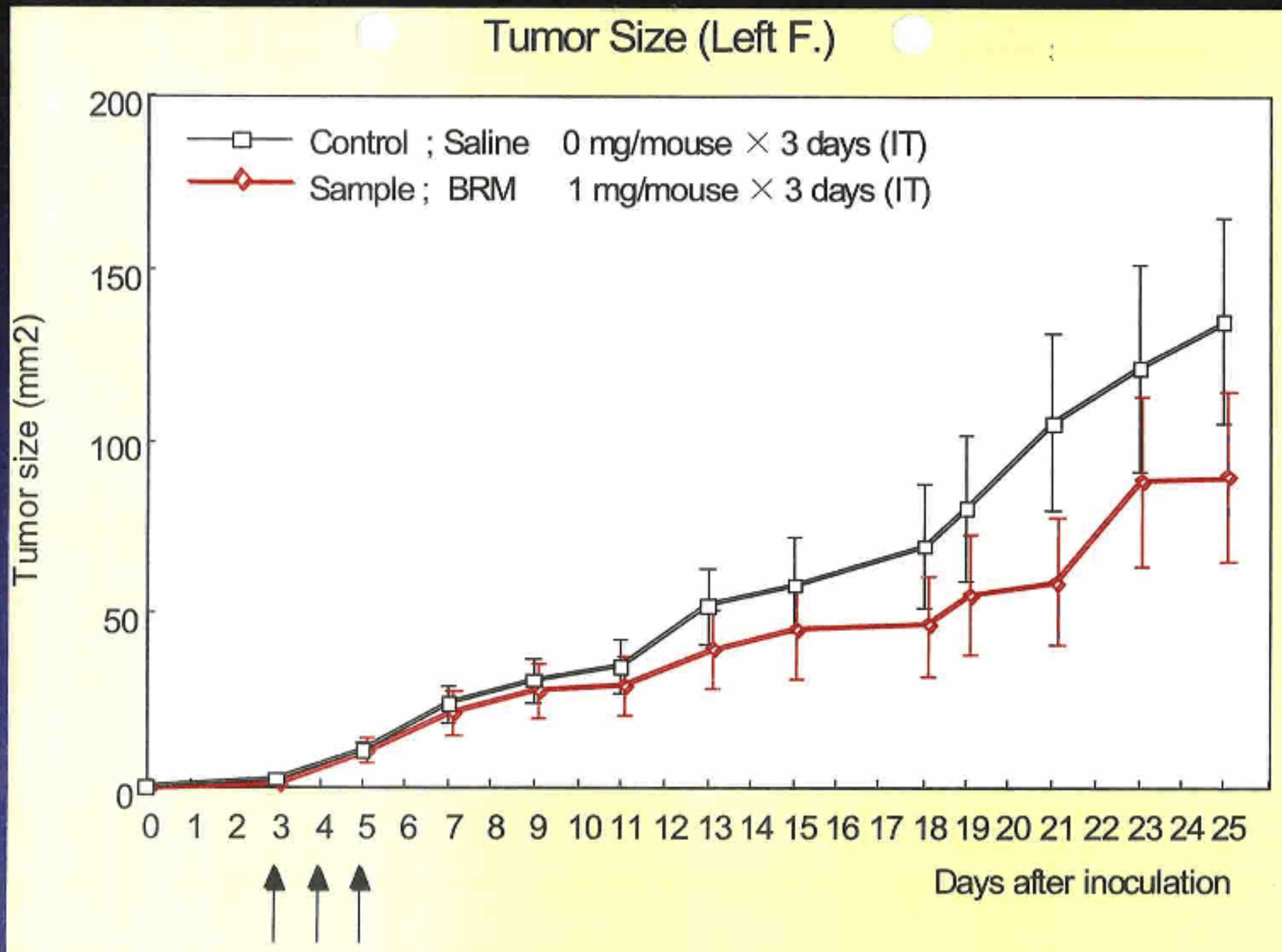
GU Lab



Anti-tumor effect of EF-2001 on Meth A fibrosarcoma (solid type) in BALB/c mice

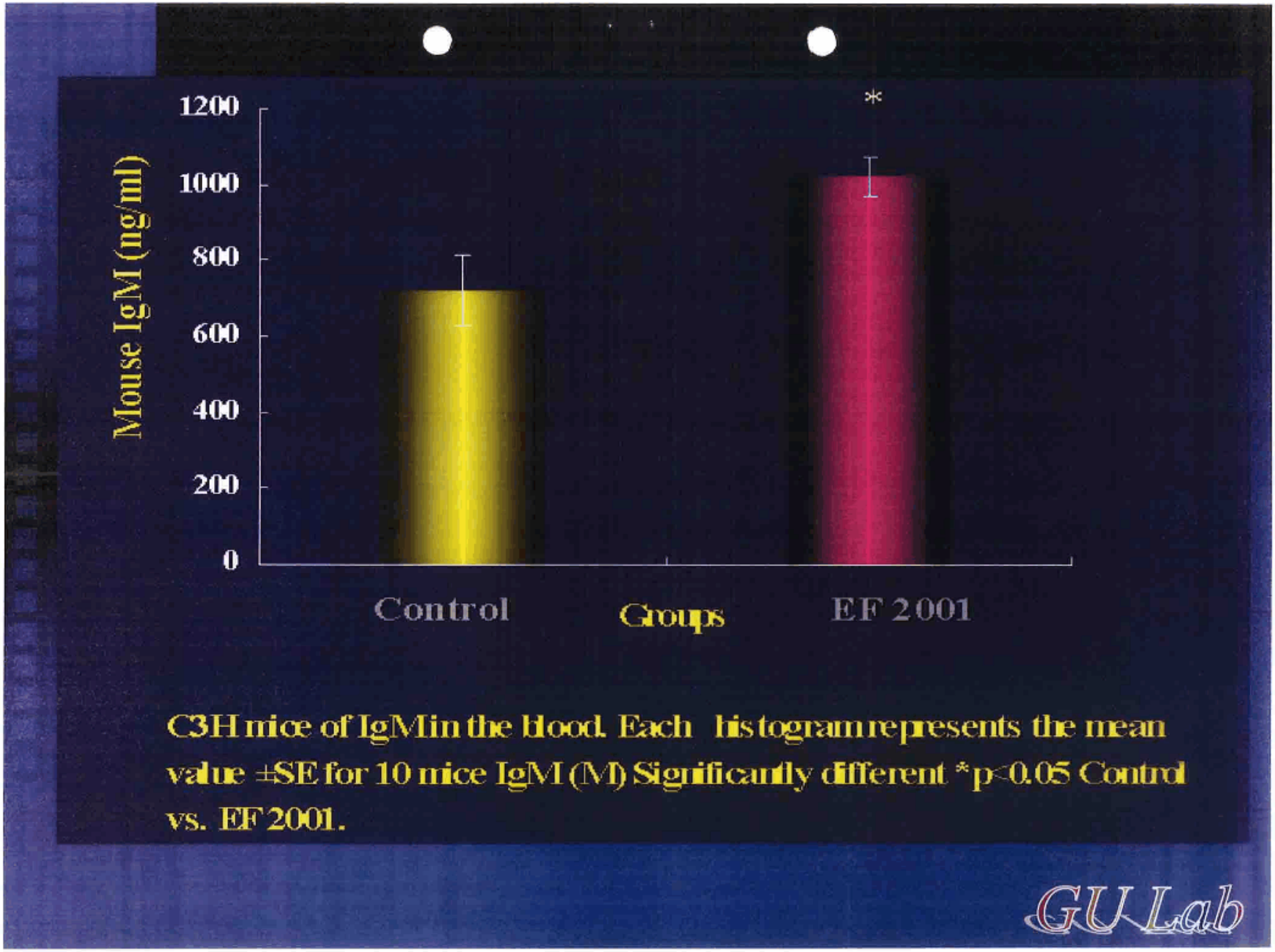
**P<0.01 *P<0.05 vs Control group

Gu-Lab



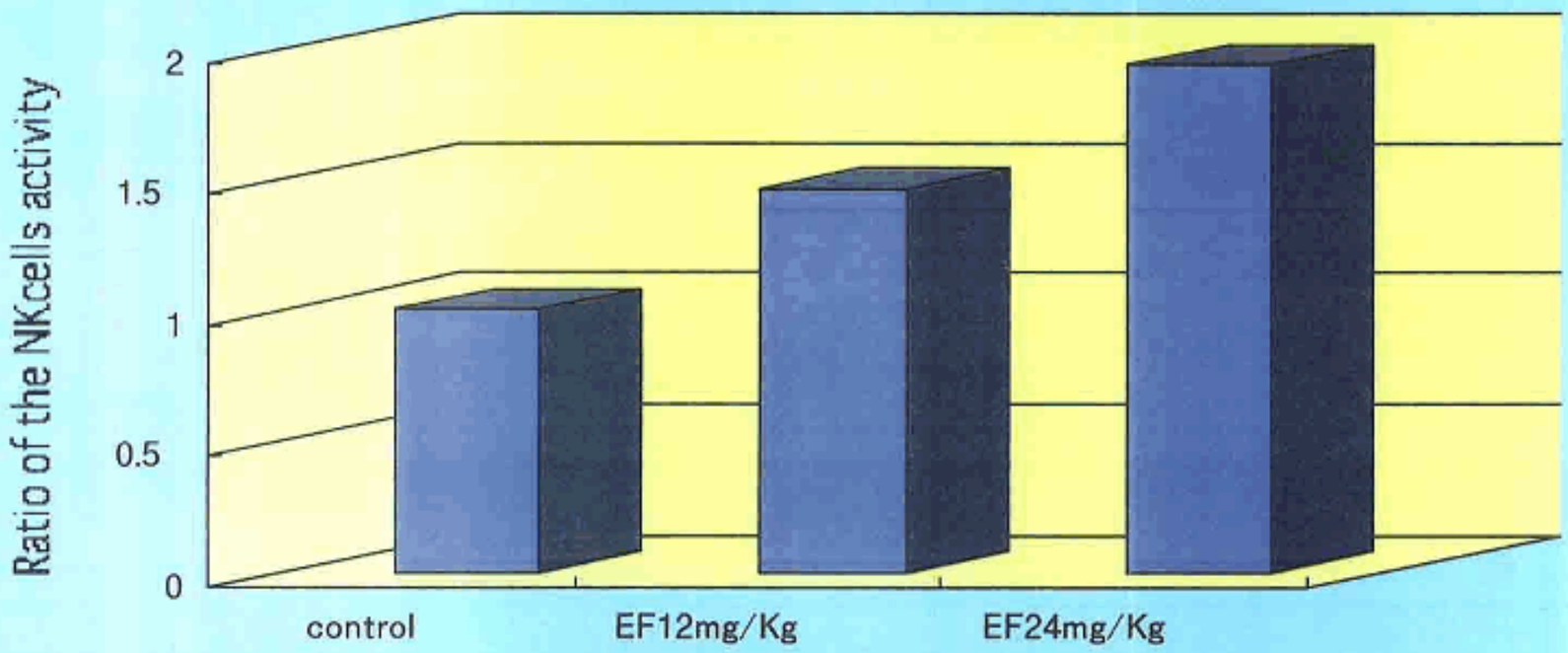
Anti-tumor effect of BRM on Meth A fibrosarcoma (solid type) in BALB/c mice

Gu Lab



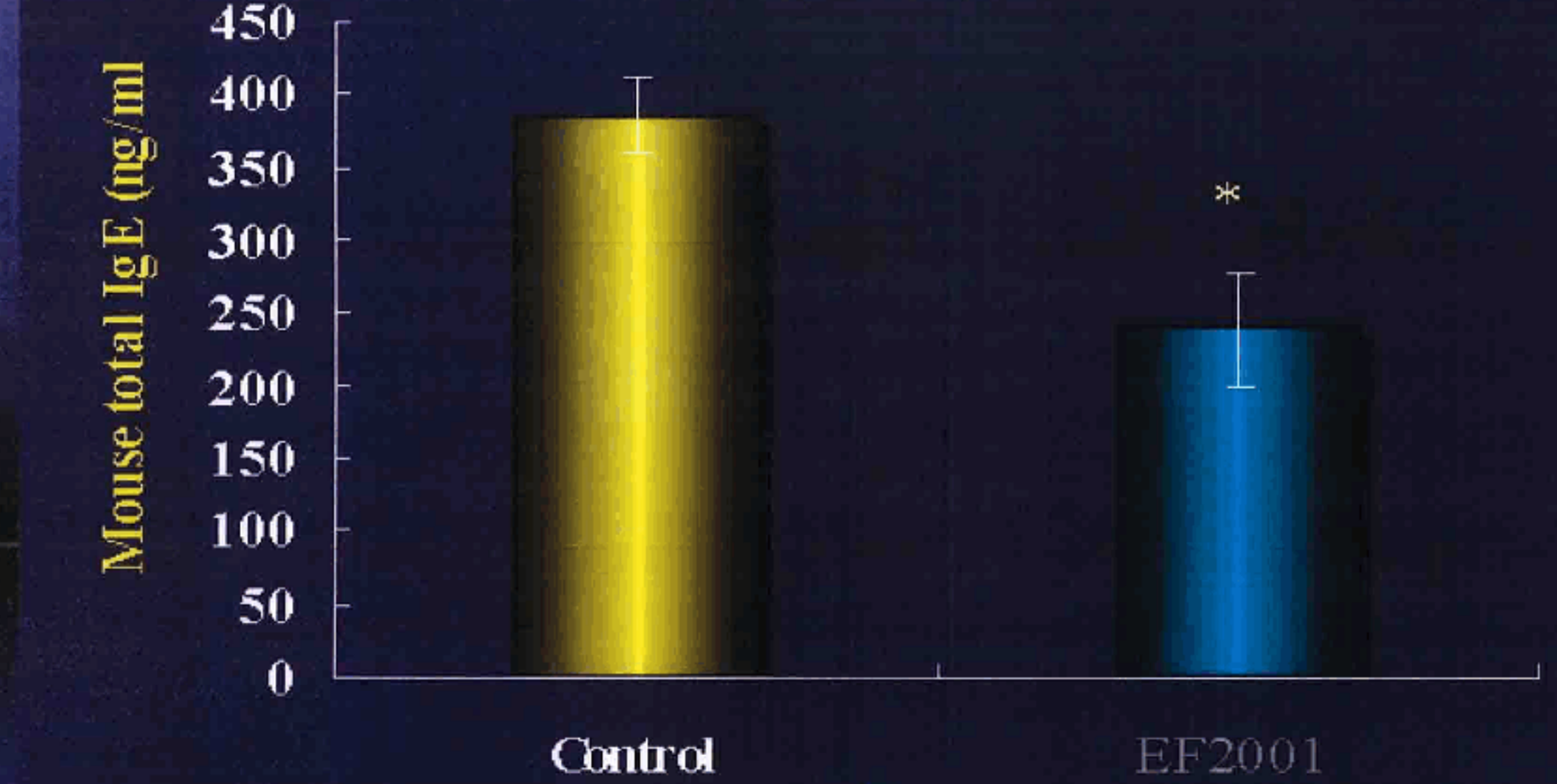
C3H mice of IgM in the blood. Each histogram represents the mean value ±SE for 10 mice IgM (M) Significantly different *p<0.05 Control vs. EF 2001.

GU Lab



NK cells activity
Activities of NK cells are enhanced 1.46 and 1.94 times in EF2001 12mg and EF2001 24mg groups respectively.

Gu Lab



BLB/C mice of IgE in the blood. Each histogram represents the mean value ±SE for 10 mice IgE (M). Significantly different $*p<0.05$ Control vs. EF 2001.

GU Lab

Conclusion 1

- **Anti-cancer effects : EF 2001 administration group: positive**
- **EF 2001 to the radiation protection effect: precision**
- **Immune activity effect: EF 2001 administration group: positive**
- **Anti-aging effect: EF 2001 administration group: positive**
- **Long life effect: EF 2001 administration group: positive**
- **It put the *Enterococcus Faecalis* dosage, and the level of total IgE in serum glutamic-oxaloacetic fell.**
- **The level of total IgM in serum glutamic-oxaloacetic increased the *Enterococcus Faecalis* dosage group. However, the level of total IgG in serum glutamic-oxaloacetic rather fell slightly.**

GU Lab

Conclusion 2

1.It let cell-mediated immunity such as a macrophage and natural killer T cell activate, and the immunization activation action that Enterococcus Faecalis has does not become it, and promotion of humeral immunity anti-action is thought about.

2.In the dosage of *Enterococcus Faecalis*, an IL-2 level in blood rises, and it think that cytokine of the spleen changed from Th2 type into Th1 type. Therefore, it decrease IgG and an IgE level, and it is suggested that it showed an allergic restraint effect.

GU Lab