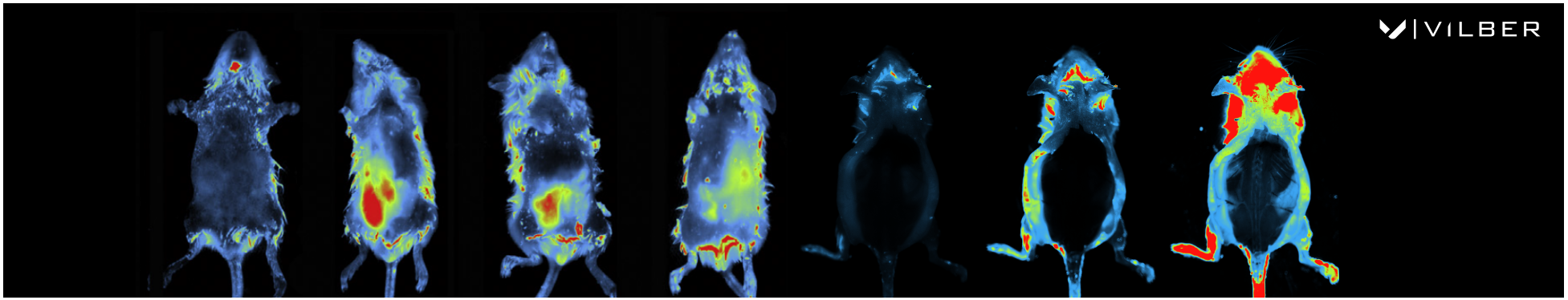

ANTI-BREAST CANCER ACTIVITY OF SPG- 56 FROM SWEET POTATO IN MCF-7 BEARING MICE IN SITU THROUGH PROMOTING APOPTOSIS AND INHIBITING METASTASIS

AUTHORS

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INTRODUCTION

Breast cancer is the second leading cause of cancer-related deaths around the world, as well as the most common type of cancer in China. Induction of apoptosis is one of the most important mechanisms by which an anti-tumor agent works. Apoptosis can be induced via two pathways, an extrinsic death-signal-induced receptor-mediated pathway, or an intrinsic distress-induced mitochondrion-mediated pathway. Modern research results show that the sweet potato (*Ipomoea batatas* (L.) Lam.) and its active ingredients have the effect of enhancing immunity, anti-oxidation, inhibiting inflammation and inhibiting cardiovascular diseases. Anti-cancer ingredients in sweet potatoes mainly include polysaccharides, sporamin, DHEA, anthocyanin and glycoprotein. As a type of mucoprotein, sweet potato glycoprotein is an important biological active constituent of sweet potatoes, with health-promoting functions and medicinal properties. Glycoprotein have pharmacologic actions such as anti-cancer, anti-oxidant, anti-hyperlipidemia, hypoglycaemic and immunological enhancement. Recently, Wang *et al*. extracted and isolated sweet potato glycoprotein-56 (SPG-56) at molecular weight of 56000 which consists of 2.9% sugar and 97.1% protein, and was found to enhance the apoptosis of colon cancer cells.

OBJECTIVE

In this study, nude mice were used as experimental animals to evaluate the anti-breast cancer effects of SPG-56 *in vivo* and *in vitro*. To clarify its possible molecular mechanisms, the effects on serum inflammation, tumor markers, and related proteins were investigated. The results are expected to provide a theoretical and experimental basis for the use of SPG-56 in anti-breast cancer applications in the future.

MATERIAL & METHODS

50 healthy four-week-old female BALB/c nude mice were randomly divided into five groups, comprising normal controls (NC), tumor controls (TC), SPG-56 with a low dose of 60 mg/kg body weight (SPG-L), SPG-56 with a middle dose of 120 mg/kg body weight (SPG-M), and SPG 56 with a high dose of 240 mg/kg body weight (SPG-H). Prepared MCF-7 cell suspensions (30 µl Matrigel and 90 µl of PBS containing 10^6 cells) were orthotopically implanted into the nude mouse breast pad. From the first day of inoculation, mice in the NC and TC groups received appropriate amounts of 0.9% saline solution. SPG-56 at doses of 60, 120 and 240 mg/kg of body weight was administered daily by gavage.

Luminescence Imaging for Detection of Metastasis *in Vivo*.

Using the same animal breeds and feeding methods described above, 12 4T1-Luc breast cancer bearing mice were randomly divided into two groups, 4T1 tumor controls (4T1-TC) and SPG-56 subjects given a high dose of 240 mg/kg of body weight (4T1-SPG). Twenty days after inoculation, the mice were injected with 10 µl/g D Luciferin, Potassium Salt via the tail vein. Ten minutes later, the mice were anesthetized by intraperitoneal injection of 10% chloral hydrate, and the distribution of luminescence in the mice was scanned using a VILBER FUSION FX7 Spectra multifunctional imager (VILBER LOURMAT, France), at a wavelength of 560 nm.

RESULTS

Figure 1. SPG-56 suppressed the metastasis of 4T1 cell in nude mice. (A) 4T1 tumor control (4T1-TC) and (B) SPG-56 with high dose of 240 mg/kg body weight (4T1-SPG). 4T1-Luc breast carcinoma cells were inoculated into nude mice, to examine whether SPG-5 inhibited the expansion and metastasis of breast cancer *in vivo*. 20 days after inoculation, the distribution of luminescence in the mice were detected by FUSION FX7 Spectra (Vilber Lourmat) at a wavelength of 560 nm. The color scale indicates the luminescence intensity per pixel, the higher the luminescence intensity detected, the more 4T1-Luc tumor cells are present. The tumor luminescence in the TC group was distributed not only in the tumor at site of inoculation, but also in other tissues, including the liver and lungs (Fig. 1A). This suggests that metastasis of the tumor occurred. However, the luminescence in the high dose of SPG-56 group (Fig. 1B) was greatly reduced, existing only in the inoculated tumor area. This indicates that SPG-56 treatment controlled the growth of the tumor, and effectively inhibited metastasis.

CONCLUSION

The *in vivo* experiment made use of *in situ* injection of tumor cells into the nude mouse mammary fat pad. Compared to subcutaneous inoculation, this inoculation method can better simulate the growth of breast cancer in its usual environment. These results demonstrate the abilities of the Fusion FX7 Spectra (Vilber Lourmat, France) in imaging the effects of SPG-56 *in vivo* and its biodistribution pattern in the treatment of breast cancer in mice.

Figure 1.