STUDY ON THE SIGNAL CHANGE OF ELECTRON SPIN RESONANCE (ESR) FOR IRRADIATED BONE IN MEAT DURING STORAGE PERIOD

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***Abstract*—This study was focused on the change of free radicals in bone in meat. Samples were irradiated with 0, 1, 3, 5 kGy of ^{60}Co-γ-ray, and measured by ESR for one year. Irradiated sample was characterized by asymmetric signal, however signal intensity was decreased for storage time, can be detected at least 6 months for cold storage and 12months for frozen.**

***Index Terms*—Electron Spin Resonance (ESR), Irradiation, Bone in Meat, Storage Period**

I. INTRODUCTION

Electron spin resonance (ESR) spectroscopy can be used to detect the free radicals of irradiated bone in meat. This study focused on the change of free radicals during storage period after irradiation in order to verify the application possibility of ESR method in quarantine field, because there was a few of this research.

II. MATERIALS AND METHODS

Bone in meats of chilled and frozen beef, pork and chicken were irradiated with doses of 1, 3, 5 kGy using cobalt 60 gamma ray. Muscle, tendon and bone marrow were removed from irradiated bone in meats. This pure bone samples were freezing-vacuum dried over 40 hours. We selected fragmented bone (0.5~1.0mm) using stainless mesh after grinding the dried bone, and measured the free radicals using ESR spectrometer (JEOL, JES-FA100, X-band) every month for one year.

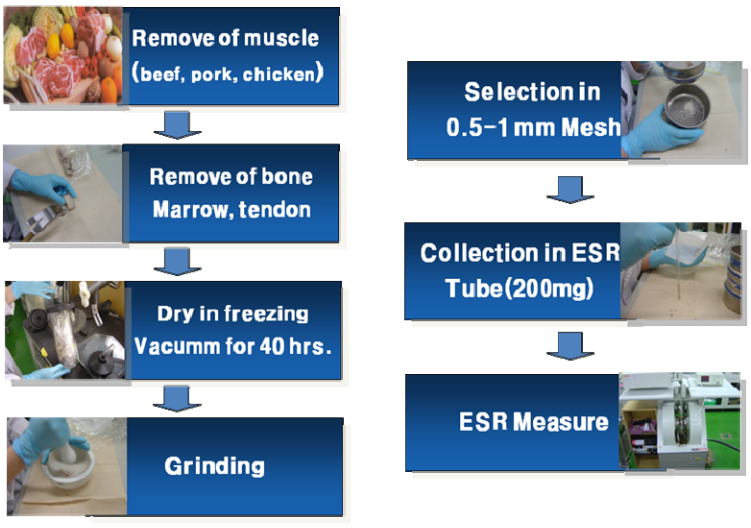

Fig. 1. Pretreatment of bone in meat irradiated with cobalt-60(0, 1, 3, 5 kGy and ESR measurement

III. RESULTS AND DISCUSSION

Dose-response curve of irradiated samples was indicated significant linearity according to the increase of absorbed dose, and beef bone in meat showed the strongest signal. The specific signal intensity decreased with increasing storage time. However, the signals were not only strong enough to be detected at least 6 months for cold storage and 12 months for frozen storage, but also the g value was not changed.

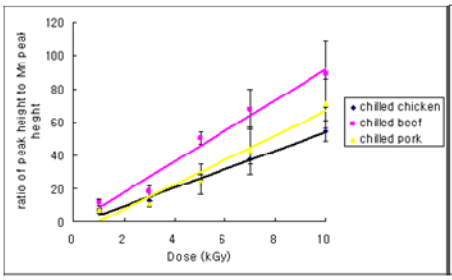

Fig. 2. Dose-response curve for irradiated chilled chicken, pork, beef bone. Error bars shown the standard deviations of the mean ESR signal strength.

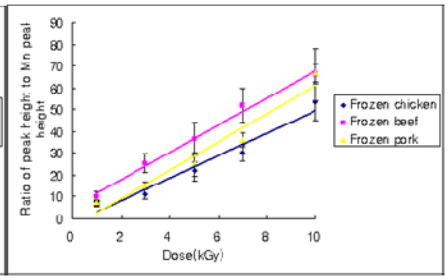

Fig. 3. Dose-response curve for irradiated frozen chicken, pork, beef bone. Error bars shown the standard deviations of the mean ESR signal strength

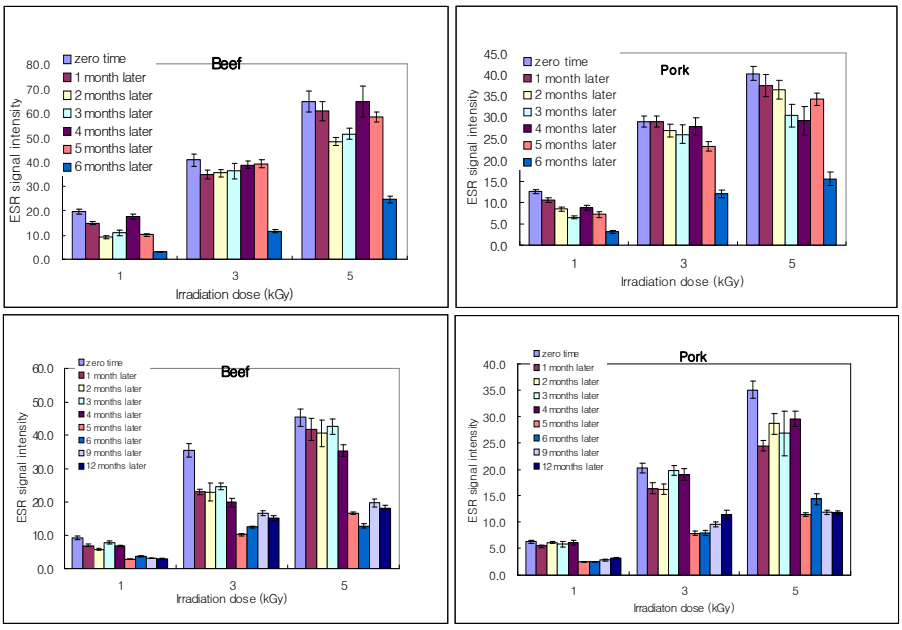

Fig. 4. ESR signal change of irradiated meat(upper: chilled, low: frozen)

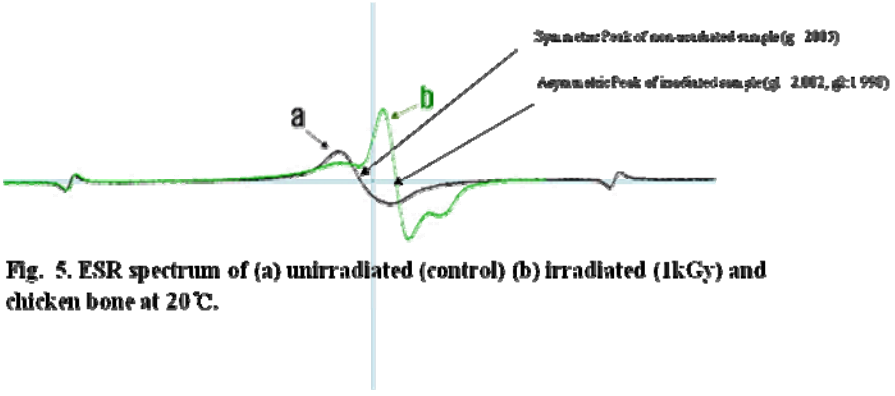

Fig. 5. ESR spectrum of (a) unirradiated (control) (b) irradiated (1kGy) and chicken bone at 20℃.

IV. CONCLUSION

ESR method could be useful for the detection of irradiated bone in meat in commercial market for more than 6monhs in chilled condition and one year in frozen, and also be applied for the quarantine stage

ACKNOWLEDGEMENT

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