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The latest developments in food irradiation research at Lomonosov Moscow State University

Ulyana Bliznyuk
Moscow State University, Russia

Considering the broad interest of food industry in enhancing the shelf life of food products while maintaining food safety, Moscow State University is studying physical and chemical aspects of food irradiation treatment in four areas: determining effective dose ranges for meat, fish and crops, specifying biochemical markers of food irradiation, developing new methods to detect chemical changes in irradiated foods, and enhancing the effectiveness of accelerated electron irradiation.

It was found that the limits of the effective dose range depend not only on the amounts of bacteria and nutrients as well as chemical composition of food but also on physical parameters of irradiation. Mathematical models suggested by our research team describe the changes in microbiological and chemical parameters of food and allow to determine the effective irradiation dose range. Our research has proved that the most effective dose range for fish and meat, recommended for irradiation treatment centers, is 250-1000 Gy while crops such as potato require 40-50 Gy. GC-MS analysis was used as a tool to determine biochemical markers of meat, fish and root crops after irradiation treatment. It was found that the concentration of certain organic compounds such as aldehydes, acetone and toluol increases with the increase in irradiation dose.

Fingerprinting technique was found to be efficient in detecting chemical changes in root crops irradiated with the doses ranging from 100 Gy to 10 kGy. A series of experiments conducted by our team prove that the fact of irradiation treatment can be successfully determined using the fluorescent method involving carbocyanine dyes.

In view of the fact that there is an increasing demand in electron accelerators for irradiation treatment we are testing new methods to enhance dose uniformity in the biological objects irradiated with electrons of different energies. Following the results of the study we propose a method involving a combination of aluminium modifier plates which allows to ensure the 100% dose uniformity in objects with the linear dimension of up to 8 cm treated from two opposite sides with accelerated electrons with the energy up to 10 MeV.

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Biography

Ulyana Bliznyuk is a professor of Lomonosov Moscow State University, Physics Department. She conducts lectures and seminars at Medical, Bioengineering, Psychology and Physics Departments. The area of Ulyana's research covers biophysics of irradiation treatment on biomaterials including food irradiation. She researches the impact of different types of irradiation on microbiological, chemical and organoleptic parameters of products. Her dissertation is on the spatial distribution of the action of electron beam irradiation on the red blood cell membranes. Ulyana is the author of more than 100 articles in different referenced magazines.

uabliznyuk@gmail.com

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