

PIXE analysis of iodine in eggs and organs of laying hen

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Abstract

Various positive effects are reported in iodine-enriched eggs laid by hens raised on iodine-blended feed. However, it is still unclear what the major chemical form of iodine compound that produces these good effects and how it distributes in the body. In this study, iodine contents of eggs and organs from laying hens were measured by using PIXE. In the prior study, recoveries detection limit of iodine by the pretreatment of the samples were also analyzed. First of all, all biological samples were freeze dried and mixed thoroughly to produce powder samples. Each sample was dissolved or suspended in distilled water, or ashed by nitric acid, or thoroughly crushed into fine powder under liquid nitrogen. Indium standard solution was used as internal standard of the samples prepared with water or nitric acid. Palladium carbon was used as internal standard of the fine powder samples. As expected, the thyroid contained more than 8,000 ppm of iodine, which was far more concentrated than any other organs investigated. Although there was variability in some range in each sample, significant reduction of the level of iodine was observed in the samples of nitric acid treatment. This is most likely that nitric acid evaporated iodine in the samples. Also the internal standard, indium solution caused underestimation of the iodine level. This was due to the close energy spectrum of the characteristic X-ray between indium-K α and iodine-K α and therefore indium masked K α of iodine. The fine powder samples showed variability in wide range. However at level of more than 10 ppm, there was a good linearity between the amounts of potassium iodine added in egg samples and observed concentration. Therefore, pretreatment of the biological samples is considered to be a critical process for iodine determination. Further study concerning pretreatment of biological samples for iodine determination by PIXE is required in order to determine accurate low levels of iodine in biological samples.