STUDY OF THE CONTENT OF CADMIUM AND LEAD IN MEAT OF BROILERS GROWN IN THE NORTH-CAUCASUS REGION OF THE RUSSIAN FEDERATION

I.M. Tchernoukha*, Yu.E. Kalinova and O.N. Orlova

The V.M.Gorbatov All-Russian Meat Research Institute, Talalikhina 26, 109316, Moscow, Russia.
Email: imcher@ inbox. ru

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Introduction

Consumer protection from contaminated foods and prevention of foodborne diseases are two main principles of the program to ensure safety of foods. The risk of raw materials and food contamination with potentially dangerous substances can be reduced only with the effective system of the control of foods safety on all stages of production and marketing. Therefore, an urgent problem is the improvement of methodology of assessment of raw materials, food quality and safety. A concept of production of safe meat products is being developed at GNU the V.M.Gorbatov All-Russian Meat Research Institute. It comprises a complex system of quality and safety assurance of protein products based, among other things, on the use of traceability system of safety and quality of the product in the whole food and technological chain of its production, transportation and marketing.

According to FAO/WHO, toxic elements of chemical origin have pronounced carcinogenic and mutagenic effect and take the first place in the list of chemical substances that are dangerous for the environment and human health. Among these substances, heavy metals, coming to the environment as a result of people's activities, take one of the leading positions. The waste and by-products of production processes, pesticides, wastewaters, slags, ash and gases, by-products of transport, enterprises of heavy industry, engineering, instrument engineering, heat and electric power stations, contain a large amount of heavy metals, among which cadmium and lead are the most toxic ones. Owing to their high migration capacity, a tendency to bioaccumulate, specific toxic effects, heavy metals in feeds and foods, a deterioration in sanitary quality, and, if higher than limit values, they are dangerous for the health of people and animals.

Therefore, to develop a traceability system a task was set to create a databank of the level of residual noxious substances present in farm animals from the environment.

Materials and Methods

The study of the level of heavy metals (cadmium, lead) was carried out in the samples of muscular tissue of broilers after 42 days of feeding, grown in agroindustrial complexes (APK) and small private chicken farms, located at different distances from the sources of ecological contamination in the North-Caucasus region of RF (conventionally considered as favourable and unfavourable regions).

The level of heavy metals was determined in the skin, fat, white meat (thoracic muscle) and red meat (leg muscle) of broilers, feed and water with the help of Atomic Absorption Spectrometer VARIAN SpectrAA 220 FS, with background correction (D_2-lamp). All measurements were carried out in triplicate.

Results and Discussion

The levels of cadmium and lead level in the tested samples are presented in Figs 1 and 2.

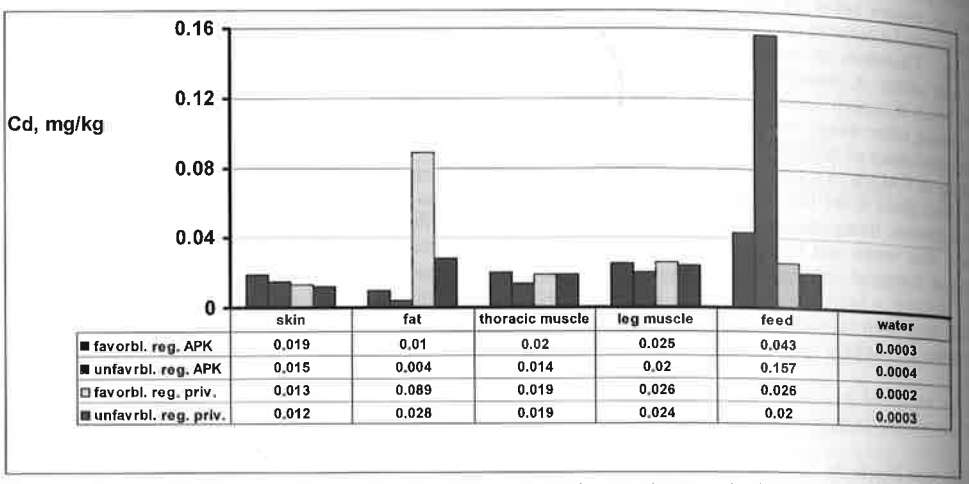
Analysis of the results of tests of water from APK and private chicken farms, situated in favourable and unfavourable regions shows that the level of both cadmium and lead is ten times lower than the limit values (not higher than 0.02 mg/kg for lead and 0.002 mg/kg for cadmium). The level of lead in all the samples of feeds is considerably lower than the limit values (not more than 2.0 mg/kg). The level of cadmium in the sample of feed also doesn't exceed the established norms (not more than 0.2 mg/kg), however, the sample of the feed from APK, situated in ecologically unfavourable region approached the limit value (0.157 mg/kg). At the same time, no accumulation of cadmium in muscle and fat tissue of broilers grown in APK was observed. The level of cadmium and lead in the white meat of chickens (thoracic muscle) is within the established norms. No significant differences in the level of cadmium were observed in the samples obtained from the farms with different forms of property. At the same time, a higher level of cadmium is observed in red meat (leg muscle 0.02 – 0.026 mg/kg) as compared to white meat (thoracic muscle 0.014-0.019 mg/kg).

There were no differences in lead level for different broiler muscle types. The level of lead in fat tissue samples of broilers, grown in the farms situated in favorable regions of the North-Caucasus region of RF approaches the limit values (not more than 0.1mg/kg), and for similar samples from broilers, grown in the farms situated in unfavorable regions is within the established norms. It should be noted that this pattern doesn't depend upon the type of property of the farms. The level of cadmium in the samples of fat tissue of broilers grown in the APK of both regions is significantly lower than the established norms (not more than 0.03 mg/kg). The level of cadmium in the tested samples of fat tissue of broilers from private farms is different. For the sample from ecologically unfavourable regions the measured values approach the limit values (nor more than 0.03 mg/kg), and for the sample from ecologically favourable

regions one can observe practically a three-fold exceeding of cadmium level. The level of cadmium in the skin samples is significantly lower than the established norms (not more than 0.3 mg/kg), and there are no large differences between the samples from different farms. It is also the case with the skin samples of broilers, as far as the content of lead is concerned, however, here, the skin sample from the APK of unfavourable region the measured level of lead is considerably lower as compared to other samples.

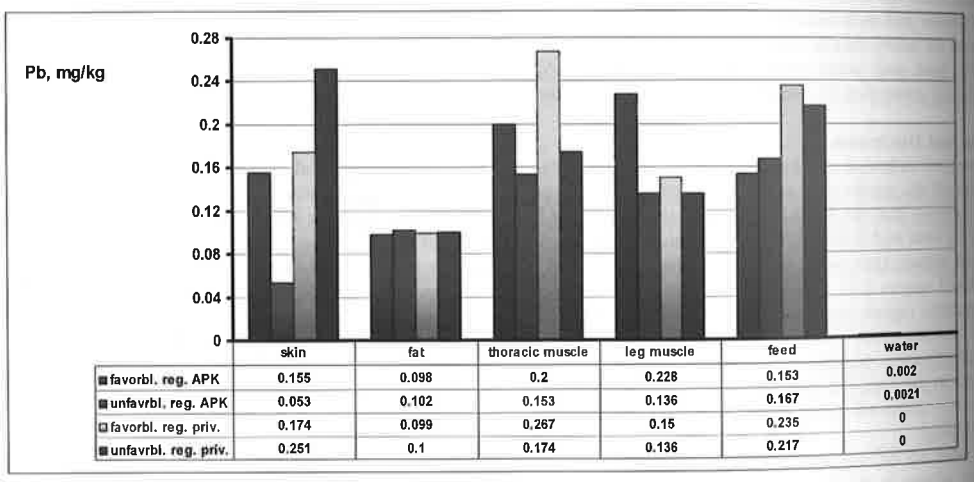
Conclusions

- The investigations carried out have shown that the most intensive accumulation of cadmium and lead in the organism of broilers, grown in North-Caucasus region of RF was in the fat tissue.
- The analysis of the obtained data has shown that the division of regions into ecologically favourable and unfavourable is rather conventional, and the analysis of the raw materials of poultry factories should be carried out for the indices of safety everywhere in the North Caucasus region.



	skin	fat	thoracic muscle	leg muscle	feed	water
favorbl. reg. APK	0.019	0.01	0.02	0.025	0.043	0.0003
unfavrbl. reg. APK	0.015	0.004	0.014	0.02	0.157	0.0004
favorbl. reg. priv.	0.013	0.089	0.019	0.026	0.026	0.0002
unfavrbl. reg. priv.	0.012	0.028	0.019	0.024	0.02	0.0003

Figure 1: Content of cadmium in the samples of poultry meat, feed, water (APK and private farms of North Caucasus region of RF).



	skin	fat	thoracic muscle	leg muscle	feed	water
favorbl. reg. APK	0.155	0.098	0.2	0.228	0.153	0.002
unfavrbl. reg. APK	0.053	0.102	0.153	0.136	0.167	0.0021
favorbl. reg. priv.	0.174	0.099	0.267	0.15	0.235	0
unfavrbl. reg. priv.	0.251	0.1	0.174	0.136	0.217	0

Figure 2: Content of lead in the samples of poultry meat, feed, water (APK and private farms of North Caucasus region of RF).