UDC 636.084 + 591.5

INFLUENCE OF COPPER, COBALT AND IODINE MICROELEMENTS ON THE EXCHANGE OF ^{137}CS IN THE COWS ORGANISMS AT DIFFERENT PHYSIOLOGICAL STATES

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Received on October 10, 2014

Aim. To estimate the impact of additions of different doses of copper, cobalt and iodine salts to the diet of dry and lactating cows on the absorption and removal of ^{137}Cs from the organism. **Methods.** Four groups of black and white breed cows — were selected for the study on the farm in Narodychi district of Zhytomyr region following the traditional methods. The animals were fed salts of microelements with concentrated feedstuffs. Specific radioactivity of feedstuffs, feces, urine, milk was defined by the gamma-spectrometry method using AMA-OZF analyzer. **Results.** During the dry period the content of ^{137}Cs in nutrition of cows of experimental groups was almost the same, whereas its removal from the organism of animals was different depending on the impact of microelements on the degree of radionuclide absorption. The exceeding of the norms of copper and cobalt by 30 % and iodine – by 70 % promotes the decrease of "visible" absorption of cesium and enhances its removal due to the radionuclide, accumulated in the tissues. The radioactivity of the diet of animals during lactation increased considerably (22–26-fold) and amounted to 17–22 kBq per day; at the same time high bioavailability of the radionuclide was revealed. The increase in ^{137}Cs content in the diet of cows during the grazing period is related to the use of contaminated fields. In May specific radioactivity of cow milk was the lowest; its insignificant increase (50–65 Bq/l) was observed in June, July and August. The radioactivity of cow milk in September and October increased considerably (150–184 Bq/l). The fortification of the diet of animals of the 3rd experimental group with copper, cobalt, and iodine promoted the decrease in the radioactivity of cow milk comparing the cow milk of the 1st experimental group and the milk of the 4th experimental group. During the lactation period the least absorption of the radionuclide was revealed for the normative consumption of all the microelements, and the highest – for the increased consumption of cobalt only. **Conclusions.** The vegetative feedstuffs of dairy cattle in Polissia provides the requirement of cobalt for 30–35 %, iodine – for 25–30 %, copper – for 70 % in winter, and during the grazing period in summer – for 25, 35, and 60 % respectively. The fortification of the diet of cows with microelements promotes the decrease in the absorption of ^{137}Cs in the gastrointestinal tract and its reduced transfer into cow milk.

Keywords: radioactive contamination, microelements, ^{137}Cs exchange in the organism of cows, dry and lactating cows.

DOI: 10.15407/agrisp2.03.033

INTRODUCTION

Because of radioactive contamination of a part of the territory of Ukraine and some neighboring countries as a consequence of the catastrophe at the Chernobyl power plant the issue of food production in accordance to DU-2006 is a major problem [1]. First and foremost, it concerns milk and milk products [2], which may be explained, firstly, by rather a high level of radioactive contamination of milk; secondly, its indispensability in infant food and, in many cases, the impossibility to use imported food (due to economic realities); thirdly, by the privatization of land resour-ces and dissolution of former farming collective bodies, due to which most cattle is privately owned by the population, who usu-

ally pasture their cattle and collect feedstuffs for it at rough pastures, in forests, where the capability of radionuclides to migrate along trophic chains is very high.

The abovementioned and a number of other reasons determined the need of elaborating the measures, aimed at decreasing the transfer of radionuclides into the livestock products. In addition to other countermeasures, one of efficient methods, stimulating the decrease of absorption and increase of removal of radionuclides from the organism of animals, is the introduction of microelement additives into nutrition. The selection of microelements to be radionuclide metabolism regulators is defined by a number of reasons, including their traditionally low content in the soils of biogeochemical province of Ukrainian Polissia, reduced availability of many mineral substances due to liming and other countermeasures after the Chernobyl catastrophe [3].

This study was aimed at estimating the impact of the introduction of microelements to the nutrition of lactating and dry cows on the absorption and removal of ^{137}Cs from the organism.

MATERIALS AND METHODS

The experiment was conducted at the territory of Narodychi district, Zhytomyr region, Ukraine where the radioactive contamination density was 185−555 kBq/m^2. Four groups of cows – black-and-white sbreeds, 5 years old, during the third lactation, 6 animals per group – were selected for the study.

In winter the animals of group 1 (control) received the main diet, balanced in nutritious substances and microelements, except for iodine, copper and cobalt, the natural content of which was 21–40 % of the required amount. The animals of group 2 were fed with the same diet with the additives of potassium iodide, cupric sulphate, and cobaltic chloride in the amounts of 5, 120 and 15 mg per capita per day respectively, which covered the required norm of these microelements for animals. The animals of group 3 were fed with the basic diet with the additives of 10 mg of potassium iodide, 200 mg cupric sulphate and 20 mg of cobaltic chloride, due to which the content of the latter in the diet exceeded the recommended norm by 70, 30, and 30 % respectively. The diet of group 4 animals was different from that of group 3 in the level of cobalt, the content of which exceeded the required norms by 70 % [11].

Two exchange experiments were carried out to study the exchange of ^{137}Cs: during the dry period (a month prior to calving) and during the lactation period (two months after the lactation started) following the traditional methods [4]. The material under study was feedstuffs, urine, feces, colostrum milk and milk. The dynamics of ^{137}Cs removal with colostrum milk and milk during lactation was studied. The samples of colostrum milk were obtained from the first milk yield of cows on the first day after calving, and on the 2nd and 3rd days – average samples from each cow for one day. The average sample of milk for 7 days was used for radiological studies. Specific radioactivity of ^{137}Cs was determined by gamma-spectrometry using AMA-OZF analyzer, the detecting block being a spectrometric scintillation block, type 6931-20, with energy extension for gamma-line of ^{137}Cs in 12.5 %.

The experiments allowed studying the exchange of ^{137}Cs in cows during dry and lactation periods.

It is known that the absorption of ^{137}Cs in the gastrointestinal tract of ruminants is characterized by some specificities, one of which being the reabsorption of the absorbed radionuclide in large intestines [5]. This process is called endogenous excretion, it influences the degree of true absorption considerably [6], the determination of which is related to significant methodological difficulties. So called "true" absorption was defined by the formula:

$$f_1 = (Q - F) \cdot 100\ \%,$$

where f_1 – coefficient of absorption of ^{137}Cs from the gastrointestinal tract in blood out of the one, introduced with the nutrition, %; Q – total amount of ^{137}Cs, introduced with the nutrition (in our case it was determined as the difference between the content of radioactivity in the daily diet and uneaten remains of feedstuffs), Bq/day; F – removal of ^{137}Cs with feces, Bq/day; 100 – coefficient of conversion in percentage units.

RESULTS AND DISCUSSION

Exchange of ^{137}Cs in the organism of cows during the dry period. The study of the specificities of exchange of ^{137}Cs in the organism of cows during the dry period is of interest due to the accumulation of the radionuclide in the mammary gland during the last months of pregnancy.

According to the data of Table 1, during the dry period the content of ^{137}Cs in the diet of experimental groups was almost the same. During this physiological state the degree of "true" absorption of ^{137}Cs is 1.9–12.1 %, which is considerably lower than the value, described in the literature [7, 8]. This may be explained by the structure of the diet, the basis of which was coarse

feedstuffs (hay, straw), characterized by low coefficients of bioavailability for ^{137}Cs [9, 10, 12]. It is noteworthy that the introduction of microelement additives to the diet decreases the absorption of ^{137}Cs in the animals of groups 2 and 3 compared to the control group. Here they demonstrate negative balance of ^{137}Cs, *i. e.* it is removed from the organism in somewhat larger amounts than it has been introduced with the nutrition – by 7.0 and 5.0 % respectively. At the same time, the animals of group 4 demonstrate sharp, almost threefold increase of "true" absorption of this radionuclide. It is possible that the decrease in absorption for animals of groups 2 and 3 is related to the normalization of microelement nutrition, which decreases the absorption of mineral elements by the principle of feedback. A contrary picture was registered for animals of group 4. This sharp increase in absorption may be explained by the biological role of cobalt, the level of which in the diet of the animals of this group was exceeding the norm by 70 %. It is known that one of the natural absorbents for ^{137}Cs is dietary fiber, forming rather a stable complex with the radionuclide. Cobalt is an ingredient of cyanocobalamine (vitamin B_{12}), which, in its turn, is a coenzyme of methylmalonyl CoA mutase. The latter is one of the key enzymes for fiber fermentation by the symbiotic microflora of the rumen. Therefore, the increase in cobalt content could stimulate the increase in cellulosolytic activity of microflora, which was the reason of the increase in ^{137}Cs bioavailability from the feedstuffs of the diet.

The share of each way of radionuclide removal was estimated for more detailed evaluation of the impact of microelements on metabolism of ^{137}Cs.

The addition of different doses of microelement salts to the diet of cows during the dry period has different impact on the removal of ^{137}Cs. The values for removal of ^{137}Cs with feces do not differ significantly for cows of groups 2 and 3 ($P > 0.05$), whereas the values for cows of group 4 are reliably lower ($P < 0.01$) (74.1 ± 2.9 %), *i. e.* the coefficient of "true" absorption is 25.9 against 5–10 in the first three groups. During this physiological period the removal of ^{137}Cs with urine is reliably higher for cows of groups 2–4 (11.5−13.8 %) compared to group 1, and in group 4 it is removed 1.7 times more intensively than in group 1 ($P > 0.05$).

Therefore, the deficiency of microelements in the diet of cows during the dry period promotes the accumulation of ^{137}Cs in their tissues. The addition of microelements (especially iodine) enhances the removal of ^{137}Cs due to the radionuclide, accumulated in tissues, and reduces the storage of radionuclide in the organism.

The increase in the cobalt content in the diet of dry cows with stable level of iodine and copper promotes insignificant increase in the removal of ^{137}Cs with urine and its considerable reduced removal with feces.

Metabolism of ^{137}Cs in the organism of cows during the lactation period. The lactation period of cows under study coincided with their going to the pasture. Therefore, during the exchange experiment the lactating cows (the end of the second month of lactation) were fed with pasture grass of natural fields, mowed herbage and compound feed with microelement additives. The radioactivity of the nutrition of animals during this period increased considerably (22–26-fold) and amounted to 17–22 kBq per day; at the same time high bioavailability of ^{137}Cs was revealed (Table 2).

The study results demonstrated that during this period the "true" absorption of ^{137}Cs in the gastrointestinal tract increases sharply and fluctuates in the range of 62.9–67.9 %. Intergroup differences are unreliable. However, the tendency is similar to that of the dry period: the least absorption (62.9 %) is noted for animals of group 2 and the highest absorption (67.9 %) – for cows of group 4.

During this period the removal of ^{137}Cs in terms of percentage was found to be less compared to the dry period, but the absolute amounts of removal via this

Table 1. The coefficient of "true" absorption of ^{137}Cs in cows during the dry period, % from the introduced amount

Index	Group of cows			
	1	2	3	4
Input with the diet, Bq/day	880.1 ± 0.9	892.6 ± 2	895.1 ± 5	887.7 ± 7
Removal from the organism, Bq/day	871.4 ± 0.3	955.3 ± 0.4	937.8 ± 0.2	785.5 ± 0.2
Including feces	90.1 ± 5.2	94.8 ± 4.1	92.3 ± 4.2	74.1 ± 2.9**
Including urine	8.0 ± 1.3	11.5 ± 0.5*	11.9 ± 1.1*	13.8 ± 2.0*

*Statistically reliable difference as regards group 1 ($P < 0.05$); ** $P < 0.01$.

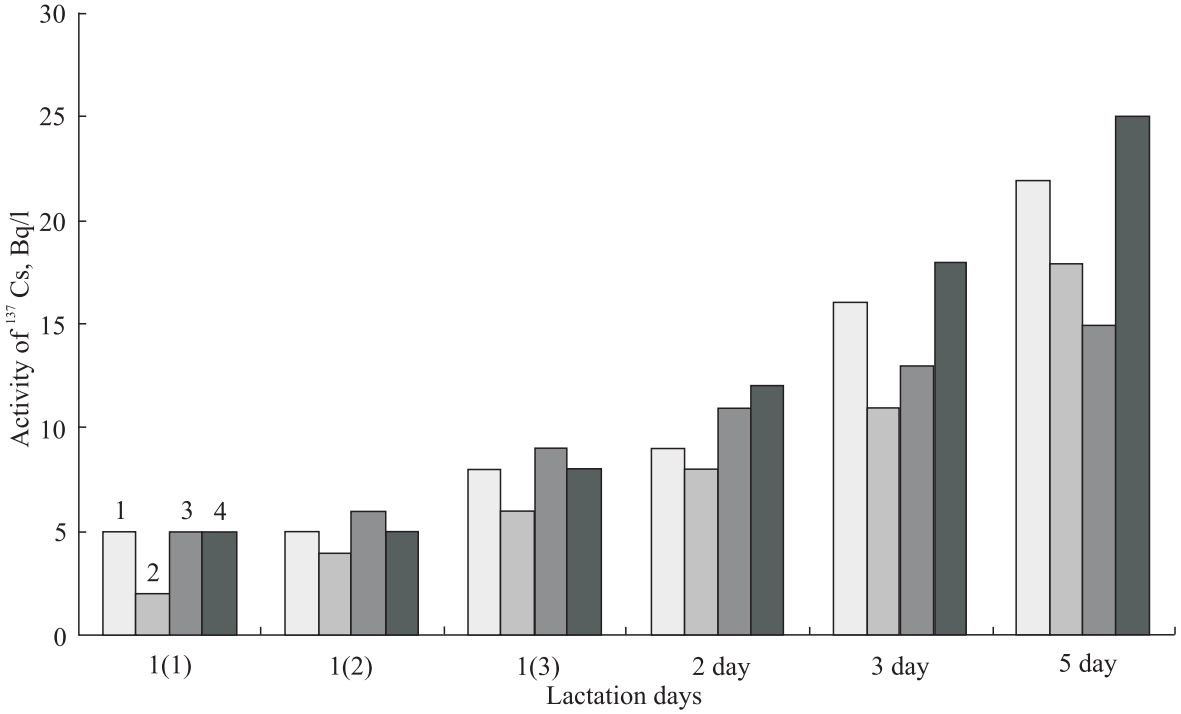

Fig. 1. The dynamics of ^{137}Cs in colostrum milk: 1 – group 1; 2 – group 2; 3 – group 3; 4 – group 4

route were almost an order higher. Here the differences between absolute amounts of ^{137}Cs, removed with the urine of cows under study compared to the control group, were statistically unreliable. This index for the animals of group 2 was reliably ($P < 0.05$) higher compared to group 1 and relatively higher as regards groups 3 and 4. 3–3.6 % ^{137}Cs out of the amount, introduced with the diet, were removed with milk per day. The highest index of ^{137}Cs removal with urine was noted for cows of group 4.

The introduction of the mentioned microelements into the diet of cows, deficient in the content of copper, iodine and cobalt, in the amounts, meeting their required needs, decreases the removal of ^{137}Cs with milk and increases its accumulation in the organism. The increase of the level of cobalt in the diet of cows above required amounts determines the reduction of its total removal from the organism and thus the increase of ^{137}Cs accumulation in tissues and its enhanced removal with milk.

The daily dynamics of ^{137}Cs removal with colostrum milk during the first 24 h after calving, milk yields I, II, and III, and on the 2nd, 3rd and 5th days was studied.

The data, presented in Figures 1 and 2, testify that both the concentration of ^{137}Cs in colostrum milk and the transfer coefficient on the first day after calving are very low; they increase gradually and reliably in the course of 5 days of lactation almost 2.5-fold. It may be explained by probable sharp decrease in the organic

Table 2. The coefficient of "true" absorption of ^{137}Cs in cows during the lactation period, % from the introduced amount

Index	Group of cows			
	1	2	3	4
Input with the diet, kBq/day	19.4 ± 1.4	17.5 ± 1.9	19.1 ± 1.6	22.1 ± 5.9
Removal from the organism, kBq/day	8.7 ± 0.2	8.4 ± 0.2	8.3 ± 0.3	8.9 ± 0.6
Including feces, %	35.5 ± 4.4	37.1 ± 6.2	34.5 ± 4.0	32.1 ± 0.9
With urine, %	6.1 ± 0.5	7.4 ± 0.2*	5.7 ± 0.2	4.5 ± 1.6
With milk, %	3.0 ± 0.3	3.4 ± 0.5	3.1 ± 0.4	3.6 ± 0.9

* Statistically reliable difference as regards group 1 ($P < 0.05$).

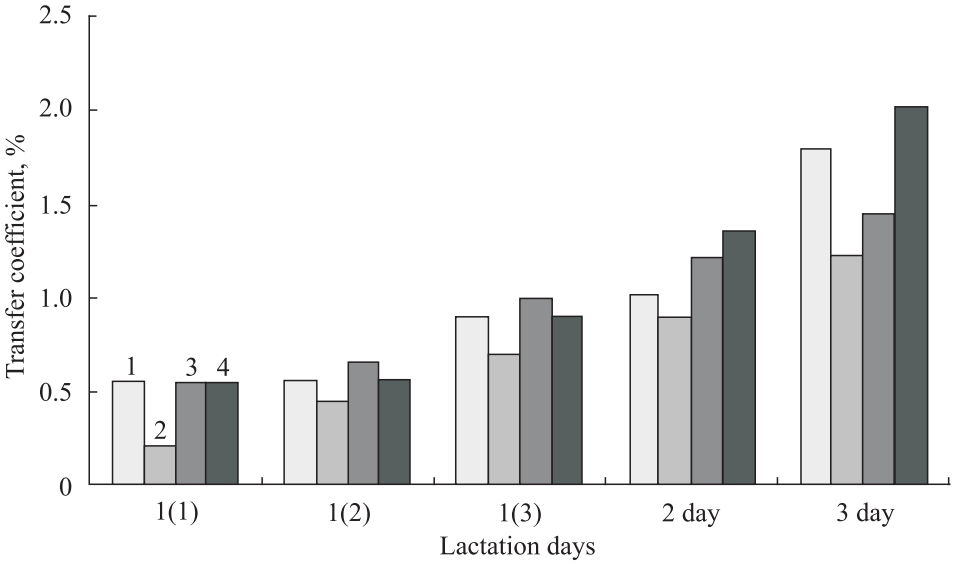

Fig. 2. The coefficients of transfer of ^{137}Cs into colostrum milk: 1 – group 1; 2 – group 2; 3 – group 3; 4 – group 4

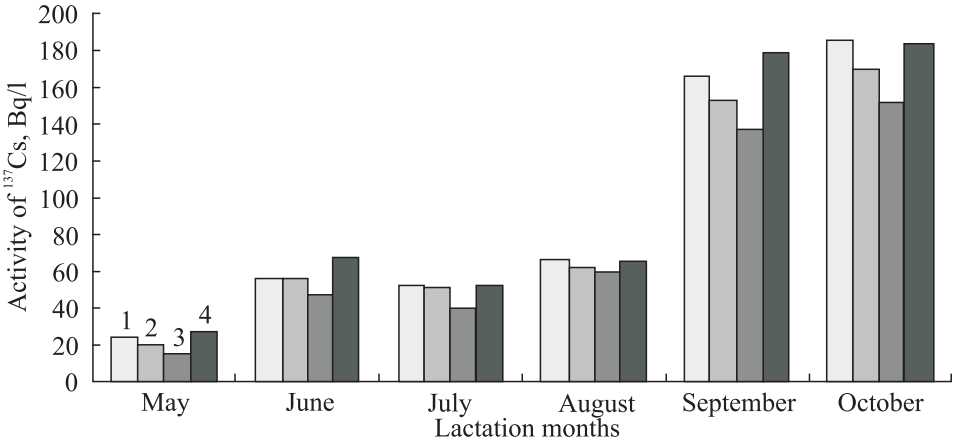

Fig. 3. Dynamics of ^{137}Cs in cow milk by lactation months: 1 – group 1; 2 – group 2; 3 – group 3; 4 – group 4

ingredient and the enhanced share of the aqueous phase in colostrum milk. No intergroup differences were revealed during two first days. The least specific radioactivity of colostrum milk was noted for cows of group 3. During the studies the level of ^{137}Cs increases almost by 100 %, whereas it increases by 400–500 % in colostrum milk of cows from groups 1 and 4. Therefore, the enhanced share of the aqueous phase results in the increase in the concentration of ^{137}Cs in the colostrum milk of cows.

Figures 3–5 present the dynamics of average daily milk yields, milk radioactivity and transfer coefficients for ^{137}Cs during lactation. These data testify to the fact that during 100 days of the lactation the milk radioactivity was relatively low (15–66 Bq/l). Intergroup differences are unreliable during this period for all the groups, except for group 3. Milk radioactivity for cows of group 3 was considerably lower compared to animals of groups 1, 2, and 4 ($P < 0.05$). By autumn (September) the concentration of ^{137}Cs in cow milk of all the groups increased sharply and exceeded 100 Bq/l. The comparison of the dynamics of specific radioactivity of ^{137}Cs in milk and its content in the diet of cows during the specified period demonstrates certain differences. For instance, if the fluctuations of radioactivity of ^{137}Cs in the diet of cows during the experiment are of sinusoid character, the radioactivity in cow milk increases linearly by the end of experimental period. These differences are explained by the decrease in milk productivity of cows in the final period of lactation, as it is known that the concentration of ^{137}Cs in milk is inversely related to milk yield [5, 7]. Different levels of copper, cobalt and iodine in the diet of cows have different impact on the content of ^{137}Cs in milk.

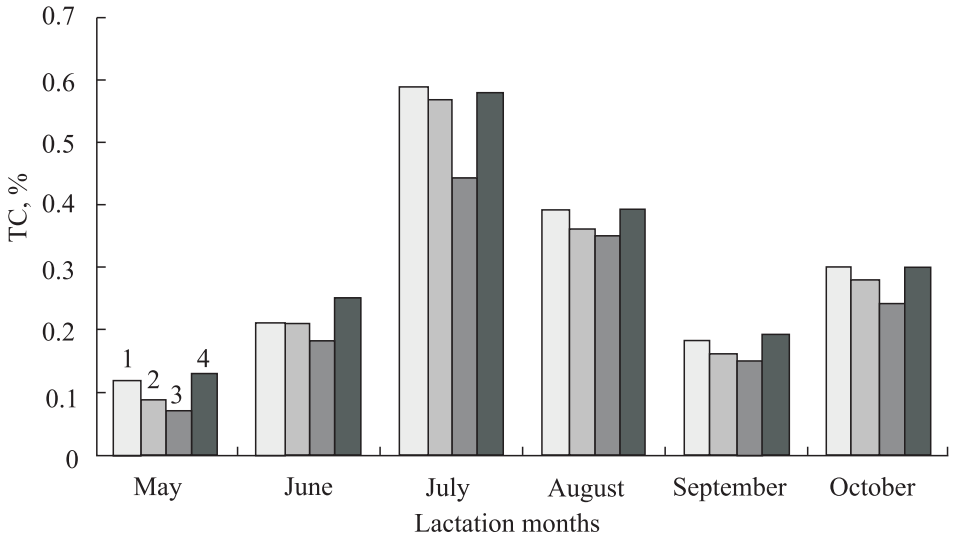

Fig. 4. Coefficients of transfer of ^{137}Cs into cow milk by lactation months: 1 – group 1; 2 – group 2; 3 – group 3; 4 – group 4

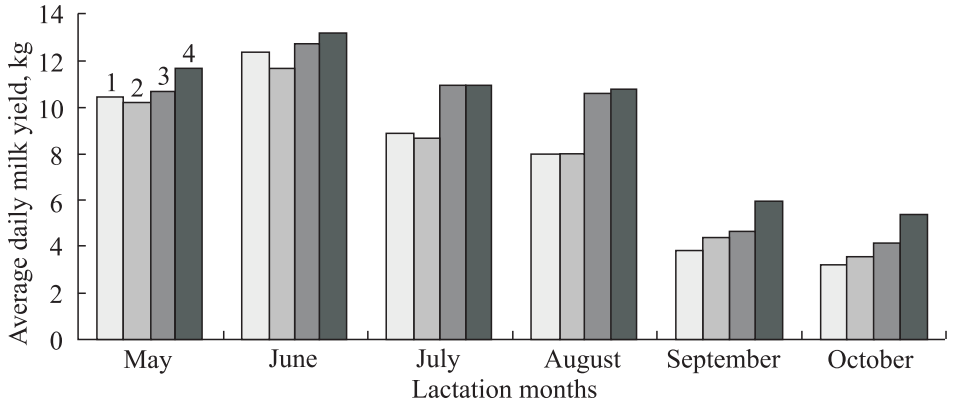

Fig. 5. Average daily milk yield of cows by lactation months: 1 – group 1; 2 – group 2; 3 – group 3; 4 – group 4

For instance, the difference for cows of group 2 does not exceed 10 % as regards the control (1st) group and is statistically unreliable. At the same time the concentration of ^{137}Cs in cow milk of group 3 was found to be 20–28 % lower as regards the control ($P < 0.05–0.01$). The difference in specific activity of ^{137}Cs in cow milk of group 4 compared to group 1 is insignificant at most stages of the studies.

It is known that the concentration of ^{137}Cs in milk depends both on its content in feedstuffs and on the level of milk productivity of cows. That is why the coefficient of transfer into milk (C_T) is used to estimate the degree of ^{137}Cs transfer into milk. It is mathematically defined as a share of radionuclide, removed from 1 l of milk (in per cent), from the amount, input with nutrition.

The results of our studies testify to the fluctuations in the degree of C_T for ^{137}Cs in milk during lactation (Fig. 4). Noteworthy is a contrary direction of changes in the dynamics of C_T ^{137}Cs in milk and the dynamics of its content in feedstuffs for the studied period. Thus, with low level of ^{137}Cs activity in the diet of animals at the end of July, the value of C_T for radionuclide in milk did not exceed 0.44–0.59 % and was the highest for the whole period of studies. With maximal pollution in September, the value of C_T for ^{137}Cs in milk was 0.15–0.20 %, *i. e.* it was close to the minimum. The lowest value for C_T was in June – 0.07–0.13 %.

The data presented testifies to the fact that the increase in the content of cobalt, copper and iodine in the diet of cows of groups 2 and 3 promotes the reduction in C_T of ^{137}Cs in milk. This reduction is statistically reliable for cows of group 3 compared to group 1 ($P < 0.05$). The increase in the level of cobalt concentration in the diet of group 4 cows leads to the increase in C_T of ^{137}Cs in milk on several stages of studies, due to which the value of C_T for animals of this group was higher compared to the control.

A considerably higher degree of radionuclide removal with cow milk on initial stages of lactation is noteworthy in the study of the quantitative aspect of ^{137}Cs removal with milk in the daily milk yield. The highest total removal of ^{137}Cs with milk takes place during the period of the highest lactation level (increasing the milk yield) – 4.1–6.6 % from the total amount of radionuclide, consumed with the feedstuffs, and the lowest – on the stage of lactation decline – 0.64–1.2 % from the total content of radionuclide in the feedstuff.

As the dynamics of total removal of ^{137}Cs with milk in the daily milk yield does not coincide with that of the content of radionuclide in the feedstuffs and the dynamics of C_T of ^{137}Cs in milk, the results obtained testify to the impact of endogenous factors on the depositing of radionuclide in the tissues of animals and its removal with milk. The reason may be found in the decreased rate of exchange between the blood circulatory system and the mammary gland of cows during lactation. It should be noted that the highest level of ^{137}Cs removal with milk in the daily yield is observed for cows of group 4 and the low level – for cows of group 2.

The differences revealed may be explained by the increase in the milk yield for cows of experimental groups, the diet of which was added different amounts of microelements; first of all, it concerns the cows of group 4, characterized by the highest level of milk productivity and also the highest C_T of ^{137}Cs in milk.

CONCLUSIONS

The vegetative feedstuffs of dairy cattle in Polissia provide the requirement of cobalt for 30–35 %, iodine – for 25–30 %, copper – for 70 % in winter, and during the grazing period in summer – for 25, 35, and 60 % respectively.

During the dry period the fortification of the diet of cows, deficient in microelements, influences the metabolism of radionuclides in the organism of animals. The excess of the level of copper and cobalt of 30 % above the requirements, and iodine – 70 % above them promotes the decrease of "true" absorption of ^{137}Cs and enhances the removal of ^{137}Cs from the organism due to the one, accumulated in the tissues, thus decreasing its accumulation in the organism.

The increase in the level of cobalt in the diet by 70 % with stable content of copper and iodine leads to the increase of "true" absorption of ^{137}Cs, insignificant increase in the removal with urine and decrease in the removal with feces.

During the lactation period the radioactivity of the diet increases 22–26-fold and "true" absorption of radiocesium in the gastrointestinal tract is sharply increased, the intergroup differences are unreliable and there is a tendency, remarkable for the dry period, – the least absorption is noted for the required consumption of microelements (group 2) and the highest – for the enhanced level of cobalt (group 4). The analysis of absorption coefficient during the dry period and lactation period testifies to the re-distribution of processes of absorption and removal of ^{137}Cs between urine and milk.

The concentration of ^{137}Cs in the colostrum milk of cows in the first 24 h is rather low and it is gradually reliably increased (in the course of 5 days) 2.5-fold. The least specific radioactivity of colostrum milk was noted for cows of group 3, who received the diet with 70 % more iodine compared to the requirements. The radioactivity of colostrum milk for animals of groups 1 and 4 increased 4–5-fold and was the highest.

Вплив мікроелементів міді, кобальту і йоду на обмін ^{137}Cs в організмі корів за різного фізіологічного стану

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Мета. Оцінити вплив добавок солей міді, кобальту і йоду до раціону сухостійних і дійних корів у різних дозах на всмоктування і виведення ^{137}Cs з організму. **Методи**. Досліди виконували на фермі в Народицькому районі Житомирської обл. за загальноприйнятими методиками. Для досліджень відібрано чотири групи корів − аналогів чорно-строкатої породи. Тварини отримували солі мікроелементів з концентрованими кормами. Питому радіоактивність кормів, калу, сечі, молока визначали методом гамма-спектрометрії на аналізаторі АМА-ОЗФ. **Результати.** У період сухостою вміст ^{137}Cs у раціонах корів дослідних груп був практично однаковим, а виведення його з організму тварин виявилося різним залежно від впливу мікроелементів на ступінь засвоєння радіонукліда. Зростання вище нормативів рівня міді і кобальту на 30 %, а йоду – на 70 % сприяє зменшенню «видимого» всмоктування цезію та підсилює виведення його з організму за рахунок радіонукліда, накопиченого у тканинах. Радіоактивність раціону тварин у період лактації суттєво збільшилася (у 22–26 разів) і становила 17–22 кБк за 1 добу, у той же час встановлено високу біологічну доступність радіонукліда. Зростання вмісту цезію-137 у раціонах корів у пасовищний період по-

в'язано з використанням забруднених угідь. Питома радіоактивність молока корів була найменшою у травні; незначне її збільшення (50–65 Бк/л) відмічено в червні, липні і серпні. Суттєво підвищилася радіоактивність молока корів у вересні та жовтні (150–184 Бк/л). Збагачення раціону тварин 3-ї дослідної групи міддю, кобальтом і йодом сприяло зниженню радіоактивності молока корів порівняно з молоком корів 1-ї контрольної групи, а також з молоком тварин 4-ї дослідної групи. У лактаційний період найменше всмоктування радіонукліда було за нормативного вживання усіх мікроелементів, а найбільше – за підвищеного споживання лише кобальту. **Висновки.** Рослинні корми у зоні Полісся забезпечують потреби молочного скота у зимовий період по кобальту на 30−35 %, йоду – на 25−30 %, міді – на 70 %, а літом у пасовищний період відповідно на 25, 35 и 60 %. Збагачення раціонів корів мікроелементами спричиняє зниження всмоктування ^{137}Cs у шлунково-кишковому тракті і зменшення його переходу в молоко корів.

Ключові слова: радіоактивне забруднення, мікроелементи, обмін ^{137}Cs в організмі корів, сухостійні і дійні корови.

Влияние микроэлементов меди, кобальта и йода на обмен ^{137}Cs в организме коров при разном физиологическом состоянии

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Цель. Оценить влияние добавок солей меди, кобальта и йода к рациону сухостойных и лактирующих коров в различных дозах на всасывание и выведение ^{137}Cs из организма. **Методы.** Опыты проводили на ферме в Народичском районе Житомирской обл. по общепринятым методикам. Для исследования отобраны четыре группы коров − аналогов черно-пестрой породы. Животные получали соли микроэлементов с концентрированными кормами. Удельную радиоактивность кормов, кала, мочи, молока определяли методом гамма-спектрометрии на анализаторе АМА-ОЗФ. **Результаты.** В период сухостоя содержание ^{137}Cs в рационах коров опытных групп было практически одинаковым, а выведение его из организма животных оказалось разным в зависимости от влияния микроэлементов на степень усвоения радионуклида. Увеличение выше нормативов уровня меди и кобальта на 30 %, а йода – на 70 % способствует уменьшению «видимого» всасывания цезия и усиливает выведение его из организма за счет радионуклида, накопленного в тканях. Радиоактивность рациона животных в период лактации существенно увеличилась (в 22–26 раз) и составила 17–22 кБк за 1 сут, в то же время установлена высокая биологическая доступность радионуклида. Возрастание содержания цезия-137 в рационах коров в пастбищный период связано с использованием загрязненных угодий. Удельная радиоактивность молока коров наименьшей была в мае; незначительное ее увеличение (50–65 Бк/л) отмечено в июне, июле и августе. Существенно повысилась радиоактивность молока коров в сентябре и октябре (150–184 Бк/л). Обогащение рациона животных 3-й опытной группы медью, кобальтом и йодом способствовало снижению радиоактивности молока коров в сравнении с молоком коров 1-й контрольной группы, а также с молоком животных 4-й опытной группы. В лактационный период наименьшее всасывание радионуклида было при нормативном потреблении всех микроэлементов, а наибольшее – при повышенном потреблении только кобальта. **Выводы.** Растительные корма в зоне Полесья обеспечивают потребность молочного скота в зимний период по кобальту на 30−35 %, йоду – на 25−30 %, меди – на 70 %, а летом в пастбищный период соответственно на 25, 35 и 60 %. Обогащение рационов коров микроэлементами способствует снижению всасывания ^{137}Cs в желудочно-кишечном тракте и уменьшению его перехода в молоко коров.

Ключевые слова: радиоактивное загрязнение, микроэлементы, обмен ^{137}Cs в организме коров, сухостойные и лактирующие коровы.

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