Studies on the contents of microelements in the meat produced in different regions in Bulgaria

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The quantitative changes of basic microelements in the muscles of animals originating from different regions in the country were determined. Clinically healthy pigs, calves and lambs that reached slaughter weight at a definite age were investigated. The basic microelements, cobalt, zinc and molybdenum, were determined spectrophotometrically, selenium, fluorimetrically, and the microelements iron, copper, lead, manganese and tin, by emission spectrographic analysis.
Recomendations are made for the registration and pasportization of the meat obtained by regions.

Untersuchungen über den Gehalt an Spurenelementen in aus verschiedenen Gebieten Bulgariens stammendem Fleisch

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Es wurden die Quantitätsschwankungen der Grundspurenelemente in der Muskulatur von Tieren, die aus verschiedenen Gebieten Bulgariens stammen, bestimmt. Dabei wurden klinisch gesunde Schweine, Kälber und Lämmer mit in einem bestimmten Alter erreichten Gewicht untersucht. Die Grundspurenelemente Kobalt, Zink und Molybdän wurden spektrophotometrisch, das Selen fluorometrisch und die Spurenelemente Eisen, Kupfer, Blei, Mangan, Zinn durch eine spektrographische Emissionsanalyse bestimmt.

Es werden Empfehlungen zur Klassifizierung des Fleisches in Kartotheken nach Gebieten zwecks Ausstellens von entsprechenden Zertifikaten gemacht.

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Etude sur la teneur en microéléments dans la viande provenant de différentes régions de la Bulgarie

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On a établi les fluctuations quantitatives des microéléments principaux dans la musculature d'animaux provenant de différentes régions de la Bulgarie. On a étudié des porcs, des veaux et des agneaux sains qui avaient atteint le poids d'abattage à un âge déterminé. Les microéléments principaux, le cobalt, le zinc et le molybdène, ont été étudiés par spectrophotométrie, le sélénium - par fluorimétrie, et le fer, le cuivre, le plomb, le manganèse et l'étain - par analyse spectrographique d'émission.
On fait des recommandations concernant le classement des viandes par régions dans le but de leur rédiger des certificats.

Исследования содержания микроэлементов в мясе, заготовленном в разных районах Болгарии

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Определены количественные колебания основных микроэлементов в мускулатуре животных, происходящих из разных районов страны. Исследованы клинически здоровые свиньи, телята и ягнята, достигшие убойного веса в определенном возрасте. Основные микроэлементы - кобальт, цинк и молибден, определены спектрофотометрически, селен - флуориметрически, а микроэлементы железо, медь, свинец, марганец, олово - эмиссионным спектрографическим анализом.

Сделаны рекомендации о картотекировании мяса, заготовленного по районам, с учетом его паспортизации.

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The problem for the correct and balanced nutrition of man, in which a basic part represents meat and the meat products is especialy interesting and actual today. This makes necessary to study the chemical composition of meat including the determination of a number of macro and race elements, vitamines, aminoacids and others.

In the present work are reflected the results of the studies of a wide specter of trace elements in meats obtained from different regions of the country. For the study are being analysed samples of the big hind muscle of clinicaly healthy and of slaughter liveweight animals, for pigs 96 kg, for beef 450 kg, for lambs of 2 months of age. The samples were taken in the district slaughter plants in North and South Bulgaria. The determination of the basic trace elements was made after the spectrophotometric methods, introduced in the analytical-chemical practice. Cobalt was determined after the method of Kovalskyi and Gololobov, 1969, Zink after the method of Baron 1954, Molybden after Tautzin, 1968. Selenium was determined after the method of Hall and Gupta,1969, fluorometricaly, with a modification of Nedkova,1976. For the determination of Manganese we used spectrographic emission analyses. The results were calculated by use of artificial standrad mixture, reflecting in quantity and quality the mineral content of the muscles, after Gribovskaya.

The obtained results were statisticaly processed and are axhibited on fig.1, 2, and 3.

The quantitative values obtained for the different trace elements, independent of the method they relate to are recalculated for dry substance. For the trace element Cobalt are made 1118 analyses of animals from 13 slaughter plants in the country. The results are presented on fig. 1 to 3 by type of animal.

The analysed muscles of pigs exhibit values from 20 to 76 μg%, while for the slaughter plants in South Bulgaria, the values are higher (Haskovo, Plovdiv,Jambol) and attein up to 75 μ g%, and in North Bulgaria the values are twice as low and go down to 40 μg% (fig.1). The analyses made for calves and lambs show that the absolute values for Cobalt in ruminants are comparatively higher : for North Bulgaria they are about 40 μg%, and for South Bulgaria they are above 80 μg%, especialy in lambs from the Haskovo plant (fig.2 and 3).These data must be related to the peculiarities of the pounch microflora for the ruminants, which microflora uses the anorganic Cobalt in the synthesis of vitamine B_{12}(cyancobalamyne).

The trace element Zink has been analysed in 756 animals. The data obtained for the variation of Zink contents in healthy animals from different regions, show that the variation is between 13 and 17 mg%, while for some regions it goes to 30 mg%. Low values were found in South Bulgaria (fig.1 and 2) as well as in some sperate regions around Rousse and Veliko Tirnovo, where often cases of para eratoses are found (Nachev, Gabrashanski 1956, Gabrashanski, Nedkova, 1972). The quantity of Zink in the feeds for the country in general (Aleksiev Krusteva,1970) of leached chernosem in the regions is lower than the general level of the country. The detailed studies of para eratoses in pigs from these regions, impelled the introduction of additional quantities of the element in the fields, and now the Zink level in the said regions is satisfactory (fig.1). The mean trace elements in tissues - liver, in which one might find parakeratoses in pigs,after the studies of(Nedkova,1976) is under 5 mg%, and in the muscles under 3 mg%. The data obtained in our studies are confirmed by results announced by a number of authors (Henning A.,1972, Kolb E.,Gurtler A.,1971, Under-

wood E.,1977, and others). In the comparison on fig.1,2,and 3 no type differences were established for this element in pigs,calves,and lambs.

In relation to the trace element Molybden, are studied 648 animals from the same slaughter plants in the country. The results are exhibited in the same order by type of animal. No type differences were established for the values of Molybden in the studied carcasses. The obtained data are very similar to the data of Tashev et al,1975, after the calculation for dry substance. In this order are the results presented by Hidiroglou M. et al,1972.

Higher than 0,05 m g% values for Molybden are obtained from some smaples in our southern regions for pigs as well as for calves.Lowest values - under 0,025 m g% are exhibited again in some southern regions in pigs and calves. Normal regulation of purine metabolism is established for animals by Kovalskyi ,1974 in the limits of 0,2 to 2,5 m g/kg Molyben in the feeds.Above and below this concentration could be expected some disturbances from excess or shortage from this element. It must be noted that inspite of the fact that the quantity of Molybden is higher in some of the samples tested,toxicoses from Molybden in the animals from this country to this moment are not encountered.

The increased Molybden containing fertilizers,no matter what effect it has on the plants of some species, has its negative impact on the organisms. The increase of Molybden in the environment (by fertilizers) leads to its increase in the animal organism and man. The stored surpluses might be neutralized by other trace metals - copper and its synergetics. This however,leads to disturbance in the processes of trace elements metabolism.

For the trace element Manganese are studied 341 animals from 10 slaughter plants. The obtained mean values in muscles of healthy animals are from 0,03 to 0,13 m g% for dry matter. The existing data in the literature for Managanese in muscles corelate with our results. The values obtained by Tashev et al,1975, are lower in comparison to those obtained by us, but they reflect fresh meat content.Near to our results, are the results obtained by Kolomyitzeva and Gabovich ,1970, Underwood,1971.

From fig.1 and 2 could be seen the fluctuations for the Manganese content in the studied regions of our country.High values for calves as well as for pigs are found in regions around Vratza and Plovdiv, i.e. above 0,1 m g%.Comparatively lower than these values under 0,025 m g% are established in most of the regions of the country.

Manganese in feeding plays a vital role. The daily income in the food comes up to 5 - 10 m g/kg. This value is adequate for ensuring the needs for this trace element. Having in mind the low cited values for Manganese in meat, it maight be expected that a ration rich of milk products,along with a low intake of fruits to prove defficient of this trace element.

The trace element Selenium is studied in 500 animals.The obtained results,presented in the figures do not exhibit any type differences in the studied animals. The rich experimental material show that the mean values are very near one to another without significant differences by type of animals.The results obtained by us are near to those of Morris V. and Lavander A.,1970 since they employ the same fluorescent technique for the analyses. Dye et al,1963 exhibit norms for Selenium on a dry substance bases in the same limits as obtained in this laboratory.

Lower from the mean norms values for Selenium are proved in the industrial calves and pigs complexes in some regions, where we find cases of muscle distrophie. These low values can serve as a directive for mass prophilactic measures with the scope regulating the Selenium levels as a factor F_3 denominating the ethyopathogenesis of myopathes. Higher values - above 0,25 mg% are established in some north regions of the country.

The quantitative fluctuations for Selenium by regions of the slaughter plant, show that

the deficiency in this trace element is not basic, i.e. the deficiency is not because of environmental reasons, but it is sooner conditional. For the development of deficiency conditions for a given trace element have an influence also other trace elements, its antagonists or synergetics. In this respect in muscle ditrophy are established positive correlative dependencies between the content of Selenium,Copper and Cobalt, and negative between the Selenium, Molybden and Zink (Nedkova,1976)

Conclusions

1.The studies on the contents of the basic trace elements Co,Zn,Mo,Mn,Se on a big number of animals throughout the country, make possible to denominate the normal-physiological levels of this index.

2.These indices can be used for pasportization of meats by regions, and this especialy for the meatpacking plants for export.

3.The given quantitative fluctuations add to the standards for the chemical composition of meat in respect to the analysed indices, for which to date in literature are found only scant data.

4.The results from the made analyses can be used for maping the regions with supluses or deficiencies in some trace elements, having a direct impact for the diagnosis of a number of animal sicknesses.

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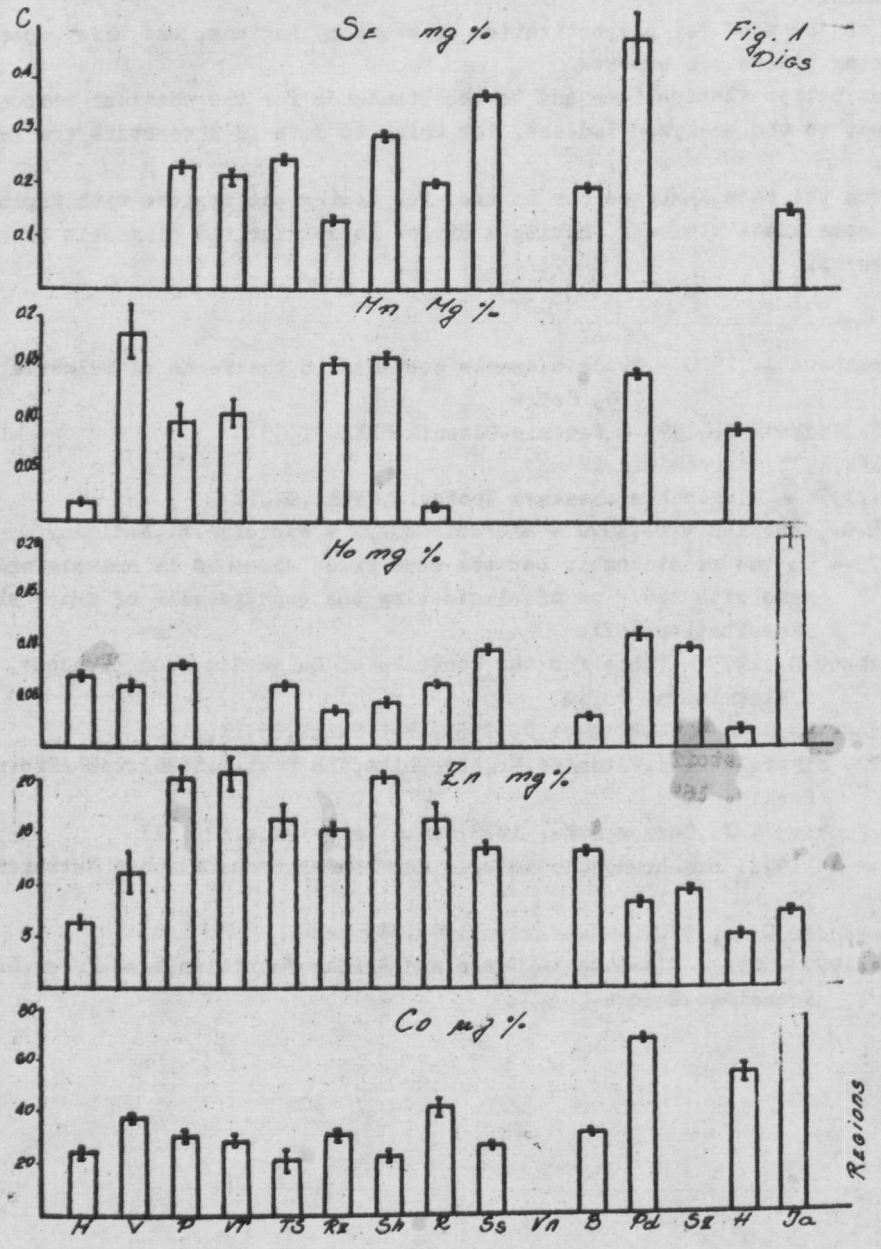

C
Se mg %
Fig. 1
Digs
0.4
0.3
0.2
0.1
Mn Mg %
0.2
0.15
0.10
0.05
Mo mg %
0.20
0.15
0.10
0.05
Zn mg %
20
15
10
5
Co µg %
80
60
40
20
Regions
H V P VP TB Rz Sh R Ss Vn B Pd Sz H Ja

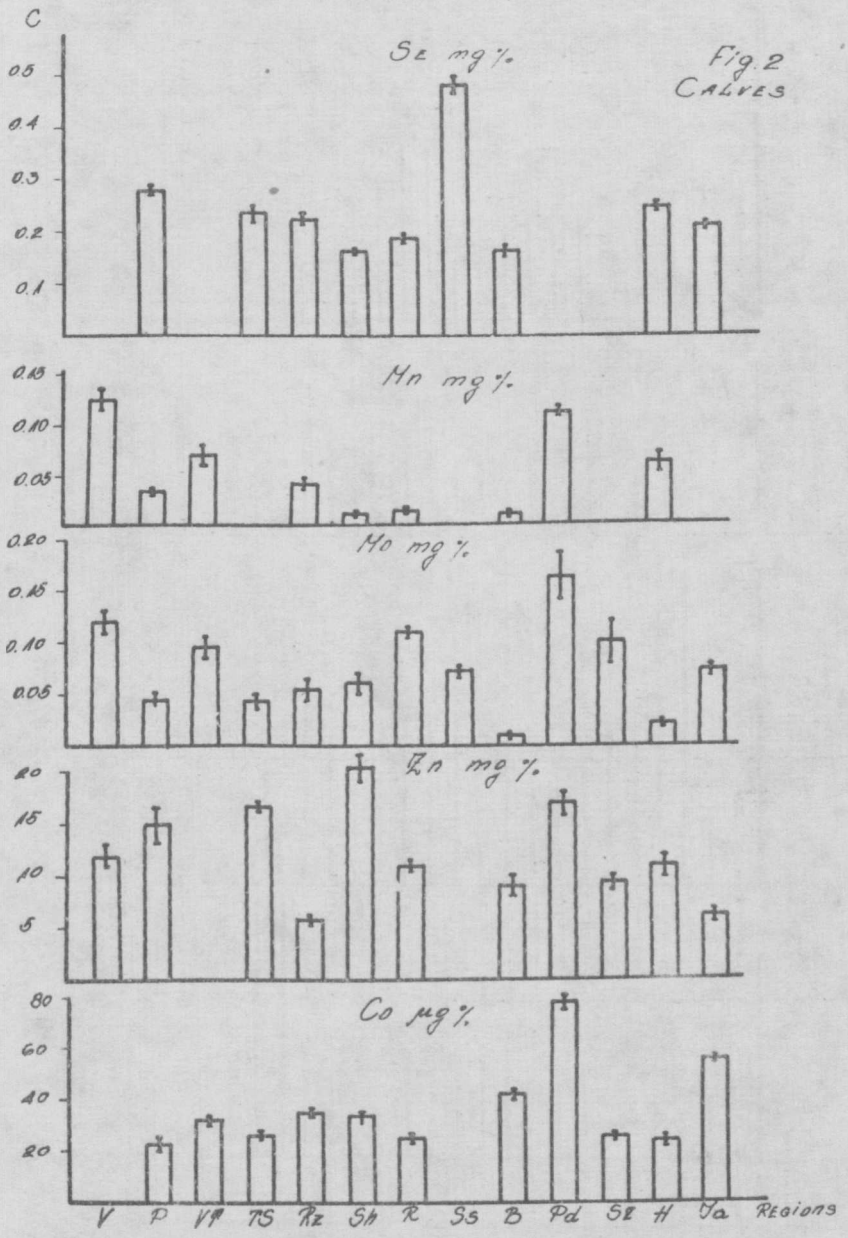
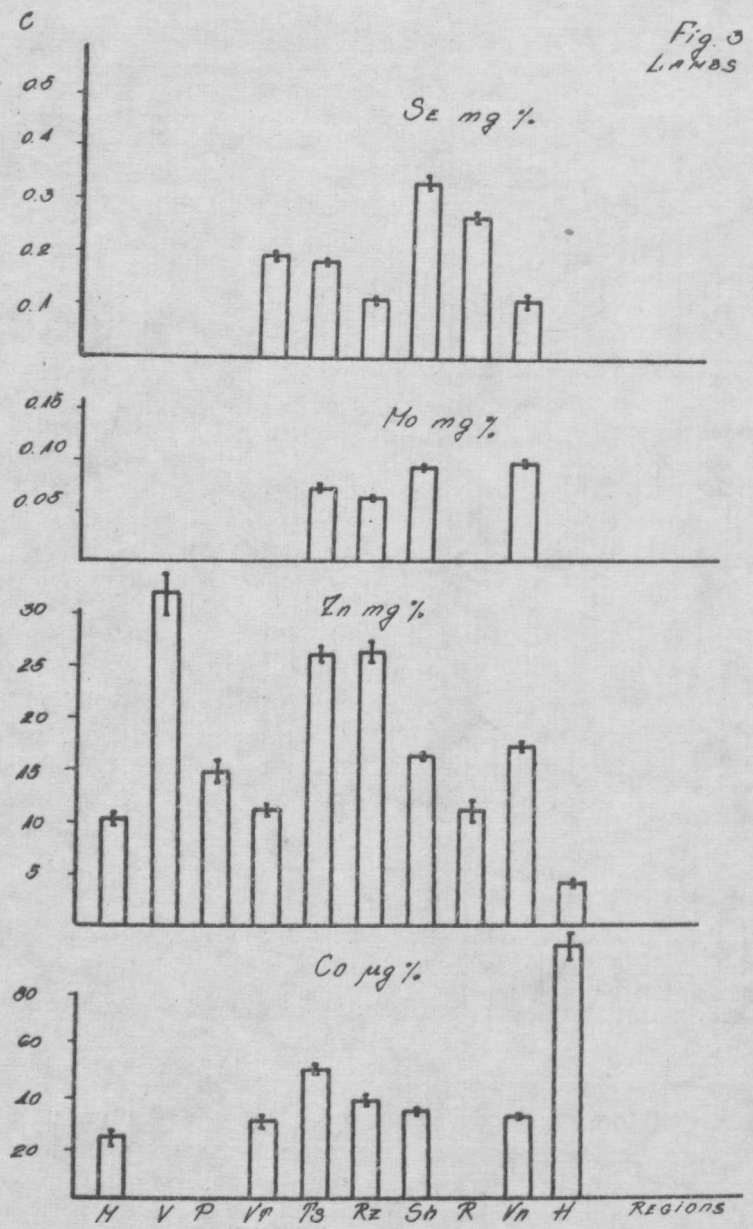

C
Se mg %.
0.5
0.4
0.3
0.2
0.1
Mn mg %.
0.15
0.10
0.05
Mo mg %.
0.20
0.15
0.10
0.05
Zn mg %.
20
15
10
5
Co µg %.
80
60
40
20
V
P
VP
TS
Rz
Sh
R
Ss
B
Pd
Sz
H
Ja
REGIONS

Fig. 2
CALVES


C
Fig. 3
Lambs
Se mg %.
0.5
0.4
0.3
0.2
0.1
Mo mg %.
0.15
0.10
0.05
Zn mg %.
30
25
20
15
10
5
Co µg %.
80
60
40
20
H V P Vg Pg Rz Sh R Vn H
REGIONS