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RAZLIKE U KONCENTRACIJI KORTIKOSTEROIDA I HORMONA ŠTITNE ŽLIJEZDE U KRVI S OBZIROM NA LIPOGENEZU KOD SVINJA

Lipogeneza kod domaćih životinja je najviše izražena kod svinja. Debljina kao fiziološka pojava varira prema pasmini i spolu. Individualne razlike postoje unutar pojedinih legla i unutar pasmine.

Itikava i sur. 1964. su studirali sposobnost deponiranja masti kod svinja, prilikom čega su našli da je hiperlipogeneza povezana s hiperfunkcijom Langerhans-ovih otočića u pankreasu zatim hiperfunkcijom kore nadbubrežne žlijezde i hipofunkcijom štitne žlijezde.

Popescu i Gurau 1964. kod masnih svinja su utvrdili hipofunkciju štitne žlijezde i hiperfunkciju kore nadbubrežne žlijezde. Kod mesnih svinja oni su primijetili neznatnu hipofunkciju štitne žlijezde, a u kori nadbubrežne žlijezde nisu našli nikakvih promjena koje bi ukazivale na hiperfunkciju.

Hausberger i sur. 1966. ukazuju na činjenicu da je endokrina disfunkcija povezana procesom debljanja.

Cilj ovoga našega istraživanja jeste ispitivanje funkcije endokrinih žlijezda u uzgoju svinja s različitim stupnjem lipogeneze.

METODA

Ispitivanje smo vršili na krmačama triju pasmina i to Landrace, Cornwall i Češka bijela svinja. Životinje smo podijelili u tri grupe od po 11 životinja.

U toku pokusa smo ispitivali brzinu rasta, iskorištavanje hrane i koncentracije proteinski vezanog joda PBI i joda topivog u butanolu (BEI).

Istraživali smo koncentraciju 17 hidrokortikosteroida i 17 ketosteroida pomoću metode Hochstadt-a 1960.

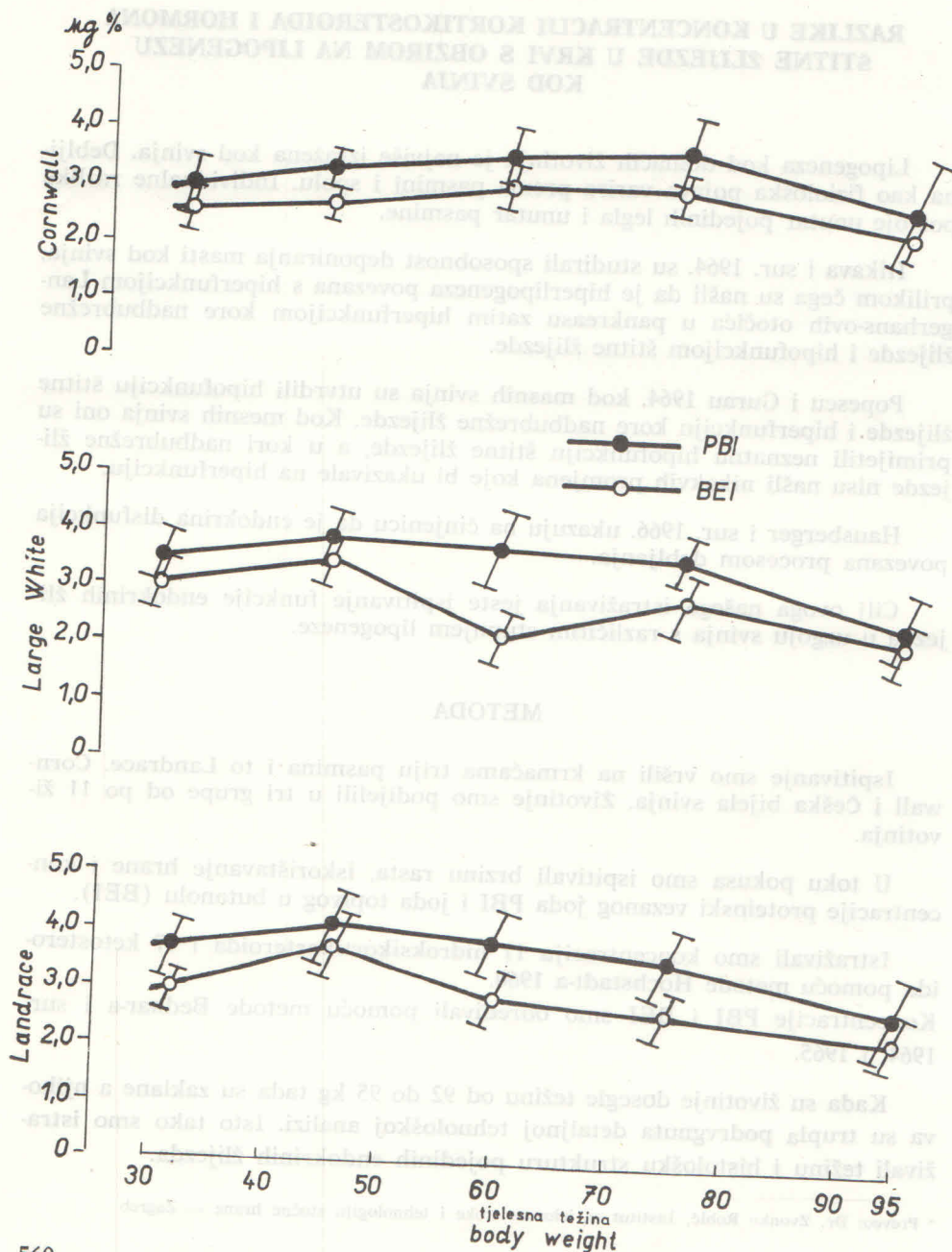
Koncentracije PBI i BEI smo određivali pomoću metode Bednar-a i sur. 1964. i 1965.

Kada su životinje dosegle težinu od 92 do 95 kg tada su zaklane a njihova su trupla podrvgnuta detaljnoj tehnološkoj analizi. Isto tako smo istraživali težinu i histološku strukturu pojedinih endokrinih žlijezda.

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Graf. 1—

KONCENTRACIJE PBI I BEI KOD RAZNIH PASMINA
 LEVELS OF PBI AND BEI
 ACCORDING TO BREEDS



REZULTATI

Koncentracije PBI i BEI kod raznih pasmina su prikazane u grafikonu br. 1

Na osnovu srednjih vrijednosti koncentracija PBI djelovanje štitne žlijezde se povećava sve do momenta kada životinja dosegne težinu od 50 kg. Kada su životinje dosegle težinu od 50 do 70 kg utvrdili smo opadanje koncentracije PBI. Koncentracija PBI kod Cornwall-a je iznosila 3,27 ug %, kod Češke bijele svinje 3,50 ug % i kod Landrace 3,57 ug %.

Koncentracija BEI (ekstrahirana u butanolu) iznosi 75 do 80% od koncentracije PBI, kod Češke bijele svinje (za razliku od ostalih) koncentracija BEI iznosi 59% u odnosu na koncentraciju PBI.

Ova niža koncentracija je vjerojatno povezana s prvim tjeranjem. Rezultate istraživanja 17-kortikosterioda smo prikazali u grafikonu br. 2

Najveću koncentraciju slobodnih i vezanih 17 -kortikosterioda smo našli kod Cornwall-a i to 3,51 ug % slobodnih i 1,87 ug % vezanih.

Kod Češke bijele svinje smo našli 2,58 ug % slobodnih i 1,87 ug % vezanih 17 — ketosterioda.

Najnižu količinu 17 — ketokortikosterioda smo našli kod Landrace-a i to slobodnih 2,35 ug % i vezanih 1,56 ug %. Koncentracije 17 — ketosterioda smo prikazali u grafikonu broj 3.

Iz grafikona je vidljivo da najveću količinu 17 — ketosterioda imade Landrace a najmanju Cornwall.

Utvrdili smo statistički opravdanu razliku ($P = 0,001$) između koncentracije 17 — ketosterioda kod svih triju pasmina.

Rezultate tehnoloških analiza kvaliteta polutke smo prikazali u grafikonu broj 4.

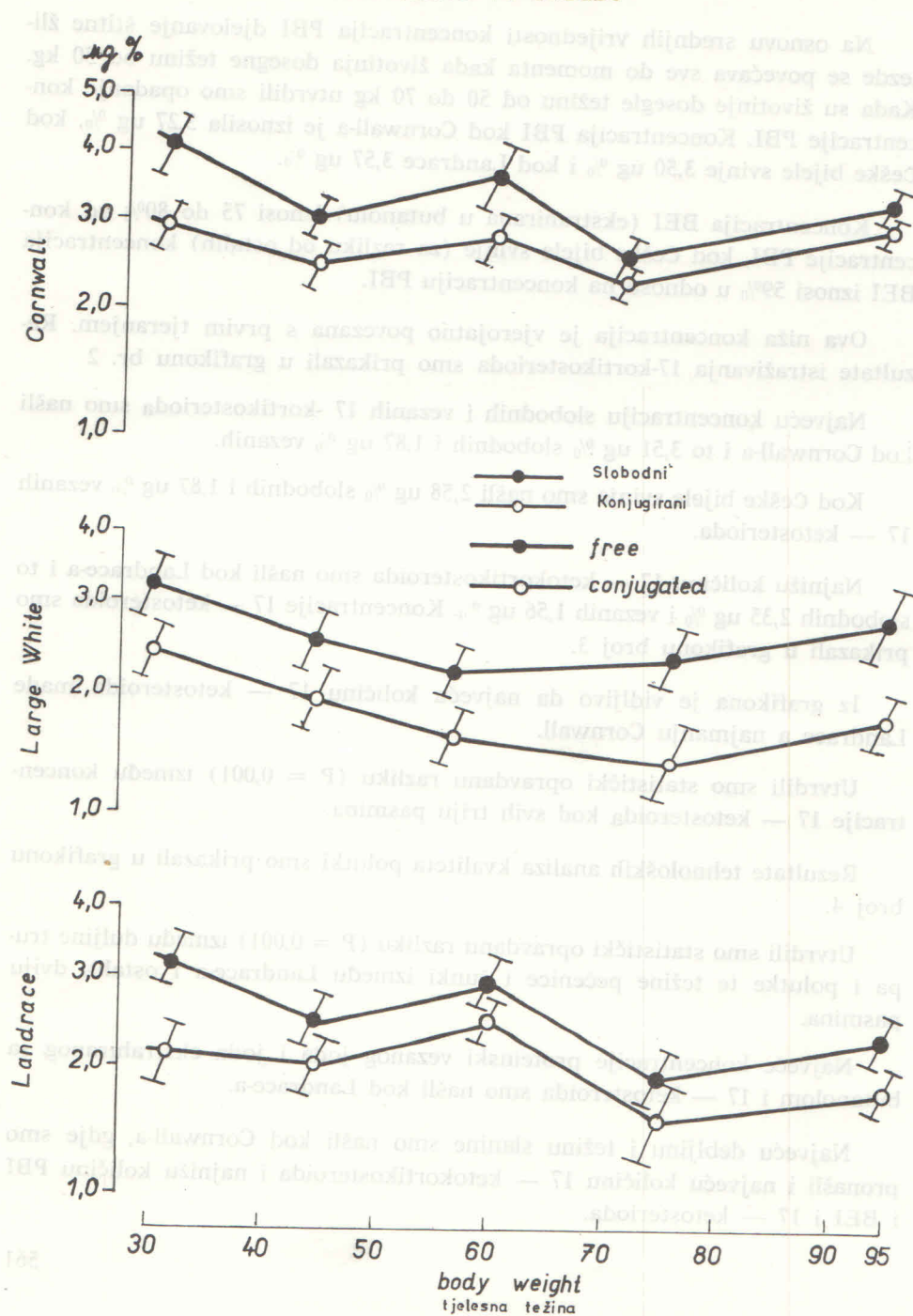
Utvrdili smo statistički opravdanu razliku ($P = 0,001$) između duljine trupa i polutke te težine pečenice i šunki između Landrace-a i ostalih dviju pasmina.

Najveće koncentracije proteinski vezanog joda i joda ekstrahiranog sa butanolom i 17 — ketosterioda smo našli kod Landrace-a.

Najveću debljinu i težinu slanine smo našli kod Cornwall-a, gdje smo pronašli i najveću količinu 17 — ketokortikosterioda i najnižu količinu PBI i BEI i 17 — ketosterioda.

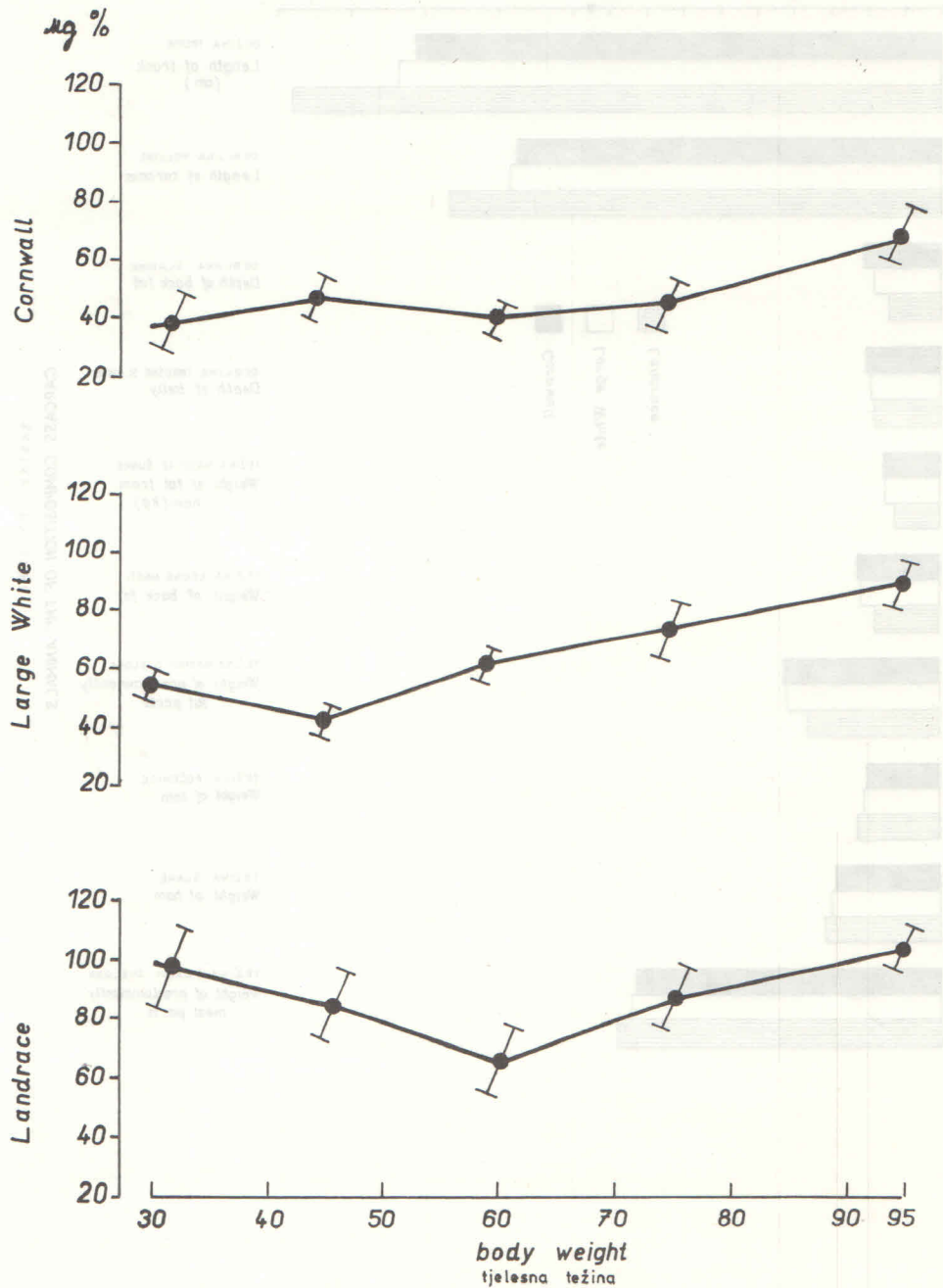
Graf 2—

KONCENTRACIJA 17 - HIDROKSIKORTIKOSTEROIDA KOD RAZNIH PASMINA
 LEVELS OF 17 - HYDROXYCORTICOSTEROIDS
 ACCORDING TO BREEDS

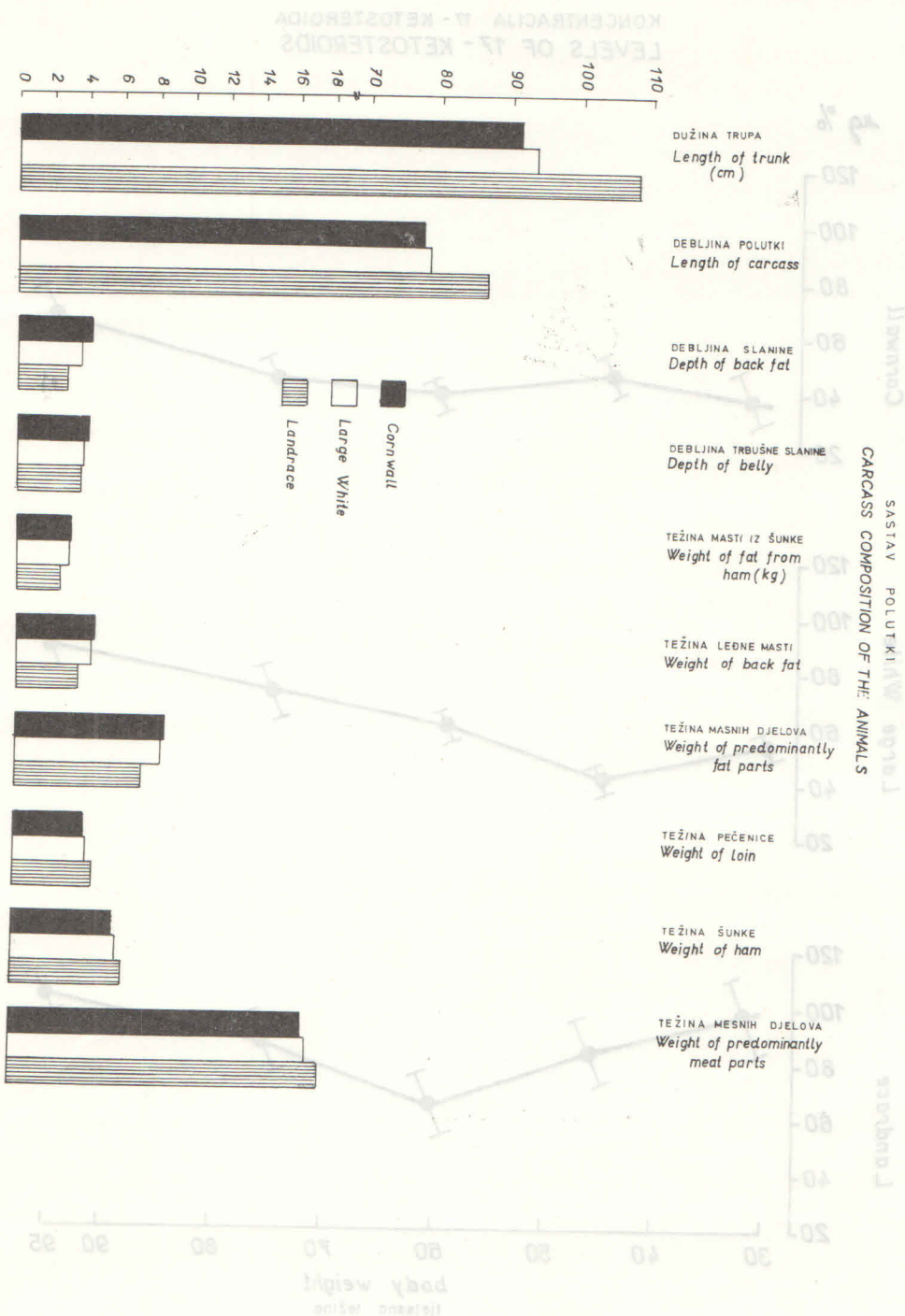


Graf. 3—

KONCENTRACIJA 17-KETOSTEROIDA
LEVELS OF 17-KETOSTEROIDS



Graf. 4—



DISKUSIJA

Djelovanje štitne žlijezde je bilo različito kod raznih pasmina svinja, koje smo podvrgnuli ispitivanju.

Tu istu pojavu su uočili Romack i sur. 1964. Utvrdili smo pozitivnu korelaciju između rasta i koncentracije PBI u plazmi što su sugerirali Ewy i Kolczak 1965.

Prosječnu koncentraciju kortikoida koju smo našli kod svinja u rastu podudara se s rezultatima Braun-a 1962. i Dvorak-a 1967.

Oprečnost ovisnosti štitne žlijezde i adrenalnih žlijezda svojim eksperimentima su nam prikazali Itikava i sur. 1964.

Naši rezultati nas upućuju da se obujam ovih razlika mijenja prema različitim pasminama svinja.

Williams i Clomset su proučavali odvojene utjecaje pojedinih hormona na formiranje masnih depoa kod ljudi.

Prilikom razmatranja uloge hormona štitne žlijezde i adrenalnih hormona za vrijeme rasta životinja ne smijemo zapostaviti niti ulogu estrogenih hormona i inzulina. U ovome našem eksperimentu nemoguće nam je bilo prikazati djelovanje estrogenih hormona i inzulina budući da nismo određivali njihove koncentracije. U toku prošlih godina potvrđeno je postojanje lipotropičnih hormona, koje su Ryska i Chochlov 1965. izolirali iz hipofize domaćih životinja. Djelovanje tih hormona na masno tkivo su proučavali Anselmino i Hoffmann 1966.

U ovoj radnji smo pokušali da izrazimo izvjesne endokrine uzroke koji su uvjetovali izvjesne razlike prilikom tehnološke analize kvaliteta polutki kod raznih pasmina svinja.

Dobivene funkcionalne vrijednosti su kompletirane težinom i histološkim studijem endokrinih žlijezda (Picha 1968).

ZAKLJUČAK

Signifikantne razlike u koncentraciji hormona štitne žlijezde su nađene kod krmača Cornwall-a i Landrace-a.

Iste razlike su nađene i u koncentraciji 17 — ketokortikosterioda. Koncentracije 17 — kortikoketosterioda diferiraju signifikantno kod svih triju pasmina Cornwall, Landrace i Češke bijele svinje u toku cijelog eksperimenta.

Razlike koje su nađene u području hormonalnog djelovanja vjerojatno su povezane s razlikama u strukturi polutki (što je determinirano pomoću detaljne tehnološke analize).

DIFFERENCES IN LEVELS OF BLOOD CORTICOSTEROIDS AND THYROID HORMONES IN RELATION TO LIPOGENESIS IN PIGS

Mrs. Drahomira Pichová, Mrs. Kyra Michalová, Mr. Josef Picha

Lipogenesis among farm animals is exceptionally highly developed in pigs. This physiological obesity varies with the breed and sex, individual differences being within strains and breeds. The ability of pigs to form deposits was studied by ITIKAWA et al. (1964, a, b). They found that hyperlipogenesis in pigs was accompanied by hyperfunction of the islets of Langerhans in the pancreas and of the adrenal cortex and by hypofunction of the thyroid. POPESCU and GURAU (1964) in a strain of pigs bred for fat found thyroid hypofunction and hyperfunction of the adrenal cortex. In a strain bred for meat they found slight thyroid hypofunction and no changes in the adrenals. HAUSBERGER et al. (1966) submitted evidence demonstrating endocrine disfunction associated with obesity.

The aim of our study was to investigate the function of certain endocrine glands in breeds of pigs with varying degrees of lipogenesis.

METHODS

The experimental animals were sows of the Landrace, Cornwall and Czech Large White breeds. Eleven of each breed were studied.

In the experimental animals we determined the rate of growth, fodder consumption and the blood hormone level. PBI and BEI were determined by the method of BEDNAR et al (1964), (1965) and free and bound 17-hydroxy-corticosteroids and 17-ketosteroids by the method of HOCHSTAEDT (1960).

Animals weighing 92 — 95 kilogrammes were killed and a detailed technological analysis was done. In the case of the endocrine glands, their weight and histological structure were determined.

RESULTS

From the mean PBI levels and their standard errors (Fig. 1) we can see that during the growth period up to 50 kg, thyroid function increased. From 70 — 90 kg we found a decrease in the PBI level, which reached values in the Cornwall breed and minimum values in the Landrace breed. The mean PBI levels were 3.27 mgrms % in Cornwall animals 3.5 mgrms % in Large White and 3.57 mgrms % in Landrace.

BEI accounts for 75 — 80 % of the PBI level, except for the values of 59 % found in Large White, which was probably associated with the first heat.

The 17-corticosteroids levels are presented in fig. 2. The maximum free 17-OHCs level (3.51 mgrms %), and the maximum conjugated 17-OHCs level

(2.99 mgrms) was found in the Cornwall breed. In Large White animals the free 17-OHCs level was 2.58 mgrms % and the bound 17-OHCs level 1.87 mgrms %. The lowest free 17-OHCs level (2.35 mgrms) % and the lowest bound 17-OHCs level (1.56 mgrms %) as found in Landrace animals.

The 17-ketosteroid levels gives fig. 3. It shows the maximum level was found in Landrace and the minimum in Cornwall animals. The difference was statistically significant ($P = 0.001$) between all three breeds throughout the whole of the experiment.

Some indicators of the technological analysis of carcass quality shows fig. 4. The length of the carcass and of the trunk, the weight of the loins and the hams were significantly higher in the Landrace breed than in the others two ($P = 0.001$). The highest PBI, BEI and 17-ketosteroid values were found in the Landrace breed.

The contrary dependence between the thyroid and adrenal glands was greatest in the Cornwall breed. In this breed we also found the highest 17-OHCs levels and the lowest PBI, BEI and 17-ketosteroid values.

DISCUSSION

The function of the thyroid according to breeds differed in all investigated age groups of pigs. This was observed also by ROMACK and al. (1964). A positive correlation was found between the growth rate and the plasma level of PBI similarly as EWY and KOLCZAK (1965) suggested.

The average levels of corticoids in the growing pigs agree with the results of BRAUN (1962) and DVORAK (1967).

The contrary dependence between the thyroid and adrenal glands was demonstrated by experiments of ITIKAWA and al. (1964 a, b). Our results suggest that the volume of this difference changes according to various breeds of pigs.

WILLIAMS and CLOMSET have studied separate influence of single hormones when forming fat deposits in human subjects. In addition to the hormones of thyroid and adrenal glands we must not forget to mention the main influence of oestrogens and insulin in the development of the obesity. It was impossible to demonstrate in our experiment the functional changes of these hormones, because the estimation of their levels has not yet been carried out.

In the course years the existence of the lipotropic hormone that RYŠKA and CHOCHLOV (1965) isolated from the hypophysis of farm animals was confirmed. Its influence on fat tissue was studied by ANSELMINO and HOFFMANN (1966).

In this paper we attempt to point out some of the many possible endocrine causes of the different results in technological analysis of carcass quality in various breeds of pigs. The obtained functional values were completed in weights and histological studies of the endocrine glands (PÍCHA and al. 1968).

SUMMARY

Significant differences in the thyroid hormone level were found in sows of the Cornwall and Landrace breeds. Similar differences were found in the 17-OHCs levels. The 17-KS level differed significantly in all three breeds, i. e. Cornwall, Landrace and Large White throughout the whole of the experiment.

The difference found in the size of hormone functions are probably related to differences in carcass structure, which we determined in a detailed technological analysis.

LITERATURE

- ANSELMINO, K. S. and HOFFMANN, F.: The metabolism hormone of the anterior pituitary (Lipotropin). German medical Monthly 11 (5), 1966 : 177.
- BEDNAR, J., ROHLING, S., VOHNOUT, S.: Príspevek k stanovení proteinového jodu v krevním séru. Českoslov. farm. 13, 1964 : 203.
- BEDNAR, J., BERGMANNOVA, E., RÖHLING, S.: Príspevek k stanovení jodu rozpustného v butanolu v krevním séru. Českoslov. farm. 14 (7), 1965 : 351 — 355.
- BRAUN, D.: Bestimmung der freien 17-Hydroxycorticosteroids im Plasma des Schweines vor und nach ACTH-Aplikation. Inaug. Dissertation, Hannover 1962.
- DVORAK, M.: Hladiny volných 17-hydroxykortikosteroidu v krevní plasmě prasat, vztah ke stáří selat. Veterinární medicína, 12 (1), 1967 : 43.
- EMY, Z., KOLCZAK, T.: Poziom jodu związanego z białkiem w osoczer krwi u swieni w okresie ich szrostuoraz w czasie laktacji u macior. Roczniki Nauk Rolniczych 85, 1966 : 492.
- HAUSBERGER, F. X. and HAUSBERGER, B. C.: Castration-induced obesity in mice. Acta Endocrinol. 53 (4), 1966 : 571 — 583.
- HOCHSTAEDT, P. B.: A method for the routine determination 17-hydroxycorticosteroids and 17-ketosteroids in plasma. Med. Experimentalis 2, 1960 : 14.
- ITIKAWA, O., ITIKAWA, A., HOSHINO, T. and GOTO, K.: Physio-histological studies on the physiological obesity in the meat pigs (report VII), especially on the increase of light cells in the intrafollicular and interfollicular parts and the occurrence of parafollicle of the swine thyroid. Tahoku J. Agric. Res 15 (4), 1964 : 319.
- ITIKAWA, O., HOSHINO, T., ISHIDA, K., TAMATE, H., YONEVA, S. and GOTO, K.: Physio-histological obesity of the meat pigs (report VI) especially on the mechanism of the pancreatic fat necrosis, fatty acid crystalization and fecal pancreas necrosis. Tohoku J. Agric. Res. 15, 1964 : 295.
- PÍCHA, J., PÍCHOVÁ, D., BURJANKOVÁ, J.: Príspevek ke studiu závislosti mezi histologickou skladbou štítné žlázy a užítkovým typem prasat. 1968, v tisku (in press).
- POPESCU, C., GURAU, L.: Certari histologice asupra glandelor tiroide si suprarenale la difereta rase du porci in legatura cu constitutia si aplitudinea pentru intragrare. Lucrarile stiint. Inst. cercetari zootehn. 21, 1964 : 347.
- RYSZKA, F. J., KHOKHLOV, A. S.: Purification and study of lipotropin from the pituitary gland of various animal species. Biochimija 30 (6), 1965 : 1277.
- WILLIAMS, R. H. and GLOMSET, I. A.: Lipid metabolism and Lipophobies. Textbook of Endocrinology, Philadelphia and London 1962.