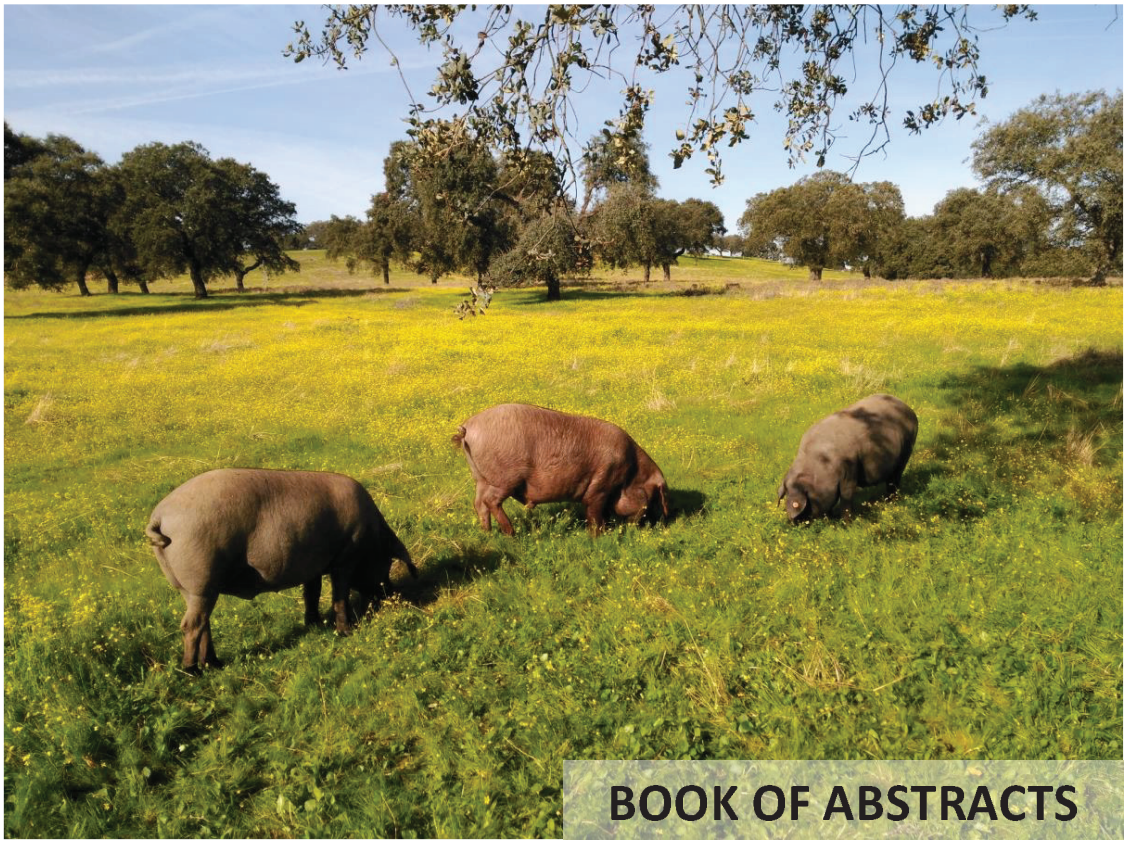
4th FATTY PIG

Science & Utilization International Conference

NOVEMBER 2017, Badajoz (SPAIN)



BOOK OF ABSTRACTS

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BOOK OF ABSTRACTS

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Cover photographs. Description and credits:

- Front cover: Iberian pigs during *montanera* in the *dehesa*. From left to right, Retinto, Torbiscal and Lampiño strains. Javier García Gudiño (CICYTEX; IRTA).
- Back cover: Blond Mangalitza piglet and sow. Francisco I. Hernández García (CICYTEX).

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GROWTH PERFORMANCE OF LOCAL PIG BREEDS – ANALYTICAL REVIEW IN THE PROJECT TREASURE (S1OC01)

M. Čandek-Potokar, N. Batorek Lukač, U. Tomažin, R. Nieto & TREASURE Consortium

To evaluate performance and growth potential of local pig breeds involved in H2020 project TREASURE (www.treasure.kis.si), data on average daily gain (ADG) was collected from the literature. Average growth rates reported for local pig breeds are generally lower than those of modern, selected breeds used in intensive farming. In the postnatal phase (lactation), ADG of local pig breeds is comparable with values of modern breeds (217±47 g/day); however it should be noted that lactation is longer (47.2±9.9 days) and birthweight lower (1.2±0.2 kg). The reported ADG in the growing phase (<30 kg) is somewhat lower compared to modern pigs (336±89 g/day), whereas fattening phases are characterised by considerably lower ADG (449-567 g/day depending on phase), but also by big heterogeneity (spanning from 85-1085 g/day), in line with different systems and feeding levels. Typically Iberíco and Alentejano pigs have smaller ADG in early than late fattening which corroborates with their typical production system, i.e. restricted (recría) in early and ad libitum feeding in late fattening (montanera). However, in other local pig breeds similar or higher ADG in early than late fattening has been observed, implying restricted feeding in the later phases. As shown for several local pig breeds, relatively high ADG can be attained (≈1000 g/day) but leading also to substantial fat deposition. As growth is directly related to energy and nutrient supply, data on average daily feed intake (ADFI) was analysed and showed that reported ADFI roughly matched the expected/theoretical values in growing and early fattening phase, whereas ADFI was lower than expected in the late fattening phases. With ad libitum feeding high ADFI could be observed (late fattening ≈6 kg/pig/day) denoting high intake capacity of these non-selected breeds, a trait which seems to be reduced in modern breeds selected for lean growth. The survey (over 200 references) revealed great variability in terms of the availability and quality of information. A big part of collected studies simulated practical conditions of the production systems used, and only a small part of them allows a rough estimation of growth potential (and consequently infer nutritional requirements) which is important for developing and

optimising the production systems for sustainable use of local pig breeds in agricultural production.

Key words: growth performance; pig; autochthonous breeds; review

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 634476 (Project acronym: TREASURE). The content of this paper reflects only the author's view and the European Union Agency is not responsible for any use that may be made of the information it contains.

USE OF RICE HUSK AS WELFARE FIBER DURING THE PREMONTANERA FEED-RESTRICTED PERIOD IN IBERIAN PIGS: EFFECTS ON GROWTH, BEHAVIOR AND BODY COMPOSITION (S1OC05)

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Due to their obesity-prone genotype, Iberian pigs must be feed-restricted during the pre-finishing period, which is named *premontanera* when preceding the acorn-feeding *montanera*. Supplementation with rice husk (an abundant and inexpensive byproduct) as welfare fiber before finishing may increase satiety sensation and decrease the hunger-derived stress and competition. These effects could reduce weight gain variability and might improve carcass uniformity and marketing conditions. The aim of this study was to evaluate rice husk supplementation during premontanera to increase animal welfare and reduce weight variability.

Castrate male Iberian pigs (n=45) were assigned to 3 treatment groups (n=15/group), which, during premontanera, from 10 to 14 months of age, were fed concentrate-based diets differing in fiber content, namely Control (C; 5.0 %), Medium Fiber (MF; 8.5 %) and High Fiber (HF; 12.0 %) groups. The MF and HF diets included rice husk (integrated into the concentrate) as a supplemental source of fiber. Daily rations were isocaloric and approximately isoproteic. During this period, pigs were housed in large outdoor corrals. Five pigs from each treatment were slaughtered at the end of premontanera, whereas the remaining animals were submitted to free-range acorn-feeding montanera and slaughtered at 16 months of age. Body weight (BW) and in vivo ultrasonographic body composition were monitored. During premontanera, behavior and welfare status (by using the Welfare Quality® protocol) were assessed, and a blood sample was collected at the end of this period to determine the neutrophil/lymphocyte ratio as a chronic stress index.

None of the groups had diarrheic problems, regardless the fiber level. In relation to behavior, the HF group showed the lowest activity, mainly after daily ration ingestion. Mean daily BW gain from the 12th to the 14th month of age was greater for the HF group, which also exhibited an apparently steadier (in time) and more homogeneous (among animals) growth rate. Moreover, the HF group had the thickest carcass backfat among the animals slaughtered before montanera and among all animals. In conclusion, supplementation with high levels of fiber (12%) from rice husk may be useful for increasing the welfare level of Iberian pigs during premontanera.

Keywords: Fatty pigs; welfare fiber; byproducts; free-range system

Acknowledgements: The research was conducted within the project TREASURE, which has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 634476. The content of this paper reflects only the author's view and the European Union Agency is not responsible for any use that may be made of the information it contains.

THE RIBATEJANO PIG: A CROSS BASED ON A FATTY PIG (S1P04)

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The Ribatejano (RI) pig productive performance, resulting from a cross between Alentejano (AL) and Bísaro (BI) breeds, was assessed within the framework of the TREASURE* project. Nine castrated male pigs from each genotype (AL, BI, ALxBI and BIxAL) were studied. Animals were raised in traditional free-range system, individually fed with commercial diets *ad libitum*, and slaughtered at ~150 kg live weight (LW). No significant (P>0.05) differences were observed between genotypes on the average daily gain. Overall, carcass length, and head and bone cuts percentages (P<0.001) were higher in BI than AL pigs, with intermediate values for both crosses. Carcass yield (P<0.01) was lower in BI and BIxAL, while commercial yield percentage (P<0.05) was lower in AL and ALxBI genotypes. Conversely, fat cuts percentage, average backfat thickness and ZP fat depth (P<0.001) were higher in AL than in BI, ALxBI and BIxAL pigs. At ~150 kg LW, RI crosses presented generally intermediate characteristics between the fatter (AL) and leaner (BI) genotypes. These trends were already observed in a previous work where these genotypes were slaughtered at ~65 kg LW (Martins *et al.* 2017). Therefore, this cross can be an alternative to the use of other breeds for crossing, and increase the income of local pig producers in a sustainable way, mitigate the exodus of rural population, and also preserve the pure breed pig populations, contributing to animal biodiversity.

Martins J.M., Neves J., Serrano A., Abecasis I., Albuquerque A., Freitas A., Nunes J.T. & Charneca R. (2017) The Ribatejano pig: Rebirth of a local population? First results on growth, and carcass parameters. Archivos de Zootecnia in press.

Key words: Local pig breeds, Productivity, Average daily gain, Carcass composition.

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DIVERSITY ACROSS MAJOR AND CANDIDATE GENES IN EUROPEAN LOCAL PIG BREEDS (S2OC01)

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In the frame of the European TREASURE* project, the genetic characterization of 20 local pig breeds is being performed with genetic and genomic tools. The objectives are the study of genetic diversity in these populations and the identification of useful markers for authentication, traceability, conservation and breeding programs. In first place, a candidate gene approach has been applied and the most relevant genes and mutations associated with pig productive, meat quality, reproductive and disease resistance traits have been prioritized and analyzed. Two OpenArray® chips of 32 and 16 SNPs were designed and genotyped in 48 animals from each one of 20 breeds included in the project (Alentejana, Apulo Calabrese, Basque, Bísaro, Black Majorcan, Black Sicilian, Black Slavonian, Casertana, Cinta Senese, Gascon, Iberian, Krskopolje, Lithuanian indigenous wattle, Mangalitsa, Mora Romagnola, Moravka, Old Lithuanian White, Sarda, Schwäbisch Hällisches, Turopolje). Forty SNPs located in 34 genes were successfully genotyped (MC1R, TYRP1, NR6A, PCK1, RYR1, IGF2, MC4R, PHKG1, SCD, GBP5, TAS2R39, TAS2R4, MUC4, ESR1, CYP2E1, LEP, CAST, MTTP, CYB5A, FTO, PPARGC1A, CAPN1, PPARD, CTSL, LEPR, PRKAG3, ACACA, KIT, ACSL4, ADIPOQ, FASN, AHR, FUT1, MSTN). Results provide relevant information

regarding genetic diversity and segregation of SNPs responsible for specific production and quality traits. Coat color and morphological trait-genes, showing low level of segregation, and fixed SNPs may be useful for traceability. On the other hand, we detected SNPs which may be useful for breeding programs. For instance, we observed predominance of unfavorable alleles for disease resistance and boar taint genes in most breeds, and segregation of many genes involved in meat quality, fatness and growth. These results joint with ongoing genomic assays, will provide essential information regarding genetic diversity, structure, selective signatures and biological processes responsible for specific production and quality traits.

Keywords: fatty pig, candidate gene, diversity, allele frequency

Acknowledgments: *This work was done in the scope of Treasure project. This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 634476 (Project acronym: TREASURE). The content of this paper reflects only the author's view and the European Union Agency is not responsible for any use that may be made of the information it contains.

EFFECT OF GENOTYPE AND SALT CONCENTRATION ON THE QUALITY OF PORTUGUESE TRADITIONAL *PAIOS* (S40C02)

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Nowadays, there is an increasing demand for traditional food products, which is concomitant with higher nutritional and health concerns. The need to reduce salt concentrations or replace NaCl by salt substitutes, such as KCl, has been evidenced by the World Health Organisation, who recommends daily salt intake values of 5 g, corresponding to less than 2 g of sodium. Alentejano (Al) and Bísaro (Bi) are two autochthonous Portuguese pig breeds, traditionally reared in extensive systems. Al is a fatty pig closely related to the Iberian pig, belonging to the group of the Mediterranean pigs, while Bi fits within the Celtic pigs. One of the most appreciated Portuguese traditional dry-cured meat products is *Paio*. For this study made in the frame of the European TREASURE* project, *Paios* were manufactured at a local production unit, using two different pig genotypes: pure breed Al and the hybrid genotype BiAl. Products were made with two different NaCl concentrations in the final product, namely 2 and 6%. The main aim of this work was to evaluate the differences in quality between the two genotypes, while attempting to reduce salt without compromising safety standards or consumer acceptability. The effect of genotype and salt content on physicochemical and microbiological parameters, along with sensory attributes, was studied on Portuguese *Paios*. Regarding total lipid content, there were significant differences between genotypes, with hybrid BiAl products showing higher values. Concerning pH and water activity (a_w), significant differences were observed between salt contents, with low-salt products showing lower pH, but higher a_w values. The total content in biogenic amines was higher in Al

products, mainly due to the amounts of putrescine and cadaverine, resultant from the presence of decarboxylating bacteria. Generally, low-salt *Paios* showed a higher content in biogenic amines. Furthermore, salt reduction did not depreciate the quality and acceptability of sausages.

Keywords: Low-salt; Alentejano pig; Bísaro pig; dry-cured meat products

Acknowledgments: * This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 634476 (Project acronym: TREASURE). The content of this paper reflects only the authors' view and the European Union Agency is not responsible for any use that may be made of the information it contains. This work was also funded national Funds through FCT-Fundação para a Ciência e a Tecnologia under Project UID/AGR/00115/2013. M. Laranjo acknowledges a Post-Doc research grant also from FCT (SFRH/BPD/108802/2015). The authors thank Paladares Alentejanos, Lda for their collaboration.

OLIVE CAKE-BASED GROWING DIET FOR MONTANERA IBERIAN PIGS: EFFECTS ON MEAT QUALITY TRAITS (S40C05)

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The traditional production system of Iberian pig includes a particular finish-fattening period called *montanera*. This semi-extensive system is based on *ad libitum* intake of grass and acorn, which has a positive effect on meat quality and favors animal wellbeing. However, the restricted diet supplied during the growing period to prevent a non-desirable fatness percentage in final pig products could cause feeding stress. The use of olive by-products during the growing phase diet of Iberian pigs could be the solution to avoid this stress, but it might have an influence on meat quality. Here, we studied the effect of three different dietary regimens given to Iberian pigs during the growing period (42 kg to 95 kg) on several meat quality traits. A control standard diet group (CD) was compared with two diets based on olive by-products, one incorporating dry olive pulp in the feed (DD) and the other one incorporating olive cake in wet form (WD). The last one consisted of olive cake in a silage presentation offered *ad libitum* and supplemented with a specific feed given once a day in a restricted regimen as the CD and DD diets. We performed meat quality analysis on several traits related with water-holding capacity (thaw loss, (TL); cook loss, (CL); and centrifuge force loss, (CFL)), tenderness (Warner-Bratzler shear force (Sf)), marbling (Vet) and color (CIELab coordinates for luminosity (L), redness (a), and yellowness (b); color indexes Hue (H) and Chroma (C); and myoglobin concentration, (Mb)). ANOVA was made in order to compare growing diets. We found significant differences in several measured traits. CFL was higher in CD than in WD, meaning that meat from pigs fed with standard diet may have lower water-holding capacity than with olive-based diets. According to color, DD samples were paler and less red-colored than CD and WD ones, and myoglobin concentration was also lower in DD. No differences were observed in visual marbling measures, nor in shear force. We conclude that *ad*

libitum supplementary silage should be a good choice to decrease stress due to pre-*montanera* restriction, but dry olive pulp-based diet may have a negative effect on meat quality, since color is important for the consumer.

Keywords: Iberian pig, olive by-products, growing period, meat quality

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NITRATES REPLACEMENT WITH NATURAL ANTIOXIDANT IN CINTA SENESE SEMI-RIPENED SALAMI (S4P04)

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In the last decades, concerns about meat and processed meat consumption raised due to their correlation with the onset of several diseases; till, in 2015, WHO classified processed meat products carcinogenic to humans, including them in Group 1. Indeed, in these products, the use of nitrites and nitrates promotes the formation of nitrosamines that are considered harmful compounds. To address the consumer's demand for healthier products, a solution has been identified in replacing nitrates and nitrites with natural antioxidants as food preservatives. So, 3 types of traditional fermented salami were manufactured and analyzed in this study. Group C (n=6) was made by adding 30 ppm of nitrates; group A (n=6) was made replacing the nitrates with a mixture of grape seed extract and olive pomace; group B (n=6) was made using a mixture of chestnut and olive pomace as nitrates replacement. Preliminary analysis on salami were carried out for fatty acids (FA) profile, lipid and cholesterol content. Moreover, a trained panel of 8 judges performed a quantitative-descriptive sensorial analysis. Results showed that, although the addition of an oleaginous element like the mixtures, no relevant modifications were observed in the total lipid content. Similarly, the FA profile of A, B and C was equivalent with the only exception of the arachidonic FA, which resulted significantly higher in A and B salami, likely due to the presence of the olive pomace. As no significant differences were found in FA profile as well as for SFA, also the cholesterol content resulted similar for all the treatments. Concerning the sensory analysis, among the attributes (oiliness, abnormal colors, texture, color uniformity, characteristic flavor, off flavor, salty, rancid, abnormal flavor, hardiness, juiciness), only for texture and color uniformity, judges assessed significant differences, being the former lower scored in A group respect to B; while for the latter, C sausages resulted in a better score than A and B ones. In conclusion, preliminary results showed that both the mixtures had not caused any significant change on lipid-correlated attributes of

salami, as well as no important sensorial attributes resulted to be affected by the replacement.

Keywords: Grape seed extract; chestnut extract; fat; fatty acid profile; cholesterol

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CONSUMERS ACCEPTABILITY OF INNOVATIVE PRODUCTS FROM MAJORCAN BLACK PIG ENRICHED WITH VEGETAL INGREDIENTS (S4P05)

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The Majorcan Black Pig (MBP) is an untapped breed from Mallorca Island, in the Mediterranean Sea. Due to its high degree of rusticity, it is suitable for extensive production systems. The aim of the study was to know the overall liking of consumers tasting different types of MBP patties to identify new market niches for this meat. To achieve this, bioactive compounds such as polyphenols and β-glucans were added to the patties, by including respectively blueberries (*Vaccinium corymbosum*) and mushrooms (*Boletus edulis*) in their composition. The study was carried out in Barcelona. A panel of 120 consumers was selected to test five types of MBP patties, three innovative treatments and two controls: MBP patties (A), MBP with porcini mushrooms (B), MBP with blueberries (C); beef and pork (D) and beef (E). The experimental design consisted of two tests: (1) Blind test: consumers tasted the five types of patties (overall liking on a scale of 1 (dislike extremely) to 9 (like extremely)). (2) Informed test: Consumers repeated the sensory test, but with information about the origin of the meat, production system and potential beneficial effects of the added healthy ingredients (improvement of the immune system in B and prevention of cardiovascular diseases in C). The results showed that there were no significant differences according to age and gender. The MBP patties had a significantly higher average acceptance than the rest (6. 60 in the Blind test and 7.06 in the informed test) with respect to its sensory attributes. Also, the information provided to the consumers had a positive effect of their level of acceptance in this product. However the type of patties with vegetal ingredients were scored significantly lower than the other types of patties, both in the Blind and Informed test. These results would indicate that consumers did not like so much the sensory characteristics of these patties (texture and flavor). In conclusion, there is a need to provide clear and understandable

information to the consumers about the differential characteristics of the products, ensuring sensory quality.

Keywords: Consumer acceptability, Majorcan Black Pig, healthy patties, polyphenols.

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EFFECT OF CASTRATION METHOD ON GROWTH RATE OF INDIGENOUS PIG BREED MANGALITSA SWALLOW BELLIE (S4P14)

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Extremely rich genetic funds of animals obtained by natural selection through the centuries are very important resources of Serbia. In Serbia, surgical castration of male animals in first week post partum is a usual practice to avoid boar taint. Considering that Mangalitsa sows are good mothers and most aggressively protect the piglets we tested the alternative to physical castration. The aim of this study was to examine the effect of method of castration (physical or immunocastration) on growth potential of indigenous pig breed Mangalitsa Swallow Bellied. Investigation included surgically castrated (SC; n=12) and immunocastrated (IC; n=11) male pigs, fed *ad libitum* a feed mixture with 12-13 MJ ME/kg; 13-15% crude protein (two-phase feeding). The experiment started at 24.4 weeks of age when average body weight (ABW) of SC pigs was 24.3 kg and of IC pigs 28.4 kg. Immunocastrates were vaccinated with Improvac® (Zoetis-Pfizer) at 39 (V1) and revacinated at 46 (V2) weeks of age (WA). Pigs were slaughtered 6 weeks after V2. Until V1 when IC are actually entire males, growth rate was slightly lower in IC than SC pigs (446 vs. 495 g/day, respectively). Established difference was statistically significant (P=0.03). In the period between V1 and V2 growth rate was alike in IC and SC (454 vs. 448 g/day, respectively; P=0.92). Overalluntil V2, there was no difference in ABW between IC and SC pigs (99.2 vs. 100.2, respectively; P=0.89). The maximal growth rate (689 vs. 683 g/d for SC and IC, respectively) was observed between 35 and 39 WA. In the period after V2 until the end of the fattening period growth rate was significantly higher (P=0.002) in IC than SC pigs (548 g vs. 392 g, respectively) in agreement with higher feed intake of IC than SC (3.2 vs. 2.7 kg/pig/day recorded on a pen basis). Present results on the indigenous Mangalitsa breed confirm what has been previously

demonstrated in modern breeds, i.e. that after the effective immunisation the pigs increase their feed intake and consequently growth rate.

Keywords: pig, surgically castrated, immunocastrated, fattening abilities

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FATTY ACIDS CONTENT OF *M. LONGISSIMUS DORSI* OF MORAVKA PIGS (S4P15)

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Fatty acids composition of *m. longissimus dorsi* (MLD) of Moravka pigs was analyzed considering also the effect of sex and body weight of pigs at slaughter. Pigs were reared in facilities with the open-aire section and fed a complete feed mixtures adapted to the stage of growth (from 20-60 kg mixture I: 15.50% of crude protein (CP) and 12.95 MJ metabolisable energy (ME)/kg,; from 60-120 kg mixture II: 13.00% CP and 13.05 MJ ME/kg). The study included 21 pigs (12 castrated males and 9 females). Pigs were slaughtered at 339±30 days of age and 112.8±19.9 kg of live weight. MLD of Moravka pigs had the following fatty acids composition: 41.8 % saturated fatty acids (ΣSFA), 54.0% monounsaturated fatty acids (ΣMUFA) and 4.1% polyunsaturated fatty acids (ΣPUFA) resulting in value 0.10 for the ratio of polyunsaturated to saturated fatty acids (P/S). Fatty acids C16:0 and C18:0 represented the largest share of ΣSFA (61.7 and 34.3 %, respectively), C18:1 and C16:1 the largest share of ΣMUFA (90.1 and 7.1%, respectively), and C18:2 the largest share of ΣPUFA (93.5%). With regard to sex effect, castrated males exhibited higher content of saturated fatty acids C14:0 (1.42 vs. 1.26, P=0.046) and C18:0 (15.07 vs. 13.38, P=0.025) than females. Significant effect (P<0.05) of body weight was observed on some fatty acids; thus 1 kg increase of slaughter weight was accompanied with 0.036% decrease of linoleic acid (C18:2n-6), 0.038% decrease of total content of polyunsaturated acids (ΣPUFA), 0.020% increase of palmitoleic acid (C16:1cis-9), 0.067% increase in total content of monounsaturated fatty acids (ΣMUFA), 0.003% increase of C17:0. Ratio P/S decreased by 0.001 unit per kg increase of slaughter weight. In agreement with their high relative content, a strong correlation (r_P=0.79 and r_P=0.77) was found between C16:0 and C18:0 and total content of saturated fatty acids (ΣSFA), between C16:1cis-9 and C18:1cis-9 and

ΣMUFA (r_P=0.80 and r_P=0.98, p<0.001), and between linoleic acid (C18:2n-6) and ΣPUFA (r_P=0.99, p<0.001).

Keywords: indigenous pig breed, sex, muscle tissue, fatty acids

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OPTIMIZATION OF A CRYOHISTOLOGICAL TECHNIQUE TO PERFORM MICRO-MORPHOMETRIC ANALYSES OF INTRAMUSCULAR FAT MARBLING IN THE IBERIAN PIG (S4P16)

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Intramuscular fat is positively associated to meat quality. Besides chemical analysis of intramuscular fat, microscopic image analysis might allow for a detailed assessment of intramuscular fat distribution and changes in adipocyte size and number. These features, which could be different for a given intramuscular fat percentage, could facilitate comparisons between growth stages, feeding systems and swine breeds, e.g., Iberian or other fatty pigs *vs.* commercial, fast-growing breeds. On the other hand, certain differences in microscopic marbling structure could account for important pork quality traits. The aim of this work is to adapt a cryohistological technique to perform microphotometric studies involving intramuscular fat deposition in pig muscle. For these purposes, a preliminary study involving Iberian pigs (*Retinto* strain, *Valdesequera* line) finished in "*montanera*" system has been carried out. Animals were previously fed with three diets differing in fibre content (control, moderate and high) during the pre-finishing stage (*pre-montanera*) and then were submitted to *montanera* (free-range acorn feeding system). Histological studies were performed in 1 cm samples excised from specific and consistent locations within a central stripe taken from the medial to the lateral surfaces of the *Longissimus dorsi* muscle at the level of the 10th intercostal space. These segments, obtained from frozen loin pieces, were fixed in paraformaldehyde and then cryoprotected in a sucrose and gelatin solution. Next, sections were embedded, and 30-µm thick cryosections were obtained and stained with Sudan III and Methylene blue. Microphotographs of the sections were analysed by using an image analysis software. Adipose tissue area and number and mean area of adipocytes within the muscle were quantified. The experimental outcome shows that this technique is feasible and prevents the formation of ice crystals. Therefore, it can be used instead of the classic paraffin-inclusion method, thus avoiding tissue dehydration. In addition, muscular and fat tissues were easily discriminated for morphometrical

measurements. Preliminary results suggest that the *premontanera* high-fiber regime resulted, after *montanera*, in smaller adipose tissue area and adipocyte number in comparison with the other two groups, although adipocyte size did not differ. Moreover, these results correlate with intramuscular fat quantified by chemical methods.

Keywords: adipocytes, *Longissimus dorsi* muscle, image analysis, meat histology

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NUTRITIONAL AND PHYSIOLOGICAL CHARACTERISTICS OF IBERIAN PIGS AS AN EXAMPLE OF FATTY PIG BREED (S6OC01)

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The precise knowledge of nutritional requirements allows the designing of balanced diets to optimize growth, development and body functions, minimize budget costs and reduce the environmental impact of pig production. As a fatty, non-selected, pig-type, the Iberian pig requires less dietary protein than conventional lean pigs during different productive phases, according to its lower muscle mass and protein deposition rates. This has been determined in dose-response experiments covering growing and fattening stages. In parallel to these studies, of mainly applied nature, comparative studies involving conventional pig breeds have been undertaken with the aim of explaining some of the metabolic peculiarities of this native porcine breed. With these purpose we will describe, among other examples, how this breed respond to essential amino acid deficiencies, and the possible consequences on growth, performance and meat quality. This later aspect shows in a way how protein and lipid metabolism can be linked and interrelated at the muscle level. We will deal with amino acid profiles of body protein, and how this approach can help to identify better definition of dietary amino acid profile for a fatty pig, with positive consequences in performance, welfare and environment. Last findings in the framework of the TREASURE project involving nutritional requirements in particular management situations, like immunocastrated pigs, or in productive phases not undertaken before, as lactating sows, will be also covered with the first results available.

Keywords: Iberian pig, protein nutrition, physiology, growth, muscle, fat deposition

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MOLECULAR BIOMARKERS AS PREDICTORS OF SENSORY AND TECHNOLOGICAL PORK QUALITY (S6OC02)

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Sensory and technological qualities of pork result from complex interactions between pig genotype, rearing conditions, and slaughtering and meat processing conditions. Despite improve knowledge on its underlying mechanisms, meat quality (MQ) still exhibits a high variability. Moreover, MQ is assessed by various indicators measured 24h up to few days post-mortem (p.m.) by using costly and/or invasive analyses. Early p.m. predictors of MQ could be used as decision-making tools in slaughterhouses to better allocate carcasses or cuts to the appropriate processes or markets. Recent developments in functional genomics enable high throughput screening of gene expression. Transcriptomics profiles of Longissimus muscle (LM) obtained by specific microarray (15K) were used to identify early p.m. biomarkers of MQ, i.e. genes whose expression level is associated to MQ traits. The experimental design included pigs from contrasted breeds (Basque, French local breed leading to high quality pork and Large White, n=50) produced in different systems, inducing a high and gradual variability in MQ. Numerous associations between LM gene expression level and MQ traits (pH, drip loss, colour, intramuscular fat, shear force, tenderness) were identified. On 40 of these genes, 113 transcript-trait associations were confirmed ($P<0.05$, $|r|\leq0.73$) by qRT-PCR, out of which 60 were validated ($P<0.05$, $|r|\leq0.68$) on complementary experimental data (n=50). Then, 19 of these biomarkers of MQ were externally validated on 100 commercial pigs ($P<0.05$, $|r|\leq0.49$). Thus, biomarkers of MQ were identified and validated, but their predictive value remained improvement before considering the development of control tools. Therefore another approach consisting in identifying biomarkers predicting overall pork quality level was developed. Using MQ data of 100 Basque or Large White pigs described above, scientific and statistical approaches were combined to select indicators and their thresholds to specify pork quality classes differing in sensory and technological dimensions: low (=defective; L), acceptable (A) and extra (E) quality. Gene expressions were used as predictive

variables in a generalized linear model to discriminate quality classes. The best model included expression levels of 12 genes (24% error rate after cross validation). External validation will be undertaken on LM samples from various local breeds collected within the Treasure1 project.

Keywords: meat quality, transcriptomics, biomarkers, pigs