

Effect of feeding maltodextrins and dextrose on rearing and slaughtering performance of immunocastrated male pigs

Volpelli, L.A.¹*; Della Casa, G.²; Minelli, G.¹; Comellini, M.¹; Macchioni, P.³; Faeti, V.²; Marchetto, G.² and Lo Fiego, D.P.¹

¹Dep. Scienze della Vita. University of Modena and Reggio Emilia. Italy.

²Consiglio per la Ricerca in Agricoltura e l'Analisi dell'Economia Agraria (CREA), Unità di Ricerca per la Suinicoltura. S. Cesario s/P. Modena. Italy.

³Dep. Scienze e Tecnologie Agro-Alimentari. University of Bologna. Italy.

SUMMARY

ADDITIONAL KEYWORDS

Immunocastration.
Feed intake.
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This study aimed to verify previous research findings showing that feeding maltodextrins (M) and dextrose (D) leads to a reduction of voluntary feed intake in the Italian heavy pig. This may be interesting for immunocastrated pigs fed *ad libitum* (*ad lib.*), whose feed intake skyrockets after the 2nd vaccination, causing too fatty carcasses at slaughtering. Thirty-six male pigs (Italian Duroc x Italian Large White crossbred) received a double immunocastrating injection at 90 and 162 days of age. At 120 days, weighing 51.84±4.38 kg, the subjects were evenly housed in 9 boxes, fed *ad lib.* till the 2nd injection and then given, until slaughtering (197 days of age; 144.51±9.70 kg), one of the experimental diets: control diet, *ad lib.* (CL); control diet, restricted at 7.5% I.w.^{0.75} (CR); with MD (3.5 + 3.5%; adjusted for energy and protein), *ad lib.* (MD). The CR diet was introduced as the alternative choice to avoid too fatty carcasses. Compared to the restricted ones, pigs fed *ad lib.* (with or without MD) showed statistically higher ($P<0.01$) ADG (1325 and 1325 vs 905 g/d), ADFI (4630 and 4637 vs 2760 g/d), feed:gain ratio (3.53 and 3.52 vs 3.11), and heavier carcasses (125.1 and 124.4 vs 113.2 kg; $P<0.01$) with lower lean meat content (52.21 and 52.09 vs 55.83 %; $P<0.01$). The results point out how immunocastrated pigs fed *ad lib.* showed similar rearing and slaughtering performance regardless of the inclusion of M and D in the diet.

Effetto della somministrazione di maltodestrine e destrosio con la dieta sulle prestazioni in vita e alla macellazione di suini maschi immunocastrati

SOMMARIO

I suini immunocastrati, se alimentati *ad lib.*, producono carcasse troppo grasse a causa dell'elevata assunzione di mangime: si è voluto verificare se maltodestrine (M) e destrosio (D) nella dieta ne riducono i consumi. Trentasei suini maschi (Duroc Italiano x Large White Italiano), uniformemente distribuiti in 9 box, trattati con doppia iniezione immuno-castrante a 90 e 162 giorni di età, sono stati alimentati dalla seconda iniezione (103,04 ± 6,47 kg p.v.) alla macellazione (197 giorni di età; 144,51 ± 9,70 kg), con una delle diete sperimentali: controllo, *ad lib.* (CL); controllo, razionata al 7,5% p.v.^{0.75} (CR); con MD (3,5 + 3,5%; bilanciata per energia e proteina), *ad lib.* (MD). La dieta CR è stata introdotta come alternativa per evitare carcasse troppo grasse. I gruppi CL e MD hanno mostrato IPG (1325 e 1325 vs 905 g/d), consumo alimentare (4630 e 4637 vs 2760 g/d) e ICA (3,53 e 3,52 vs 3,11) statisticamente più elevati ($P<0,01$), e carcasse più pesanti (125,1 e 124,4 vs 113,2 kg; $P<0,01$) con tenore di carne magra inferiore (52,21 e 52,09 vs 55,83%; $P<0,01$). I risultati sottolineano come i soggetti immunocastrati alimentati *ad lib.* abbiano mostrato prestazioni simili in allevamento e alla macellazione indipendentemente dall'inclusione di M e D nella dieta.

PAROLE CHIAVE AGGIUNTIVE

Immunocastrazione.
Consumo alimentare.
Accrescimento.
Caratteristiche della carcassa.

INFORMATION

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volpelli@unimore.it

INTRODUCTION

Castration of male pigs is commonly practiced when slaughtering weight and age are high, to avoid mature boars' aggressiveness and the development of boar taint, a

potentially off-putting odor in the meat (Stevenson, 2015). In 2009 the EU approved the use of a "castration vaccine" inducing a temporary block of testicular function. The technique involves two consecutive injections: the first one only primes the immune system, allowing the pigs to

Table I. Ingredients and chemical composition of the diets administered *ad libitum* (CL and MD) or restricted at 7.5% live weight^{0.75} (CR) to immunocastrated pigs from 162 to 197 days of age (Ingredienti e composizione chimica delle diete somministrate *ad libitum* (CL e MD) o razionate al 7,5% del peso vivo^{0.75} (CR) a suini immunocastrati da 162 a 197 giorni di età).

	CL and CR	MD
Ingredients (%)		
Corn meal	48.6	37.5
Barley meal	21.0	23.0
Beet pulp	6.0	6.0
Soybean meal, dehulled	13.5	14.5
Wheat bran	7.5	8.5
Dextrose	-	3.5
Maltodextrins	-	3.5
L-lysine	0.32	0.30
DL-methionine	0.05	0.06
L-threonine	0.06	0.06
L-tryptophan	0.04	0.04
Salts and vitamins	2.93	3.04
Chemical composition (as fed)		
Crude protein, % (*)	13.83	13.76
Crude fibre, % (*)	5.05	5.04
Crude fat, % (*)	2.50	2.13
Starch, % (**)	46.01	47.25
Digestible lysine, % (**)	0.80	0.80
Net energy, kJ/kg (**)	9.59	9.63

(*)Analysed (AOAC, 1995).
(**)Calculated according to Sauvant et al. (2004)

growth as intact males, which leads to better growing and feed efficiency; the second one actually depresses sexual functions (Mavromichalis, 2014). Immunocastrated pigs,

when fed *ad lib.*, show very high feed intake after the second vaccination, what causes excessive fat depots. On the other hand, *ad lib.* feeding maximizes weight gain. Previous research findings showed that the inclusion of maltodextrins and dextrose in the diet of Italian heavy pigs, thanks to the increase of glycaemia, leads to a reduction of voluntary feed intake when animals are fed *ad lib.* (Mordenti et al. 1983; Parisini et al. 1986). The aim of this research was to verify whether the inclusion of maltodextrins and dextrose in the diet reduces feed intake and carcass fatness in immunocastrated pigs fed *ad lib.* and slaughtered at about 140 kg live weight (l.w.).

MATERIAL AND METHODS

The research was carried out at CREA, in stables equipped with 9 m² concrete floored pens, 60 (*ad lib.* feeding) or 300 cm (restricted feeding) troughs, forced ventilation, daily cleaning, natural and artificial lighting, and temperature between 18°C and 25°C. Thirty-six male pigs (Italian Duroc x Italian Large White crossbred) were used. The subjects received a double immunocastrating injection at 90 and 162 days of age (Improvac, Zoetis, Belgium, S.A.). At 120 days, weighing 51.84±4.38 kg l.w., the pigs were evenly housed in nine pens and fed *ad lib.* until the second injection (103.04±6.47 kg l.w.) with the same dry farm concentrate. After the second injection and until slaughtering (197 days of age; 144.51±9.70 kg l.w.), the pigs were fed one of the experimental diets (three pens with 4 pigs per diet), administered dry: control diet, *ad lib.* (CL); control diet, restricted at 7.5% l.w.^{0.75}, fed 2 times/d (CR), introduced as the alternative to avoid too fatty carcasses; test diet, *ad lib.*, with M and D (3.5 + 3.5%; Roquette Italia S.p.A.) (MD). The composition of the experimental diets is shown in **Table I**. Fortnightly, pigs were individually weighed and the feed refusals of *ad lib.* fed pigs were measured; CR pigs consumed their meals thoroughly, in 30-40'. Data were evaluated by One Way ANOVA and Independent Samples T-test of IBM SPSSX

Table II. Effect of feeding regimen and dietary inclusion of maltodextrins and dextrose on live and at slaughter performance of immunocastrated pigs (Effetto del regime dietetico e dell'inclusione di maltodestrine e destrosio sulle prestazioni in vita e alla macellazione di suini immunocastrati).

Group	CL	CR	MD	
Diet	Control	Control	Maltodextrins +dextrose	Mean Squared Error
Feeding	<i>ad libitum</i>	restricted	<i>ad libitum</i>	
Pigs, n.	12	12	12	-
Days on trial, n.	35	35	35	-
Starting live weight, kg	102.9	103.7	102.5	44.11
Final live weight, kg	149.3 ^A	135.4 ^B	148.9 ^A	54.18
Average weight gain, g/d	1325 ^A	905 ^B	1325 ^A	16677.95
Daily feed intake, g/head	4630 ^A	2760 ^B	4637 ^A	18577.78
Feed:gain ratio	3.53 ^A	3.11 ^B	3.52 ^A	0.13
Warm carcass weight, kg	125.1 ^A	113.2 ^B	124.4 ^A	36.75
Dressing percentage	83.84	83.65	83.58	1.24

Within a row, means with different superscript differ significantly (P<0.01).

Table III. Effect of feeding regimen and dietary inclusion of maltodextrins and dextrose on carcass and thigh traits of immunocastrated pigs (Effetto del regime alimentare e dell'apporto dietetico di maltodestrine e destrosio sulle caratteristiche delle carcasse e delle cosce di suini immunocastrati).

Group	CL	CR	MD	
Diet	Control	Control	Maltodextrins +dextrose	Mean Squared Error
Feeding	<i>ad libitum</i>	restricted	<i>ad libitum</i>	
Pigs, n.	12	12	12	-
<i>L. dorsi</i> thickness, mm ⁽¹⁾	66 ^A	59 ^B	62 ^B	14.19
Backfat thickness, mm ⁽¹⁾	29 ^A	22 ^B	30 ^A	10.47
Lean meat (FOM), % ⁽²⁾	52.21 ^A	55.83 ^B	52.09 ^A	2.86
Thigh, %	25.35	25.84	25.33	0.60
Loin, %	16.46	16.82	15.97	1.29
Shoulder, %	14.80 ^a	15.37 ^b	14.83 ^a	0.25
Backfat, %	7.06 ^A	5.41 ^B	6.73 ^A	0.53
Lean cuts/fat cuts	2.69 ^A	3.07 ^B	2.65 ^A	0.05
Technological traits of thighs				
Chilling loss, %	1.12	1.14	1.17	0.01
Trimming loss, %	16.39 ^a	14.76 ^b	16.09 ^{ab}	2.68
Fat thickness at the head of the femur, mm	28 ^A	21 ^B	28 ^A	19.12

⁽¹⁾ Measured between the 3rd and the 4th last rib, at 8 cm from carcass splitting line.

⁽²⁾ Measured by Fat – O – Meater instrument.

Within a row, means with different superscript differ significantly (uppercase: P<0.01; lowercase: P<0.05).

Statistics, version 22. The experimental unit was the pen for feed intake, the individual for the other data.

RESULTS AND DISCUSSION

All the pigs remained healthy and feeds were readily consumed. Until the second injection, weight gain and feed consumption were very similar among groups (P>0.05; data not shown). As reported in **Table II**, daily feed intake was significantly lower (P<0.01) in CR pigs, which showed also lower daily weight gain (P<0.01) and feed:gain ratio (P<0.01). Carcass weights varied accordingly. No difference for these parameters was found between the two groups fed *ad lib.*, thus indicating that the feeding of M and D to finishing immunocastrated pigs affected neither feed intake nor the other traits examined. Eventually, the dressing percentage was very similar among the three groups. As a consequence of the different food intake, carcass and thigh traits (**Table III**) show a greater fat cover in pigs fed *ad lib.*: backfat thickness (measured between the 3rd and the 4th last rib, at 8 cm from carcass splitting line, and at the head of the femur) and backfat proportions were significantly higher (P<0.01), whilst lean meat and lean cuts/ fat cuts ratio were significantly lower (P<0.01), in CL and MD pigs.

CONCLUSIONS

Our results are inconsistent with previous findings suggesting that the inclusion of maltodextrins and dextrose in the diet could limit feed consumption in heavy pigs fed *ad lib.* In this trial, only the adoption of restricted feeding contained feed intake. Intermediate weight pigs fed *ad lib.*

performed the same way on farm and at slaughter, regardless of the dietary inclusion of M and D, highlighting a lack of interest in feeding these products. Further research is advocated to manage the feeding regimen of traditional Italian pigs submitted to immunocastration, and to fully exploit the productive potential of this technique.

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