WEIGHT OF PLACENTAL MEMBRANES IN SEVEN BREEDS OF SWINE AND ITS RELATIONSHIP WITH LITTER SIZE AND WEIGHT AT BIRTH

There is little information on the weight of placental membranes from different breeds of swine or its relationship with litter size and weight at birth. These data are available for other species and are helpful in understanding the causes of variation in litter weight at birth shown by different breeds and individuals. Barcroft (1944) suggested that in large litters, size of the fetus may be limited mainly by the size of placenta. Hafez (1963) reviewed the existing literature and showed that fetal growth may be retarded due to any limitation in placental growth caused by various maternal processes.

The data used in the present study were collected on 115 gilts farrowed in 1969 at an age ranging from 14 to 17 months. Fetal placentas delivered after normal parturition were collected within 24 hours, kept in sealed plastic bags and weighed 48 hours after farrowing. Litter weight and size at birth and farrowing weight of the gilts were recorded.

The average weights of placental membranes in the seven breeds, adjusted for litter size and weight, were obtained by the method of fitting constants (Harvey, 1960). Yorkshire and Berkshire gilts had the lightest placentas, and Duroc followed by Large Black and Lacombe had the heaviest (Table 1). The differences between the former breeds and Duroc were significant ($P < 0.05$). Yorkshire gilts farrowed the largest and Landrace the heaviest litters. Lacombe was among the highest breeds in the three traits. The rank correlations between placental weight and each of litter weight and litter size among the seven breeds were 0.46 and zero, respectively.

In order to study the association among the three traits independent of breed effect, the constants reported in Table 1 were used to adjust placental and litter weights to a common basis. The total placental and litter birth weights increased as the number of individuals in the litter increased (Table 2). The average placental weight per pig showed little change with increased litter size up to six

Table 1. Least squares constants for placental weight, litter birth weight and litter size

Classification	No.	Placental wt. kg		Litter birth wt. kg		Litter size	
		Constant	±SE	Constant	±SE	Constant	±SE
General mean	115	2.25	0.07	12.47	0.31	8.78	0.27
Breed							
Duroc	19	0.19 *a*	0.10	−0.50	0.36	0.32	0.57
Large Black	5	0.14 *ab*	0.13	0.23	0.45	−0.58	0.80
Lacombe	19	0.08 *ab*	0.10	0.86	0.36	0.43	0.57
Landrace	20	−0.02 *ab*	0.10	1.50	0.35	−0.28	0.56
Hampshire	19	−0.09 *ab*	0.10	−0.14	0.36	−0.94	0.57
Yorkshire	19	−0.14 *b*	0.10	−1.32	0.37	1.32	0.57
Berkshire	14	−0.17 *b*	0.10	−0.64	0.40	−0.28	0.64
Partial regression							
Litter size		−0.014	0.03	0.95	0.06		
Litter weight		0.18	0.02				

a,b Constants followed by the same letters do not differ significantly ($P > 0.05$).

Table 2. Total and average placental weight and litter birth weight in litters of different sizes

Litter size	No. of litters	Placental weight in kg			Litter birth weight in kg			Litter wt/ placental wt
		Litter total		Av. per pig	Litter total		Av. pig weight	
		Mean	SD		Mean	SD		
2	2	0.63	0.13	0.31	3.79	0.80	1.90	6.02
3	3	0.92	0.26	0.31	4.57	1.72	1.52	4.97
4	2	1.46	0.21	0.36	7.01	0.35	1.75	4.80
5	3	1.55	0.11	0.31	8.38	0.52	1.68	5.41
6	5	1.80	0.23	0.30	9.52	1.11	1.59	5.27
7	16	2.09	0.35	0.30	11.34	0.93	1.62	5.43
8	15	2.23	0.54	0.28	12.30	1.37	1.54	5.52
9	22	2.39	0.67	0.26	12.73	1.52	1.41	5.33
10	18	2.53	0.54	0.25	14.00	1.78	1.40	5.53
11	14	2.34	0.50	0.21	13.92	1.92	1.26	5.95
12	6	2.80	0.33	0.23	15.63	1.95	1.30	5.58
13	5	2.73	0.87	0.21	15.57	2.59	1.20	5.70
14	1	2.19			16.74		1.20	
15	3	3.12	0.36	0.21	17.28	2.08	1.15	5.54

piglets (based on relatively few litters), but decreased markedly with further increase in size. Mean fetal weight per unit of placental weight was almost constant in litters with different sizes. This agrees with Barcroft's (1944) suggestion that in large litters, size of the fetus may be limited mainly by the size of the placenta.

The relations between litter birth weight and placental weight for litters of different sizes (2–5, 6–8, 9–11, 12–15) were linear except for litters of 9–11 piglets, where it was quadratic.

The correlation coefficients between the three traits studied were positive and highly significant (Fig. 1). The partial correlation coefficients showed that litter size was 1.4 times more important in determining litter weight at birth than placental weight. A nonsignificant relationship was found between litter size and placental weight, holding litter weight constant.

The following conclusions were obtained from the study.

(1) With two exceptions there were no significant differences in placental weight among the seven breeds.

(2) Mean placental weight per pig and mean fetal weight tended to decrease with increased litter size.

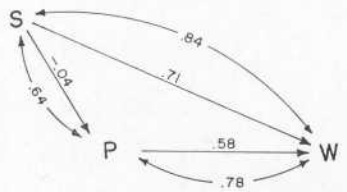

Fig. 1. Correlation diagram to illustrate the relationship between litter size (S), placental weight (P), and litter birth weight (W). The straight lines represent partial correlation coefficients and the curved lines represent simple correlation coefficients.

(3) The ratio of litter weight to placental weight in litters of different sizes was nearly constant.

(4) Litter size was 1.4 times more important than placental weight in determining litter weight at birth.

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