Pig Housing and the Environment
Occasional Publication No. 11—British Society of Animal Production 1987
edited by A. T. Smith and T. L. J. Lawrence

VOLUNTARY WATER USE BY GROWING PIGS OFFERED LIQUID FOODS OF DIFFERING WATER-TO-MEAL RATIOS

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INTRODUCTION

The benefits of improved food conversion and live-weight gain by wet feeding of growing pigs have recently increased the popularity of pipe-line liquid feeding systems. In addition, liquid feeding systems offer greater flexibility over dry feeding as they allow novel and cheap ingredients to be incorporated into the wet mix. However, the use of liquid feeding systems has often led to the assumption that the entire water needs of wet-fed pigs are satisfied by water consumed in the liquid diet. It is therefore common for liquid-fed pigs to have no separate source of drinking water. Although the Codes of Recommendations for the Welfare of Livestock, Pigs (1983) recognizes the importance of a free water supply, it makes this recommendation optional if at least 2·5 l of water are added to each kg of meal. This experiment was conducted to investigate whether these recommendations satisfy the physiological water needs and safeguard the welfare of liquid-fed pigs.

MATERIAL AND METHODS

Thirty-two Large White × (Landrace × Large White) entire male and female growing pigs were allocated to four pens of an experimental testing house according to initial weight 14·6 (± 0·25) kg and balanced for sex. A commercial meal (Table 1) was mixed with water to produce four liquid food treatments comprising water-to-meal ratios of 2:1, 2·5:1, 3:1 and 3·5:1 volume for weight respectively. The treatments were randomly allocated to each pen group of eight pigs and were systematically rotated across the pens at 3-weekly intervals according to a 4 × 4 balanced Latin-square design. The pigs were individually fed the liquid ration to a scale which provided 700 g meal per kg $M^{0.75}$ per week. The calculated weekly meal allowance was divided into 13 equal feeds, such that pigs were fed twice daily at 09.00 and 16.00 h except Sundays when only the 16.00 h feed was given. A voluntary water supply was available *ad libitum* to each pen group from a single wall-mounted Arato 80 bite drinker located in the dunging passage. Water was supplied to each drinker from a water metering device. Pigs were individually weighed weekly and voluntary water intake readings were taken daily at 16.00 h.

RESULTS

Voluntary water intake, food intake and performance data are presented in Table 2. Voluntary water was drunk on all water-to-meal treatment ratios. Increasing the water content of the liquid food significantly ($P < 0·005$) decreased the amount of voluntary water. As the decrease in voluntary water intake was not directly proportional to the water content of the liquid food, total water intake (voluntary water intake plus water intake from liquid food) and the total water-to-meal intake ratio increased significantly ($P < 0·005$) with increasing water content of the liquid food. Average daily voluntary water intake expressed as a per-

TABLE 1
Composition and calculated nutrient specification of meal mixture (g/kg)

Ingredient		Nutrient specification	
Wheat	585		
Soya-bean meal	190	Dry matter	850
Skim milk	75	Crude Protein	200
Wheatfeed	70	Crude Fibre	35
Fat pre-mix	25	Oil	31
Meat and bone	25	Available lysine	10·5
Fish meal (herring)	12·5	Methionine and cystine	6·7
Mineral/vitamin supplement	19		
Salt	0·6		

centage of total daily volumetric intake (liquite food intake plus voluntary water intake) increased markedly with each treatment when pigs were fed only once daily on Sundays. Live-weight gain and food conversion ratio improved significantly ($P < 0{\cdot}005$) as the water content of the liquid food increased.

DISCUSSION

This study showed that liquid-fed pigs will readily utilize a voluntary water supply even when the water-to-meal ratio of the liquid food exceeded 2·5:1, which is the current recommendation of the Codes of Welfare. The additional voluntary water taken with liquid food consumed at a water-to-meal ratio of 2:1 resulted in a final ratio approaching 3:1. The Nutrient Requirements of Pigs (ARC, 1981) which states that the water requirements of growing pigs can be met with a water-to-food ratio of 2:1 have therefore proved to be totally inadequate. An increase in voluntary water intake (as a proportion of total volumetric intake) when pigs were fed once daily only, supports the findings of Yang, Howard and MacFarlane, (1981) who showed that increased water intake could serve as a temporary substitute for food when food intake is insufficient to satisfy the animal's hunger. Pigs offered free access to water show considerable individual variation in daily water consumption (Garner and Sanders, 1973; Holmes and Robinson, 1965; Barber, Braude and Mitchell, 1964). When both food and water are freely available, pigs can adjust their water and food intake which allows them to express their individual needs for both dry matter and fluid. Computer-assisted liquid feeding systems which deny access to a free water supply, limit the water intake of pigs to discrete feeding times and therefore restrict the expression of normal drinking behaviour. A voluntary water source may be of even greater significance when novel ingredients such as whey, which contain a high content of osmotic salts, are used in the liquid mix.

Improvements in pig performance resulting from increasing the water content of the liquid food found in

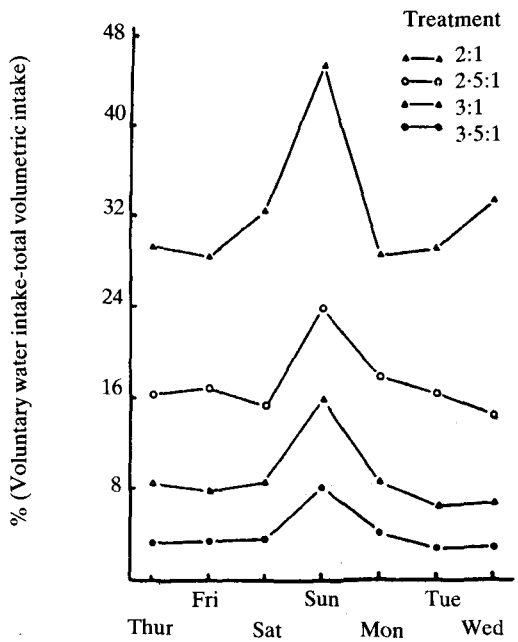

FIG. 1. Voluntary water intake as a percentage of total volumetric intake.

TABLE 2

Voluntary water intake and performance of growing pigs offered liquid foods of four different water-to-meal ratios

Water-to-meal treatment ratio	Voluntary water intake (kg per pig per day)		Total water (kg per pig per day)		Meal intake (kg per pig per day)		Live weight gain (kg per pig per day)		Food conversion ratio		Total water intake-to-meal intake ratio	
	Mean	s.e.	Mean	s.e.	Mean	s.e.	Mean	s.e.	Mean	s.e.	Mean	s.e.
2:1	1·26[a]	0·1	4·23[a]	0·4	1·48	0·06	0·73[a]	0·08	2·01[a]	0·03	2·97[a]	0·05
2·5:1	0·78[b]	0·08	4·51[a]	0·46	1·49	0·06	0·74[a]	0·08	2·00[a]	0·04	3·12[b]	0·04
3:1	0·44[c]	0·04	4·86[b]	0·42	1·46	0·05	0·75[ab]	0·08	1·95[ab]	0·04	3·36[c]	0·04
3·5:1	0·24[d]	0·04	5·40[c]	0·51	1·47	0·05	0·77[b]	0·07	1·90[b]	0·04	3·68[d]	0·02
Significance	**		**				*		*		**	

[a,b,c] Means bearing the same superscript letter in the same column are not statistically significant ($P < 0{\cdot}05$).

https://doi.org/10.1017/S0263967X00001889 Published online by Cambridge University Press

this experiment have not been reported in earlier investigations (Barber, Braude and Mitchell, 1963; Braude and Powell, 1967). Unfortunately direct comparisons cannot be made with the present study as no voluntary water supply was offered under the conditions of these previous experiments. Further research is required on the effects of water-to-meal ratio on the performance of liquid-fed pigs before the results presented here can be substantiated.

In summary, this study has demonstrated that recommendations on the water needs of growing pigs published in the Codes of Recommendations for the Welfare of Livestock, Pigs (MAFF, 1983) and in the Nutrient Requirements of Pigs (ARC, 1981) are unsatisfactory and do not safeguard either the physiological or welfare requirements of liquid-fed pigs.

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