For comparison purposes, gestation lengths and calf birth weights were available for several of the donor cows, sometimes for several pregnancies per cow.

Some large calves out of small dams appeared for a couple of days after birth to be a little slower to move about than calves from larger dams, possibly due to the former group having been somewhat cramped in the late pre-natal period.

REFERENCES

HARVEY, W.R. (1977) User's guide for LSML76. Mixed model least-squares and maximum likelihood computer program - Ohio State University; November 1977

JOANDET, G.E. (1977). Crossbreeding research in South America. In "Crossbreeding Experiments and Strategy of Beef Utilization to Increase Beef Production," pp.155-173 (Verden Seminar, February 1976; Editors, I.L. Mason & W. Pabst). Commission of the European Communities: Luxembourg.

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GENETIC CORRELATION BETWEEN HEAT TOLERANCE AND FERTILITY IN BEEF COWS

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The effect on growth of reducing heat stress in the field, and the phenotypic regression of growth on body temperature, have been estimated in British-breed cattle (Turner, 1962). By extrapolation, a part of the superior performance of Zebu crosses can be attributed to their heat tolerance. There remains a question whether the heat tolerance of Zebu crosses is beyond the threshold for effects on performance in this environment. This paper reports covariation of body temperature and fertility in cows within different breeding lines.

MATERIAL

Observations were made on the herd of over 1100 cows at the National Cattle Breeding Station, "Belmont", Rockhampton, in 1976 and 1977. The results here are for lines of British breeding (Hereford-Shorthorn) and of Zebu crossbreds (each F_2+ ½-breds derived from Brahman, Africander, or Sahiwal bulls and Hereford/Shorthorn cows). Rectal temperatures were recorded in March-April, following mating in single-sire families for 7 weeks in January-February. At the rate of 60-70/hr, readings took several days, and conservative corrections for major environmental variations were applied. The mean numbers of readings/animal were 1.2 (1976)

and 2.0 (1977). Fertility was recorded as calf born = 1, no calf = 0. All variation reported is residual in relation to a model fitting breeding lines, age, lactation status and, where appropriate, bull-mate, sire of cow, or interactions.

RESULTS

Mean rectal temperature was about 39.8°C. British were higher than Zebu cross by 0.35° (1976) and 0.62° (1977). The residual standard deviation among animals was about 0.4°. Repeatability from year to year, within breed etc., was 0.433 (d.f. 833, $P < 0.01$).

Phenotypic regressions of fertility on temperature were highly significant and did not differ significantly between breeding lines. In 1976, the pooled regression was -0.150 ± 0.038 (i.e. 15%/°C) and varied only from -0.17 to -0.20 in two British lines and from -0.10 to -0.19 in four Zebu-cross lines. In 1977, the pooled regression was -0.191±0.041 and did not differ significantly between British (-0.24) and Zebu-cross (-0.14). Regressing deviation of fertility from the model against actual temperature across all breeds gave no evidence of curvilinearity.

Temperature recorded in 1977 was significantly correlated with fertility in each of the 3 years 1975-77.

TABLE 1: Half-sib and dam-daughter analyses of breeding cow records of rectal temperature (T) and fertility (F) in 1977

	British		Zebu-cross	
(a) Half-sib	Between sires	Within sires	Between sires	Within sires
d.f.	42	144	120	410
Correlation	-0.40**	-0.19*	-0.24**	-0.04
Regression (F/°C)	-0.42±0.15	-0.20±0.09	-0.29±0.11	-0.05±0.06
h^2_T	-0.02 ± 0.29		0.36** ± 0.17	
h^2_F	-0.02 ± 0.29		0.43** ± 0.18	
r_G	-		-0.70** ± 0.20	
(b) Dam-daughter				
d.f.	54		180	
h^2_T	0.56* ± 0.24		0.55** ± 0.15	
h^2_F	0.16 ± 0.30		-0.17 ± 0.15	
r_G	-0.38 ± 0.63		-	

* $P < 0.05$; ** $P < 0.01$

Genetic analysis of the 1977 data (Table 1) partitions variance between and within sires of cows and also uses the limited number of dam-daughter pairs. The most substantial evidence is for Zebu-cross half-sibs, where $h^2_T = 0.36$, $h^2_F = 0.43$, and $r_G = -0.70$, all highly significant. The British half-sibs show no heritability but the strong regression between sires suggests that there is genetic variation and that the correlation is predomonantly genetic. The dam-daughter pairs show the same high h^2_T in both breed types but no h^2_F, with r_G not calculable for Zebu cross and poorly estimated at -0.38 ± 0.63 for British.

Possible mechanisms of this association and its implications will be discussed.

Contributions of G.W. Seifert, H.R. Christensen and staff to pedigree and breeding records, the use of R.M. Seebeck's Least Squares Program, and support of AMRC are acknowledged.

REFERENCE

TURNER, H.G. (1962) Effect of clipping the coat on performance of calves in the field. *Aust. J. Agric. Res.* 13: 180-192.

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CENTRAL BULL TESTS IN AUSTRALIA - PROS AND CONS

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Bulls from different herds are sometimes compared by running them in a common environment, so that differences among them may be used for selection. In central bull tests in Australasia, weaner bulls are run together for about 10 months on pasture. In North America and Britain, central tests are generally conducted in the feedlot for a shorter period. While they can be justified due to higher sale prices at the end, they are appraised here according to their potential *genetic* contribution to productivity in participating herds.

Some bulls grow faster than others on test because of their pre-test feeding and management, rather than because of greater genetic potential. These "carryover effects" make comparisons less accurate than within-herd testing, and can completely offset any advantage of across-herd comparisons. Carryover effects are, however, less of a problem if average preweaning growth rates are fairly similar and if age ranges of bulls from co-operating herds are fairly small. In some cases the carryover effects seem to favour bulls from herds with a poor environment (compensatory growth), while in others the opposite is true. Thus we cannot make reliable corrections for them.