

EFFICIENCY OF USING IDENTICAL TWINS IN SHEEP EXPERIMENTS

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Studies of environmental factors affecting sheep production are influenced by the genetic variation that exists between animals. Recent technological advances in embryo splitting have increased the ability to produce sufficient identical twins for experimentation so it is now possible to exploit the uniformity that exists between genetically identical twins. Hancock (1951) published a series of papers on the similarity of identical twins in cattle, however, no results could be found for sheep. This paper reports the efficiency of the use of identical twins in wool sheep experiments.

Thirty-five pairs of identical twins were produced over 2 years by splitting embryos collected at day 6 of pregnancy and placing each clone in a different recipient ewe. DNA testing has confirmed that the 35 pairs were identical. A wide range of fleece and body weight traits were measured at hogget age. The data were adjusted for the known environmental factors, ie birth year, sex of the lambs and age of the recipient dam and the intraclass correlation between members of a pair estimated. Efficiency was calculated according to the method of Biggers (1986) as defined in Table 1.

The results presented in Table 1 indicate that 1 pair of identical twins can replace between 10 and 50 randomly selected animals in experiments without loss of statistical efficiency. Many investigations, however, involve the comparison of more than 2 treatments. Using a randomised block design, twins will allow the comparison of only 2 treatments. Biggers (1986) shows how these figures can be used to determine the most desirable experimental design where more than 2 treatments are involved.

Table 1. Intraclass correlation and efficiency of using twins

Trait	Intraclass correlation	Efficiency ^A
12 month body weight	0.834	24.0
16 month body weight	0.723	14.4
Greasy fleece weight	0.847	26.2
Clean fleece weight	0.871	31.0
Clean yield	0.913	46.0
Staple length	0.919	49.4
Staple strength	0.801	20.2
Fibre diameter at midside (FD)	0.668	12.0
Standard deviation of FD	0.659	11.6
Coefficient of variation of FD	0.761	16.8
Secondary/primary follicle ratio	0.600	10.0

^A Efficiency = number of animals chosen at random needed to replace 1 pair of identical twins.

Feeding and maintaining large numbers of sheep is a major cost item in experiments. Identical twins have the potential to reduce the number of animals necessary and maximise the utilisation of data as a result of the reduced variation that exists between twins. If identical twins could be produced at low cost, they could dramatically increase the cost effectiveness of long term and detailed experiments.

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BIGGERS, J.D. (1986). *Theriogenology*. 26: 1-25.

HANCOCK, J. (1951). *N.Z. J. Sci. Technol.* 33: 17-29.