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Monozygotic Twin Beef Cattle in Nutrition Research

A NEW and powerful method of attacking problems that have hitherto defied solution is supplied animal husbandmen by the use of monozygotic, or identical, twin beef animals in growth and nutrition studies. The problem of continuous versus discontinuous growth of beef cattle in relation to the economics of beef production is under investigation at the U. S. Animal Husbandry Experiment Station at Beltsville, Maryland, and data now being obtained with identical twins should lead eventually to the production of more pounds of beef per 100 pounds of expensive concentrate feeds consumed.

Geneticists have estimated that, in nutrition studies, a pair of identical twin calves will yield data equivalent to that otherwise obtainable only with a herd of 40 or more, less closely related, individuals. Because both members of a monozygotic twin pair possess the same inherited characteristics, they respond in the same way to a given nutritional or environmental regimen. One member can thus be subjected to experimental treatment and the other used as a control animal without complications caused by different inherited characteristics. Identical twin calves are rare, however. In the dairy breeds in which twins (both fraternal and monozygotic) occur once in every 49 births, monozygotic twins occur only once in every 1000 births, and monozygotic twins are born in beef herds even more rarely, since twins of both kinds occur only once in 227 calvings.

It is not always easy to determine whether a given pair of twins is monozygotic, since fraternal twins often appear very much alike, especially at an early age. Identical twinning is established by *differences* rather than *similarities* in the two individuals, and a blood test can be used for confirmation, although it is not entirely reliable. The test is based upon antigenic

characters in the blood, and if used in conjunction with critical examinations of co-twins, it is the best method now known for determining which twins are identical.

The Beltsville experiments are the first on record in which identical twin beef calves have been used. However, monozygotic twins of the dairy breeds were used at the Animal Breeding Institute at Wiad, Sweden, 14 years ago, and are now being used at experiment stations in the U. S. A., England, New Zealand, and in some European countries.

Although the growth studies at Beltsville have been in progress less than three years, they already suggest that the loss of efficiency in the conversion of feed materials and the difficulty exhibited by growing animals in recovering from the effects of interrupted growth under range conditions, originate in protein, mineral, or vitamin A deficiencies rather than in a deficiency of feed energy. Results obtained with the first six pairs of identical twins have shown that beef animals fed a ration at the maintenance level with regard to energy value, but otherwise adequate for growth, and on which they were unable to gain weight from the age of six months to one year, remained healthy and were able, when given full rations, to make gains as rapidly and as economically as their twin brothers that had been fed adequate rations throughout the experiment. The meat of the animals that had received the low-calorie rations was found to be equal to that of the well-fed animals by every test to which it was subjected. With only one exception, both members of each pair reached the slaughter weight of 1000 pounds within about three months of the same time.

Ten additional pairs of identical twin beef animals are currently being subjected to experimental treatment at Beltsville.

C. F. WINCHESTER

*Animal Husbandry Division, Bureau of
Animal Industry
USDA Research Center, Beltsville, Maryland*

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