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## Summary

# USE OF MONOZYGOUS TWINS FOR EXPERIMENTS INVOLVING CHANGES IN THE CHARACTERISTICS OF BUTTERFAT\*

F. H. McDowall†

VARIATION IN THE PROPERTIES of butterfat can affect the butter-manufacturing process, and the quality, colour and nutritive value of the butterfat.

In New Zealand butterfat, particularly that produced in all North Island districts, there is a regular seasonal change in butterfat properties. The causes of this change have not yet been established.

For an investigation on this subject with paired cows it would be necessary to use a large number of cows, owing to the wide variation in properties of butterfat even from cows of the same breed. Use of monozygotic twins appeared to offer a promising means of obtaining the information with reasonable expenditure of analytical work. An investigation was therefore made of the extent of agreement in properties of butterfat from a number of monozygotic twins.

It was shown:

- (a) That monozygotic twins yield butterfats of closely similar properties.
- (b) That where there was an appreciable difference between butterfats from cows of a twin set this difference persisted throughout the lactation.
- (c) Twin cows reacted in a remarkably similar way to factors causing changes in butterfat properties.
- (d) The lactational curves for cows of the twin sets were remarkably similar in shape, but the curves for the separate pairs showed considerable differences.
- (e) Twin sets showing close similarity in values for one butterfat property showed in general a close similarity for all butterfat properties.
- (f) Close agreement in body weight does not serve as an index of the suitability of a set of twins for work on butterfat, and difference in body weight is not a reliable index of an unsatisfactory set of twins.

\*A paper giving the full report has been accepted for publication in the *Journal of Dairy Research*.

†Chief Chemist, The Dairy Research Institute (N.Z.), Massey College P.O., Palmerston North.

## DISCUSSION

DR. A. H. CARTER: : While I would agree with Dr. McDowall that monozygotic twins have a considerable advantage over unrelated cattle as regards long-term experiments, I feel that it was unfortunate that the examples shown referred to short-term experiments where groups of unrelated animals might have been more efficient.

A: : The examples shown of use of monozygous twins were not really short-term experiments—they extended over 6 to 8 weeks; and I doubt whether there are any experiments on factors influencing butterfat properties where groups of unrelated animals would be more efficient than monozygous twins.

DR. JOHN HAMMOND: : Much of the variation in carotene levels in milk can surely be ascribed to a dilution effect. Thus on a constant intake of green stuff the level of carotene in the milk varies inversely with the level of milk yield.

A: : The intake of carotene in grass is very much greater than the amount absorbed. There may be a direct relationship between yield from any one cow and carotene appearing in the butterfat, but the seasonal change in carotene and vitamin A contents of New Zealand butterfat cannot be explained solely on a dilution basis.

Q: : *This would not apply in New Zealand since the lowest point for carotene content in the milk falls in February. Did Dr. McDowall not suspect that T53 and 54 were not in fact monozygous?*

A: : I would say that we did suspect that T53 and 54 were not monozygous but since they were judged to be monozygous on the basis of the normal tests they could have been used for experimental work, and therefore we thought their results should be included in the report on the uniformity trial.

Q: : *I wonder if Dr. McDowall has taken the rumens of these twins into account and considered the possibility of monozygous twins having different ruminal flora and in this connection whether he has any data on butterfat components which are more affected by the rumen conditions?*

A: : No. That is part of the normal hazard that any trial would have to meet. We were interested only in the end results, namely, effect on the butterfat.

C. S. W. REID: : We have run trials at Grasslands to compare the rumens of identical twins and find that, provided the short-term feeding history is the same, acid levels etc. are very similar in the animals of a twin pair.

DR. C. P. MCMEEKAN: : Assuming that these animals (T53, 54) were used in experiments involving differences before these studies, when one uses unrelated animals one tries to select a uniform group, whereas with twins there is no need to worry, but if twins have been subjected to differing previous treatment it is logical to reject non-compatible pairs of twins.

DR. D. S. FLUX: : Provided it be remembered that a twin pair is an experimental block there need not be any worry about Dr. McMeekan's objection.

DR. MCDOWALL: : I would agree with Dr. McMeekan that there is a danger of one treatment of twins affecting their usefulness for other experiments, but we have not found this to be of much consequence in practice. Even with monozygous twins it is necessary to conduct a pre-treatment control and any differences that may have resulted from earlier experiments would then be revealed.