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SUMMARY ON

"CHROMIUM OXIDE METHOD FOR DETERMINING DIGESTIBILITY"

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Dr. C. R. Barnicoat, Dairy Research Station,
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Edin (1926) has developed a method which measures digestibility by an indirect method, using Chromium oxide as an indicator. The advantage of such a procedure is that it is not necessary to have a special collection device for faeces, as they need not be weighed. It is only necessary that the indicator substances and the feed shall be carefully weighed in order that the weight of the dry matter and Chromium oxide fed are measured exactly. After allowing for the usual preliminary feeding period, a sample of the faeces, which is truly representative, is taken. The method can be explained best by means of a simplified example:

A pig received daily 1000 grams of dry matter to which was added 4 grams of Chromium oxide. For every one per cent of indicator, therefore, there are 250 parts of dry matter. The whole of the indicator substance will be excreted in the faeces since it is insoluble and not digested. Suppose the dry matter is digested to the extent of 80%, then only 200 grams will be excreted. This will, however, carry 4 grams of Chromium oxide. In practice, samples of faeces are collected but no weights need be taken. For this particular experiment we would expect to find that for every one part of Chromium oxide, there are 50 parts of dry matter. The calculation of digestibility coefficients would be made from the ratios of indicator to dry matter, in the following manner:

Ratio of Chromium oxide: Dry matter fed = 1 : 250
 " " " " " " excreted = 1 : 50

Of the original 250 parts fed, 200 parts have been digested. The digestibility coefficient of the dry matter is 80%, and the values of the various nutrients can be calculated in the same way.

The method has been tested for pigs on fixed intakes of mixed meals, and for calves on fixed intakes of skim milk and meal; and appears to give reliable and reproducible results. When tried with sheep on variable intakes of ensilage ("ad lib feeding"), the results were rather difficult to interpret, and were consistently lower than those found by the usual bag method.

The following is a typical result obtained by feeding copra meal (prepared in New Zealand) to one pig. For comparison, results obtained by Kellner with coconut cake, using the bag method, with two pigs is also given.

Digestibility Coefficients.		Chromium Oxide Method	Kellner.
Organic matter	%	81	80
Crude Protein	%	79	73
Crude Fat	%	88	83
Nitrogen - free extract	%	84	89
Crude Fibre	%	66	60

Considering that Kellner's results were obtained probably under very different conditions and at least forty years ago, the agreement between the two sets of values is quite satisfactory.

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DISCUSSION ON PAPERS BY BARNICOAT & LANCASTER

Dr. Filmer congratulated both speakers and emphasized the extremely close agreement between digestibility figures obtained by calculating from the lignin content and that obtained from digestibility trials over a wide range of fodder. He hoped that the methods could be adapted for use with grazing animals.

Mr. R.E.R. Grimmett emphasized that crude fibre method is empirical and therefore correlation with digestibility is an observed fact and not due to any variability in the method of analysis.

Dr. I. Cunningham: Reproducibility of results very satisfactory in view of possible differences of rate of passage of different nutrients in ruminants. Has digestibility of crude fibre in ruminants been determined? Suggestion re combination of Lancaster's method and Barnicoat's. There appears to be a danger in Lancaster's method of excluding the animal altogether because of unreliability of this chemical means.

Dr. Barnicoat: In sheep, pigs and calves (under 200 lbs.) the Chromium oxide appears in the faeces 12 to 24 hours after feeding, but takes 3 or 4 days, as a rule, before it comes through at a steady rate, more or less in equilibrium with the food intake. It seems to take rather longer to disappear from the faeces when the feeding of Chromium oxide is discontinued.

Dr. P. R. McMahon: Pointed out the application of these new methods either singly or perhaps in combination to the study of the nutritional problems of wool growth. Wool is produced mainly under extensive pastoral conditions where traditional techniques cannot be applied - at the same time the scope is wide on account of the very varied nature of food available at different times of the year, and the correlation of food intake, digestibility and wool growth may well point to very profitable alterations in sheep management.

Dr. I. Cunningham: Is all CrO_2 returned in faeces? What is the rate at which appearance in faeces occurs?

Dr. Barnicoat: It is intended to try out the method of measuring the appetite of grazing animals. It would appear likely that if a known amount of indicator is fed, and the digestibilities of the feed nutrients are known (either calculated or determined in a concurrent trial), the ratio of the undigested portions of the faeces to the Chromium oxide found should be convertible to give a measure of the weights of the feed nutrients ingested.

^x Mr. Lancaster's paper - see page 38.