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Dear Dr. Fisher,

You must forgive my troubling you at Christmas-time with Milk when the thoughts of all good men are directed towards another kind of beverage. Miss Robison has produced some more figures—from the Dairy Shorthorn breed.

The virtue of these results is that the data are drawn from only two herds of which each has been analysed separately. The chief point against the Ayrshire data on which we previously worked was that a number of herds had been used and also the low yielding animals excluded. The only drawback that I see to the results which accompany this letter is that we have been unable to get reliable figures for butterfat yield.

To make the whole story clearer I will summarise all the results we have obtained by the "Squared Difference Method".

Table I shows the differences in the total Butterfat yield of pairs of cows of the Ayrshire breed. On the whole these results show a consistent increase in the difference as the degree's of kinship widen. There is nothing to show the existence of sex-linkage. The results of this table may be taken as showing the reliability of the method.

Table II is the same but deals with total yield of milk. The difference between the two groups,

1. Common Paternal Grandsire	-	49931
2. Common Maternal Grandsire	-	24218

would indicate the existence of sex linked factors affecting yield. This table, however, is not wholly consistent. Why should the group with a Common Sire show greater variation than the group with a common Maternal Grandsire? Why should the Common Paternal Grandsire group show a larger variation than the random sample of unrelated animals? Both these points could be explained on a sex linked basis as I have indicated in the paper in which they were published. It was because of these points that I was reserved as to the conclusions to be drawn from these results.

Table III shows the results from a study of the records of R.W. Hobbs & Sons (total milk yield). The increase in the difference from the group, same sire dams paternal half sister 27,000, to the group, same sire dams unrelated 40,000, seems all

right and the figure for the group with a common maternal grandsire 38,000, is pretty close. The difference between the two groups

1. Common Paternal Grandsire - 57,000
2. Common Maternal Grandsire - 38,000

again may be interpreted as showing the existence of sex linked factors. The unrelated group gives 61,000 which is again consistent

In the Ayrshire data we had dealt with selected high yielders. Accordingly we divided the Hobbs herd into two groups of animals, giving over 700 gallons, Table IV, and giving under 700 gallons, Table V. The figures are fairly consistent but, however, there is no difference between the two groups which are the test for sex linkage.

	High	Low
1. Common Paternal Grandsire	16,774	17,237
2. Common Maternal Grandsire	15,652	17,723

How does one get an adequate explanation for this?

The next step was to analyse another herd, that of Robinson (Table VI) also Dairy Shorthorns and also for total yield of milk. The figures here show a consistent increase in the difference but there is no trace of sex-linked factors:

1. Common Paternal Grandsire - 66,553
2. Common Maternal Grandsire - 71,845

Is there no sex linkage here? Or has it been masked in the same way as it was masked in the divided Hobbs herd?

To try to find something we analysed the data used for all these investigations. You will find these on the attached graph. There is a similarity between the Hobbs and the Ayrshire data both as regards the shape of the curve and the actual standard deviation. The Robinson data is distinct from the others and shows a bigger deviation but this may be due to smaller numbers. There is a big difference in the average yields of the Ayrshire and the Hobbs data.

I leave the matter in your hands now, and would be most awfully grateful for your advice on the proper way in which we should interpret these results.

Yours apologetically,

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