procedure. Permanent preparations can be made in the usual way[2].

Among the genera and families in which this method has proved successful are *Nicotiana* and cultivated tomato (Solanaceae), *Ribes* (Grossulariacae), *Rubus*, *Fragaria* and *Malus* (Rosaceae), *Brassica* and radish (Cruciferae) and *Daucus* (Umbelliferae). It was found advisable in *Daucus* to fix portions of the umbel without prior removal of buds and dissection of the tiny corollas. Heterochromatic regions were readily seen in this material following cold treatment of the plants. A particular advantage of making chromosome counts from corollas is seen following the treatment of somatic tissues with colchicine to induce polyploidy. Thus it was possible to confirm the chromosome number $2n = 34$ in the diploid apple variety 'Spartan' (from flower buds collected on a dull, wet day); but a strain of this variety received as a colchicine-induced tetraploid proved also to be diploid, so confirming a previous suspicion deduced from floral morphology and stamen number.

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[1] Darlington, C. D., and LaCour, L. F., *The Handling of Chromosomes* (Allen and Unwin, London, 1960).
[2] Haskell, G., and Wills, A. B., *Primer of Practical Cytology* (in the press).
[3] Burns, J. A., *Tobacco Sci.*, **8**, 1 (1964).
[4] Dyer, A. F., *Stain Tech.*, **38**, 85 (1963).
[5] Haskell, G., and Paterson, E. B., *Genetica*, **33**, 52 (1962).

Polymorphism in the Serum Proteins of the Reindeer

Polymorphism in the serum proteins of the reindeer was detected in 1959 (unpublished results) in samples collected by me and investigated by Dr. B. Cohen, then at the University of Edinburgh. Gahne and Rendel[1] reported the findings of six different transferrin types which they explained on a basis of three alleles.

In this communication results from investigations of serum samples from 132 reindeer are reported. Of these, 100 came from the district of Jotunheimen and 32 came from northern Norway. The samples were investigated by two different techniques. One was that used for examining horse transferrins[2]: the other was that developed by Kristjansson[3] for cattle transferrins. The two methods led to the same conclusions; but Kristjansson's technique gave more distinct zones. Accordingly, results obtained by using this last-mentioned technique were photographed for demonstration in the present report.

The reindeer sera investigated in this work showed great variation in the β-globulins. Two, three or four clearly recognizable zones or bands were seen. They appeared in a total of 15 different phenotypes of which four were two-band and eleven were three or four bands. To account for these various patterns a hypothesis of six codominant autosomal alleles was advanced, each allele being responsible for two bands. The products of the individual alleles were named: *C*, *E*, *G*, *I*, *K* and *M*, the fastest migrating being *C* and the slowest *M*. In all these six two-band patterns the slowest band was generally considerably thicker and stained more heavily than the fast band. The following combinations of the two-band patterns were encountered: *CC*, *CE*, *CG*, *CI*, *CK*, *CM*, *EE*, *EG*, *EI*, *EK*, *EM*, *GI*, *II*, *IK* and *KK*. Most common were *C* and *E* types, most rare were the *G* and *M* patterns.

In Fig. 1, which is a photograph of a stained gel, the results from investigation of eight selected serum samples are shown. The positions of the albumins, the α- and the β-globulins are marked on the left of the photograph. Because of the special electrophoretic conditions the albumins are condensed into a thick, heavily stained line going across the gel. The α-globulins are thin, indistinct,

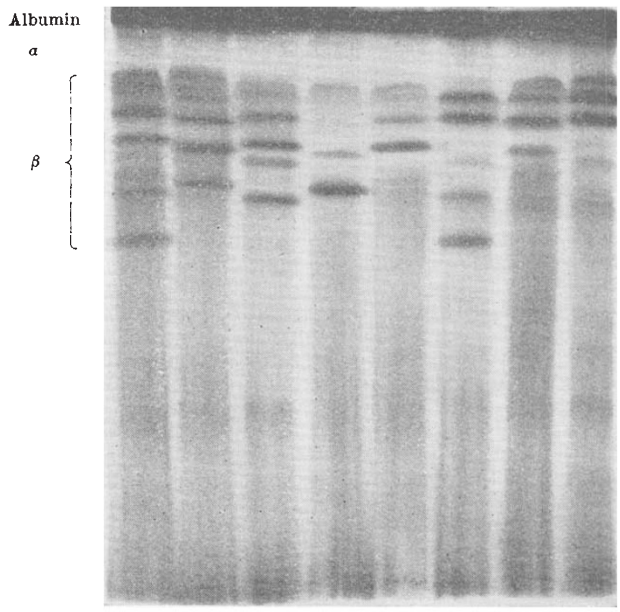

Fig. 1. Photograph of a stained gel showing eight selected reindeer transferrin phenotypes

curved bands. Three of the samples are from animals being homozygous as to β-globulin types. They are *CC*, *EE* and *II*. The five other samples all show heterozygous animals. Phenotypes representing the remaining two-band patterns *G*, *K* and *M* are seen in all of them. The migration rates for the six two-band patterns are clearly different, the positions of the *G* bands, however, being only slightly slower than the *E* bands under the electrophoretic conditions used in these investigations. There is some indication that the *C* bands actually are of two types, the one, which is rare, being insignificantly slower than the common *C* type.

Besides these different bands in the β-globulin region other but more faint bands or zones may be seen on the photograph, for example, in the samples showing the phenotypes *CC*, *CM* and *EM*. In the first sample there is a faint band in front of the *C* bands. In the two other phenotypes faint bands may be seen between the fastest and slowest two-band patterns of the respective phenotypes. Whether these faint bands belong to the same protein system as those previously mentioned is not known. The occurrence and relative positions of some of these very faint bands in the β-globulin region may, however, indicate that they belong to the same protein system as that already described. This would then suggest that each allele is responsible for three bands or zones.

The serum proteins described by Gahne and Rendel[1] were reported to be transferrins. The proteins dealt with in this work are of a similar type. It is, therefore, concluded that they are transferrins. Accordingly, a genetic theory of six transferrin alleles, Tf^C, Tf^E, Tf^G, Tf^I, Tf^K and Tf^M, is proposed.

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[1] Gahne, B., and Rendel, J., *Nature*, **192**, 529 (1961).
[2] Brænd, M., and Stormont, C., *Nord. Vet.-Med.*, **16**, 31 (1964).
[3] Kristjansson, F. K. (personal communication).