ing the rate when nitrogen is bubbled through the suspension. Under these conditions the rate of uptake is much lower than with air or oxygen. Thus although aeration has its main effect through mechanical agitation, the absence of oxygen results in a considerable lowering of the rate of glucose uptake.

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A Probable Deletion in a Human *Rh* Chromosome

A SAMPLE of blood sent to us because of the presence of most unusual antibodies has proved, on investigation, to have even more extraordinary *Rh* antigens. The blood is unique in our experience, and in the literature, in that it has the antigen *D*, but lacks any detectable representative of the *C* and *E* allelomorphic series of antigens.

The donor of the blood is homozygous for this deficiency, owing without a doubt to her parents being half second cousins. Her mother is heterozygous for the condition; her father and two brothers are dead.

The genotype of the donor may be written —*D*—/—*D*—, the dashes representing the absence of *C*, *c*, C^w, c^v, C^u and the absence of *E*, *e*, E^u. The absence of these antigens was demonstrated by negative results of agglutination tests in saline and in albumin, of indirect anti-globulin tests, of trypsin tests and of absorption tests. The presence of an abnormal amount of the *D* antigen was demonstrated by the much greater power of the —*D*—/—*D*— blood to absorb anti-*D* compared with that of *CDe*/*cDE* blood; it was also shown in comparative tests with *CDe*/*cDE* and *cDE*/*cDE* cells against titrations of incomplete anti-*D* in albumin; it was shown most strikingly of all by the unique ability of the cells to be agglutinated in saline by incomplete anti-*D* (which, incidentally, makes it almost certain that this antibody is not monovalent as it has so often been represented). The somewhat extensive serological details will be recorded elsewhere. Nothing abnormal was found in the other blood groups of the donor.

In the serum of the donor we have so far been able to identify anti-*e*, anti-*C* and anti-*c*. The finding of both anti-*C* and anti-*c* in one serum is extraordinary but not altogether unexpected in a person lacking any *C* or *c* antigens.

Three possible genetic interpretations suggest themselves:

(1) The *C* and *E* loci may be represented by unknown, silent allelomorphs. This is unlikely, for all the known allelomorphs produce antigens which are easily detectable; it is highly improbable because two of this new kind of allelomorph, one at the *C* and the other at the *E* locus, would have to be postulated on the same chromosome.

(2) A suppressing gene may be at work. It is difficult to imagine that such a gene would suppress all activity at the *C* and *E* loci yet not at the *D* locus. Moreover, the presence of *C* or *c* antigens, even when suppressed, would surely be incompatible with the existence in the serum of both anti-*C* and anti-*c*.

(3) Deletion of a portion of the *Rh* chromosome seems to offer the most satisfying explanation. It would fit well with the total absence of the *C* and *E* antigens and might explain the exalted *D* antigen. We have for some time had evidence that suggests that a common basic material of limited amount is available for the production of the *C D E* antigens. Freed from the competition of *C* and *E*, *D* might take all such hypothetical raw material. That the deletion is probably a short one is suggested by the good health of the donor and by the absence of any other congenital abnormality.

Whatever the exact genetic mechanism, the fact that *C* and *E* are involved supports from an unexpected angle Fisher's tentative suggestion[1] that the order of the genes on the chromosome would be found to be *D C E*. It also seems that the very controversial question whether the genes are separable or not is settled in the most convincing way of all—by their separation.

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Separation and Identification of Sugars using Paper Chromatography

CHROMATOGRAPHY on filter paper has provided an excellent and a much-needed method for the investigation of the structure of polysaccharides[1–5] and proteins[6–10] While butanol–ethanol–water, butanol–acetic acid–water, and phenol–water are effective mixtures, among others[1], for the separation of a wide variety of sugars[11,12,5] and their methyl derivatives[13], the phenol–water mixture is usually better than either of the other two mentioned above for the separation of unmethylated sugars (cf. ref. 14). The method using phenol–water, however, suffers from the disadvantage that the location of the sugars on the paper by treatment with ammoniacal silver nitrate cannot be accomplished without some difficulty because the paper quickly becomes dark or sometimes black. It is claimed that suitable purification of the phenol either reduces the darkening[5] or eliminates it altogether[15]. We find that most of the darkening can be avoided by extracting the paper with ether before spraying with the silver reagent. By adopting this slight modification, it has been found unnecessary to purify the phenol.

The use of either malonic acid (10 gm.) or propionic acid (10 ml.)[16] in conjunction with butanol (40 ml.) and water (50 ml.) as partitioning solvents has also been shown to avoid the over-all blackening of the paper produced by spraying with the silver reagent and subsequent heating.