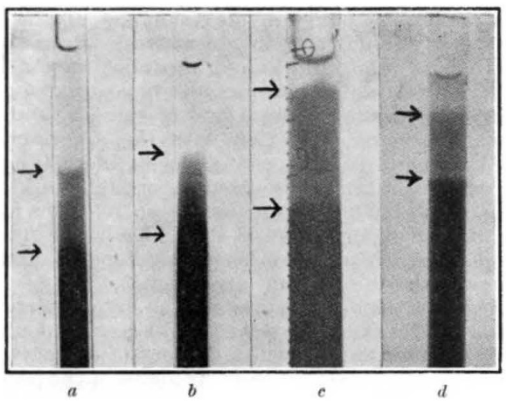
Stratified Blood Sedimentation—Isolation of Immature Red Cells

DURING sedimentation tests, blood often forms a clearly demarcated zone of red cells above the main sedimenting column[1]. Typical appearances are shown in the accompanying photographs.



STRATIFICATION IN BLOOD SEDIMENTATION TESTS IN SECONDARY ANÆMIA OF (*a*) TUBERCULOUS ADENITIS, (*b*) BRONCHOPNEUMONIA, (*c*) AND (*d*) ANÆMIA IN DOG.

Red cells of the upper zone, or of the diffuse upper cloud when the stratification is not clear cut, are all immature. In some cases, the upper zone contains up to 85 per cent of reticulocytes, less than ½ per cent being found in the main sedimenting column. Withdrawal of the upper zone and resedimentation enables the relatively few immature cells carried into the lower column to be separated.

The formation of the upper zone is due to the low aggregation tendency of the red cells comprising it, but these also have lower electrophoretic speeds, usually two thirds to a half that in the lower main column, the same ratio being found in man and dogs, when measured in isotonic sucrose solution buffered at *p*H 7·4. The low electrokinetic potential thus evidenced should favour aggregation, so that the non-aggregation indicates a marked deviation from the normal erythrocyte surface. Here, however, the usually more spherical shape of the upper zone corpuscles must also be considered. Typically the upper zone red cells have the same absolute electrophoretic speeds as leucocytes in the same animal, the surface resemblance being also shown by the low aggregation tendency of leucocytes.

In some cases, the upper zone contains only 2–3 per cent of reticulocytes, and in others no reticulocytes but a few red cells showing punctate basophilia. The identity of the upper zone constituents in these cases was established as immature red cells by (*a*) their electrophoretic speeds, (*b*) their occasional deeper generalized basophil staining than cells in the lower column, and (*c*) their diminished aggregation tendency, which is the cause of the differential flotation.

Sometimes a third uppermost zone forms; it usually contains red cells with electrophoretic speeds generally half the normal value. This third zone is apparently derived by selective flotation of cells from the stratum of immature cells and could sometimes be induced artificially. The electrophoretic speed always increases from top to bottom strata, and also when there are no definite strata but merely an upper cloud. The simple approximately 2 : 3 ratio corresponds to the reticulocyte phase of maturation. In later phases the electrophoretic speed difference is less marked although the diminished aggregation tendency persists.

Stratification was never seen in normal subjects, but was found in 37 of a series of 56 patients, and in splenectomized or desanguinated dogs. Of the human patients exhibiting the phenomenon, 35 showed some degree of secondary anæmia.

Stratification is an indication of bone marrow reaction and is of importance in revealing young cells not identifiable by staining. It occurs in association with normal and increased sedimentation rates as measured to the top of the lower main column. Both when stratification is present and when absent, a new factor, the age of the red cell population, must be considered in relation to sedimentation rates, and indications have been found that young bloods sediment more slowly than old ones, other factors being equal.

Even when stratification does not appear, immature cells are concentrated in the upper limit of the sedimenting column. Centrifugation without sedimentation also causes immature red cells to be concentrated in the upper limit of the centrifuged deposit.

J. G. STEPHENS.
Sir William Dunn School of Pathology,
Oxford. May 6.

[1] Stephens, J. G., *J. Physiol.*, **92**, 39 (1938).

Motor Spirit from Coal

OUR attention has been directed to the article by Messrs. J. L. Strevens and A. C. Cross in NATURE of May 7 on "Motor Spirit from Coal". We have no desire to enter into any controversy on a subject ably and impartially covered, in our view, by the Falmouth Committee, but we cannot help correcting at least two misstatements.

It is stated that "the octane rating of this spirit [produced by hydrogenation] is 70 plus". The hydrogenation process is elastic enough to enable us at Billingham to produce regularly no fewer than four different types of spirit: aviation (87 O.N.), ethyl spirits (81 O.N.), Straight No. 1 spirits (75 O.N.) and commercial grades (68 O.N.). All these petrols are used directly, without admixture with other materials, for their appropriate purposes.

Again, it is stated that "phenols so essential to the nation's needs in times of peace and war can only be obtained from coal distillation processes and the tar industry, and not from hydrogenation or synthesis". When coal is hydrogenated it gives a much greater yield of phenol than when it is carbonized; typical figures per 100 tons of coal treated are: hydrogenation, 0·9 ton; distillation, 0·03–0·04 ton according to temperature of carbonization. In actual fact, during 1937 the production of phenols manufactured on the hydrogenation plant and sold was more than 850 tons. This figure is well below the present capacity of the plant.

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IN reply to Mr. James's letter, we have to make the following comments.

In the 1936 report of the Imperial Chemical Industries, Ltd., it was mentioned that plant had been installed for the recovery of two further by-products, phenol and cresol, and in the 1937 report