ethers. A preferential rearrangement of the α-ether III has proved feasible, however. When held at 120° for 18 hours III undergoes rearrangement with the appearance of a deep blue ferric chloride test; a sample of pure IV, under the same conditions, develops only a very faint ferric chloride test. Claisen alkali extraction of the preferentially rearranged α-ether preparation permits the isolation of relatively pure rearranged α-ether, V, b.p. 95–96° at 0.18 mm; $n^{20}D$ 1.5266. Hydrolysis of V yields an acid, VI, m.p. 102.5–103°, *not identical* with the corresponding acid from the rearranged γ-ether, m.p. 115–116°[3], mixed m.p. 72–94°. *Anal.* of VI, calcd. for $C_{13}H_{16}O_3$: C, 70.89; H, 7.33; Found, C, 70.68; H, 7.58. Ozonolysis of V produces formaldehyde in amounts corresponding to 84 ± 8% rearrangement product with a terminal methylene group. Infrared spectra likewise confirm the terminal methylene group of V.

The generally accepted idea concerning the course of the *para*-Claisen rearrangement, *i.e.*, that the rearrangement proceeds in a way that allows equilibration of the migrating allylic system,[4,5,6] appears, therefore, erroneous; instead the rearrangement proceeds without inversion and must involve partial bonding of a sort which maintains, or restores, the original structure of the migrating fragment. Our findings accord with the results of Ryan and O'Connor[1] and with observations made by Marvell on a comparable pair of ethers.[7]

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(7) Dr. E. N. Marvell, private communication.

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RECEIVED APRIL 18, 1953

ISOLATION AND CHARACTERIZATION OF GLYCOPROTEINS FROM HUMAN PLASMA

Sir:

Human plasma contains several glycoproteins which are distinguished by their acid isoelectric points and their low molecular weights. Recently, the major component of these glycoproteins (the "acid glycoprotein," an α_1-globulin) has been described.[1,2]

The purpose of this note is to report the isolation from human plasma of a further group of such glycoproteins and to describe some of their properties.

The starting material for these studies was the supernatant solution of Fraction V obtained after precipitation of over 98% of the proteins from pooled normal human plasma, according to the low temperature–low salt–ethanol fractionation method.[3] The proteins (Fraction VI) in this supernatant solution were concentrated with the aid of zinc hydroxide and fractionated by a method described earlier.[2] Following removal of the proteins identical with those of Fraction V and of the acid glycoprotein from Fraction VI, the remaining protein fraction appeared essentially homogeneous in the ultracentrifuge ($S_{20,w}$ approximately 3) and by electrophoresis at pH 8.6. The electrophoretic mobility, $u = -4.2 \times 10^{-5}$ cm.^{2}/volt $\times$ sec., corresponded to an α_2-globulin.

In acetate buffer solutions of ionic strength 0.1, this α_2-protein fraction separated into three components. Taking advantage of the specific interaction with cations, these α_2-glycoproteins were fractionated from each other. Two proteins were rendered insoluble, at low ionic strength, pH 5.7 and at −5°, in a solution containing 19% ethanol by addition of barium acetate to give a final concentration of 0.02 M. Further addition of an equal amount of zinc acetate to the supernatant solution precipitated the third glycoprotein[4] which was isoelectric between pH 4.1 and 4.3. The optical density in a 1-cm. cuvette of a 1% solution ($E^{1\%}_{1\text{ cm.}}$) of the latter protein was approximately 15 at 278 mμ. The "barium-insoluble" proteins were separated from each other under similar conditions. After exchange of the protein-bound barium ions for zinc ions, one of these plasma constituents was removed as insoluble zinc-lead-complex upon the addition of lead acetate. This "lead-insoluble" glycoprotein, showing an extinction coefficient of approximately 5 at 278 mμ, was denatured in acid phosphate buffer solutions as judged by the insolubility in 0.15 M NaCl solution. Its isoelectric point was found to be between pH 3.5 and 3.8. The protein which remained in solution and represented the major component of these α_2-glycoproteins, absorbed at 278 mμ with a coefficient ($E^{1\%}_{1\text{ cm.}}$) of about 5. Its isoelectric point was near pH 4.

Further details of these investigations will be reported later.

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(2) K. Schmid, THIS JOURNAL, **75**, 60 (1953).

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(4) This was the only glycoprotein which was colored.

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THE REARRANGEMENT OF THE NEOPHYL RADICAL

Sir:

Although several examples of the migration of a phenyl group to an adjacent radical center have been published,[1] no evidence concerning the process by which this rearrangement takes place has been reported. It has now been found that, in contrast to similar ionic migrations which pro-

(1) (a) W. H. Urry and M. S. Kharasch, THIS JOURNAL, **66**, 1438 (1944); (b) S. Winstein and F. H. Seubold, Jr., *ibid.*, **69**, 2916 (1947); (c) W. H. Urry and N. Nicolaides, *ibid.*, **74**, 5163 (1952); (d) D. Y. Curtin and M. J. Hurwitz, *ibid.*, **74**, 5381 (1952).