429. *The Cardio-active Glycosides of* Strophanthus sarmentosus *P.DC.* " *Sarmentoside B* " *and its Relation to an Original Sarmentobioside.*

By R. K. Callow and D. A. H. Taylor.

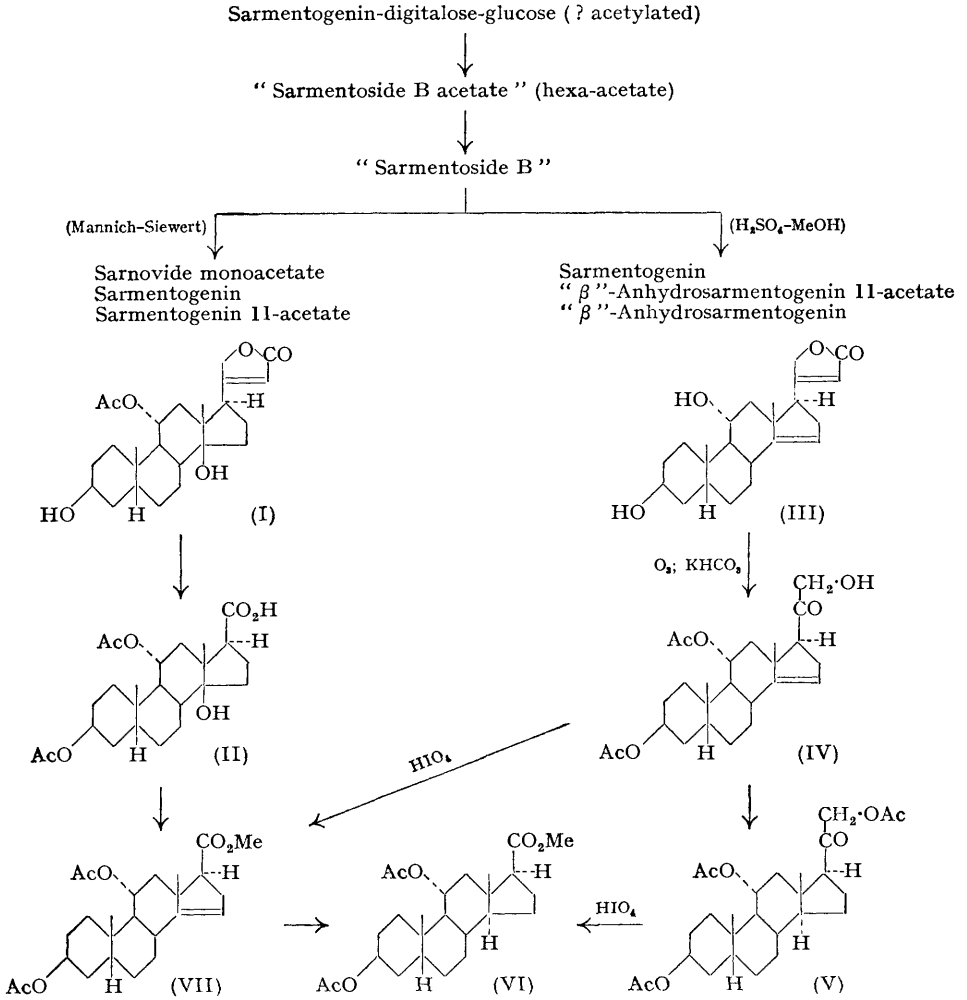
The " sarmentoside B," separated as an acetate from the glycosides present in the savannah form of *Strophanthus sarmentosus* P.DC., is a partially acetylated sarmentogenin digitaloside-glucoside derived from an original glycoside which was not isolated in crystalline form. Products of hydrolysis have been identified and constitutions confirmed by degradation to known pregnane and etianic acid derivatives.

In the course of fractionation of the glycosides of certain batches of seeds of *Strophanthus sarmentosus* P.DC. a material is obtained, in the portion most soluble in water, from which a finely crystalline acetate can be prepared. Schmutz and Reichstein (*Pharm. Acta Helv.*, 1947, **22**, 167) obtained this acetate from a sarmentogenin-containing seed of unknown origin; Callow, Meikle, and Taylor (*Chem. and Ind.*, 1951, 336) obtained it from seed of the " savannah " form of *S. sarmentosus*; Professor T. Reichstein has found it, so he informs us, in the seeds of *Strophanthus* species M.P.D. 50 when this has not been submitted to enzymic action, although von Euw, Reber, and Reichstein (*Helv. Chim. Acta*, 1951, **34**, 413) at first did not report its presence in these seeds.

From this acetate Schmutz and Reichstein obtained, by hydrolysis with potassium hydrogen carbonate, a material, presumed to be the original glycoside, which was called " sarmentoside B." In our work on Northern Nigerian seeds we have obtained an identical substance by hydrolysis of this acetate with barium hydroxide in anhydrous methanol. The hydrolysis of " sarmentoside B " by the Mannich–Siewert method yielded, in the hands of Schmutz and Reichstein (*loc. cit.*), two sugars, glucose and digitalose, and a material " sarmentosigenin B " to which the formula $C_{23}H_{34}O_6$ was assigned. The microscopic amounts of material then available precluded further examination.

In our hands hydrolysis by the Mannich–Siewert method and, more harshly, by boiling 10% (v/v) methanolic sulphuric acid, has given the same two sugars and products which are closely related to sarmentogenin, $C_{23}H_{34}O_5$, and not, as the earlier work suggested, to a genin with one more oxygen atom.

The Mannich–Siewert hydrolysis yielded (i) some sarmentogenin, (ii) a substance which is a partially acetylated sarnovide (sarmentogenin digitaloside), since acetylation yields sarnovide triacetate, and (iii) an amorphous material which is sarmentogenin 11-acetate (I), since acetylation and oxidation by permanganate yield 3β : 11α-diacetoxy-14β-hydroxyetianic acid (II), identified as the methyl ester.



Hydrolysis of " sarmentoside B " or of its acetate with methanolic sulphuric acid yielded (i) sarmentogenin, (ii) a substance which, following the convention of Fieser and Fieser (" Natural Products Related to Phenanthrene," Reinhold Pub. Corp., New York, 1949, p. 534) must be named " β "-anhydrosarmentogenin, although described by Tschesche and Bohle (*Ber.*, 1936, **69**, 2479) as α-anhydrosarmentogenin, and (iii) " β "-anhydrosarmentogenin 11-acetate. The " β "-anhydrosarmentogenin (III) is identical with the substance obtainable from sarmentogenin by dehydration, and yields the 3 : 11-diacetate obtainable also from the 11-monoacetate.

" Sarmentoside B " can, therefore, be assumed to be 11-acetylsarmentogenin digitaloside-glucoside, possibly with acetyl groups also in the sugar residues. The original, natural glycoside is probably not acetylated, at least in the sarmentogenin or digitalose portions, for von Euw, Reber, and Reichstein (*loc. cit.*) obtained sarnovide, *i.e.*, sarmentogenin digitaloside, presumably a hydrolysis product of the original bioside, by fractionation after enzymic hydrolysis from seeds of M.P.D. 50, whilst we (and also Professor Reichstein himself)

obtained sarmentoside B acetate from the same seeds. " Sarmentoside B " has a partition coefficient, K, of 11·6 between *n*-butanol and water, whilst the original glycoside has a value of K of about 1·5. The latter material, separated in a countercurrent fraction (Callow, Meikle, and Taylor, *loc. cit.*), has not been obtained crystalline.

As a further confirmation of the conclusions about structure, " β "-anhydrosarmentogenin from " sarmentoside B " has been degraded to known pregnane and etianic acid derivatives, by adopting the method used by Lardon (*Helv. Chim. Acta*, 1949, **32**, 1517) in the degradation of periplogenin: the diacetate of " β "-anhydrosarmentogenin (III) is brominated to protect the 14 : 15-double bond and then, by ozonolysis followed by mild hydrolysis, converted into the amorphous 3β : 11α-diacetoxy-21-hydroxypregn-14-en-20-one (IV), which, by successive acetylation, hydrogenation, and reoxidation gives 3β : 11α : 21-triacetoxypregnan-20-one (V) which was degraded to methyl 3β : 11α-diacetoxyetianate (VI). Also, periodate oxidation of 3β : 11α-diacetoxy-21-hydroxypregn-14-en-20-one (IV) gave 3β : 11α-diacetoxyeti-14-enic acid (VII), identical with a specimen prepared by the dehydration of methyl 3β : 11α-diacetoxy-14β-hydroxyetianate with phosphorus oxychloride.

The discovery that " sarmentoside B " is a sarmentogenin derivative enhances the possible value of the seeds of the savannah form of *S. sarmentosus* as a source of 11-oxygenated steroids, for, by the process described below, 0·27% of sarmentogenin and 0·86% of sarmentoside B acetate can be obtained.

[*Note added, March 19th*, 1952.] Professor Reichstein, with great courtesy, has informed us of his own results in this field, which are to be published in *Helv. Chim. Acta* at the same time as our communication. We have exchanged specimens of seeds and reference compounds, and he concludes that apparent differences in " sarmentoside B " content of his and our seeds were simply due to the fact that the fermentation process he uses leads to degradation to sarnovide. Professor Reichstein suggests that the original glycoside (not yet isolated) should be named " sargenoside," from which are derived the partially acetylated sargenoside, probably the diacetate (" sarmentoside B ") and sargenoside hexa-acetate (" sarmentoside B acetate "). The same conclusions as to the constitution of " sarmentoside B " have been reached independently in the two Laboratories.

Experimental

M. p.s were determined on the Kofler micro-apparatus. Optical rotations were determined in a 4-dm. tube. Microanalyses were by Drs. Weiler and Strauss.

Extraction of Seeds.—Strophanthus sarmentosus seeds (5 kg.) from Katsina, Nigeria, were mixed with about one-half of their weight of kieselguhr and ground finely in a disintegrator mill. The powder was then extracted thoroughly with methylated spirit in a Soxhlet apparatus, and the extract concentrated to about 3 l. under reduced pressure. The extract was then diluted with about one l. of water to aid the separation of the layers and repeatedly extracted with light petroleum. When further extraction removed no more chlorophyll from the extract, the latter was concentrated to small volume and then taken up in 50% aqueous methanol (4 l.) to which was added sufficient sulphuric acid to bring the pH of the solution to about 1. The extract was then washed with sufficient chloroform to form a layer of about 100 c.c. and then again with light petroleum. No difficulty with emulsification was experienced during the extraction procedure provided that the solution of glycosides was kept fairly concentrated. The aqueous methanolic extract was then refluxed for 0·5 hour, cooled, and extracted with chloroform (3 × 1 l.). The chloroform extracts were combined, washed with water, and evaporated. The residue crystallised on the addition of a little methanol, and on recrystallisation from methanol furnished sarmentogenin (13·5 g.), m. p. 270—273°.

The aqueous-alcoholic layer from the hydrolysis was neutralized with calcium carbonate, filtered, evaporated under reduced pressure to 750 c.c., and extracted five times with an equal volume each time of 2 : 1 chloroform–ethanol. The lower layers were combined and evaporated. The residue (300 g.), which still contained solvent, was dissolved in pyridine (500 c.c.) and treated with cooling with acetic anhydride (700 c.c.) and kept at room temperature for 24 hours. Methanol (500 c.c.) was then added with cooling to destroy excess of acetic anhydride, and the whole evaporated in a vacuum to small volume. The residue was taken up in chloroform (1·5 l.), washed with dilute hydrochloric acid and water, dried, and evaporated. The residue was taken up in ethanol (500 c.c.) and kept overnight. Crystals (43 g.), m. p. 272—274°,

separated and were collected. By recrystallisation from methanol–chloroform, sarmentoside B acetate was obtained as felted needles, m. p. 282°, $[\alpha]_D$ −11° in chloroform (Found: C, 59·2; H, 6·9; Ac, 24·6. Calc. for $C_{48}H_{68}O_{20}$: C, 59·7; H, 7·05; Ac, 26·8%).

"Sarmentoside B".—Sarmentoside B acetate (13 g.) was dissolved in methanol (2 l.) and treated at 0° with 0·3N-barium hydroxide in methanol (15 c.c.). After being kept overnight in the refrigerator, the solution was neutralised with 0·1N-sulphuric acid (45 c.c.), filtered with the aid of a little Celite, and evaporated under reduced pressure. The residue was taken up in acetone (50 c.c.) and set aside after the addition of ether (50 c.c.). After three recrystallisations from methanol there was obtained sarmentoside B (6 g.) showing a double m. p. 193—195° and 266—270°, $[\alpha]_D^{21\cdot5}$ 3·4° (*c*, 1·85 in acetone) (Found: C, 59·1; H, 7·6. Calc. for $C_{38}H_{58}O_{15}$: C, 60·4; H, 7·7. Calc. for $C_{40}H_{60}O_{16}$: C, 60·3; H, 7·5%). Reacetylation of a specimen of this substance gave sarmentoside B acetate m. p. 282°, showing no depression of m. p. admixed with the original material.

We are indebted to Dr. G. F. Somers at the London University School of Pharmacy who determined approximately the cardiac toxicity of sarmentoside B. His results indicated an activity of the order of 1/50th of that of digitoxin. This is concordant with the low toxicity of the material of Schmutz and Reichstein (*loc. cit.*) reported by Chen.

Mannich–Siewert Hydrolysis of Sarmentoside B.—Sarmentoside B (18 g.) in acetone (1200 c.c.) was treated with concentrated hydrochloric acid (12 c.c.) and kept at room temperature for 11 days. The solution was then evaporated to 300 c.c. under reduced pressure and diluted with water (300 c.c.), and the remaining acetone removed in a vacuum. After the addition of methanol (300 c.c.) the solution was refluxed for 0·5 hour, cooled, and extracted with chloroform (3 × 300 c.c.). Evaporation of the chloroform layers gave a white foam (6 g.). A similar foam (5 g.) was obtained by extracting the aqueous layer with *n*-butanol (3 × 300 c.c.). This was soluble in water and presumably still glycosidic in nature.

The chloroform extract was dissolved in chloroform (200 c.c.), diluted with benzene (200 c.c.) and chromatographed on acid-washed alumina (180 g.). The first fraction (1·2 g.), eluted with chloroform–benzene (3 : 2), remained amorphous. It gave a positive Legal reaction, and with concentrated sulphuric acid gave a yellow colour, slowly becoming blue, indistinguishable from the colour reaction given by sarmentogenin. The second fraction, eluted with pure chloroform, crystallised readily from methanol, and after several recrystallisations furnished a substance (300 mg.), m. p. 154° and 237°, $[\alpha]_D^{20}$ +8° (*c*, 0·22 in ethanol) (Found: C, 61·3; H, 8·3. $C_{32}H_{48}O_{10},H_2O$ requires C, 61·1; H, 8·28%). Acetylation furnished sarnovide triacetate, m. p. 288—291°, $[\alpha]_D^{20}$ +8° in methanol, showing no depression of m. p. mixed with a specimen kindly supplied by Professor Reichstein (Found: C, 64·1; H, 8·0. Calc. for $C_{34}H_{50}O_{11}$: C, 64·3; H, 7·9%). The remaining fractions (total, 4 g.) eluted from the column with chloroform–methanol remained amorphous.

Oxidation of Fraction I.—The material (1·2 g.) obtained as described above was acetylated at room temperature overnight with pyridine (10 c.c.) and acetic anhydride (10 c.c.), and the amorphous acetate obtained on evaporation was dissolved in acetone (60 c.c.) and oxidised with solid potassium permanganate (1·3 g.). After working up in the usual manner there were obtained an acid fraction (0·64 g.) and a neutral fraction (0·75 g.) which was reoxidised. After three successive oxidations in this manner the total acid product was esterified with diazomethane and chromatographed in light petroleum–benzene on a column of acid-washed alumina (30 g.). The benzene eluate crystallised from methanol and yielded methyl 3β : 11α-diacetoxy-14β-hydroxyetianate (200 mg.), m. p. 168°, $[\alpha]_D^{25}$ +16·8° (*c*, 0·15 in chloroform) (Found: C, 66·25; H, 8·2. Calc. for $C_{25}H_{38}O_7$: C, 66·6; H, 8·5%). The mixed m. p. with an authentic sample showed no depression.

Further Treatment of the Residues from the Mannich–Siewert Hydrolysis.—The material extracted by butanol (5 g.) was combined with the third fraction from the chromatography described above (4·0 g.) and refluxed for 0·5 hour with a 10%(v/v) solution of sulphuric acid in ethanol (250 c.c.). After cooling, the solution was diluted with water (250 c.c.), and the ethanol removed under diminished pressure. Extraction with chloroform gave a pale gum (5 g.) which was dissolved in a little chloroform, diluted with benzene, and chromatographed on acid-washed alumina (150 g.). The eluate (580 mg.) obtained with a 10% solution of chloroform in benzene crystallised from methanol and yielded *"β"-anhydrosarmentogenin 11-acetate* (270 mg.), m. p. 253° (Found: C, 72·9; H, 8·5. $C_{25}H_{34}O_5$ requires C, 72·4; H, 8·2%), $[\alpha]_D^{20\cdot5}$ −35·9° in methanol (*c*, 0·25), $[\alpha]_D^{20}$ −62°, $[\alpha]_{5461}^{20}$ −77° in chloroform (*c*, 0·33). Acetylation gave "β"-anhydrosarmentogenin diacetate, m. p. 205—206°, $[\alpha]_D^{21}$ −39·6° (*c*, 0·34 in chloroform), giving no depression of m. p. on admixture with an authentic specimen.

The eluate obtained with chloroform–benzene containing increasing amounts of chloroform and finally with pure chloroform crystallised from methanol, to give "β"-anhydrosarmentogenin (2·5 g.), m. p. 128°, $[\alpha]_D^{21}$ −17·2° ±0·5° (*c*, 0·52 in chloroform) (Found: C, 71·05; H, 8·7. Calc. for $C_{23}H_{32}O_4,H_2O$: C, 70·95; H, 8·65%). Finally chloroform containing 10% of methanol gave an eluate (350 mg.) which on crystallisation from methanol furnished sarmentogenin (150 mg.), m. p. 273°, $[\alpha]_D^{19}$ +21° ± 1° (*c*, 0·35 in methanol).

Sulphuric Acid Hydrolysis of Sarmentoside B Acetate.—Sarmentoside B acetate (10 g.) in a 10% (v/v) solution of sulphuric acid in methanol (125 c.c.) was refluxed for 0·5 hour and then diluted with water (125 c.c.). Extraction with chloroform yielded a pale gum (3·5 g.) which was taken up in benzene and chromatographed on alumina (80 g.). Chloroform–benzene (1 : 10) eluted "β"-anhydrosarmentogenin (1·05 g.), m. p. 128°; and 5% methanol in chloroform finally gave sarmentogenin (250 mg.), m. p. 273°. If the hydrolysis of the acetate was carried out by refluxing the solution for 1 hour almost the entire product could be obtained as "β"-anhydrosarmentogenin, which then crystallised directly on evaporation of the chloroform extract.

"β"-*Anhydrosarmentogenin.*—Sarmentogenin (2·5 g.) was dissolved in 10% methanolic sulphuric acid (100 c.c.) and refluxed for 0·5 hour. After dilution with water (100 c.c.) the solution was extracted with chloroform (2 × 100 c.c.), and the extract washed, dried, and evaporated. The residue crystallised from methanol, to give "β"-anhydrosarmentogenin, m. p. 128°, with solvent of crystallisation lost on fusion. Recrystallisation from ethyl acetate gave the anhydrous material, m. p. 210—212°, $[\alpha]_D^{23}$ −25·9°, $[\alpha]_{5461}^{23}$ −32·0° (*c*, 1·08 in chloroform) (Found: C, 74·5; H, 8·5. Calc. for $C_{23}H_{32}O_4$: C, 74·2; H, 8·7%). Acetylation gave the diacetate, m. p. 206°, $[\alpha]_D^{21}$ −39° ± 2° (*c*, 0·5 in chloroform) (Found: C, 70·7; H, 7·85. Calc. for $C_{27}H_{36}O_6$: C, 71·0; H, 7·9%).

Molecular-rotation Differences in "β"-Anhydrosarmentogenin and its Acetates.—These are in accordance with the constitution assigned, for $[M]_D$ 3-ol 11-acetate *minus* $[M]_D$ 3 : 11-diol is −161° (in chloroform), which may be compared with the value for position 11 of ΔOAc(α) −ΔO(α) = −149° quoted by Barton and Klyne (*Chem. and Ind.*, 1948, 755), whilst $[M]_D$ 3 : 11-diacetate *minus* $[M]_D$ 3-ol 11-acetate is +76° (in chloroform) compared with the value for position 3 in the 5-*n*-series of ΔOAc(β) − ΔO(β) = +17°.

Methyl 3β : 11α-*Diacetoxy*-14β-*hydroxyetianate.*—Sarmentogenin (2 g.) was dissolved by gentle warming in a mixture of pyridine (20 c.c.) and acetic anhydride (20 c.c.) and left overnight at room temperature. The solution was then cooled, diluted with methanol (20 c.c.), and evaporated under reduced pressure. The residual amorphous acetate crystallised when seeded with a specimen of the acetate kindly sent to us by Professor Reichstein and then melted over the range 130—150°. Even after chromatography the melting range could not be improved. The crude acetate was found satisfactory for all purposes.

The crude acetate obtained as described above was dissolved in ethyl acetate (150 c.c.) and ozonised at −80° until the solution became deep blue. After warming to room temperature the solution was treated with zinc powder (2 g.) and acetic acid (10 c.c.) and left with occasional shaking for a further 0·5 hour. After filtration, washing, and drying, the solution was evaporated under reduced pressure, and the residual white foam (2·6 g.) dissolved in methanol (150 c.c.). The solution was then treated with potassium hydrogen carbonate (2 g.) in water (75 c.c.), left overnight at room temperature, diluted with water (75 c.c.), and extracted with chloroform (2 × 150 c.c.). The extract was washed, dried, and evaporated, to give crude 3β : 11α-diacetoxy-14 : 21-dihydroxy-14β-pregnan-20-one (2·34 g.) as a white foam.

This was treated in dioxan (90 c.c.) with a solution of periodic acid (3·6 g.) in water (26 c.c.). Next morning the solution was diluted with water (40 c.c.), concentrated under reduced pressure to remove most of the dioxan, and extracted with ethyl acetate. The organic layer was then washed with 0·1N-sodium carbonate (100 c.c.), the aqueous layer acidified, extracted with chloroform, and the extract dried and evaporated. The residue (1·38 g.) was esterified with excess of ethereal diazomethane, the excess of reagent decomposed with a little glacial acetic acid, and the solvent evaporated. The residue crystallised readily from methanol and after recrystallisation methyl 3β : 11α-diacetoxy-14β-hydroxyetianate (1·108 g.) was obtained as flakes, m. p. 168°, $[\alpha]_D^{20}$ +18·9° (*c*, 0·38 in chloroform), showing no depression of m. p. on admixture with the previous specimen.

Methyl 3β : 11α-*Diacetoxyeti*-14-*enate* (*from Methyl* 3β : 11α-*Diacetoxy*-14β-*hydroxyetianate*).—The last-named ester (942 mg.) was dissolved in anhydrous pyridine (12 c.c.) and freshly redistilled phosphorus oxychloride (3 c.c.) added. After the addition of one drop of water the mixture was kept at room temperature overnight, and then poured into a mixture of ice and ether. The ethereal layer was separated, washed with dilute hydrochloric acid, aqueous sodium

carbonate, and water, dried, and evaporated. The residue was taken up in light petroleum and chromatographed on a column of 25 g. of acid-washed alumina. The petroleum eluate crystallised and after recrystallisation from methanol yielded *methyl* 3β : 11α-*diacetoxyeti*-14-*enate* (680 mg.) in large hexagonal plates, m. p. 117—120°, $[\alpha]_D^{22.5}$ 5° ± 0·5° (*c*, 1·0 in chloroform) (Found : C, 69·4; H, 8·35. $C_{25}H_{36}O_6$ requires C, 69·35; H, 8·3%).

Methyl 3β : 11α-*Diacetoxyetianate*.—Methyl 3β : 11α-diacetoxyeti-14-enate (2·75 g.) was dissolved in ethyl acetate (100 c.c.) and one drop of 70% perchloric acid added. The solution was then hydrogenated over 200 mg. of platinum oxide catalyst. In 20 minutes 183 c.c. of hydrogen were taken up (calc., 177 c.c.); the uptake of hydrogen then ceased. After filtration from catalyst the solution was washed with sodium hydrogen carbonate solution, dried, and evaporated. The residue, which was largely crystalline, was dissolved in light petroleum and chromatographed on alumina (100 g.). The first fractions eluted with light petroleum crystallised from ether, to give a compound (0·5 g.), m. p. 138—141°, $[\alpha]_D^{21}$ +44° ± 2° (*c*, 0·85 in chloroform), which is probably methyl 3β : 11α-diacetoxy-14-*iso*etianate (cf. Meyer, *Helv. Chim. Acta*, 1949, **32**, 1599) (Found : C, 68·95; H, 8·8. Calc. for $C_{25}H_{38}O_6$: C, 69·1; H, 8·8%). Subsequent fractions crystallised from ether, to give methyl 3β : 11α-diacetoxyetianate (1·75 g.), m. p. 180—181°, $[\alpha]_D^{21}$ +26·6° ± 0·3° (*c*, 0·61 in chloroform) (Found : C, 68·8; H, 9·1. Calc. for $C_{25}H_{38}O_6$: C, 69·1; H, 8·8%).

3β : 11α-*Diacetoxy*-21-*hydroxypregn*-14-*en*-20-*one*.—" β "-Anhydrosarmentogenin diacetate (800 mg.; from sarmentoside B) was treated in ethyl acetate (20 c.c.) at 0° with bromine (250 mg.) in ethyl acetate (5 c.c.). After 0·5 hour at 0° the mixture was cooled to −80° and ozonised. The solution did not become blue in this case, but ozonolysis was continued for twice the time calculated from ozonolyses of sarmentogenin acetate with the same ozoniser. After warming to 0° the solution was treated with zinc powder (2 g.) and acetic acid (5 c.c.), and the solution left for 0·5 hour at room temperature. After filtration and washing with aqueous sodium hydrogen carbonate the solution was evaporated. The residue (about 800 mg.) was dissolved in methanol (120 c.c.) and treated with potassium hydrogen carbonate (1·6 c.c.) in water (60 c.c.). After being kept overnight the solution was diluted with water (60 c.c.) and extracted with chloroform. Evaporation of the extract left crude 3β : 11α-diacetoxy-21-hydroxypregn-14-en-20-one (750 mg.) as a white foam.

Methyl 3β : 11α-*Diacetoxyeti*-14-*enate* (*from* 3β : 11α-*Diacetoxy*-21-*hydroxypregn*-14-*en*-20-*one*).—3β : 11α-Diacetoxy-21-hydroxypregn-14-en-20-one (750 mg.) was treated in dioxan (45 c.c.) with periodic acid (1·5 g.) in water (12 c.c.). After being kept overnight the solution was diluted with water (45 c.c.), the dioxan removed *in vacuo*, and the aqueous remainder extracted with ethyl acetate. The acid part of the extract was separated in the usual way and esterified with diazomethane. The ester thus obtained was chromatographed on alumina (15 g.); the light petroleum eluates crystallised from ether and yielded methyl 3β : 11α-diacetoxyeti-14-enate (370 mg.), m. p. and mixed m. p. 117—120°.

3β : 11α : 21-*Triacetoxypregnan*-20-*one*.—Crude 3β : 11α-diacetoxy-21-hydroxypregn-14-en-20-one (1·5 g.) obtained as described above was acetylated overnight with pyridine (6 c.c.) and acetic anhydride (6 c.c.). The solution was then diluted with methanol (20 c.c.) and evaporated to dryness *in vacuo*. The residue was taken up in benzene (60 c.c.) and light petroleum (60 c.c.), and chromatographed on acid-washed alumina (60 g.). Benzene eluted 850 mg. of a colourless gum which had a strong reducing action on ammoniacal silver nitrate solution. The gum was taken up in acetic acid (50 c.c.) and hydrogenated over Adams's catalyst, filtered from the catalyst, and re-oxidised with 10% aqueous chromic acid solution (2·5 c.c.) at room temperature overnight. The solution was then diluted with water (250 c.c.), extracted with ether, and worked up in the usual manner. The residue crystallised and on recrystallisation from methanol 3β : 11α : 21-*triacetoxypregnan*-20-*one* (570 mg.) was obtained in long needles, m. p. 180—181°, $[\alpha]_D^{20}$ +63° ± 3° (*c*, 0·25 in methanol) (Found : C, 67·8; H, 8·1. $C_{27}H_{40}O_7$ requires C, 68·1; H, 8·4%).

Methyl 3β : 11α-*Diacetoxyetianate* (*from* 3β : 11α : 21-*Triacetoxypregnan*-20-*one*).—3β : 11α : 21-Triacetoxypregnan-20-one (80 mg.) was dissolved in methanol (10 c.c.) and treated with potassium hydrogen carbonate (80 mg.) in water (2 c.c.). Next morning the ketol was worked up as usual, and then oxidised with periodic acid (100 mg.) in dioxan (10 c.c.) and water (1 c.c.). Esterification of the acid product with diazomethane gave, after recrystallisation from ether, methyl 3β : 11α-diacetoxyetianate (49 mg.), m. p. 181—182°, $[\alpha]_D^{21}$ +26° (*c*, 0·3 in chloroform), which gave no depression of m. p. on admixture with an authentic sample.

THE NATIONAL INSTITUTE FOR MEDICAL RESEARCH,
THE RIDGEWAY, MILL HILL, LONDON, N.W.7.

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