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The Rearrangement Reaction of Some Acetylated Unsaturated 2-Acetamidoaldose Derivatives. Selective Removal of one *N*-Acetyl Group from 2-(*N*-acetylacetamido) Compounds*

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Two pairs of anomers, the 1,4,6-tri-*O*-acetyl-2-(*N*-acetylacetamido)-2,3-dideoxy-D-hex-2-enopyranoses of the *erythro*- (II and III) and the *threo*- series (IV and VI) have been prepared and characterized. The molecular conformation of these substances has been discussed on the basis of their NMR spectral characteristics. It is suggested that the α-anomers II and IV adopt the H_5^O conformation as the favorable one, while the β-anomers III and VI most probably tend to take a slightly modified H_5^O conformation.

A convenient preparative method for selective removal of one *N*-acetyl group from *O*-acetylated *N*-acetylacetamido compounds is described. The reaction can be carried out in aqueous dioxane solution at room temperature in the presence of an ammonium salt at pH *ca.* 9.

In a previous paper[1] the isomerization of 3,4,6-tri-*O*-acetyl-2-(*N*-acetylacetamido)-1,5-anhydro-2-deoxy-D-*arabino*-hex-1-enitol (I) into 1,4,6-tri-*O*-acetyl-2-(*N*-acetylacetamido)-2,3-dideoxy-α-D-*erythro*-hex-2-enopyranose (II) through the action of acetic anhydride — zinc chloride was described. The α-D anomeric configuration for II was assigned on the basis of its NMR spectral characteristics. This compound, showing $[\alpha]_D$ + 22.3° (in chloroform), was isolated in 59% yield; however, a mixture containing II contaminated with a more dextrorotatory compound was also obtained[1]. The ratio of the two components in a particular sample could be estimated from the relative intensities of the peaks at τ 3.31 and 3.60, corresponding together to one proton.

The aim of this further investigation was the isolation and structure determination of that accompanying substance. Elemental analysis and the NMR spectrum of the mixture revealed the presence of two *N*-acetyl and three *O*-acetyl groups and showed the unknown substance to be an isomer of II. By gas liquid chromatography the components of the mixture were easily distinguishable, II being the one with the longer retention time. All attempts to separate the mixture either by repeated column chromatography on silica gel or by preparative thin layer chromatography were unsuccessful.

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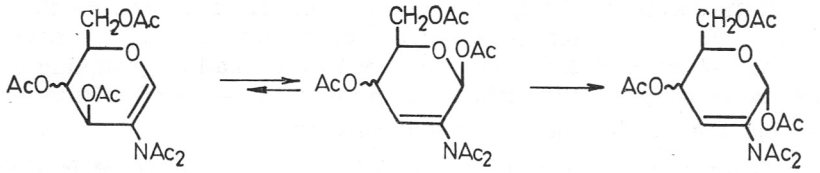
However, slow and careful crystallization of the mixture from ethanol and seeding with a crystal of II permitted the removal of most of II. Thereafter, it was possible to isolate from the mother liquor the second component that, on further recrystallization, was obtained in pure form (1—3%, $[\alpha]_D$ + 228°, in chloroform). Its NMR spectrum showed the absence of the signals at τ 3.60 and 3.95 (H-1 and H-3 of II)[1]. It seemed plausible to assume that this minor product isolated besides II might be its β-D anomer, 1,4,6-tri-*O*-acetyl-2-(*N*--acetylacetamido)-2,3-dideoxy-β-D-*erythro*-hex-2-enopyranose (III). However, the possibility of isomerization at C-4 in such allylic rearrangements cannot be ignored since Lemieux and coworkers[2] isolated a crystalline byproduct, later identified as 1,3,4,6-tetra-*O*-acetyl-3-deoxy-α-D-*threo*-hex-2-enopyranose[3], in an analogous isomerization of 2,3,4,6-tetra-*O*-acetyl-1,5-anhydro-1-deoxy-D--*arabino*-hex-1-enitol. Such an isomerization, taking place during the rearrangement of I to II, would have given 1,4,6-tri-*O*-acetyl-2-(*N*-acetylacetamido)--2,3-dideoxy-α-D-*threo*-hex-2-enopyranose (IV). Fortunately, the availability of 3,4,6-tri-*O*-acetyl-2-(*N*-acetylacetamido)-1,5-anhydro-2-deoxy-D-*lyxo*-hex-1--enitol[4] (V) made IV accessible by an independent route. The action of acetic anhydride-zinc chloride on V gave two products that were found to be separable on columns of silica gel and were obtained in yields of 30 and 18%. The major product had a negative optical rotation and an NMR spectrum that established its α-D-*threo* configuration (IV). The minor product, with $[\alpha]_D$ + 286°, was designated as 1,4,6-tri-*O*-acetyl-2-(*N*-acetylacetamido)-2,3-dideoxy-β-D-*threo*--hex-2-enopyranose (VI). Both products of this reaction were easily distinguished from compound III.

In constrast to the isomerization of I which proceeded readily at room temperature leaving unreacted starting material only in traces, the allylic rearrangement of the D-*lyxo* derivative V was slow and incomplete even on heating. It has already been noticed[3,5] that glycal esters having *cis* groups at C-3 and C-4 generally react much less easily than do those in which the C-3 and C-4 substituents are *trans*, and an explanation using geometric factors has been given[5].

In discussing the mechanism of the reactions involving nucleophilic attack on acetylated glycals, we earlier proposed[1] a pathway proceeding through initial rearrangement[6] of I into the thermodynamically less stable β-D anomer, which then anomerizes into II. As in the isomerizations of both 2-(*N*-acetylacetamido)-D-glycals I and V, the β-D anomers III and VI were obtained in very low or low yields, the same mechanism might be postulated. Evidence in support of that mechanism has been now obtained. Treatment of the β-D-*erythro* derivative III under identical isomerizing conditions, with acetic anhydride — zinc chloride, resulted in the formation of the α-D-*erythro* anomer II (as well as in the isolation of a minor amount of I). This observation supports the view that the acetoxy group at C-3 attacks C-1 from the more accessible side as the first step in the allylic rearrangement of glycals into 2,3-unsaturated derivatives and that the β-D esters are the initial intermediates.

Compounds II, III and IV, VI represent the first known pairs of anomers in the class of acetylated 2-(*N*-acetylacetamido)-2,3-unsaturated carbohydrates. It should be noted that the α-anomers II and IV are less dextrorotatory than the corresponding β-anomers III and VI. Thus, these are exceptions to Hudson's



arabino- I *lyxo-* V — *erythro-* III *threo-* VI — *erythro-* II *threo-* IV

isorotation rule, and in agreement with the rotational anomalies already observed with some other dideoxyaldenoses[7,8].

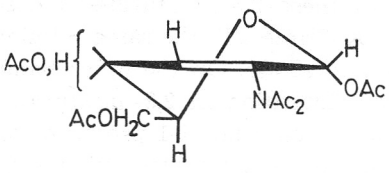
The NMR parameters for the two pairs of anomers are given in Table I. An attempt has been made to utilize the spectral data to determine the molecular conformation of these substances. It is well established that given anomeric pairs of 2,3-unsaturated aldopyranose esters exist in different half-chair conformations[7–10] and that this most probably arises from the anomeric

TABLE I

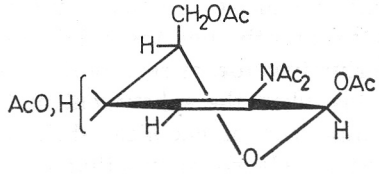
Chemical Shifts and Coupling Constants of Acetylated 2-(N-acetylacetamido)-2,3--dideoxy-D-hex-2-enopyranoses

	Compound	Chemical shifts (τ values)					Coupling Constants (Hz)	
		H-1	H-3	H-4	NAc (6H)	OAc	$J_{3,4}$	$J_{4,5}$
II	α-*erythro*-	3.60	3.95	4.40	7.62	7.90, 7.91 (9H)	2.0	~ 8.5
III	β-*erythro*-	3.31	4.32	4.60	7.61	7.89, 7.93, 7.98	4.0	~ 10
IV	α-*threo*-	3.50	3.74	4.68	7.65	7.90, 7.92, 7.96	5.8	2.0
VI	β-*threo*-	3.27	4.68	4.88	7.65	7.85, 7.89, 7.94	2.8	~ 1

effect[11]. With a positive anomeric effect, some esters of the α-D configuration assume H_5^O conformation while the β-D configuration takes the H_O^5 conformation. However, the generalization that β-anomers adopt the H_O^5 conformation is not always valid since anomeric pairs of 2,3-unsaturated aldopyranoses not differing in this fashion are known[12–14]. The values for coupling constants $J_{3,4}$ and $J_{4,5}$ are the most important for such conformational studies. While both of these values differ considerably when the anomeric pairs are in opposite conformations[3,7], they are almost of the same order of magnitude when both anomers adopt the H_5^O conformation[13].



H_5^O



H_O^5

The NMR spectrum of the α-D-*erythro* isomer II, together with the spectra of several 2,3-unsaturated-α-D-*erythro* derivatives having a diacylamino function at C-2, have already been described[1]; the small $J_{3,4}$ coupling constant and the large coupling indicating the *quasi*-axial — axial orientation ($J_{4,5}$) clearly sugested the H_5^O half-chair conformation.

The β-D-*erythro* isomer III in its NMR spectrum at 60 MHz showed a sharp singlet at τ 3.31, assigned to H-1, and a H-3 doublet at τ 4.32 with a spacing of 4.0 Hz ($J_{3,4}$). Although the H-4 signal at τ 4.60 was not clearly resolved, a pair of doublets containing the $J_{3,4}$ (4.0 Hz) and indicating the $J_{4,5}$ coupling (10 Hz), may be discerned. For a β-D-*erythro* derivative existing in the alternative H_O^5 conformation two coupling constants have been found to be characteristic[3,7]: the $J_{3,4}$ of the magnitude of 5—6 Hz and the narrow $J_{4,5}$ coupling of 1—2 Hz originating from *quasi*-equatorial H-4 and equatorial H-5 protons. This was not the case with the spectrum of compound III, the most striking difference being the large $J_{4,5}$ coupling constant. However, the value for $J_{3,4}$ suggested that the substance might be conformationally mobile, with an average ring shape between the H_O^5 and H_5^O conformations. Since the method of conformational »freeze-out« was successfully applied for the study of the conformational equilibria of carbohydrates[15], the NMR spectrum of III was measured at 100 MHz in deuterochloroform solution at low temperatures (to — 70°). The general feature of the spectra recorded at low temperatures was unchanged; no evidence for the existence of two separate conformers has been obtained. This negative result can be regarded as confirming the assumption that the compound is conformationally stable.

The α-D-*threo* isomer IV adopts the H_5^O conformation, the values for both $J_{3,4}$ and $J_{4,5}$ (Table I) being fully consistent with that conformation. Its anomer, β-D-*threo* derivative VI shows well defined H-1, H-3, and H-4 signals. Comparing with the spectrum of IV, the H-3 doublet in the spectrum of VI is shifted considerably upfield, to τ 4.68. This is compatible with the H-3 proton chemical shift change in anomeric pairs of 2,3-unsaturated purine derivatives of the D-*threo* series[13], which were found to exist in the same conformation. Although the $J_{3,4}$ and $J_{4,5}$ values in the spectrum of VI are reduced, relative to those of its α-anomer IV, the differences are not as great as would be expected if the anomers adopted different half-chair conformations. Furthermore the spectra at low temperatures failed to reveal the presence of a second conformer.

It may be noted that the H-1 proton of the β-anomers III and VI resonates at lower field than the *quasi*-equatorially oriented H-1 of the corresponding α-anomers II and IV. Although a diacylamino group at C-2 is known to cause axial anomeric protons to resonate at lower field than equatorial ones[16], this is apparently not the origin of the effect with these 2,3-unsaturated aldose derivatives for, as seen with compounds IX and X (Table III), the same relation holds when the substituent at C-2 is an acetamido group. On the other hand, comparison of chemical shift with anomeric configuration in 2,3-unsaturated systems clearly shows that the signal for a *quasi*-equatorial H-1 proton of an α-anomer appears at higher field than that of the β-derivatives existing in the opposite[3,7,9] or in the same[12,14,17] conformation.

In conclusion it might be suggested that the α-anomers II and IV do adopt the H_5^0 conformation as the favorable one, while the β-anomers III and VI most probably tend to assume a conformation close thereto.

Although the 2-(*N*-acetylacetamido)-D-glycals are rather stable compounds, particularly when in the crystalline form, it was earlier noted that partial de-*N*-acetylation occurs during column chromatography[1,18,19]. In the course of the present research a similar observation was made with the crude mixtures from the isomerization of I or V; extensive elution of the columns led to the isolation of 2-acetamido derivatives. By way of confirming the structure of these compounds, we searched for a convenient method for the deliberate removal of one *N*-acetyl group from 2-(*N*-acetylacetamido) compounds.

Treatment of a solution of II in dioxane with saturated aqueous solution of ammonium acetate at room temperature for 7 hours afforded 2-acetamido--1,4,6-tri-*O*-acetyl-2,3-dideoxy-α-D-*erythro*-hex-2-enopyranose (IX) in very good yield. The substance was found to be identical with material isolated during the fractionation of the crude isomerization mixture on columns of silica gel. This simple preparative method proved to be efficient; it was tested on many samples and was found to be of general applicability. Thus, the compounds VII—XII were prepared from the corresponding *N*-acetylacetamido derivatives (Tables II and III). It is of particular interest to note that the reaction is quantitative with substances having a double bond in either the C_1—C_2 or the C_2—C_3 position. On the other hand, the saturated *N*-acetylacetamido derivatives are more stable; 2-acetamido-1,3,4,6-tetra-*O*-acetyl-2-deoxy-D-galactopyranoses (XII and XIV) could only be obtained in moderate yields.

Further investigation designed to give a better understanding of the course of the selective de-*N*-acetylation has been undertaken. 3,4,6-Tri-*O*-acetyl-2-(*N*--acetylacetamido)-1,5-anhydro-2-deoxy-D-*arabino*-hex-1-enitol (I) was chosen as the model substance, and the action of several ammonium salts was examined. In addition to ammonium acetate, saturated aqueous ammonium carbonate was found to be effective for selective removal of one *N*-acetyl group. As the next step, the reaction of I in the presence of *a)* ammonium acetate, and *b)* ammonium carbonate, was carried out under pH control; the progress of the reaction was followed on thin layer chromatography. Whereas in *a)* during the time necessary for the completion of the reaction (20 hours), the pH dropped from an initial value of 8.1 to 7.3, in *b)* the pH of the reaction mixture was 9.0 at the beginning and at the termination of the reaction (2 hours). In the presence of ammonium chloride, at pH 6.5, the reaction did not take place. However, when the reaction mixture containing ammonium chloride was buffered by the addition of 1 *M* ammonia to pH 9.0, the reaction started immediately and it was completed in the course of 3 hours with the pH dropping to 8.4.

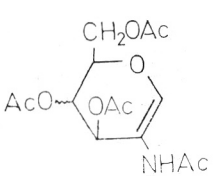
It is evident that the selective de-*N*-acetylation of *O*-acetylated *N*-acetylacetamido containing compounds is a pH-dependent reaction. The following mechanism might be supposed to be operating:

$$NH_4^+ \rightleftarrows NH_3 + H^+$$

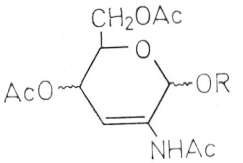
$$R\text{-}N(COCH_3)_2 + NH_3 \longrightarrow R\text{-}NHCOCH_3 + CH_3CONH_2$$

TABLE II

Acetylated 2-Acetamido-1,5-anhydro-2-deoxy-D-hex-1-enitols (A) and 2-Acetamido-2,3-dideoxy-D-hex-2-enopyranoses (B)



A



B

No.	Structure	Time hours	Solvent for column. chromat.	Yield %	M. p. °C	$[\alpha]_D$ in $CHCl_3$	Formula	Calc'd. C	Calc'd. H	Calc'd. N	Found C	Found H	Found N
VII	*A, arabino,*	20	*B*	99		— 21.4[a]							
VIII	*A, lyxo-*[b]	20	*B*	89	colorless foam, unstable[c]	+ 18.5					50.93	5.68	4.16
IX	*B,* R = Ac *α-erythro-*	7	*A*	98	colorless foam, unstable[d]	+ 31.5	$C_{14}H_{19}NO_8$ (329.31)	51.06	5.82	4.25	50.92	5.72	4.05
X	*B,* R = Ac *β-erythro-*	20	*B*	99	118—120[e]	+ 298					51.04	5.72	4.04
XI	*B,* R = Ac *α-threo-*	7	*B*	83	80—82[e]	— 198					51.24	5.91	4.19
XII	*B,* R = COC_6H_5 *α-erythro-*	20	*A*	98	colorless foam, stable[c]	— 15.5	$C_{19}H_{21}NO_8$ (391.39)	58.31	5.41	3.58	58.60	5.60	3.49

[a] ref. 18: $[\alpha]_D$ — 24.6° (in $CHCl_3$; [b] ref. 20: compound was synthesized, but not isolated; [c] for analysis rechromatographed from the same solvent; [d] for analysis rechromatographed using solvent system *B*; [e] crystallized from ethanol.

In favor of the suggested mechanism stands the fact that evidence for the formation of acetamide has been obtained through GLC examination of the crude product from the reaction carried out with ammonium carbonate. Acetamide cannot be an artifact here, and we may regard the di-*N*-acyl compound as simply an acylating agent.

TABLE III

Assignments in the NMR Spectra of Acetylated 2-Acetamido-1,5-anhydro-2-deoxy--D-hex-1-enitols (A) and 2-Acetamido-2,3-dideoxy-D-hex-2-enopyranoses (B)

No.	Chemical Shifts (τ values)					Coupling Constants (Hz)	
	NH	H-1 (s)	H-3 (d)	H-4 (q)	NAc and OAc	$J_{3,4}$	$J_{4,5}$
VIII	3.22	2.82	4.28	4.51	7.89, 7.92, 7.95, 8.00	4.5	2.0
IX	2.09	3.72	3.40	4.41	7.85, 7.91, 7.98 (12H)	2.5	~ 9
X	2.88	2.56	4.47	4.80	7.89, 7.93, 7.97, 8.00	3.8	~ 10
XI	2.30	3.67	3.18	4.65	7.85, 7.94 (12H)	6.2	2.1
XII	2.19	3.52	3.24	4.36	7.89, 7.97 (9H)	2.5	9.5

EXPERIMENTAL*

Melting points are uncorrected; specific rotations were measured at 20—23° in chloroform. Thin layer chromatography was conducted on silica gel G (E. Merck) on microscope slides and 5 × 20 cm plates, the components being detected by spraying with 10% sulfuric acid and heating at 100°. Column chromatography was carried out on silica gel (0.05—0.2 mm, E. Merck) using the following solvent systems: *A*, ether; *B*, ether-benzene-methanol (5 : 5 : 1); *C*, benzene: acetone (2 : 1). GLC was run on a Hewlett-Packard No. 700 instrument, equipped with a thermal conductivity detector; the column employed (0.25 in × 6 ft) was filled with 10% SE 52 on Chromosorb W.

Infrared spectra were recorded on a Perkin-Elmer model 137 instrument. The NMR spectra were taken in chloroform-*d* solution using a Varian A-60*A* spectrometer and tetramethylsilane as an internal standard, unless stated otherwise.

*Isomerization of I and Isolation of 1,4,6-Tri-*O*-acetyl-2-(*N*-acetylacetamido)-2,3--dideoxy-β-*D*-erythro-hex-2-enopyranose* (III)

A mixture of I (2.0 g) and anhydrous zinc chloride (400 mg) dissolved in acetic anhydride (8 ml) was stirred at room temperature for 6 hours. The solution was poured onto ice-water, neutralized by addition of sodium bicarbonate, and then was extracted with chloroform. The extract was washed with aqueous sodium bicarbonate solution and water, and dried. Removal of the solvent gave a syrup which was chramatographed on a column of silica gel (90 g) using solvent *A* for elution, and collecting 7-ml franctions. All fractions were examined on large thin layer plates developed in ether, and were divided into two groups. In the first group were collected fractions containing the product contaminated with I, which was the first compound to emerge; evaporation of these fractions (*ca.* 5 fractions) yielded 180—280 mg of the mixture.

Further fractions (*ca.* 10) contained the mixture of II and III. The ratio of anomers was monitored by GLC (isothermally at 220°). Evaporation of the second group gave 1.1—1.5 g. (55—75%) of crystalline product having $[\alpha]_D$ + 64°.

Elution of the column with solvent *C* isolated material (195 mg, 11%) which was rechromatographed using the same solvent mixture. NMR and IR spectra identified

* Some experiments on the isolation of compound III were carried out by I. Franjić, B. Sc.

it as *2-acetamido-1,4,6-tri*-O-*acetyl-2,3-dideoxy*-α-D-erythro-*hex-2-enopyranose* (IX), described later in this paper.

The mixture of anomers II and III (1.1—1.5 g) was dissolved in ethanol (11—15 ml), the solution cooled at room temperature and seeded with a crystal of II. It was kept at room temperature for a few hours and then for two days in a refrigerator. Large crystals which deposited were filtered off: 720—870 mg, m. p. 90—91°, $[\alpha]_D$ + 22.0° (*c* 1.05). The sample appeared to be homogeneous on GLC. The NMR spectrum was indistinguishable from that of the described[1] α-D-anomer II.

Mother liquors of two batches were evaporated together to a syrupy residue, which was thoroughly dried. After trituration with absolute ether it afforded crystalline material showing $[\alpha]_D$ *ca.* + 110°. After two or three crystallizations from ethanol (2 ml./100 mg.) crystalline *1,4,6-tri*-O-*acetyl-2-(*N-*acetylacetamido)-2,3-dideoxy*--β-D-erythro-*hex-2-enopyranose* (III), which was homogeneous by TLC and GLC, was obtained. Yield: 40—115 mg, 1—3%; m. p. 99—101°, $[\alpha]_D$ + 288° (*c* 0.60).

Infrared absorption (KBr) at 1760, 1720, 1695 (OAc and NAc), and 1670 cm^{-1} (C=C).

Anal. $C_{16}H_{21}NO_9$ (371.36) calc'd: C 51.75; H 5.70; N 3.77%
found: C 51.46; H 5.53; N 3.72%

Isomerization of V into the 1,4,6-Tri-O-*acetyl-2-(*N-*acetylacetamido)-2,3-dideoxy*--D-threo-*hex-2-enopyranoses* (IV and VI)

A mixture of V[4] (1.0 g) and anhydrous zinc chloride (200 mg) dissolved in acetic anhydride (4 ml) was stirred and heated at 50—55° for 6 hours. The solution was worked up as described above; the syrup obtained on evaporation of the chloroform extract showed on TLC in ether the presence of three very close-moving components. It was chromatographed on a column of silica gel (100 g). using solvent *A* for elution, with collection of 6-ml. portions of eluate.

Fractions 17—24 contained crystalline material (185 mg, 18%), which was crystallized from ethanol. Chromatographic behaviour, infrared spectrum, and mixed m. p. identified it as unchanged 3,4,6-tri-*O*-acetyl-2-(*N*-acetylacetamido)-1,5-anhydro--2-deoxy-D-*lyxo*-hex-1-enitol (V).

Fractions 25—30 gave after evaporation 182 mg (18%) of a crystalline product showing $[\alpha]_D$ + 157° (*c* 0.90). Crystallization from ethanol afforded pure *1,4,6-tri*-O--*acetyl-2-*(N-*acetylacetamido)-2,3-dideoxy*-β-D-threo-*hex-2-enopyranose* (VI); m. p. 138—139°, $[\alpha]_D$ + 286° (*c* 0.96).

Infrared absorption at 1760 (OAc), 1710 (NAc), and 1670 cm^{-1} (C=C).

Anal. $C_{16}H_{21}NO_9$ (371.36) calc'd.: C 51.75; H 5.70; N 3.77%
found: C 51.85; H 5.66; N 3.97%

Fractions 33—44 yielded *1,4,6-tri*-O-*acetyl-2-(*N-*acetylacetamido)-2,3-dideoxy*--α-D-threo-*hex-2-enopyranose* (IV) in crystalline form (300 mg, 30%), which after crystallization from ethanol had m. p. 138—139° and $[\alpha]_D$ — 216° (*c* 0.96). A mixed m. p. with VI was depressed.

Infrared absorption at 1740 (OAc), 1700 (NAc), and 1675 cm^{-1} (C=C).

Anal. found: C 51.69; H 5.48; N 3.85%

Anomerization of III into II

A sample (100 g) of III, anomerically pure by NMR and showing $[\alpha]_D$ + 270°, was dissolved in acetic anhydride (1 ml) and anhydrous zinc chloride (20 mg) was added. The mixture was stirred at room temperature for 6 hours, then was poured onto ice-water and processed as described above. Evaporation of the solvent from the dried extract left a crystalline residue, which was chromatographed on a column of silica gel (25 g) using solvent *A* for elution and collecting 2-ml portions of eluate.

Fractions 11—13 contained a crystalline compound (10 mg, 10%); its chromatographic behavior and infrared spectrum identified it as 3,4,6-tri-*O*-acetyl-2-(*N*--acetylacetamido)-1,5-anhydro-2-deoxy-D-*arabino*-hex-1-enitol (I).

Fractions 14—21 were pooled and evaporated to yield 1,4,6-tri-*O*-acetyl-2-(*N*--acetylacetamido)-2,3-dideoxy-D-*erythro*-hex-2-enopyranose (84 mg, $[\alpha]_D$ + 50.4°). It gave NMR signals at τ 3.31 (H-1 of the β-anomer III) and 3.60 (H-1 of the α-anomer II). The relative intensities of the two singlets suggested that the ratio of II to III was at least 5 : 1.

Removal of one N-*Acetyl Group from 2-(*N-*Acetylacetamido) Compounds*

General Procedure. — To a solution of the 2-(*N*-acetylacetamido) compound (0.5 g) in dioxane (20 ml) was added a saturated aqueous solution of ammonium acetate (1 ml) and then water (*ca.* 7 ml) until the turbidity disappeared. The solution was stirred at room temperature, the progress of the reaction being followed by thin layer chromatography. It was kept for 7 or 20 hours (see Table II) with the exception of 1,3,4,6-tetra-*O*-acetyl-2-(*N*-acetylacetamido)-2-deoxy-α-D-galactopyranose[17] and its β--D-anomer[4] in which cases the reaction was prolonged for three days. The solvents were then evaporated *in vacuo,* the residue dissolved in chloroform (60 ml) and washed several times with water. The moisture was removed with sodium sulfate and the extract was concentrated to a syrup which was chromatographed on a column of silica gel (50—60 g) using the solvent system specified. Compounds VII—XII showed in the infrared C=C absorption in the region 1670—1700 cm^{-1}, and gave a positive test for unsaturation with fluorescein-bromine.

The data for glycals VII—XII are summarized in Table II; their NMR spectral characteristics are given in Table III.

*2-Acetamido-1,3,4,6-tetra-*O*-acetyl-2-deoxy-*α*-D-galactopyranose* (XIII) was obtained by fractionation on a column of silica gel using solvent *B*. The first compound to emerge was recovered 1,3,4,6-tetra-*O*-acetyl-2-(*N*-acetylacetamido)-2-deoxy α-D--galactopyranose[19] (32%), followed by crystalline XIII in 47% yield. Triturated with anhydrous ether, the substance showed m. p. 174—177° and $[\alpha]_D$ + 97.6°; a mixed m. p. was undepressed, and the infrared spectrum was superimposable with that of an authentic sample[21].

*2-Acetamido-1,3,4,6-tetra-*O*-acetyl-2-deoxy-*β*-D-galactopyranose* (XIV) was obtained in 60% yield after chromatography using solvent *B*. Chromatographic behavior, infrared spectrum, and mixed m. p. were indistinguishable from those of an authentic specimen[21]. 1,3,4,6-Tetra-*O*-acetyl-2-(*N*-acetylacetamido)-2-deoxy-β-D-galactopyranose[4] was recovered in 14% yield.

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IZVOD

Reakcije pregrađivanja derivata acetiliranih nezasićenih 2-acetamidoaldoza. Selektivno uklanjanje jedne *N*-acetil grupe iz spojeva koji sadrže 2-(*N*-acetilacetamido) grupu

N. Pravdić, B. Židovec i H. G. Fletcher, Jr.

Pripravljena su i karakterizirana dva anomerna para nezasićenih amino šećera, 1,4,6-tri-*O*-acetil-2-(*N*-acetilacetamido)-2,3-dideoxy-D-heksen-2-piranoze iz *eritro* (II i III) i iz *treo* serije (IV i VI). Molekularna konformacija ovih spojeva diskutirana je na osnovu njihovih NMR spektralnih karakteristika, te se predlaže da α-anomeri II i IV kao najpovoljniju zauzimaju H_5^O konformaciju, dok β-anomeri III i VI najvjerojatnije poprimaju neznatno modificiranu istu konformaciju.

Opisana je jednostavna metoda za selektivno uklanjanje jedne *N*-acetil skupine iz *O*-acetiliranih spojeva koji sadrže *N*-acetilacetamido skupinu. Ta se reakcija izvodi na sobnoj temperaturi u smjesi dioksan-voda u prisutnosti jedne amonijske soli kod pH oko 9.

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