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Synthesis and Acid-induced Ring Opening of Modified Glycals. Synthons for (14*R*,15*R*)-Lipoxin B and (7*S*,8*R*)-(−)-Disparlure

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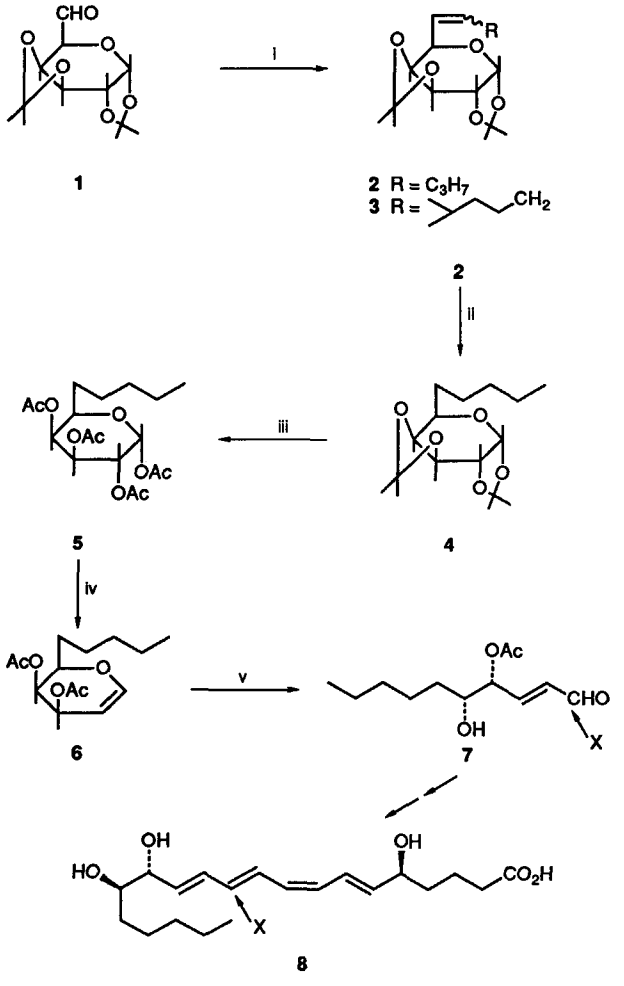
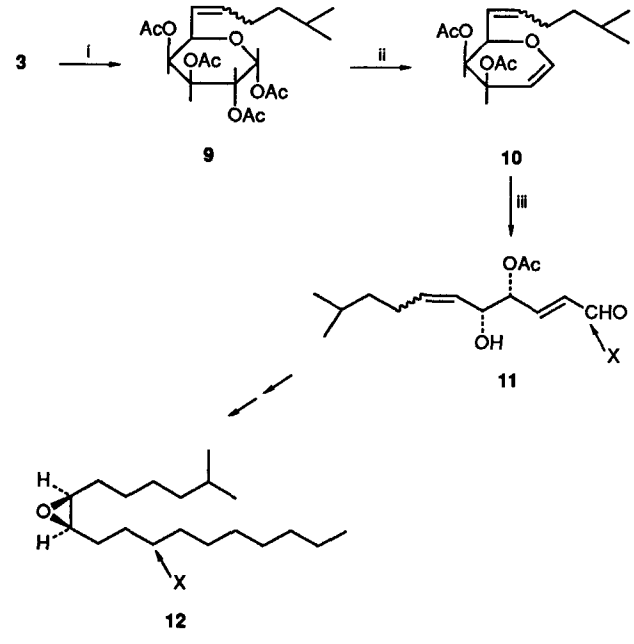
The chiral 1,2-unsaturated dihydroxyaldehydes **7** and **11** were synthesized as synthons for (14*R*,15*R*)-lipoxin B **12** and (7*S*,8*R*)-(−)-*cis*-disparlure **13**, based on new glycals **6** and **10** prepared from α-D-galactose.

The preparation of α,β-unsaturated dihydroxyaldehydes *via* the acid-induced ring opening of glycals obtained from 6-deoxyhexoses is known only for rhamnal.[1] In connection with our research on the synthesis of aliphatic polyhydroxy compounds, we have studied the glycals **6** and **10** prepared from 1,2;3,4-di-*O*-isopropylidene-α-D-*galacto*-hexodialdo-1,5-pyranose **1** (Scheme 1). Compounds **2** and **3** were synthesized in 64 and 45% yields, respectively, in reactions of the aldehyde **1** with butylidene- or 4-methylpentylidene-triphenylphosphorane. The hydrogenation of compound **2** led to a 98% yield of the pyranose **4**; following acidic hydrolysis and acetylation, the latter was transformed into the tetraacetate **5** in 78% yield. Compound **5** was treated with anhydrous hydrogen bromide in acetic acid and then with zinc dust resulting in the glycal **6**. Acid-induced ring opening of the glycal **6**, catalysed by mercury(II) sulphate, led to a 68% yield of (2*E*,4*R*,5*R*)-4-acetoxy-5-hydroxydec-2-enal,† a key synthon for the linear trihydroxy-icosanoid (14*R*,15*R*)-lipoxin B **8**.[2]



Scheme 1 *Reagents and conditions*: i, $Br^-Ph_3P^+CH_2R$, Bu^nLi, tetrahydrofuran (THF), −78→0 °C, 1 h; ii, H_2, Pt, EtOH, 3 h; iii, 50% AcOH, 100 °C, 3 h; Ac_2O, pyridine, 25 °C, 2 h; iv, HBr, AcOH, 0 °C, 2 h; Zn, AcOH, 10 °C, 3 h; v, 0.05 mol dm^{-3} H_2SO_4, $HgSO_4$, dioxane, 25 °C, 3 h



Scheme 2 *Reagents and conditions*: i, HCl, THF, 65 °C, 3 h; Ac_2O, pyridine, 25 °C, 2 h; ii, HBr, AcOH, 0 °C, 1 h; Zn, AcOH, 10 °C, 3 h; iii, 0.05 mol dm^{-3} H_2SO_4, $HgSO_4$, dioxane, 25 °C, 3 h

Acidic hydrolysis and acetylation of compound **3** led to a 77% yield of tetraacetate **9**, which yielded the glycal **10** in 30% yield *via* a sequence of transformations similar to those for **5** (Scheme 2).

The opening of the glycal **10** proceeds smoothly in the presence of mercury(II) sulphate resulting in a 70% yield of (2*E*,4*R*,5*R*)-4-acetoxy-5-hydroxy-10-methylundeca-2,6-dienal† **11**, a synthon for (7*S*,8*R*)-(−)-*cis*-disparlure **12**.[3]

Therefore, acid-induced ring opening of modified glycals prepared from α-D-*galacto*-hexodialdo-1,5-pyranose is a convenient method for the synthesis of chiral structural units of various aliphatic polyhydroxy compounds.

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† The IR and ^1H and ^{13}C NMR spectra were as expected for all new compounds; their elemental analyses were satisfactory. Spectral data for **7**: $[\alpha]_{20}^D$ + 29.5° (*c* 1.11, $CHCl_3$); ^{13}C NMR ($CDCl_3$) δ 13.96 (C-10), 20.80 (*Me*CO), 22.53 (C-9), 25.19 (C-7), 31.62 (C-8), 32.96 (C-6), 72.40 (C-5), 75.16 (C-4), 133.04 (C-2), 151.03 (C-3), 192.86 (C-1); for **11**: $[\alpha]_{20}^D$ − 40° (*c* 2.0, $CHCl_3$), ^{13}C NMR ($CDCl^3$) δ 20.90 (*Me*(O), 22.23 (C-12), 22.37 (C-11), 25.85 (C-8), 27.50 (C-10), 38.42 (C-9), 68.19 (C-5), 75.14 (C-4), 125.94 (C-2), 137.76 (C-7), 136.43 (C-6), 150.43 (C-3), 169.88 (MeCO), 192.73 (C-1).