Synthesis of \( p \)-Trifluoroacetamidophenyl 3-\( \text{O-}(\alpha \text{-d-Glucopyranosyl}) \)-\( \alpha \text{-d-mannopyranoside} \)

PER J. GAREGG and THOMAS NORBERG

Department of Organic Chemistry, Arrhenius Laboratory, University of Stockholm, S-106 91 Stockholm, Sweden

In our continuing programme of synthesis of artificial \textit{Salmonella} antigens, oligosaccharides linked to a moiety suitable for attachment to proteins corresponding to O-antigens \(^1\) 2,4,8 and 9 have been made.\(^2\)–\(^6\) We now report the synthesis of the title substance, required for immunological studies. The disaccharide moiety has been suggested to be the immunodominant part of O-antigen 14 occurring in \textit{Salmonella} bacteria belonging to serogroup C\(_1\).\(^7\)

\( p \)-Nitrophenyl 2-O-benzyl-4,6-O-benzylidene-\( \alpha \text{-d-mannopyranoside} \)\(^6\)–\(^8\) (1) was converted into the corresponding \( p \)-trifluoroacetamido mannoside\(^9\) (2). This was allowed to react with 2,3,4,6-tetra-O-benzyl-\( \alpha \text{-d-glucopyranosyl} \) bromide\(^10\) under halide-ion assisting conditions using molecular sieves as acid acceptor.\(^11\) The resulting \( \alpha \)-linked disaccharide 3 was obtained in a 44\% yield. Hydrogenation over palladium on carbon afforded the title compound 4. The conversion of 4 into the corresponding isothiocyanate and the subsequent coupling to bovine serum albumin were carried out as previously described.\(^6,12\)

\textbf{Experimental}. General methods were the same as those described before.\(^13\)

\( p \)-\textit{Trifluoroacetamidophenyl} 2-O-benzyl-3-O-(2,3,4,6-tetra-O-benzyl-\( \alpha \text{-d-glucopyranosyl}) \)-4,6-O-benzylidene-\( \alpha \text{-d-mannopyranoside} \) (3). 2,3,4,6-Tetra-O-benzyl-\( \alpha \text{-d-glucopyranosyl} \) bromide\(^10\) (prepared from the corresponding 1-O-p-nitrobenzoate (1.60 g, 2.32 mmol and used directly) in dichloromethane (2 ml) was added to a solution of \( p \)-trifluoroacetamidophenyl 2-O-benzyl-4,6-O-benzylidene \( \alpha \)-d-mannopyranoside (2)\(^6\)–\(^8\) (1.0 g, 2.32 mmol) in dichloromethane (9 ml) and \( N,N \)-dimethylformamide (1 ml) containing tetraethylammonium bromide (0.42 g) and powdered 4 Å molecular sieves. After stirring at 35 °C overnight, when TLC indicated that most of the bromide had reacted, the mixture was filtered, the filtrate was washed with water and aqueous sodium hydroxycarbonate, dried (\textit{MgSO}_\textsubscript{4}), filtered and concentrated to syrupy crude 3 which was purified by silica gel column chromatography\(^14\) (toluene – ethyl acetate 9:1) Syrupy 3 (0.85 g, 44\% \([\alpha]_D +113^\circ (c \text{ 0.5, CHCl}_3) \) was obtained.

\( p \)-\textit{Trifluoroacetamidophenyl} 3-O-(\( \alpha \text{-d-glucopyranosyl}) \)-\( \alpha \text{-d-mannopyranoside} \) (4). 3 (0.85 g) in 95\% aqueous ethanol was hydrogenated with 10\% palladium on carbon (0.4 g) at 400 kPa. After filtration, concentration, partitioning between water and diethyl ether and lyophilization of the aqueous phase, chromatographically (TLC, ethyl acetate – methanol – acetic acid – water, 20:3:3:2) pure 4 was obtained (0.40 g, 96\% \([\alpha]_D +108^\circ (c \text{ 0.5, H}_2\text{O})\). 25 MHz \( ^1\text{C} \) NMR (\textit{D}_2\text{O}, external TMS): \( \delta \) 61.8 (glucose and mannose \( \text{C-6} \)), 66.9, 70.9, 73.0, 73.6, 74.1, 74.6, 79.8 (pyranose ring carbons), 99.3 (mannose C-1), 101.8 (glucose C-1), 118.5, 124.5, 130.8, 154.7 (aromatic C). 100 MHz \( ^1\text{H} \) NMR (\textit{D}_2\text{O}, external TMS): \( \delta \) 5.28 (d, 1 \( H, J_{1,2} 3.7 \) Hz, glucose H-1), 5.57 (d, 1 \( H, J_{1,2} 2.0 \) Hz, mannose H-1).

\textbf{Acknowledgements}. We are indebted to Professor Bengt Lindberg for his interest and to the Swedish Natural Science Research Council for financial support.


0302-4369/81/040305-02$02.50
© 1981 Acta Chemica Scandinavica
Short Communications


Received March 24, 1981.