used thin-layer chromatography coupled with liquid secondary ion mass spectrometry (TLC-LSIMS) as part of an analytical protocol to determine the core structures of O-linked glycans isolated from mucins. In this procedure, glycan alditols derived from mucins were used to synthesize neoglycolipids, which can be separated by TLC and analyzed by IRMS directly on the thin-layer chromatogram (21a).

V. CONCLUSION

Thin-layer chromatography is a well-established method in carbohydrate analysis. It is suitable for analysis of monosaccharides and short-chain sugars, oligosaccharides, and carbohydrate polymers. Glycolipids can be analyzed as intact glycoconjugates by TLC or by TLC-immuno-overlay procedures, whereas carbohydrate moieties of other glycoconjugates must be enzymatically cleaved or digested by acid hydrolysis prior to TLC analysis. Although there may be little room for improvement on the basic uses of TLC, some unique advantages of planar chromatography, including the potential for interfacing with modern image processing systems, have not yet been fully exploited. The ability of analytical and preparative TLC to interface with more recently developed chromatographic and mass spectrometric analytical techniques ensures that TLC will have a place in carbohydrate analysis in the future.

ABBREVIATIONS

Abbreviations used in the tables and figures are as follows: Ara = arabinose, Rib = ribose, Gal = galactose, Glc = glucose, Xyl = xylose, Man = mannose, Fuc = fucose, Fru = fructose, Sor = sorbose, MeGlc = 3-*O*-methylglucose, dGlc = 2-deoxyglucose, drib = 2-deoxyribose, Suc = sucrose, Mal = maltose, Lac = lactose, Pan = panose, Nig = nigerose, Raf = raffinose, Mel = melezitose, AraH = arabinitol, XylH = xylitol, ManH = mannitol, SorH = sorbitol, Ino = inositol, Ery = erythritol, GalN = galactosamine, GlcN = glucosamine, GlcNAc = *N*-acetylglucosamine, ManNAc = *N*-acetylmannosamine, LacNAc-*N*-acetyllactosamine, GlcU = glucuronic acid, GalU = galacturonic acid, DP = degree of polymerization, GSL = glycosphingolipid, TLC = thin-layer chromatography (plate), HPTLC = high-performance thin-layer chromatography (plate), MD = multiple development, AMD = automated multiple development, HPPLC = high-pressure planar liquid chromatography, OPLC = overpressured planar liquid chromatography, PAGE = polyacrylamide gel electrophoresis, NST = 2-aminoethyldiphenylborinate, ADP = aniline–diphenylamine–phosphoric acid reagent, aq. = aqueous, sat = saturated, sol = solution.

ACKNOWLEDGMENTS

I gratefully acknowledge the contributions of Marko Pukl, Mirko Prosek, Alenka Golc-Wondra, and Katarina Jamnik, whose chapter on carbohydrate analysis in the second edition of this handbook provided considerable material and the framework for this revised chapter. The contributions of Joshua Jenkins, Marlo Carter, and Rana Snipe of Spelman College and the RIMI program office staff (funding from NIH/RIMI grant RR 011598 and MBRS grant GM 08241) to the literature search and manuscript preparation are also gratefully acknowledged.

REFERENCES

1. S. Hakomori. J. Biol. Chem. 265:18713–18716, 1990.
2. F. G. Hanisch, W. Chai, J. R. Rosankiewicz, A. M. Lawson, M. S. Stoll, and T. Feizi. Eur J Biochem. 217:645–655, 1993.
3. D. J. Cline, B. Fried, and J. Sherma. Acta Chromatogr. 9:79, 1999.
4. S. D. Wagner, Y. Kim, B. Fried, and J. Sherma. J. Planar Chromatr.-Mod. TLC 14:459–461, 2001.
5. M. D. Maloney, L. H. Semprevivo, and G. C. Coles. Int. J. for Parasitol. 20:1091–1093, 1990.
6. J. A. Wasylnka, M. I. Simmer, and M. M. Moore. Microbiology 147:869–877, 2001.

7a. S. C. Churms. J. Chromatogr. 500:555–583, 1990.