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Lipids

Bernard Fried

Lafayette College, Easton, Pennsylvania, U.S.A.

1. INTRODUCTION AND ADVANTAGES

Thin-layer chromatography (TLC) is used extensively for lipid analysis and is a valuable tool for the separation and tentative identification of neutral and complex lipid classes. TLC can achieve separations of complex mixtures comparable to other types of liquid column chromatography. Although numerous sorbents are available for lipid TLC, silica gel is the one used most frequently. In recent years, lipid TLC has made use of the newer, finer grades of silica gel, which are also used in high-performance liquid chromatography (HPLC) columns. TLC has the distinct advantage of allowing for the separation of lipids of different polarities on the same plate with a single solvent system.

Silica gel plates can be sprayed or dipped with general or specific detection reagents for the identification of numerous lipophilic compounds. Moreover, prior to sample spotting, a TLC plate can be treated with chemicals that alter its properties, e.g., borate and silver ions. Such alterations can be made on either homemade or commercial plates, thus increasing the versatility of TLC in the separation of additional compounds. TLC allows for the removal of lipids by scraping and elution of compounds from plates [preparative layer chromatography (PLC)]. It also allows for the quantification of lipid classes by *in situ* densitometry. TLC has been used as a rapid, convenient, and inexpensive method for testing (scouting) solvent systems for HPLC. The development of high-performance TLC (HPTLC) has enhanced the versatility of lipid TLC. HPTLC allows for the use of less sample and development solvent and shorter development times. The use of two-dimensional (2-D) TLC is also valuable for the separation of multicomponent samples, particularly those with complex lipid mixtures. TLC interfaces with numerous other analytical techniques, most notably gas-liquid chromatography (GLC) and mass spectrometry. Although lipid TLC is currently used mainly in basic research and in the pharmaceutical industry, in the future it will probably be used more in clinical work, particularly with the advent of automated TLC procedures.

II. DEFINITION, STRUCTURE, AND OCCURRENCE

There is no universal definition of the term "lipids." Lipidologists have provided useful definitions for workers interested in the chromatographic analysis of these compounds. Thus, Kates (1) considered lipids as compounds generally insoluble in water but soluble in a variety of organic solvents, e.g., ether, hexane, chloroform. He recognized various classes of lipids, including hydrocarbons, alcohols, aldehydes, fatty acids, and derivatives such as glycerides, wax esters, phospholipids, glycolipids, and sulfolipids. His consideration of lipids also included the fat-soluble vitamins and their derivatives, carotenoids, sterols, and their fatty acids. Chapter 1 in Kates (1) provides a comprehensive treatment of the classification and structure of lipids. Chapter 1 in Hammond (1a) provides concise coverage of lipid structure. Gunstone and Herndlöf (1b) considered "that lipids are compounds based on fatty acids or closely related compounds such as the cor-