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## Lipophilic Vitamins

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### I. INTRODUCTION

Vitamins are defined as biologically active organic compounds, controlling agents that are essential for an organism's normal health and growth, not synthesized within the organism, available in the diet in small amounts, and carried in the circulatory system in low concentrations to act on target organs or tissues. Vitamins are classified according to their solubility in water and in fats. Lipophilic vitamins are vitamins A, D, E, and K. Chromatography is useful in the identification and determination of vitamins in pharmaceutical preparations, the identification and determination of vitamins and related substances in natural materials and foodstuffs, and the chemical and biochemical determination of vitamins and their metabolites in fats and tissues. The isolation of the vitamins, their metabolites, and related substances from natural material is the most difficult task (1–4).

Vitamins that are soluble in fat (lipophilic vitamins) are the object of wide investigations because of their biological properties. HPLC, TLC, and GC are the principal techniques used for the qualitative and quantitative investigations of lipophilic vitamins. Analysis of lipophilic vitamins by liquid chromatography (TLC and HPLC) is the subject of many scientific publications (1–18).

Generally TLC is useful for the investigation of a wide range of lipophilic vitamin applications, i.e., purification of samples, qualitative detection, quantitative determination, and the use of new visualizing agents and also for the separation of some optical isomers. The aim of this chapter is to present selected works that describe the analytical separation of lipophilic vitamins by means of TLC.

### II. VITAMIN A

#### A. Introduction

Physiological forms of vitamin A include retinol (vitamin A<sub>1</sub>) and its esters, 3-dehydroretinol (vitamin A<sub>2</sub>) and its esters, retinal (retinene, vitamin A aldehyde), 3-dehydroretinal (retine-2), retinoic acid, neovitamin A, and neo-b-vitamin A<sub>1</sub>. Active analogs and related compounds known as vitamins A are  $\alpha$ -,  $\beta$ -, and  $\gamma$ -carotene; neo- $\beta$ -carotene B, cryptoxanthine, myxoxanthine, torularhodin, aphanicin, and echinenone (19). Kitol, xanthophyll, and others are inactive analogs of vitamin A (19).

Vitamin A supports the formation of the cells of the skin and is essential to the process of vision. It is involved in the viability of the reproductive system by acting as a hormone and regulating the expression of specific genes. Good sources of vitamin A are fish liver oil from cod, salmon, halibut, and shark; chicken; eggs; milk; cheese; butter; and liver (see Table 1). Vitamin A occurs as retinyl esters in foods of animal origin.