**Table 3** Detection of Cephalosporins on Silica Gel Plates by NP-TLC and RP-TLC

| No. | Reagent | Limit of detection[a] ($\mu$g) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | A | B | C | D | E | F | G |
| 1 | Dragendorff reagent (after Amelink) | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| 2 | Iodine vapor | 0.6 | 0.6 | 0.8 | 0.5 | 0.6 | 0.8 | 0.8 |
| 3 | 0.2% Ninhydrin solution in ethanol | 0.8 | 0.8 | 0.8 | 0.8 | 0.8 | 0.8 | 0.6 |
| 4 | 0.25% Ninhydrin solution in 1% acetic acid | 0.5 | 0.8 | 0.8 | 0.8 | 0.8 | 0.8 | 0.8 |
| 5 | Hexacyanoferrate(II) and ferric chloride(III) | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| 6 | 2% *p*-Dimethylamine–benzaldehyde in ethanol | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 |
| 7 | Potassium iodoplatinate (acidified with HCl) | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 |
| 8 | Sulfuric acid–formaldehyde Marquisa reagent | 1.0 | 1.0 | 0.8 | 0.8 | 0.8 | 0.8 | 0.8 |

[a]A–G: See text listing.
*Source*: Ref. 30.

1. Propionic acid–2-propanol–water (6:3:3)
2. Ethyl acetate–2-propanol–water (3:5:3)
3. *n*-Butanol–water–acetic acid (5:4:2)

Qureshi et al. (32) used layered double hydroxide (LDH) anion exchanger mixed with silica gel as the stationary phase for separation of ceftriaxone, cefuroxime, cefotaxime, ceftazidime, cefadroxil, and cefalexin. LDHs consist of positively charged brucite-like layers with partial substitution of M(II) cations by M(III); their formula is $Mg_{2.44}Al(OH)_{0.88}(CO_3)_{0.5} \cdot nH_2O$. Eighteen mobile phases were tested, and the best were buffer–methanol (2:8), buffer–methanol–acetonitrile (85:10:5), buffer–methyl acetate (85:15), and buffer–diethyl ether (85:15). The buffer solution consisted of a 15% w/v solution of ammonium acetate adjusted to pH 6.2 with glacial acetic acid. The spots were detected with iodine vapor, and $R_f$ and $R_M$ were calculated. For the phase buffer–methanol, $R_f$ and $R_M$ values vs. methanol concentration were established. For quantitative work the regions containing the cephalosporins were scraped from the plate and eluted with distilled water, and the content was spectrophotometrically determined. Recovery was close to 100%.

Eric-Jovanovic et al. (33) presented the method of quantitative determination of ceftriaxone, cefixime, and cefotaxime, third-generation cephalosporins, in dosage forms. The standards and sample solutions were injected into the concentrating zones of silica gel HPTLC plates and developed with the mobile phase ethyl acetate–acetone–methanol–water (5:2.5:2.5:1.5). The densitograms were produced at 270 nm. The calibration curves were established in the concentration range 125–500 ng per spot, for all cephalosporins analyzed. The limits of detection for ceftriaxone, cefixime, and cefotaxime were found to be 19.1, 18.4, and 16.7 ng, respectively.

Dhanesar described the use of scanning densitometry for direct quantification of ceftriaxone (34,35) and 12 other cephalosporins (36) on hydrocarbon-impregnated silica gel plates without prior solvent elution. The method was similar to the one described above for quantification of penicillins (17).

## C. Aminoglycosides

Aminoglycosides consist of two or more amino sugars joined via glycosidic bonds to an aminocyclitol nucleus. Streptomycin, the first known aminoglycoside, was isolated in 1943 by Selman