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Note

Determination of sodium, ephedrine and procaine in pharmaceuticals by capillary isotachophoresis

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Ephedrine and procaine are substances frequently used as active agents in pharmaceutical preparations for treating bronchitic diseases. In these preparations, ephedrine and procaine are usually combined with inorganic salts and also with various essential oils and saponins extracted from appropriate medicinal drugs. The analytical control of ephedrine and procaine in such preparations is not easy and time-consuming and cumbersome classical methods are still used[1].

Liquid chromatography can be used for the determination of procaine and ephedrine in solutions[2] but the direct analysis of the above-mentioned preparations does not seem to be practical because of possible column deterioration.

Capillary isotachophoresis is not sensitive to the interfering effects of non-ionic sample components and is suitable for the simultanous determination of inorganic and organic ionogenic substances in one run[3]. Cationic isotachophoresis has already been shown to be suitable for the determination of procaine[3,4] and/or ephedrine[5,6] and we therefore applied this method to the above-mentioned analytical problem.

In this work we have found that isotachophoresis can serve as a convenient analytical method for such problems. As an example, the analysis of the pharmaceutical preparation Solutan (Spofa, Czechoslovakia), in which procaine and ephedrine are combined with Radobelinum, saponinum, extract balsami tolutani and aqua amygdalae amarae, is described. It is shown that cationic isotachophoresis permits the direct analysis of the sample and the rapid simultaneous determination not only of the ephedrine and procaine but also of some inorganic substances such as sodium.

EXPERIMENTAL

Analytical isotachophoresis was performed by using a CS Isotachophoretic Analyser (Úrvjt, Spišská Nová Ves, Czechoslovakia). The single-column mode was employed, where a PTFE capillary (200 × 0.3 mm I.D.) proved to be sufficient for the separation of this type of sample. The conductivity detector signal and its derivative were recorded on a TZ 4200 line recorder (Laboratory Instruments, Prague,

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Czechoslovakia). The separations were carried out at room temperature. The current used was 50 μA, switched to 25 μA during detection.

Samples were injected either by a Model 701 microlitre syringe (Hamilton, Bonaduz, Switzerland) or by a sampling valve of the ITP analyser.

Reagents and materials

Ammonium acetate, acetic acid and sodium bromide (Lachema, Brno, Czechoslovakia) were of analytical-reagent grade. Triton X-100 (Serva, Heidelberg, F.R.G.) was purified by passing it through a mixed-bed ion exchanger. Distilled water was deionized with the mixed-bed ion exchanger. Standard samples of ephedrine and procaine and the original pharmaceutical preparation Solutan were kindly supplied by Dr. Šubert of the Drug Control Laboratory, Brno, Czechoslovakia. The approximate composition of Solutan given by the manufacturer is as follows: Radobelinum 0.1 mg, saponinum 1 mg, procainum chloratum 4 mg, ephedrinium chloratum 17.5 mg, natrium iodatum 100 mg, extr. balsami tolutani 25 mg and aqua amygdalae amarae 30 mg in 1 ml.

Electrolytes

A mixture of 2.8 m*M* ammmonium acetate adjusted with acetic acid to pH 4.9, and containing 0.3% of Triton X-100 as an additive, was used as the leading electrolyte; 5 m*M* acetic acid served as the terminator.

RESULTS AND DISCUSSION

The selection of the electrolyte system and its concentration were based on several preliminary experiments, in which the system of ammonium acetate (leading ion NH_4^+) and acetic acid (terminating ion H^+) as the leading and terminating electrolyte, respectively, was found to be very satisfactory. It did not show any impurities, *e.g.*, sodium, which could interfere in the analysis.

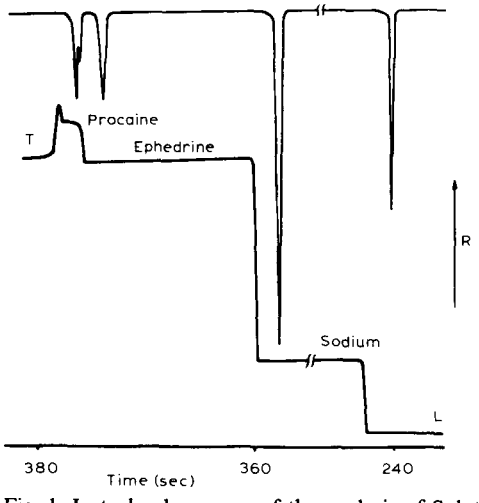

Fig. 1. Isotachopherogram of the analysis of Solutan. The original preparation of Solutan was diluted 180-fold and 6 μl of this mixture were injected. For conditions, see text.

Several concentration levels of the electrolyte system in the range 0.02–0.002 mol/l were tested. The lower the concentration, the faster is the migration that can be obtained in principle, but there are certain concentration limits given by the requirements for the separation capacity and correct migration zones. Finally, an optimum concentration of 0.0028 mol/l was selected.

An example of the analysis is shown in Fig. 1. The analysis is completed within 6 min and sodium, ephedrine and procaine can easily be determined. Procaine migrates with inversion of mobilities with respect to the terminator H^+, but its migration is correct, as shown by calibration. The linearity of the calibration graphs was tested in the ranges $3.7 \cdot 10^{-9}$–$37 \cdot 10^{-9}$, $0.72 \cdot 10^{-9}$–$7.2 \cdot 10^{-9}$ and $0.08 \cdot 10^{-9}$–$0.8 \cdot 10^{-9}$ mol for sodium, ephedrine and procaine, respectively, and was found very good, all the lines passing through the origin. The correlation coefficients were 0.9991, 0.9992 and 0.9983 and relative standard deviations were 0.3, 0.7 and 2% (eight measurements). For sodium, ephedrine and procaine, respectively.

REFERENCES

1 *Internal Standard, Solutan, PNY 06-55-78*, Galena, Opava-Komárov, Czechoslovakia.
2 I. Jane, A. Scott, R. W. L. Sharpe and P. C. White, *J. Chromatogr.*, 214 (1981) 243.
3 P. Boček, *Topics in Current Chemistry*, Springer Verlag, Berlin, Heidelberg, New York, 1981, p. 131.
4 H. Klein, *Arzneim.-Forsch./Drug. Res.*, 11 (1982) 795.
5 H. Klein and R. Teichmann, *Pharm. Ztg.*, 8 (1982) 447.
6 A. Barcuchova and V. Jokl, *Česk. Farm.*, 1 (1983) 12.