

Spectrophotometric Determination of Three Sulfa Drugs in Combination

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The principle of simultaneous equations has been applied to a tertiary mixture containing three sulfa drugs. A rapid procedure for the spectrophotometric determination, without prior separation, of sulfacetamide, *N*¹-benzoylsulfanilamide, and sulfathiazole in combination has been developed.

WHERE the individual amounts of three sulfa drugs appearing in combination with each other in a product are to be estimated, the official procedures (1, 2) utilize paper strip chromatography to first separate each drug and then colorimetric procedures to estimate the individual amounts of the components. The official procedures are quite time-consuming and not so accurate. There is a need, therefore, for a method which will permit the quick and accurate estimation of sulfacetamide, *N*¹-benzoylsulfanilamide, and sulfathiazole in combination with each other in a water-dispersible cream base.

Marzys (3) has developed a procedure for the individual estimation of the components of sulfathiazole, sulfamerazine, and sulfadiazine mixtures utilizing a combination of colorimetric and spectrophotometric procedures. Since no specific color reaction was known for any of the three sulfas studied, their ultraviolet absorption spectra in 0.1 *N* hydrochloric acid were used to determine whether or not the amounts of the individual sulfas could be estimated from the absorption at three wavelengths and solving simultaneous equations with three unknowns (4).

EXPERIMENTAL

Apparatus: Beckman spectrophotometer model DU 4700 with 1-cm. matched quartz cells was used. Cell correction was applied where necessary. Unless otherwise mentioned the measurements were done against 0.1 *N* hydrochloric acid as blank.

Reagents: Hydrochloric acid, A.R. grade, solvent ether, reagent grade, sulfacetamide U.S.P. XV (5), sulfathiazole N.F. X (6), *N*¹-benzoyl sulfanilamide, supplied by Bengal Immunity Co. Ltd., conforming to the specifications of Basu & Sikdar (7).

The absorption spectra for the three sulfas were determined at 220, 235, and 280 $m\mu$ (see Fig. 1). They conformed to Beer's law between 5 and 25 mcg./ml.; the absorption being additive. The absorptivities of the three compounds, determined using 1-cm. quartz cells and 0.2-mm. slit width, are given in Table I.

By solving the following three simultaneous equations from the absorbances at the indicated wave-

lengths, one obtains the concentrations of the three ingredients:

$$460 a + 465 b + 345 c = 1000 \times A_{220}$$

$$56.5 a + 584 b + 106.5 c = 1000 \times A_{235}$$

$$167.5 a + 189 b + 489 c = 1000 \times A_{280}$$

where a = concentration of sulfacetamide, b = *N*¹-benzoylsulfanilamide, and c = sulfathiazole, expressed as mg. per 100 ml. of solution.

Analysis of Known Synthetic Mixtures.—Known mixtures were prepared by taking suitable aliquots of solutions of individual components. The acidity in the final solution was maintained at 0.1*N*. The absorbances were measured at 220, 235, and 280 $m\mu$ and the content of each component calculated using simultaneous equations. The results are given in Table II.

Analysis of the Cream Containing Sulfacetamide, *N*¹-Benzoylsulfanilamide, and Sulfathiazole.—About 1 Gm. of the cream (containing about 100 mg. of total sulfonamides) was mixed with a little solvent ether to get a good dispersion and transferred to a 250-ml. separator with the aid of about 50 ml. of

TABLE I.—ABSORPTIVITY VALUES (E 1%, 1 CM.)

Wavelength, $m\mu$	220	235	280
Sulfacetamide	460	56.5	167.5
<i>N</i> ¹ Benzoylsulfanilamide	465	584	189
Sulfathiazole	345	106.5	489

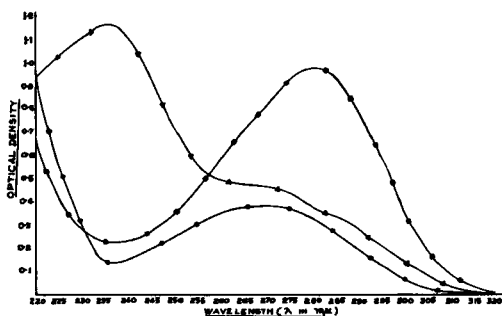


Fig. 1.—Absorption spectra determined for the three sulfa drugs studied. Sulfacetamide—●—●—, *N*¹-benzoylsulfanilamide—▲—▲—, sulfathiazole—■—■—, (concn., 20 mcg./ml.)

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