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Extended Abstract
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Pharmaceutical Chemistry 2017: Development Green Spectrophotometric Method for Determination of Sulfamethoxazole in Pure and Pharmaceutical Formulations - Al-Okab RA - Taiz University

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Introduction

The green analytical chemistry was first mentioned by Paul Anastas in 1999. Analytical methodologies have continuously been improved by their accuracy, sensitivity and precision to monitor pollutants from environmental and food samples. In addition, improvements may be done in terms of reducing or eliminating the use of reagent / solvents in a sample preparation and determination, however, not always mentioning the concept of green analytical chemistry. Out of the 12 Paul Anastas principles, can be extracted 7 principles of green analytical chemistry.

We have to consider the method to be environmentally sustainable as possible as without effecting accurate, precise and sensitive of analytical method in this direction Sulfa drugs have attracted special attention from their therapeutic importance. Sulfamethoxazole (SMX) belongs to Sulfa drugs and its chemical name 4-amino-N- (5- methyl-1, 2-oxazol-3-yl) -benzenesulfonamide. The official method is based on diazocoupling reaction with N- (1-naphthyl) ethylenediamine dihydrochloride resulting in dye formation and this is characterized by high sensitivity but often has drawbacks of pH dependence, diazotization temperature and coupling time. Besides, these procedures often use large sample volumes of carcinogenic reagent (s), which makes it excluded out of the standards of green analytical chemistry.

Apparatus

The absorption spectra and absorbance were recorded and obtained by using computerized UV-Visible spectrophotometer Shimadzu-1800 with 1 cm quartz and glass cells for product analysis and using quartz cell.

General recommended procedure

After optimizing the instrumental parameters for the spectrophotometric method, the analytical curves (n = 3) were constructed by addition of aliquots of different volumes of the stock solution of SMX into a 25 ml flasks 2 ml of PNZ (0.025%) w / v, 1 ml of HCl (2 N) and 1 ml 0.01 M of iron (III) finally the mixture was left for 2 min and make up with water.

Results and Discussion

Consequently, a more ecological analytical process can be achieved by: avoiding toxic reagents; reagents and solvents should be eliminated or reduced. The spectrophotometric method presented was established to improve the determination of SMX by optimizing the best chemical and physical conditions with good sensitivity and precision. The influence of various analytical parameters, including the acid solution, the amount of reagent, the coexisting ions, the reaction time and the sample volume were studied.

Absorbance spectra of the colored reagent

The absorption spectrum was scanned on a spectrophotometer in the wavelength region of 200 to 700 nm against the reagent blank and the maximum absorption at 520 nm.

Effect of phenoxazine concentration

The effect of the concentration of PNZ considerably improves the reaction and color production during the day. The effects were

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tested from 1 to 5 ml of phenoxazine 0.025% w / v.

Effect of temperature

The temperature effect on reaction was studied. The absorbance was measured at 10 ° C, 20 ° C, 30 ° C, 40 ° C, 50 ° C, 60 ° C, 70 ° C and 80 ° C temperatures under optimum conditions. The highest absorbance was determined at 30 ° C. Therefore, room temperature was considered as an optimal for the reaction. The intensity of the color decreased when the temperature increases this may be due to the dissociation of complex.

Effect of Time

The optimum reaction time was determined by monitoring the color developed at room temperature the development was attained after 2 min and remained stable for at least 2 h.

Effect of acid

The effect of different acids sulfuric, hydrochloric, phosphoric or acetic acid showed that hydrochloric acid was the best and give maximum intensity of color. The volume of HCl of 2 M was tested from 1–5 ml HCl. Therefore, 1 ml gives maximum color intensity and was chosen as the best volume for the reaction.

Precision and accuracy

The precision and accuracy of the method were determined as documented by the BP. The precision (repeatability) of the proposed method was calculated from a series of three solutions of 1, 3 and 5 ppm of SMX on the same day analyzes. The day to day precisions were obtained by the repeated analyzes of 1, 3 and 5 ppm of SMX (three analyzes) over one week. The results showed that the inter-day RSD was 0.64, 0.81 and 0.51% and accuracy was 98.92%, 99.91% and 99.60% respectively.

Stoichiometry of the reaction

It was Job's method of continuous variation used for determining the molar ratio of SMX to each of the analytical reagents employed in the oxidative coupling reactions. These ratios were 1: 1 in all cases. This indicates that only one dye products are formed is possible for the formation of the complex have stability constant 3.23 × 108 M-1.

Conclusion

Analytical methods are developing rapidly and introducing Phenoxazine as novel spectrophotometric reagent for the direct determination of SMX. There is a strong driving force that is concerned about this reagent (PNZ) whish exhibit better sensitivity, safety of the environment and higher reproducibility. So, the public needs confirmation that chemical products and processes are safe in this way the use of mild acidic medium and choice available with the reagents make the procedure versatile and cost-effective. On the other hand, when choosing the proper analytical method waste prevention must become a part of the decision process, pharmaceutical chemistry will reduce of toxic waste as consequence result in exploitation of less or non-toxic reagents. The new direct method has special advantages of simplicity, reproducibility, sensitivity and mainly use and produce lower amounts of toxic. Finally the replacement of old reagent by an attractive oxidative electrophilic reaction by taking the advantage of available plenty molecules in the area of pharmaceutical chemistry increases utilization in pharmaceutical drugs.

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