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# **TOPICAL ISSUES, ACHIEVEMENTS AND INNOVATIONS OF FUNDAMENTAL AND APPLIED SCIENCES**

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## **THE KINETIC SPECTROPHOTOMETRIC METHOD FOR THE DETERMINATION OF MEZLOCILLIN IN SOLUTIONS**

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Mezlocillin (Mezl) is a semisynthetic, extended-spectrum penicillin. Available as the sodium salt, it can be administered intravenously. Mezl is a beta-lactam antibiotic active against gram-positive cocci, including nonpenicillin resistant streptococcal, staphylococcal, and enterococcal species, although it is rarely used for gram-positive infections since there are more potent agents. It is active against most gram-negative organisms, including *Pseudomonas aeruginosa*. Gram-positive and gram-negative anaerobic organisms are also sensitive to mezl. Mezl is used for the treatment of a variety of conditions, including lower respiratory infections, skin and skin structure infections, urinary tract infections, and intraabdominal infections.

In vitro efficacy against *B. cepacia* has been demonstrated for ureido-penicillins, third-generation cephalosporins, carbapenems, fluoroquinolones. Among the novel antimicrobials, tigecycline has shown less activity compared to minocycline. Resistance to several classes of antimicrobial agents is often observed, especially in patients receiving multiple courses of antibiotics over a prolonged period of time. Therapy of *B. cepacia* infections should be based on the results of antimicrobial susceptibility testing. In cases of multi- or pandrug-resistant strains, combination therapy is recommended and the use of agents such as polymyxins may be considered. In addition, inhalation therapy in combination with intravenously administered antimicrobials can control pulmonary exacerbation by *B. cepacia* infection [1]. Mezl sodium monohydrate substance (CAS Number 51481-65-3) was used in the experiment. Its chemical structure is following (2*S*,5*R*,6*R*)-3,3-dimethyl-6-[(2*R*)-2-[(3-

methylsulfonyl-2-oxoimidazolidine-1-carbonyl) amino]-2-phenylacetyl] amino]-7-oxo-4-thia-1-azabicyclo[3.2.0] heptan-2- carboxylate (C<sub>21</sub>H<sub>24</sub>N<sub>5</sub>NaO<sub>8</sub>S<sub>2</sub>) [2].

Literature review revealed enormous analytical method were reported for the estimation of mezl individually or in combination with other drugs [3]. International Pharmacopoeia recommends to determine penicillin summary in semisynthetic penicillin by neutralization method after preparation hydrolysis by excess of sodium hydroxide titrated solution at heating [4].

The scheme of peroxy acid oxidation and perhydrolysis conjugated reactions of Mezl on the time are shown on Fig. 1.

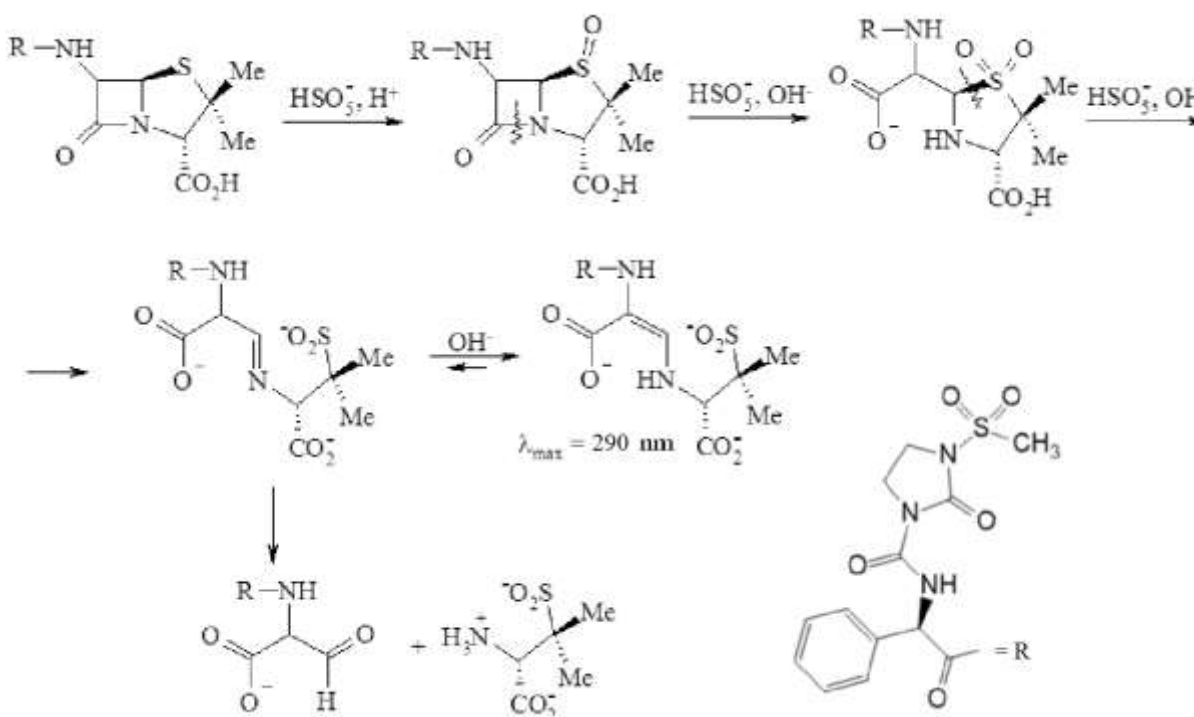


Figure 1. The scheme of peroxy acid oxidation and perhydrolysis conjugated reactions of Mezl.

The following quantitative procedures of penicillin determination are described: using potentiometry titration and ionometry, spectrophotometry, extraction photometry, voltammetry and polarography, micelle electrokinetic capillary and paper chromatography, chemiluminescence and kinetic analysis methods [5-14].

A new procedure for the quantitative determination of Mezl sodium in the Baypen<sup>®</sup> (Manufacturer Bayer Aktiengesellschaft, Germany) preparation by the method of back spectrophotometric method using potassium peroxomonosulfate (KHSO<sub>5</sub>) as an analytical reagent was developed [15].

Thus, the improvement of the known and development of new methods of quantitative determination of penicillin is rather important. The existing

pharmacopoeial methods of penicillin preparations determination are quite complex, long-lasting and require the application complex and expensive devices. The disadvantage of the known simple enough in performance methods of spectrophotometric determination of penicillin, which are based on the determination of the final products of their hydrolytic cleavage, is the requirement of prolonged heating.

The developed method of Mezl kinetic determination has several advantages: makes it possible to identify the preparation in much smaller quantities than the pharmacopoeial iodometric method, it is applicable to the same range of concentrations, as in photometric determination of hydrolysis products, but it doesn't require prolonged heating of the reaction mixture, it is simpler and faster than the method of chromatographic analysis.

The reaction kinetics of the peroxyacidic oxidation and perhydrolysis of Mezl with potassium caroate in the alkaline medium is studied. As an oxidizing agent, the potassium triple salt of peroxymonosulfuric acid,  $2\text{KHSO}_5 \cdot \text{KHSO}_4 \cdot \text{K}_2\text{SO}_4$ , syn. "Oxone", was applied. The procedure was developed and the possibility of the quantitative determination of Mezl in the Baypen<sup>®</sup> preparation based on the results of the kinetic-spectrophotometric method with potassium caroate as reagent was shown. RSD = 1.5 %,  $\delta = + 0.5$  %.

#### REFERENCES:

1. United States Pharmacopeial Convention. 38<sup>th</sup> ed. 2015; 3795.
2. British Pharmacopeia: London: The Stationery Office. 2014; 1-6: 5860.
3. U.S. Pharmacopoeia 30-NF25, National Formulary 25, Pharmacopoeial Convention: Rockville. 2008: 2137.
4. Wang P, Wang B, Cheng X: A Method for Determination of Penicillin G Residue in Waste Penicillin chrysogenum Using High Performance Liquid Chromatography. Applied Mechanics and Materials. 2015; 768:15-24.
5. Liu, Sun, Zhao: Assay detection for azlocillin sodium and sulbactam sodium for injection by HPLC. Chinese Journal of Pharmaceutical Analysis. 2008; 28: 1568-1570.
6. Ahmad A, Rahman N, Islam F: Spectrophotometric Determination of Ampicillin, Amoxicillin, and Carbenicillin Using Folin-Ciocalteu Phenol Reagent. Journal of Analytical Chemistry. 2004; 59(2): 119-123.
7. Diaz-Bao M, Barreiro R: Method for Determining Penicillin Antibiotics in Infant Formulas Using Molecularly Imprinted Solid-Phase Extraction. Journal of Analytical Methods in Chemistry. 2015; [10.1155/2015/959675](https://doi.org/10.1155/2015/959675).
8. Puing P, Borull F, Calull M: Sample stacking for the analysis of eight penicillin antibiotics by micellar electrokinetic capillary chromatography. Electrophoresis. 2005; 26: 954-961.
9. Batrawi N, Wahdan S, Al-Rimawi F: A Validated Stability-Indicating HPLC Method for Simultaneous Determination of Amoxicillin and Enrofloxacin Combination in an Injectable Suspension. Scientia Pharmaceutica. 2017; 85(6): 1-8.
10. Kipper K, Barker C, Standing J: Development of a novel multi-penicillin assay and assessment of the impact of analyte degradation: lessons for scavenged sampling in antimicrobial pharmacokinetic study design. 2017; [10.1128/AAC01540-17](https://doi.org/10.1128/AAC01540-17).

11. Shapiro A: Investigation of  $\beta$ -lactam antibacterial drugs,  $\beta$ -lactamases, and penicillin-binding proteins with fluorescence polarization and anisotropy: a review. *Methods and Applications in Fluorescence*. 2016; 4(2): 1-8.
12. Navarro M, Li M, Muller-Bunz H, Bernhard S: Donor-Flexible Nitrogen Ligands for Efficient Iridium-Catalyzed Water Oxidation Catalysis. *European Journal of Chemistry*. 2016; 22(20): 6740-6745.
13. Khare B, Khare K: Spectrophotometric Determination of Antibiotic Drug Penicillin in Pharmaceutical Samples Using 2,6 Dichlorophenol Indophenol, N-Bromocaprolactam and N-Chlorosuccinimide. *International Journal of Recent Research in Physics and Chemical Sciences*. 2017; 4: 1-7.
14. Sangeetha S, Kumar M, Kumudhavalli M: Development and validation of UV spectrophotometric area under curve method for quantitative estimation of piperacillin and tazobactam. *International Journal of ChemTech Research*. 2017; 10(2): 988-994.
15. Sallach J, Snow D, Hodges L: Development and comparison of four methods for the extraction of antibiotics from a vegetative matrix. *Environmental Toxicology Chemistry*. 2016; 35(4): 889-897.