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Research Article

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Control of Physico-Chemical Quality of Amoxicillin Sodium

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Abstract The control of the pharmaceutical raw material is essential before the formulation to ensure the safety of the drug treatment. This study describes an application of Physico-Chemical Control of Amoxicillin Sodium quality according to the requirements of the European Pharmacopoeia 8th edition. The Amoxicillin Sodium raw material appears as substantially white powder, very hygroscopic, soluble in water and ethanol but very slightly soluble in acetone. Its melting point, pH determination and specific rotatory power are respectively: 207.8 °C, 8.82 and +269. Its solution develops a dark yellow color with sulfuric acid and formaldehyde. The Determination of water content is 2.75 % and HPLC Determination of Content is 97,6 %. The Amoxicillin sodium controlled is conforming to the tests required by the European Pharmacopoeia. Due to the lack of availability of standards, the analysis of related impurities hasn't been carried out.

Keywords Pharmaceutical Raw Material, European Pharmacopoeia, HPLC, Content

1. Introduction

Amoxicillin sodium, chemically known as 6-(p-hydroxy-alpha-amino phenyl acetamido) penicillanic acid. Its molecular weight is 387,4 and its molecular formula is $C_{16}H_{18}N_3NaO_5S$. It is a white powder with sulphurous odour and has a water solubility of 958 mg/ mL (Figure 1) [1,2]. It is a broad spectrum antibiotic used in the treatment of infections caused by both gram-positive and gram-negative bacteria, specially tonsillitis, dental abscess, osteomyelitis and upper respiratory tract infections [3]. Testing active pharmaceutical ingredients and excipients is one of the main tasks of the quality control units in the pharmaceutical industry. It must be ensured that the necessary tests are conducted on the incoming goods and that the starting materials are released only after their quality was judged as satisfactory [4]. The control of the pharmaceutical raw material is essential before the formulation to ensure the safety of the drug treatment [5].

The main aim of this work is to control the physico-chemical quality of active pharmaceutical ingredient denominate Amoxicillin sodium.

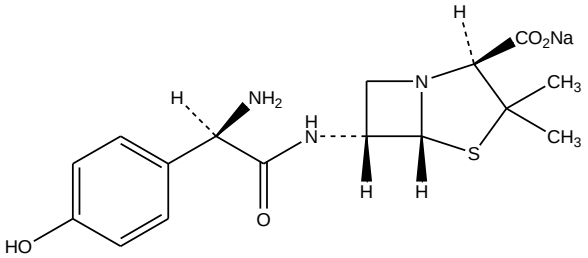

Figure 1: Chemical structure of Amoxicillin sodium [1]

2. Materials and Methods

The control of physico-chemical quality of Amoxicillin sodium is carried out according to the requirements of the European Pharmacopoeia 8th edition [1].

2.1. Organoleptic characteristics and solubility

We checked the appearance of Amoxicillin sodium and its solubility in water, anhydrous ethanol and acetone according to the requirements of the European Pharmacopoeia.

2.2. Melting point measurement

The melting point is a specific physical character of each solid substance; it plays an important role for its identification. The measurement was made using a device called: Köfler bench.

2.3. Characterization by chemical processes

In a test tube, introduce approximately 2 mg of Amoxicillin sodium. Moisten with 0.05 ml of water and add 2 ml of sulfuric acid reagent and formaldehyde. Mix the contents of the tube while turning; the solution is virtually colorless. Immerse the tube in a water bath for 1 min. He is develops a dark yellow color.

2.4. pH determination

Dissolve 2 g of Amoxicillin sodium in water and dilute to 20 ml with the same solvent.

2.5. Specific rotatory power

Dissolve 62.5 mg of Amoxicillin sodium in solution of potassium phthalate acid at 4 g/l and complete at 25 ml with the same solution.

2.6. Determination of water content

Determination of water content is realized according to the Karl Fischer method using 0.4 g of Amoxicillin sodium [1,6].

2.7. HPLC Determination of Content

An HPLC brand WATERS 2695 was used, the chromatographic conditions were regled at injection volume: 50 µl, Flow: 1 ml/min, Temperature: 25°C, Column: C_{18} (5µm x 4,6mm x 250 mm) and the wavelength λ: 254 nm. The mobile phase is composed of 1V acetonitrile and 99 V monopotassium phosphate solution 0.2 M. The pH was adjusted to 5 with sodium hydroxide solution. The SCR control and test solution were prepared at 2 mg/ml [1, 7].

3. Results and Discussion

3.1. Organoleptic Characteristics and Solubility

Appearance: the Amoxicillin sodium is white or substantially white powder, very hygroscopic (figure 2).

Figure 2: Organoleptic characteristics of Amoxicillin sodium

Solubility: the solubility test showed that Amoxicillin sodium is soluble in water and ethanol but very slightly soluble in acetone.

3.2. Melting point measurement

Measurement of the melting point revealed an average value of 207.8 °C, value close to that required by the European Pharmacopoeia (208 °C).

3.3. Characterization by chemical processes

The solution of Amoxicillin sodium develops a dark yellow color in presence of sulfuric acid reagent and formaldehyde (figure 3).

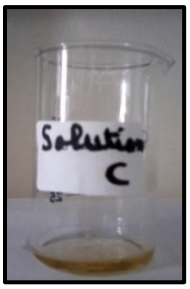

Figure 3: Identification reaction of Amoxicillin sodium

3.4. pH determination

The pH determination revealed an average value of 8.82, a value included in the range required by the European Pharmacopoeia [8,0-10,0].

3.5. Specific rotatory power

The Specific rotatory power of Amoxicillin sodium solution is +269, a value included in the range required by the European Pharmacopoeia [+ 240 à + 290].

3.6. Determination of water content

The Determination of water content is 2.75%, value lower than the required standard of 3%.

3.7. HPLC Determination of Content

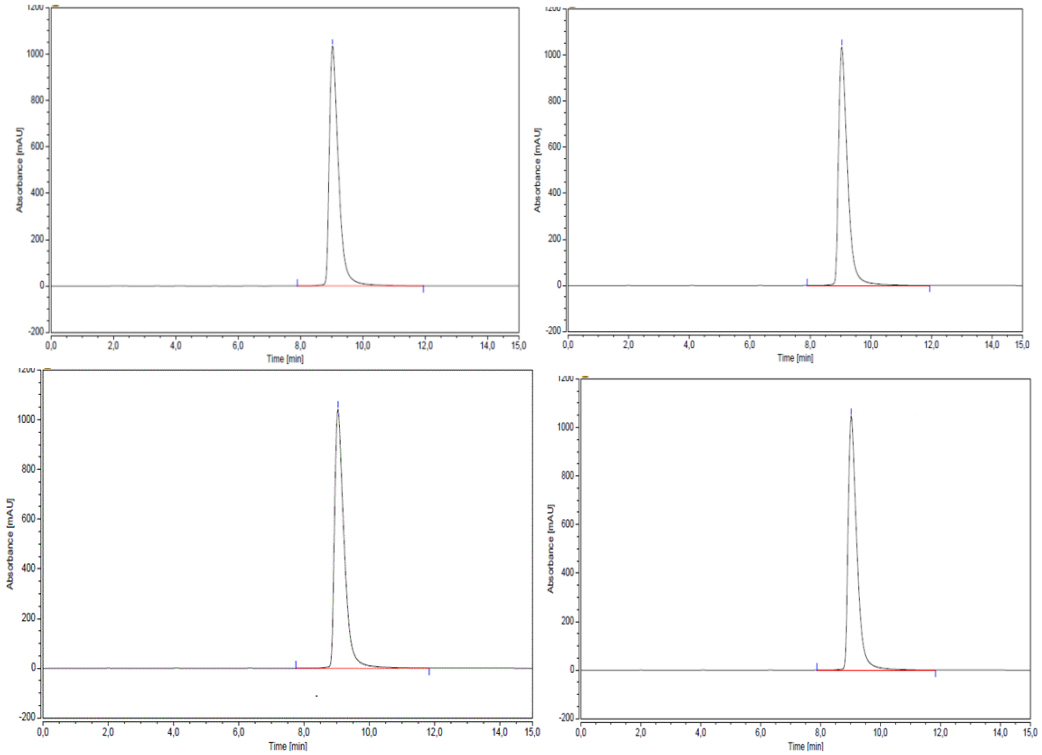

Figure 4: Control solution chromatograms of four injections

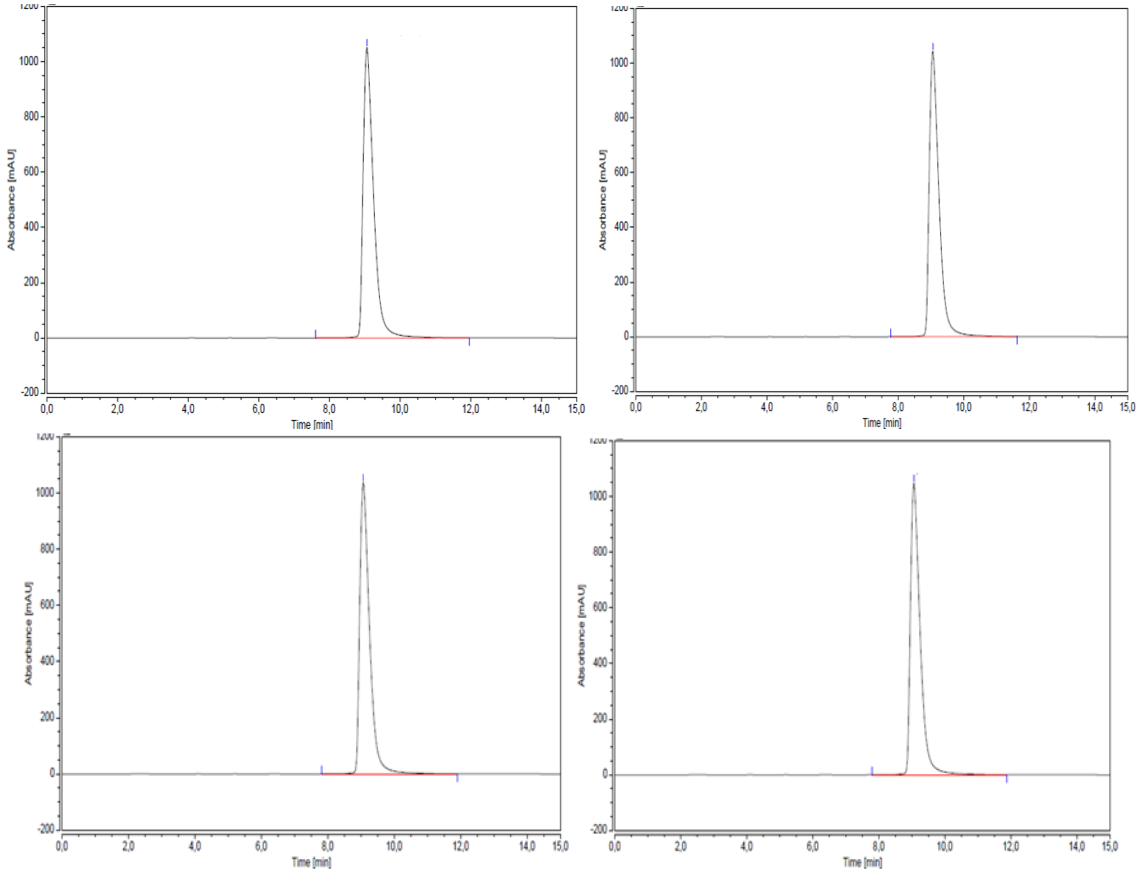

Figure 5: Test solution chromatograms of four injections

Table 1: Results of HPLC Determination of Content

Name	Retention Time (min)	Area Average (mAu.min)	Content (%)	Normes (%)
Control solution	9.047	354.269	100	89-102
Test solution	9.062	354.835	97.6	

According to the chromatograms, the retention time of Amoxicillin sodium is 9,062 min. Value close to that required by the European Pharmacopoeia. The content of Amoxicillin sodium anhydrous is 97.6 %, it meets the required standard.

4. Conclusion

The control of the pharmaceutical raw material is essential before the formulation to ensure the safety of the drug treatment, our sample of Amoxicillin sodium raw material is conform to the tests required by the European Pharmacopoeia. Due to the lack of availability of standards, the analysis of related impurities hasn't been carried out.

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