

# Determination of Dipirone 500 mg by Spectrophotometry of Molecular Absorption - UV, Marketed in Drugs

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**Abstract**— Sodium dipyrone undergoes the biotransformation effect, in order to achieve activation in higher potency, producing metabolites and consequently improving the absorption and action of this drug. It presents analgesic and antipyretic action in vivo, designed to act with antipruritic and anti-inflammatory properties, being very used for simple pains to the chronic pains. The study analyzed the content of the concentration of dipyrone tablets marketed in drugstores in the city of Vitória da Conquista - BA, in which it used the UV absorption spectrophotometry method in 500 mg samples of reference brands, generic and similar. The results obtained in the analysis had an average concentration content for generic drugs 95.93%, similar 91.17% and reference 92.92%. According to the Brazilian Pharmacopoeia the values must be between 95% and 105% to be able to attend pharmacotherapy. Therefore, the drug of the generic class was fit for consumption, since its concentration meets the standards of the Brazilian Pharmacopoeia.

**Keywords**—Analgesic, Anti-inflammatory, Dipyrone, Spectrophotometry, Medication.

## I. INTRODUCTION

To Ferraz (1994), the solid dosage form has shown advantages both in their production, and in better patient compliance (SANTOS, 2019). In the case of tablets that have modifiable formats, in their manufacture has better preparation conditions, physico-chemical stability, economy and efficient result in their presentations, as well as greater ease and convenience in administration.

Dipyrone Sodium monohydrate is a prodrug derived from the drug named pyrazolone; It has the molecular weight of 341.36 g / mol and its molecular formula is  $C_{13}H_{16}N_3NaO_4SH_2O$  (COSTA *et al*, 2010). It is an analgesic, antipyretic and antipyretic drug, with antispasmodic and anti-inflammatory properties. It is used excessively, because of its high capacity to considerably reduce body temperature, thus reducing fever and pain (MELO, 2018). Its action is simultaneous in the peripheral and central nervous system, in order to inhibit in high selection the prostaglandins  $F_{2a}$ . At the

gastrointestinal level, its absorption occurs quickly and practically, in which the half-life of this occurs in a maximum of four hours. Dipyrone is biotransformed in hepatocytes and its excretion is performed. The biotransformation is hepatic and the residual products generated from metabolism are excreted through renal excretion. (MALVAR *et al*, 2014) (RAMACCIOTTI *et al*, 2014).

Patients allergic to the properties or excipients of the drug formulation Dipyrone or acute porphyria of the intermittent liver, congenital glucose-6-phosphate dehydrogenase deficiency or insufficient bone marrow function should be warned about the contraindication of intake of this medicinal product. (ANVISA, 2010).

Medicines are classified as reference, similar and generic. Reference drug is innovative, presents bioavailability, efficacy and safety through a set of investigative procedures during its development, commonly defined by clinical trial carried out prior to the

achievement of the document that regulates the legal marketing of medicines. When the drugs have the same drug, base or some compound that is part of the same active molecule of the reference medicine, as well as in the concentration and pharmaceutical form, it is pharmacologically equivalent. The similar drug must present the active principle with immense fidelity to the reference, in the same way as the concentrations, the final state of the active substance is presented (pharmaceutical form) the way in which the drug will come in contact with the organism (route of administration), therapeutic regimen and the same therapeutic indication regarding the comorbidity of the patient, differ in the characteristics of the formulation. The trade or brand name must be identified on the packaging (MEDEIROS *et al*, 2019).

In Brazil there is a high presence of medicines that are exempt from medical prescription, popularly known as drug cartels (MOURA, 2018). Dipyrone is a nonprescription medication (MIP), found at low cost, which in a way is an advantage for patients whose purchasing power is mild. It is presented in several pharmaceutical formulations ranging from oral, injectables and suppositories (SILVA, 2019). Sodium dipyrone presents characteristics in quality control as a white, odorless, crystalline powder (DIOGO, 2003).

In order for an input, drug or drug to be released for marketing, they must comply with regulations and standards that are determined by international and national Good Manufacturing Practices (GMP) standards in order to ensure that a drug is released for the ingestion with the proper quality proven through the quality control carried out, where it is part of GMP (CFF, 2001) (CAMPOS, 2018).

The Brazilian pharmacopoeia has criteria about the particularities of the drug in its dissimilar forms. Cognomulated as the official code that presents the details of the minimum quality requirements to carry out the appropriate analyzes. (BRAZIL, 2015).

The efficacy and quality of the tablet are two extremely important factors to guarantee an excellent therapy, and in order to achieve them, it is necessary to perform operations, thus ensuring that adequate characteristics are achieved (MOISÉS, 2006). In the process of tablet production, interference may occur, such as contamination of powders due to interactions of substances or excipients, compression error or flow problems, loss of active principle or degradation and others, and at the end of production, it is necessary to carry out the quality control, so that a thorough analysis is carried out in order to guarantee maximum quality so that the medicine is fit, safe and effective for the population to

use, according to the necessary specifications (SUPP, 2011).

Spectrophotometry is a technique that presents the purpose of dosing dipyrone, based on the Lambert-Beer law, which has a mathematical basis, whose radiation absorption measurements are found in the liquid or gaseous in the ultraviolet regions of the apparatus and that are visible in all the infrared of the electromagnetic spectrum (ROCHA; TEIXEIRA, 2004) (NASCIMENTO, 2005).

Given the importance of the commercialization of a drug that presents the content of the substance according to pharmacopoeia standards, it was necessary to analyze the content of sodium dipyrone using samples of the standard drug and 500 mg tablets of the reference mark, generic and similar products that are sold in drugstores in the city of Vitória da Conquista-BA. The method chosen to perform the quality control was ultraviolet (UV) absorption spectrophotometry, in order to obtain satisfactory values that could guarantee the quality and efficacy of the drug (JUNIOR *et al*, 2019).

## II. METHODOLOGY

This is a descriptive research, with a quantitative approach, carried out at the Laboratory of the Faculdade Independente do Nordeste (FAINOR), located in the city of Vitória da Conquista, Bahia, Brazil (Latitude: 14 ° 51 '58 "S; ° 50 '22 "W, Altitude: 923m), located 518.8 km from the capital. To obtain the results, a standard dipyrone feedstock was used, with the corresponding report and all the information necessary to perform the quality control analysis of the three drugs of the substance present in the drug dipyrone sodium: reference medicine, generic and similar, all in tablet form of 500mg. The samples were analyzed in the laboratory of the Faculdade Independente do Nordeste (FAINOR), following the method ultraviolet / visible spectrophotometry (UV / VIS).

To establish and determine the contained content of dipyrone in the tablets the UV molecular absorption spectrophotometry technique was used. The spectrophotometer used was the (QUIMIS U2M) selected wavelength 258 nm. The stock solution was prepared by weighing 0.1000 g of the dipyrone in a beaker, dissolving with 0.1 mol / L HCl and transferred to a 100 ml volumetric flask, obtaining a solution with a concentration of 1000 mg / L.

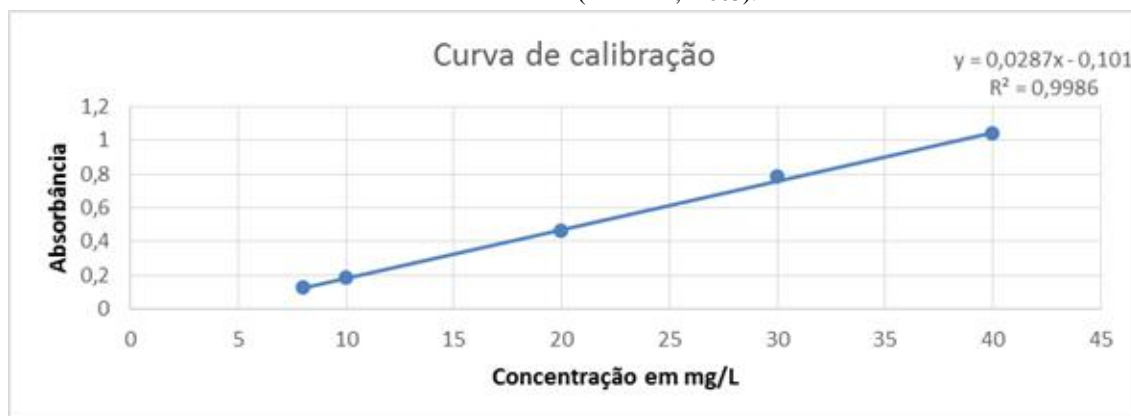
The calibration curve was constructed using the standards with the following concentrations: 8, 10, 20, 30, 40 mg / L. In the preparation of standards, 0.8 mL (8mg / L), 1.0 mL (10mg / L), 2.0 mL (20mg / L), 3.0 mL (30mg / L), 4.0 mL (40mg / L), using the micropipette and

graduated pipette, completing the volume of the 100.00 mL volumetric flask with 0.1 mol / L hydrochloric acid using the Pasteur pipette. A three-fold analysis of the tablets for each brand was performed, being named G, S and R. With a mortar and pestle the 500mg tablet was macerated and diluted with 0.1 mol / L HCl in the 100mL flask, obtaining a solution of 5000 mg / L. It was then

diluted to 10 mg / L by pipetting 0.2 mL into a 100.00 mL volumetric flask.

### III. RESULTS AND DISCUSSION

The following figure shows the calibration curve of dipyrone, it presents an efficient linearity range, with a linear regression coefficient  $r^2 = 0.998$ , which is a satisfactory value in front of the required parameters. (BRAZIL, 2003).



The analyzes performed on the three drugs named G, S and R, applied three samples for each. After obtaining the results, a mean value of the content was determined, being G: 95.93%, S: 92.92% and R: 91.17%. According to the values stated by the Brazilian

Pharmacopoeia (2010), the content of dipyrone should be between 95% (minimum) and 105% (maximum) to meet the efficacy in the treatment of the patient (ANVISA, 2010).

Table 1 -

Sample	Absorbance	$\square = \text{mg / L}$ (diluted)	$\square = \text{mg / L}$ (concentrated)	Mass (g)	Drug	(generic)%
G1	0.168	% 9.3728223	4686.41115	468.6411	93.728223	95 , 93495935
G2	0.189	10.10452962	5052.264808	505.22265	101.0452962	
G3	0.166	9.303135889	4651.567944	465.1568	93.03135889	

Source: Research data.

Table 2 -

Sample	Absorbance	$\square = \text{mg / L}$ (diluted)	$\square = \text{mg / L}$ (concentrated)	Mass (g)	Drug	(similar)
S1	0.169	% 9407665505	4703.832753	470.3833	94.07665505	91 , 17305459
S2	0.168	9.3728223	4686.41115	468.6411	93.728223	
S3	0.145	8.571428571	4285.714286	428.5714	85.71428571	

Source: Research data.

Table 3

Sample	Absorbance	$\square = \text{mg / L}$ (diluted)	$\square = \text{mg / L}$ (concentrated)	Mass (g)	Drug	(reference)
R1	0.134	% 8.181815331	4094.076655	409.4077	81.8815331	92, 91521487

R2	0.177	9.68641115	4843.205575	484.3206	96.8641115	
R3	0.186	10	5000	500	100	

Source: Research data.

After evaluation of the analysis in question, it was observed that only the generic drug presented with the amount of adequate content, since the samples of dipirone reference and similar are low concentration of active principle, being inappropriate to meet the desired therapeutic purpose.

The use of drugs with low concentration can cause a delay in the treatment of the patient, as well as the worsening of the patient's condition.

#### IV. FINAL CONSIDERATIONS

The present study was of great value for the quality control of the content of sodium dipyrone concentration in G, S and R tablets being sold in drugstores, although the analysis was satisfactory in terms of tests performed, only the generic drug presented ideal content.

The use of medication with a low amount of active ingredient may lead to a lack of efficacy and quality of treatment, leading to worsening of symptoms and worsening of symptoms.

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