The Pharma Research
Year: 2009, Vol: 01

THE DETERMINATION OF NATEGLINIDE IN BULK AND PHARMACEUTICAL PREPERATIONS UV SPECTROPHOTOMETRIC METHOD

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ABSTRACT

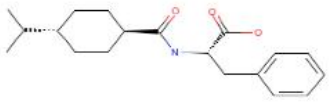
A simple and precise UV-SPECTROPHOTOMETRIC method for NATEGLINIDE was developed for the stimulation estimation of in tablet formulation. The method was carried out on an ELICO uv-visible spectrophotometer (MODEL SL- 159) with a methanol A.R grade as solvent at 209 nm. The validation of propped method is specific, accurate, precise and linear. The linearity of NATEGLINIDE was to 2.5 - 50 µg/ml. The proposed method can be used for NATEGLINIDE in bulk drugs and tablet formulation by UV-SPECTROPHOTOMETRIC method.

Keywords: NATEGLINIDE; UV-SPECTROPHOTOMETRIC METHOD

1. INTRODUCTION

Nateglinide (na-TEG-li-nide) is used to treat a type of diabetes mellitus (sugar diabetes) called type 2 diabetes. With this type of diabetes, insulin produced by the pancreas is not able to get sugar into the cells of the body where it can work properly.

The structure of Nateglinide is 3-phenyl-2-(4-propan-2ylcyclohexyl) carbonylamino-propanoic acid



It is official in British Pharmacopoeia, Indian Pharmacopoeia and United States Pharmacopoeia [1- 3.].

There is no UV-SPECTROPHOTOMETRIC method for the estimation of in dosage forms. The present work describes a simple, precise and accurate UV-SPECTROPHOTOMETRIC method for the estimation of Nateglinide in dosage forms.

2. EXPERIMENT:

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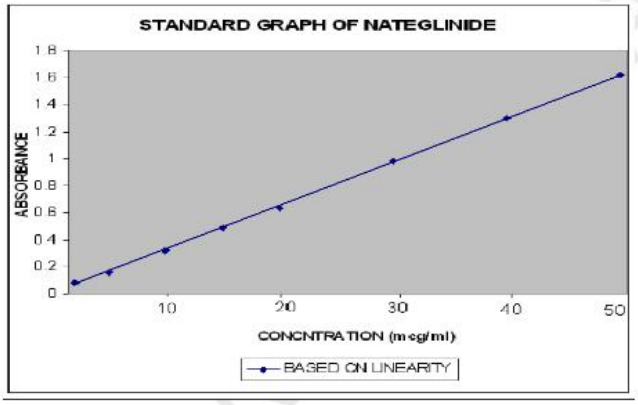
REAGENT AND CHEMICALS;

Methanol was supplied by Qualigens Chemicals, Mumbai. Reference drugs were obtained as gift samples from manufacturer.

UV-SPECTROPHOTOMETRIC CONDITIONS;

AN **ELICO UV-visible spectrophotometer (MODEL SL- 159)** was used for analysis. In order to ascertain the wavelength of maximum absorbance (λmax) of the pharmacodynamic agents, solutions of particular concentration of drug 10µg/ml in methanol was scanned within the wavelength range of **200-380 nm** against a corresponding reagent as blank. The resulting spectrum was presented in fig: - 1. The absorption curves showed characteristics absorption **maxima at 209 nm.**

Fig: 2



PREPARATION OF STANDARD SOLUTION;

Standard Stock solution is prepared by adding of 1 mg/ml of **NATEGLINIDE** were taken into 100 ml standard volumetric flask using methanol to get concentration of 1000 ppm. From the standard stock solutions, 1 ml was taken and further diluted to 10 ml with methanol to get working standard solution of 100 µg/ml.

CONSTRUCTION OF THE STANDARD CALIBRATION CURVE;

To construct Beer's law plot different aliquots of **NATEGLINIDE** were transferred separately in to a series of 10 ml volumetric flasks and final volume was made up to 10 ml with methanol. The absorbances were measured at respective λmax 209 nm against methanol as a blank. The result were shown in table: 1. the standard graph for NATEGLINIDE was plotted by taking concentration of drug on X- axis and absorbance on Y-axis were shown in Fig: - 2, nateglinide obeyed Beer's law in the concentration range of 2.5 – 50 µg/ml.

TABLE: 1 OPTICAL CHRACTERSTIC AND PRECISION:

Parameters	Nateglinide
Beer's Law Limit (µg/ml)	2.5-50
Sandell's sensitivity (µg/cm^2/0.001 Abs unit)	0.0308
Molar extinction coefficient (1 mole. Cm^{-1})	
% RSD (with in analyst)	0.3309
% range of error	0.037
0.05 confidence limit	
0.01 confidence limit	0.0487
correlation coefficient	
regression equation (Y)*	0.9999
slope (a)	0.0325
intercept (b)	0.0012

PREPARATION OF SAMPLE SOLUTION;

Twenty tablets, each containing 120 mg NATEGLINIDE were weighed and collect the powder, weight a quantity of powder equivalent to 10 mg of NATEGLINIDE and makeup volume to 10 ml with methanol and sonicate it then filter. Resulting solution was further diluted to get a concentration of 5 µg/ml of NATEGLINIDE and this was used for the estimation (sample solution).

PROCEDURE;

With the above optimized chromatographic conditions, the standard solution and sample solution were sampled and the absorbances were recorded. The Assay was calculated using the following formula and the result were shown in table 2.

TABLE: 2 MEAN (± SD) amount of Nateglinide in tablets by proposed method

Formulation	Labeled amount (mg)	Observed amount (mg)	% amount found	% RSD
Glinate(Glenmark)	120 mg	119.52 ±0.4214	99.60	0.3525
Natelide(Alembic)	120 mg	120± 0.4099	100.00	0.3415

Each value is averaged of three determinations ± standard deviation

$$\text{Concentration of Drug} = \frac{\text{ABSORBANCE OF THE TEST}}{\text{ABSORBANCE OF THE STANDARD}} \times \text{Concentration of Standard}$$

VALIDATION OF THE METHOD;

1. Accuracy

Accuracy of method was studied by the recovery experiments. To the powdered tablet formulations (each containing 120 mg NATEGLINIDE reference standard drugs were added at the level of ± 20% of the label claim. The extraction of drugs was followed using sample preparation procedure and these were analyzed. The percentage recovery was calculated and presented (Table-3).

TABLE: 3 Accuracy

Sample ID	Concentration (µg/ml)		%recovery of pure drug	Statistical Analysis
	Pure drug	Formulation		
S_1: 80%	2	2.5	100.31	Mean : 99.28
S_2: 80%	2	2.5	98.77	SD : 0.8882
S_3: 80%	2	2.5	98.77	%RSD ; 0.8946
S_4: 100%	2.5	2.5	101.17	Mean : 100.76
S_5: 100%	2.5	2.5	99.94	SD : 0.7106
S_6: 100%	2.5	2.5	101.17	%RSD ;0.7052
S_7: 120%	3	2.5	99.69	Mean : 100.034
S_8: 120%	3	2.5	100.72	SD : 0.5921
S_9: 120%	3	2.5	99.69	%RSD ;0.5919

2. Precision

The precision of the method was by repeatability studies. The percentage recovery was demonstrated by the standard solution for 8 times and passing them through the assay procedure. From these results mean, SD and %RSD were calculated and presented in Table-4.

TABLE: 4 PRECISION READINGS:

Concentration (µg/ml)	Absorbance	Statistical analysis
5	0.161	
5	0.161	
5	0.162	Mean : 0.1615
5	0.161	SD : 0.0005345
5	0.162	%RSD ; 0.3309
5	0.162	
5	0.162	
5	0.161	

3. Linearity

Linearity of the method was done by analyzing standard solution containing 2.5 to 50 µg/ml of the targeted level of the assay concentration of NATEGLINIDE. These were analyzed and the response factors were calculated. The calibration curve was plotted using response factor Vs concentration of the standard solutions and presented in Table-5.

TABLE: 5 LINEARITY:-

CONCENTRATION (mcg/ml)	ABSORBANCE
2.5	0.081
5.0	0.162
10	0.324
15	0.486
20	0.638
30	0.981
40	1.296
50	1.621

RESULTS AND DISCUSSION:

From the optical characteristics of the proposed method it was found that nateglide obeys linearity with in the concentration range of **2.5 – 50 µg/ml.** From the results shown in the **table: 2**, it was found that % RSD is less than **2%**, which indicates that the method has good reproducibility. The accuracy of the method was determined by the recovery studies from the results shown in **table: 3** it was found that the % recovery values of the pure drug from the pre-analyzed solution of formulation were in between **98.77% – 101.17%,** which indicates that the method is accurate, The precision data shows that the reproducibility of the assay procedure was satisfactory.

The concentration range from **2 to 3 µg/ml** of NATEGLINIDE, The calibration curve shows linear response over the range of concentration used in the assay procedure. The calibration curve passes through the origin, which justifies the use of single point calibration and the proximity of all points to the calibration line demonstrated that the method has adequate linearity to the concentration of the analyte. And also reveals that the commonly used excipients and additives in the pharmaceutical formulations were not interfering in the proposed method.

CONCLUSION:

The proposed UV-SPECTROPHOTOMETRIC method is simple, accurate, precise, linear and rapid. The proposed method is specific in estimating the commercial formulations without interference of excipients and other additives. Hence this method is suitable for the quality control of raw materials, formulations and can be applied in dissolution studies.

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Source of support: Nil, Conflict of interest: None Declared