



**CRYSTAL**  
**MANAGEMENT SERVICES**  
**(CMS SKILL CENTER)**

+91 8919168131  
0891-3597541  
jd@cmsskillcenter.com  
www.cmsskillcenter.com

Date: 9-11-2020

To  
The Principal  
Avanthi Institute of Pharmaceutical sciences, Cherukupally,  
Vizianagaram.

Dear Sir,

Sub: Looking for qualified team who can work for our organization's project.

I'm **Mr.G.JAGADEESHWARA RAO**, Managing Director of Crystal Mangement Services which is located at Visakhapatnam in Andhra Pradesh, India

Offering the ideal platform, for creative thinkers for creative thinkers to design and develop new drug entities. we guarantee incredible opportunities in different Pharmaceutical industries. With the best infrastructure, Technology, Equipments, and system support in its class, the innovators have nothing to be worried about. In particular, we offer cutting-edge facilities for improving instrument handling skills.

In addition to offering training and project development. we also offer consultancy and help with Characterization of Prepared formulations Formulate and evaluate. For aspiring Pharmacy researchers, our fund also acts as a catalyst to encourage the technological advancement. Therefore, if you have an idea, which you think is innovative then we are the right place where you can implement it

We are looking for a team of qualified faculty members at your college in Pharmacy Department who can work on analytical research and development and formulation research and development. If your college is interested to work in collaboration. We forward further documentation & I sincerely hope that we can keep the information confidential

Looking forward & thank you

**Mr.G.JAGADEESHWARA RAO**

Managing Director



# AVANTHI INSTITUTE OF PHARMACEUTICAL SCIENCES

(Approved by AICTE, PCI, Recognized by the Govt. of A.P. & Affiliated to JNTUK, Kakinada)

Cherukupally (Village), Chittivalasa (SO), Bhogapuram (Mandal), Vizianagaram (Dist) -531162.

[www.avanthipharma.ac.in](http://www.avanthipharma.ac.in), [principal@avanthipharma.ac.in](mailto:principal@avanthipharma.ac.in)

Cherukupally,  
12-11-2020.

From  
The Principal,  
Avanathi Institute Of Pharmaceutical Sciences,  
Cherukupally (Village).

To  
The Managing Director,  
Crystal Management Services  
Visakhapatnam,

Respected sir,

**Sub:** Req- Project Development-Acceptance -Reg

It gives us great pleasure to let you know that the project proposal for "**Artificial Neural Networks in the dissolution enhancements of BCS Class-II drugs**" has been confirmed. As we discussed in our conversation, we agreed to maintain the confidentiality of the Project. We appreciate you giving us the opportunity to work on your current project, which has to do with the most recent developments in the design sector.

Please be assured that we will make every effort to complete the project as quickly as we can.

Thanking you,

  
PRINCIPAL

PRINCIPAL

Avanathi Institute of Pharmaceutical Sciences  
Cherukupally (V), Bhogapuram Mandal  
Vizianagaram Dt., - 531162

Copy to :

HOD of Pharmacy





# AVANTHI INSTITUTE OF PHARMACEUTICAL SCIENCES

(Approved by AICTE, PCI, Recognized by the Govt. of A.P. & Affiliated to JNTUK, Kakinada)

Cherukupally (Village), Chittivalasa (SO), Bhogapuram (Mandal), Vizianagaram (Dist) -531162.

[www.avanthipharma.ac.in](http://www.avanthipharma.ac.in), [principal@avanthipharma.ac.in](mailto:principal@avanthipharma.ac.in)

Cherukupally,  
12-11-2020.

From

The Principal

Avanathi Institute of Pharmaceutical Sciences,

Cherukupally (Village)

To

The Managing Director,

Crystal Management Services

Visakhapatnam.

Respected Sir,

**Sub: Project Development Team. I'm pleased to depute**

1. Dr.G.Prashanti
2. Ms.Y.V.Vandana
3. Ms D.Purnima Yadav

It's for necessary work.

Thanking You ,

Copy to :

HOD of Pharmacy

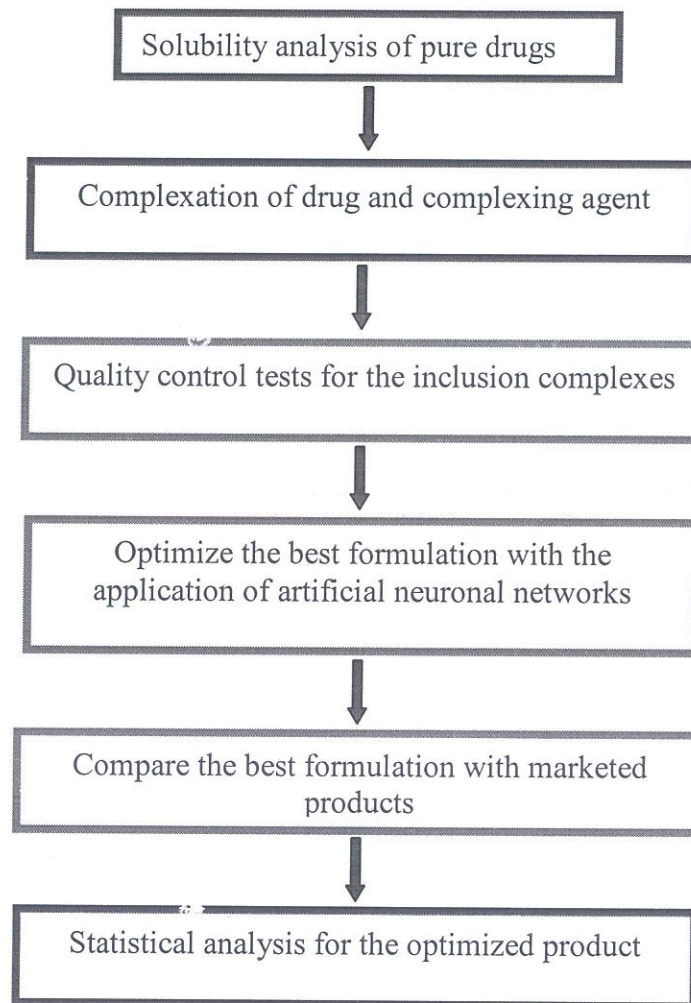


  
PRINCIPAL

PRINCIPAL

Avanathi Institute of Pharmaceutical Sciences  
Cherukupally (V), Bhogapuram Mandal  
Vizianagaram Dt., - 531162

## Flow chart of Project Procedure



### Objectives:

- To carry out modelling by artificial neural networks and use them in the characterization of prepared formulations and in the selection of the best product.
- To formulate an immediate release tablet of Clopidogrel bisulphate and Dolutegravir sodium based on the optimized formulation given by the ANN.
- To evaluate the prepared immediate release tablet of Clopidogrel bisulphate and Dolutegravir sodium by *in-vitro* studies





**CRYSTAL**  
**MANAGEMENT SERVICES**  
**(CMS SKILL CENTER)**

+91 8919168131  
0891-3597541  
jd@cmsskillcenter.com  
www.cmsskillcenter.com

**WORK ORDER**

Date: 08-12-2020

Visakhapatnam

To  
The Principal  
Avanathi Institute of Pharmaceutical sciences, Cherukupally,  
Vizianagaram.

Dear Sir,

**Sub:** Request –Applicability of Artificial Neural Networks in the dissolution enhancement of BCS class –II drugs - Reg

To carryout modelling by Artificial Neural Networks and use them in charecterization of Prepared formulations as per telephonic discussion quotation we are pleased to place Work Order as below

<b>Requirements</b>	<b>Amount(in Rs.)</b>
Chemicals & Solvents	1,00,000/-
Equipments & Glassware	1,30,000 /-
Artificial Neural Network Software	1,20,000 /-
BCS Class II Drug Molecules	1,00,000/-
In-Vitro Pharmacological Studies	50,000/-
<b>Total Cost in rupees</b>	<b>5,00,000/-</b>

Rupees in words :Five Lakhs Only

Work Order Valid: One year (8<sup>th</sup> Dec 2020 to 31<sup>st</sup> Nov 2021)

**WORKING LOCATION:**

- Your Premises

Crystal Mangement Services

  
  
MANAGING DIRECTOR



# AVANTHI INSTITUTE OF PHARMACEUTICAL SCIENCES

(Approved by AICTE, PCI, Recognized by the Govt. of A.P. & Affiliated to JNTUK, Kakinada)

Cherukupally (Village), Chittivalasa (SO), Bhogapuram (Mandal), Vizianagaram (Dist) -531162.

[www.avanthipharma.ac.in](http://www.avanthipharma.ac.in), [principal@avanthipharma.ac.in](mailto:principal@avanthipharma.ac.in)

Cherukupally,

16-11-2021.

From  
The Principal,  
Avanathi Institute of Pharmaceutical Sciences,  
Cherukupally (Village)

To  
Managing Director,  
Crystal Management Services  
Visakhapatnam,

Respected Sir,

**Sub:** Project Completion-Reg

The project has been completed on 15.11.2021. It has been a great achievement by us to complete this prestigious project on time. It has been a great privilege, working in association with you and looking forward to work with you in future projects. We request you to please come along with your team for collecting, retrieving of important and confidential data .

I am looking forward to quick response from your side.

Thanking you



  
Principal

**PRINCIPAL**  
Avanathi Institute of Pharmaceutical Sciences  
Cherukupally (V), Bhogapuram Mandal  
Vizianagaram Dt., - 531162



## Project Report

### Introduction:

The project aims in formulating a product that gives the required release of the drug which then gets absorbed in an appropriate manner to give maximum possible bioavailability as oral route is the most preferred route of drug administration, from the perspective of the patients as well as the doctors. Oral solid formulations and especially tablets are preferred by one and all because of their several advantages. The primary objective of the project is to formulate an immediate release tablet of Clopidogrel bisulphate and Dolutegravir sodium based on the optimized formulation given by the ANN and to evaluate them by *in-vitro* studies.

### Scope of the Project:

An extensive amount of recent research has gone into methods to enhance the dissolution rate of poorly soluble drugs. This research project is involved in enhancing the solubility and developing formulations that enhance the dissolution rate of two poorly soluble drugs, namely, Clopidogrel bisulphate (CBS) and Dolutegravir sodium (DTG) by using cyclodextrins as complexing agent with the application of Artificial Neural Networks (ANN).

### Project planning and scheduling:

This research project was started with the aim of enhancing the solubility and consequently the bioavailability of the two selected BCS Class II drugs. Experimental work was carried out to achieve the objectives listed above. An introduction to the main topics in the research project, literature review, experimental procedures adopted, results obtained and discussions containing the interpretation of the results, usage of artificial neural networks to get at the optimised product will be effectively developed and ensure on-time project delivery.

### Methodology:

It was envisaged to enhance the solubility of the drugs, by preparing inclusion complexes of the drugs with cyclodextrins and to enhance it further by adding hydrophilic polymers to the complexes. The cyclodextrins selected for the study were  $\beta$ -CD and HP- $\beta$ -CD. The hydrophilic polymers selected were polyvinyl pyrrolidone K30 (PVP K30), poly ethylene glycol 6000 (PEG 6000) and polyvinyl caprolactam-polyvinyl acetate-polyethylene glycol graft copolymer (Soluplus). All the selected excipients are well known agents in causing enhanced dissolution of drugs.

Use of statistical techniques and optimization methods that rely on response surface methodology is nowadays a well-known practice in formulation development. But when the number of inputs increases, statistical conceptualization and optimization techniques become unmanageable. Further, statistical techniques need a hypothesis to generate a suitable model.



  
PRINCIPAL

Avanthi Institute of Pharmaceutical Sciences  
Cherukupally (V), Bhogapuram Mandal  
Vizianagaram Dt., - 531162



ESTD : 2005

### **Technology and tool Used:**

Artificial neural networks (ANN) are going to be a better working tool or modeling tool. The ANNs are computational algorithms implemented by computer software that study data in a manner similar to the human brain. They try to learn, extrapolate and extract the basic logic or meaning or trend of the data. ANNs comprise of different processing nodes. These nodes are skilled in taking out non-linear relationships from the input data and using the knowledge in predicting the outcome from the preferred situation. ANNs are very beneficial. ANNs do not depend on rigidly organized experimental designs. They use past or incomplete data and can map functions.

A two-layer artificial neural network, named, Levenberg-Marquardt Algorithm was proposed to be studied for applicability in the characterization of the developed formulations and in the selection of the best formulation in the present research project.

### **Budget:**

A budget will be estimated to cover the costs of human resources, ANN software, selected BCS Class II drugs, Chemicals, reagents, statistical techniques and other miscellaneous expenses.

### **Risk Management:**

A risk assessment will be conducted to identify potential challenges such as data inaccuracies, result analysis and time constraints. Extenuation plans will be developed to minimize these risks effectively.

### **Conclusion:**

The application of artificial neural networks in formulation development of Clopidogrel bisulphate and Dolutegravir sodium complexes. In this study, ANNs were used as a machine learning technique to evaluate the influence of cyclodextrins ( $\beta$ -CD, HP- $\beta$ -CD) on dissolution enhancement of CBS and DTG with and without hydrophilic polymers (PVP K30, PEG 6000 & SOLUPLUS. A trained ANN model was employed to predict release profile and optimize the formulation composition based on the percentage of the drug released. The network performance was validated by the regression data which validates the network output with respect to training, validation and test sets and a good fit shows the network outputs are almost equal to targets with minimum error. The successful completion of project will significantly benefit the pharmaceutical industry by providing reliable results.

  
PRINCIPAL INVESTIGATOR

  
PRINCIPAL

PRINCIPAL

Avanthi Institute of Pharmaceutical Sciences  
Cherukupally (V), Bhogapuram Mandal  
Vizianagaram Dt., - 531162







ESTD : 2005

# AVANTHI INSTITUTE OF PHARMACEUTICAL SCIENCES

(Approved by AICTE, PCI, Recognized by the Govt. of A.P. & Affiliated to JNTUK, Kakinada)

Cherukupally (Village), Chittivalasa (SO), Bhogapuram (Mandal), Vizianagaram (Dist) -531162.

[www.avanthipharma.ac.in](http://www.avanthipharma.ac.in), [principal@avanthipharma.ac.in](mailto:principal@avanthipharma.ac.in)

## UTILITY CERTIFICATE

We the principal investigator and Co-investigators hereby certify that the work order for "Artificial Neural Networks in the dissolution enhancements of BCS Class-II drugs", as per the discussed quotation and telephonic conversation, has been placed with e respective party.

The details of the work order as follows:

Requirements	Amount (in Rs.)
Chemicals & Solvents	1,00,000/-
Equipments & Glassware	1,30,000 /-
Artificial Neural Network Software	1,20,000 /-
BCS Class II Drug Molecules	1,00,000/-
In-Vitro Pharmacological Studies	50,000/-
<b>Total Cost in rupees</b>	<b>5,00,000/-</b>

We confirm that the before mentioned rates are reasonable and necessary for carrying out the mentioned tasks efficiently. We assure you that these rates will be utilized in the best possible manner to achieve optimal results in this project. Furthermore, we ensure complete transparency and accountability in all our financial transactions related to this project.

Please let us know if any additional information is required from our end .We look forward to your continued support and cooperation.

Thanking you,

Yours sincerely,

*G. Prashanti*

Dr.G.Prashanti  
Principal Investigator

*Y.V. Vandana*

Ms Y.V.Vandana  
Co-Investigator

*D. Purnima*

Ms D.Purnima Yadav  
Co- Investigator



*Dr. G. Prashanti*  
**PRINCIPAL**  
Avanthi Institute of Pharmaceutical Sciences  
Cherukupally (V), Bhogapuram Mandal  
Vizianagaram Dt., - 531162



सेंट्रल बैंक ऑफ इंडिया  
Central Bank of India

CD

सभी शाखाओं पर देय / PAYABLE AT ALL BRANCHES

मधुरवाडा शाखा, विशाखपट्टणम् - 530041  
Madhurawada Branch, Visakhapatnam - 530041  
A IFS Code : CBIN0283559

दि	दि	मा	मा	व	व	व	व
2	9	1	1	2	0	2	1
D	D	M	M	Y	Y	Y	Y

KL HI-TECH SECURE PRINT LTD. HYD./CTS-2010  
केवल तीन माह के लिये वैध FOR THREE MONTHS ONLY

PAY ANANTHI INSTITUTE OF PHARMACEUTICAL SCIENCES

या धारक को OR BEARER

रुपये RUPEES FIVE LAKH RUPEES ONLY

अदा करें ₹ 5,00,000/-

खा.सं.  
A/c No. 3804596950

For Crystal Management Services  
Managing Partner

कृपया हस्ताक्षर ऊपर करें / Please sign above

⑈032065⑈ 530016005⑈

29

**AVANTHI INSTITUTE OF PHARMACEUTICAL SCIENCES**

Joint Holder :-

CHITTIVALASASO, CHERUKUPALLY VILLAGE

BHOGAPURAM MANDAL

MAIN ROAD

VIZIANAGARAM

ANDHRA PRADESH-INDIA

531162

Customer No : 879983002

Scheme : SB-TRUST/SOCIETY/NGO/GOVT

Currency : INR

**Statement of Axis Account No : 918010018191104 for the period (From : 29-11-2021 To : 30-11-2021)**

Tran Date	Chq No	Particulars	Debit	Credit	Balance	Init. Br
		<b>OPENING BALANCE</b>			<b>345722.31</b>	
29-11-2021		AVANTHI INSTITUTE OF PHARMACEUTICAL SCIENCE - 02 26.11.		25925.00	371647.31	274
30-11-2021		By Clg 7086616002 Vizag		500000.00	874647.31	2568
30-11-2021		AVANTHI INSTITUTE OF PHARMACEUTICAL SCIENCE - 02 29.11.		143820.00	1015467.31	274
30-11-2021		AVANTHI INSTITUTE OF PHARMACEUTICAL SCIENCES		10000.00	1025467.31	274
		<b>TRANSACTION TOTAL</b>		<b>679745.00</b>		
		<b>CLOSING BALANCE</b>			<b>1025467.31</b>	

Unless the constituent notifies the bank immediately of any discrepancy found by him/her in this statement of Account, it will be taken that he/she has found the account correct.

The closing balance as shown/displayed includes not only the credit balance and/or overdraft limit, but also funds which are under clearing. It excludes the amount marked as lien, if any. Hence the closing balance displayed may not be the effective available balance. For any further clarifications, please contact the Branch.


We would like to reiterate that, as a policy, Axis Bank does not ask you to part with/disclose/revalidate of your iConnect passord, login id and debit card number through emails OR phone call. Further, we would like to reiterate that Axis Bank shall not be liable for any losses arising from you sharing/disclosing of your login id, password and debit card number to anyone. Please co-operate by forwarding all such suspicious/spam emails, if received by you, to [customer.service@axisbank.com](mailto:customer.service@axisbank.com)

With effect from 1st August 2016, the replacement charges for Debit card and ATM card applicable on Current accounts have been revised. To know more about the applicable charges, please visit [www.axisbank.com](http://www.axisbank.com)

Deposit Insurance and Credit Guarantee Corporation (DICGC) insurance cover is applicable in all Bank's deposits, such as savings, current, fixed, recurring etc. \* up to maximum amount of Rs 5 Lakh including principal & interest both\* (\*for exceptions and details please refer <http://www.dicgc.org.in/>)

REGISTERED OFFICE-AXIS BANK LTD, TRISHUL, Opp. Samartheswar Temple, Near Law Garden, Ellisbridge, Ahmedabad. 380006. This is a system generated output and requires no signature.

S

  
**PRINCIPAL**  
**Avanthi Institute of Pharmaceutical Sciences**  
**Cherukupally (V), Bhogapuram Mandal**  
**Vizianagaram Dt., - 531162**