**BIO-DATA**

**1. Name of the candidate:** Dr (Mrs.) Anuradha Dube nee Misra

**2. Date of birth:**  27.11.1955

**3. Highest Academic Degree** Ph.D. in Zoology/Life Sciences (specialization in Parasitology), 1983: Central Drug Research Institute, Lucknow, India (University of Kanpur, Kanpur, India)

**4. Broad subject area:** Life Sciences

**5. Area of specialization:** Parasite Immunobiology and drug discovery

Current area of research: Leishmaniasis: -

Development of antileishmanial vaccine(s) generating Th1 type of immune response for their prophylactic and therapeutic potential.

Evaluation of vaccination strategies (delivery) with potential antileishmanial protein/peptide and their chimeras.

**6. Mailing address:** INSA Emeritus Scientist and Sir JC Bose National Fellow

Division of Parasitology, Central Drug Research Institute,

BS-10/1, Sector 10, Jankipuram Extension, Sitapur Road,

Post Box No 173, Lucknow-226031, India,

Tel: 0522-2771940, Fax: 0522 277194

 Email:anuradhadube@gmail.com /a\_dube@cdri.res.in anuradha\_dube@hotmail.com

**7. Positions held till superannuation**:

2009-Nov 2015: Chief Scientist (Sc. G), Area Leader-Project Leishmaniasis,

 Division of Parasitology; Central Drug Research Institute (CDRI),

2004 - 2009: Senior Principal Scientist (Sc. F) & Area Coordinator - Leishmaniasis; Division of Parasitology; CDRI, Lucknow

1999 - 2004: Principal Scientist (Sc. E-II); Division of Parasitology; CDRI, Lucknow

1994 -1999: Senior Scientist (Sc. E-I); Division of Parasitology; CDRI, Lucknow

1989 -1994: Scientist (Sc. C); Division of Parasitology; CDRI, Lucknow

1984 -1989: Junior Scientist (Sc. B), Division of Parasitology; CDRI, Lucknow

**8. Details of research experience**:

**Indian National Science Academy (INSA) Emeritus/ Senior Scientist and Sir JC Bose Fellow (SERB/DST), 2015- till date:** workingonImmunobiology and molecular immunology of experimental Visceral Leishmaniasis

**Scientist to Chief Scientist, CSIR-Central Drug Research Institute, 1984 – 2015 (superannuation):** 31 years’ research experience on parasitic infections; Initial 5 years on drug discovery, Immunobiology of intestinal helminthic (roundworm/hookworm) infection and later 26 years on drug discovery, Immunobiology and molecular immunology of experimental Visceral Leishmaniasis.

**9. Details of professional training:**

 **Visiting Scientist** under:

 Indian National Science Academy (INSA) - Royal Society, UK Exchange Program to Liverpool School of Tropical Medicine & Hygiene, Liverpool, UK for 3 months from August to November,1993: To gain practical experience on Immunodiagnostics of Leishmaniasis

TDR/WHO project to the Institute of Primate Research, Nairobi, Kenya for 15 days in Jan 1997: To gain practical experience on the vaccination studies against non-human primate

TDR/WHO project to Razi Institute of Vaccine Serum and Pasteur Institute of Iran, Tehran, Iran, for 15 days May-June 1999: To have an exposure of GMP & GLP regarding Leishmania vaccine preparation.

 DBT Visiting Associateship to Walter and Elisa Hall Institute of Medical Research, Melbourne, Australia for 3 months from March to June, 2006: To gain practical experience on the molecular biology of Leishmaniasis.

**10. Awards, Fellowships and other Professional recognitions received**

**a) Awards Received:**

**Professor Bhim Shanker Trivedi Memorial Medal** 2020 (instituted byIndian National Science Academy) for contributions in any branch of Biological Science including Medicine and Psychology)

**Kshanika Oration Award** 2018 (instituted by Indian Council for Medical Research for outstanding contributions in the field of Biomedical Sciences)

**Dr. BN Singh Memorial Award** 2017 (instituted by Indian Society for Parasitology for outstanding contributions in the field of Parasitology)

**TWAS visiting scientist fellowship** 2013 to University of Colombo, Colombo, Sri Lanka (26th March to 5th April, 2013). This visit was as an **expert** to guide the scientists/medicos for development of leishmaniasis research and to assist in establishing diagnosis laboratory for University of Colombo.

**b) Fellowships:**

Fellow of Indian National Science Academy (FNA) (2014),

Fellow Indian Academy of Sciences (FASc) (2015)

Fellow of National Academy of Sciences, India (FNASc) (2015)

JC Bose National Fellow (DST) (2015)

INSA Senior/Emeritus Scientist (INSA) (2016)

**c) Membership of Professional bodies**

Indian Society for Parasitology Life member 1986

Indian Immunological Society Life member 1989

Lab. Animal Science Association of India Life member 1990

Indian Society for Pharmacologists Life member 2004

The Cytometry Society Life member 2012

The Indian Science Congress Association Life Member 2017

**d) Member of Technical/Standing/Sectional Committees**

**INSA Editorial Board**: Proceedings of the Indian National Science Academy 2019-20

**INSA Sectional committee** (**Animal Sciences**) for the selection ofa) INSA Young Scientist award and b) INSA Fellows (FNA) 2018-2020

**ICMR Panel** for evaluation of WHO proposal on "Clinical trial of Leish3 vaccine against PKDL cases" Jan 29, 2004

**DNDi meeting** in ICMR, N Delhi Jan 30 & Feb 1, 2004

**Product Development team** (Leishmania Vaccine) TDR/WHO at Venezuela as Co-opted Member Oct 14-16, 1999

**e) Reviewer for Journals and Research Grants**

**Journals: International**

Applied Biochemistry and Biotechnology

PLoS Neglected Tropical Diseases

Emerging Infectious Diseases

Acta Tropica

Vaccine

Emerging Infectious Diseases

Proteomics

The American Journal of Tropical Medicine and Hygiene

Free Radical Research

The Lancet Infectious Diseases

Expert Opinion on Emerging drugs

Journal of Antimicrobial Chemotherapy

Parasitology

Journal of Medicinal Chemistry

Frontiers in Immunology

Journal of Infectious Diseases

Cytokine

Scientific Reports

Virulence

**National**

Current Science

Indian Journal of Medical Research

Journal of Parasitic Diseases (formerly Indian Journal of Parasitology)

* **Research Grant**

Indian Council for Medical Research (ICMR)

Department of Biotechnology (DBT)

Department of Science Technology (DST)

West Bengal Council for Science and Technology (WBDST)

Projects under Kothari Scheme

Structural Research Funding ITM (SOFI) Funded by the Flemish Ministry of Economy, Sciences and Innovation (EWI), Belgium

**f) Other professional activities**

**Organization of Conference/Workshops**

1. Workshop on Good Laboratory Practice sponsored by WHO under the WHO project “Visceral leishmaniasis and PKDL in India: New therapeutic, immunologic and diagnostic studies, and site preparation for vaccine trial” on March 19 to 21, 2001
2. Workshop on use of animal models for microbiological research at CDRI in collaboration with SGPGI in November, 2004 and delivered lectures and gave training to participants
3. DNDi training Workshop on Antiprotozoal Drug Screening on February 12, 2007 as faculty member
4. Fourth World Leishmania Congress (WorldLeish4) on February 3 to 8, 2009 as one of the Organizing Secretary.

**Faculty member of JNU pre-PhD course** and M. Pharm, NIPER, Raebareli, delivering lectures on “Leishmaniasis: An Overview”, “Screening models and antileishmanial testing” and “Cell- biology of leishmanial parasite” every year since 2001 till 2016

**Examiner for evaluation of M. Sc and M.Phil thesis** in Amity University, Lucknow, GB Pant University of Science and Technology, Pantnagar , Colombo University, Colombo, Sri Lanka

**Examiner for evaluation of Ph. D thesis** in BITS, Pilani, Rajasthan; Jadhavpur University, Kolkata, Calcutta University, Kolkata West Bengal; Symbiosis University, Pune, Maharashtra; Kanpur University, Kanpur; IMS, BHU, Varanasi, and SGPGIMS, Lucknow, UP

**Member, Editorial Board** – J Biomed Res (Elsevier) & BioMed Central (BMC) Infectious Diseases (Associate Editor) (Open access) (2010 onwards)

**Area Co-ordinator/Leader** (In house): Leishmaniasis (2004- 2012)

**Nodal Officer CDRI CSIR Net Work Project**: HOPE-Leishmaniasis (2012- November, 2015)

**11. Details regarding Research Grants and Collaborations:**

**(A) International**

**Tropical Disease Research/ World Health Organization (TDR/WHO), Geneva:**

Development of monkey model for visceral leishmaniasis (VL) as **Co-PI** (1994- 1997)

Development of a vaccine against VL: Evaluation of killed L. major vaccine as **PI** (1998 - 2000)

Visceral leishmaniasis and PKDL in India: new Therapeutic, Immunologic and Diagnostic Studies, and Site Preparation for Vaccine Trial as **Co-I** (1999-2001)

 **(B). National**

**Department of Biotechnology (DBT) New Delhi:**

Identification of immunostimulatory proteins of Leishmania infection based on TH1 response as PI **(2000-2004**)

Leishmania Amastigote Target Antigens: Identification on the basis of Th1 stimulatory proteins for immunoprophylactic studies against experimental Visceral Leishmaniasis as PI (**2005-2008**)

Evaluation of *Mycobacterium W* as an immunomodulator for the management of visceral leishmaniasis and as an adjunct to antileishmanial vaccine/drug as PI (**2006-2009**)

Cloning and Over Expression of Th1 Stimulatory Poly-proteins identified through Proteomics for their Prophylactic Potential against Experimental VL as PI (**2009- 2012**)

Development of new live attenuated vaccine candidates for kala-azar & the Preclinical evaluation for safety and efficacy of Centrin KO live attenuated Leishmania parasite as PI (**2011-2014**)

Investigation of Effect of Polysaccharide in Modifying Leishmanicidal Potential of Nanoparticular System Bearing Chemotherapeutic Agent as Co-PI (**2011-14**)

An approach towards identification and synthesis of antigenic epitopes of potential L. donovani Th1 stimulatory proteins for the development of synthetic vaccine against Visceral

 Leishmaniasis as PI (**2013-2016**)

Study to establish infection of *Leishmania donovani* through intradermal route in hamsters and its pathological validation as Co-PI **(2017-2019**)

**Department of Science and Technology (DST), New Delhi:**

Isolation and characterization of Proteophosphoglycans of *Leishmania* *donovani* as PI (**2006-2009**)

Proteomic analysis of drug resistance in *Leishmania donovani* clinical isolates as Co-PI (**2009 -2012**)

Studies to delineate the Immunoregulatory role of PD-L1/PD-1 pathway and exploring it as a potential tool for vaccination strategies against Visceral Leishmaniasis - as Co-PI (**2017-**

**20**)

**Indian Council of Medical Research (ICMR), New Delhi:**

Evaluation of Immunogenicity and Efficacy of Nucleosomal Histone Proteins of L. donovani as Vaccine Candidate Against Experimental Visceral Leishmaniasis as PI (**2011-14**)

**Collaborative Research**

Rosalind Franklin School of Medical Sciences, Chicago, USA for vaccination studies using porphyric Leishmania mutants in animal models (2004-2007)

Food and Drug Administration, NIH, USA IOP, Safdarjang Hospital, New Delhi and Institute of Molecular Medicine, Delhi for vaccination studies using Leishmania centrin knock outs in animal models (hamster & monkey models) (2010-2014)

**12. Details of any commercialization of technology/ies developed**

**Generation of stable transgenic Red as well as Green Fluorescent Protein (RFP&GFP) tagged *Leishmania donovani* cell lines** for High/Medium throughput drug/vaccine screening using Flow Cytometer.

GFP tagged *Leishmania donovani* cell lines are being used by Dr Louis Maes, Laboratory of Microbiology, Parasitology and Hygiene, Antwerp University, campus Groenenborger, Groenenborger 171, B-2020 Antwerp-Wilrijk, Belgium for rapid drug screening program under WHO and DNDi.

The transfectants are also transferred to other Indian laboratories for R&D work.

**Twenty-two gene accessions** have been obtained from NCBI

**13. Lectures delivered for dissemination of research activities**

### Abroad:

*Prospects of a Th1 stimulatory protein(s) I based vaccine against Visceral Leishmaniasis.in* 6th World Congress of Leishmaniasis May 16-20, 2017

*Experimental models for Leishmania research*: in Symposium on “Update on Clinical, Diagnostic, Chemotherapeutic and Entomological Aspects of Leishmaniasis” March 25 and 26, 2013, at Distance learning Centre (DLC), Sri Lanka Institute of Development Admin-istration (SLIDA), Colombo 7, Sri Lanka

*Strategies for Developing Safe and Effective Vaccines against Visceral Leishmaniasis:* a Guest Lecture in Dept of Parasitology, University of Sri Lanka, Colombo, Sri Lanka

*Proteophosphoglycans in Leishmania donovani clinical isolates:* in Dept of Infection and Immunity, Walter Eliza Hall Institute (WEHI) of Medical Research, Royal Melbourne hospital, Melbourne, Australia on March 28, 2006

*Vaccination studies against experimental VL*:in WorldLeish 2, Crete island, Greece May 2001

*Immunoprotective studies in experimental visceral leishmaniasis* in Rosalind Franklin School of Medical Sciences, Chicago, USA on October 20, Chicago 1999

*Experimental models for kala-azar vaccine research* in San Antonio, Texas, USA on October 18, 1999

*Efficacy of killed Leishmania vaccine in experimental VL* in Teheran Institute of Pasteur, Teheran, Iran on May 29, 1999

*Immunological responses in Indian langur (Presbytis entellus)* in Institute of Primate research, Nairobi, Kenya on January 27, 1997

**India:**

*Experimental models for kala-azar vaccine and drug development research* In the "The Vth Sir Dorabji Tata Symposium on Leishmaniasis" IISc, Bangalore, March 10, 2004

*Search for antileishmanial agents from plant and marine resources* in the conference of Indian Pharmacology Society held on January 15, 2005 at Science City, Salt Lake, Kolkata

*Screening of some indigenous plant and marine extracts for their antileishmanial activity* in the symposium on Drug initiatives in leishmaniasis held in February, 9, 2005 at PGIMS, Kolkata

*Strategies for developing first generation vaccines against visceral leishmaniasis* in National Conference on Immunology in Health & Disease, Kanpur University on Jan. 12, 2006

*Strategies for developing first generation vaccines for VL* in National Conference on Immunology in Health & Disease, Kanpur University, Kanpur on Jan. 12, 2006

*Green Fluorescent, Green Fluorescent Protein (GFP) transfectants Leishmania donovani: Studies on its applications for drug discovery* in the Training Workshop on Antiprotozoal Drug Screening on Feb 12, 2007

*Overview of Leishmaniasis* and *Immunology of Parasitic infections:* in Himanchal University, Shimla, HP on May 8, 2011

*Search for Safe & Effective Vaccines against Visceral Leishmaniasis- a disease of poverty* in Symposium on “Recent Advances in Biochemistry & Biotechnology: Applications in Health, Environment & Agriculture” October 29-30, 2013, Dept of Biochemistry, Lucknow university, Lucknow

*Search for a Vaccine against Kala azar: Classical and molecular approaches*, on October 11, 2015 in conference “IMMUNOCON 2015” under the aegis of Indian Immunology Society (9-11th Oct. 2015) Rajendra Memorial Research Institute of Medical Sciences, Patna

*Advancing Th1 Stimulatory Proteins Towards Development of Polypeptide Vaccine Against Kala-Azar* November 2, 2015 in 8th Indo Global summit and Expo on Vaccines, Therapeutics & Healthcare November 02-04, 2015 HICC, Hyderabad, India

*Feasibility of Therapeutic Proteins for The Management of Visceral Leishmaniasis in* Indo-Brazil symposium on the Biochemistry of Kinetoplastid Parasites Organized by CSIR-Indian Institute of Chemical Biology, Kolkata, India 19-20 th September, 2016

*Feasibility of Th1 stimulatory proteins as therapeutic vaccine for the management of VL* in International Conference on Innovations for The Elimination and Control of Visceral Leishmaniasis (IEC-VL Conference), Jamia Hamdard Institute of Molecular Medicine, JAMIA HAMDARD New Delhi 110062 INDIA 28th – 30th November, 2018

**14. Human Resources Development:**

**Supervised/co-supervised** 19 students for Ph.D degree

**Trained** 50 post-graduate summer-trainees;

**Delivered lectures as a faculty member** in JNU-Ph.D program of CDRI and M.Pharm program of NIPER, Raebareilly

1. **A Misra,** JC Katiyar (1984) Avermectins-novel and unique broad-spectrum antiparasitic agents. *Journal of Scientific Industrial Research* **43**: 276-283.

**15. Details of any commercialization of technology/ies developed -**

* **Generation of stable transgenic Red as well as Green Fluorescent Protein (RFP&GFP) tagged *Leishmania donovani* cell lines** for drug/vaccine screening.
	+ - GFP tagged *L.donovani* cell lines are being used by Dr Louis Maes, Laboratory of Micro-biology, Parasitology & Hygiene, Antwerp Univ., campus Groenenborger, Groenen-borger 171, B-2020 Antwerp-Wilrijk, Belgium for rapid drug screening prog. under WHO & DNDi.
		- The transfectants are also transferred to other Indian laboratories for R&D work.
* **Twenty-two gene accessions** have been obtained from NCBI

**16. Overseas visits:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Name of the place** | **Country** | **Duration of visit with dates** | **Purpose** |
| Liverpool School of Tropical Medicine & Hygeine Liverpool, UK under *INSA fellowship* | United Kingdom | Three months from 26/8/1993 to 25/11/1993 | To gain practical experience on the immunodiagnostic techniques |
| Institute of Primate Research Nairobi, Kenya under *TDR/WHO project* | Kenya | Eleven days from 18/1/ 1997 to 31/1/1997 | To gain practical experience on the immunoprophylaxis of Leishmania-sis in non-human primate |
| Razi Institute of Vaccine Serum & Pasteur Institute of Iran, Tehran,Iran under *TDR/WHO project*  | Iran | Eleven days from 30/05/ 1999 to 09/06/ 1999 | To have a good exposure of GMP & GLP regarding vaccine prepara-tion & to discuss on experimental protocol for vaccine trial |
| Bailadores, Venezuela *TDR/WHO project* ***Invited as co-opted member*** | Venezuela | Three days 14/10/1999 to 16/10/ 1999 | To present data on pre-clinical vaccine trials in 2nd Leishmaniasis Vaccine Product Development Team Meeting of TDR/WHO |
| Crete Island, Greece | Greece | Three days 21/5/ 2001 to 23/5/2001 | To present (oral) a paper in the 2nd world Congress of Leishmaniasis |
| WEHI Medical Research Melbourne, Australia *Under DBT overseas fellowship* | Australia | Three months from 22/3/ 2006 to 21/6/ 2006 | To gain practical experience on molecular Immunology of Leishmaniasis |
| Distance Learning Centre (DLC), Sri Lanka Institute of Development Administration (SLIDA), Colombo 7, Sri Lanka | Sri Lanka | Two days 25/3/2013 to 26/3/2013 | To deliver lecture in Indo-Sri Lanka Symposium “Update on Clinical, Diagnosis, Chemotherapeutic and Entomological Aspects of Leishmaniasis” |
| Dept of Parasitology, University of Sri Lanka, Colombo, Sri Lanka | Sri lanka | Eleven days from 27/3/2013 to 6/4/2013 | Visiting Scientist as an expert under the TWAS visiting Scientist Fellowship program |
| Toledo, Spain  | Spain  | Four days from 16.5.2017 to 19.5.2017 | Paper presentation in the 6th World Congress of Leishmaniasis |

**Highlights of Research Contributions**

Visceral Leishmaniasis (VL), a disease of poverty in the Indian subcontinent, is debilitating infectious disease which becomes lethal if left untreated. In India, approximately, 100,000 new cases of VL occur annually and nearly 90% cases come from Bihar. Chemotherapy, fraught with cost and side effects, remains the key element in the control of VL as there are no vaccines to prevent VL infection. Unresponsiveness of 37-64% of newly diagnosed cases of the standard drugs has emerged as a challenge to the current line of treatment. The depressed immune system due to infection is not always able to control the disease or augment the effects of the drugs. In the backdrop of these challenges my group took the challenge towards the discovery of effective and safe drug molecules from natural resources and search for novel vaccine molecules in leishmanial parasites with long lasting effects- the two-pronged strategies which need to be followed to win the battle against VL.

Our group has contributed significantly in the following aspects:

1. Immunobiology of Leishmania parasite by identification and molecular characterization of vaccine molecules and their prophylactic potential against Leishmania, molecular mechanism of host-response in relation to potential vaccine, evaluation of vaccine delivery systems:

Our work on immunobiology of VL identified parasite proteins /epitopes possessing Th1 stimulatory property as potential vaccine targets against VL. ***Currently we are trying to develop a chimeric vaccine for its prophylactic as well as therapeutic potential.***

We further explored and validated the identified vital proteins/pathways as antileishmanial drug targets;

1. Development of newer screening models for disease understanding and fluorescent protein tagged parasite based in vitro system for rapid screening of test compounds:

The only nonhuman primate (*Presbytis entellus*) model for VL for preclinical evaluation of potential drug/vaccine was developed in our lab.

For rapid screening of new antileishmanials a stable Green Fluorescent Protein (GFP) as well as Red Fluorescent Protein (RFP) tagged *Leishmania donovani* transfectant cell lines, were generated in our lab which are being used by other labs in India and abroad.

1. Generation of antileishmanial lead from natural resources as well as newer molecules, their detailed mechanistic studies and application of various delivery systems for antileishmanial drugs that are toxic but effective:

We identified compounds, isolated from *Peganum harmala* seeds as well as from *Polyalthia longifolia* as potential antileishmanials which were also found to be safe.

Immunomodulation using medicinal plants viz. root extracts of *Withania somnifera* chemotypes and pure *withanolide–withaferin A* were explored as an immunoprophylactic and/or adjunct approach to conventional treatment with known antileishmanials with reduced dose schedules to optimize their efficacies.

We have also contributed in the applications of various new drug delivery systems in collaborations with the scientists of Pharamaceutics for better efficacy of standard and potential antileishmanials

1. Exploration of the molecular mechanism of drug resistance using structural proteomics and genomic approaches.

To unravel the drug resistant mechanism, we developed drug (SAG) resistant *in vitro* and *in vivo* models using antimony resistant clinical isolates and identified/detected several novel biomarkers/proteins overexpressed in drug resistant parasites through differential genomic/proteomic analysis, which are having implications in drug resistance mechanism

*These findings have significant translational potential* *~~i~~ in vaccine and drug development leading to the improvement of human health and alleviation of human suffering.*