

Pervaiz A. Dar, PhD

Associate Professor

Division of Veterinary Microbiology and Immunology, FVSc & AH, SKUAST-Jammu
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RESEARCH PROFILE

Research Score(ResearchGate)	669.2
Total Citation (Google Scholar)	1505
h-Index	21
I10 index	32
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Google Scholar	https://scholar.google.com/citations/user=yyA5Oh0AAAAJ&hl=en

EDUCATION

- 2012 **PhD (Veterinary Immunology)** Indian Veterinary Research Institute, Bareilly, U.P, India (Supervisor, Dr Ganesh Kondabatulla)“*Investigating Novel Aspects of Immune Response to Foot-and-Mouth Disease Virus in Cattle*”
- 2008 **Masters in Veterinary Immunology**, Indian Veterinary Research Institute (I.V.R.I), Bareilly, U.P., India (Supervisor, Dr VVS Suryanarayana)“*Correlation between interferon gamma production and protection against FMD in self-replicating DNA vaccinated Animals*”
- 2006 **Bachelor’s in Veterinary Sciences and Animal Husbandry (B.V.Sc & A.H.)**, Sher-i- Kashmir University of Agricultural Sciences and Technology (SKUAST-K), Srinagar, Jammu and Kashmir, India

POSITIONS AND EMPLOYMENT

- May 2024- Present **Associate Professor**, Division of Veterinary Microbiology & Immunology, FVSc & AH, RS Pura, SKUAST-Jammu, Jammu & Kashmir, India
- Feb 2023- May 2024 **Assistant Professor**, Division of Veterinary Microbiology and Immunology, SKUAST-K, Jammu and Kashmir, India
- Dec 2016- Feb 2023 **Scientist**, ICAR-Krishi Vigyan Kendra-Ganderbal, SKUAST- Kashmir, Jammu and Kashmir, India
- May 2013- Dec 2016 **Assistant Professor**, Division of Veterinary Microbiology and Immunology, SKUAST-K, Jammu and Kashmir, India
- Aug 2012- May 2013 **Guest Lecturer**, Division of Veterinary Microbiology and Immunology, Faculty of Veterinary Sciences and Animal Husbandry, SKUAST-K

POSTDOCTORAL TRAINING

- 2016-2018 **Postdoctoral Research Associate**, Division of Endocrinology, Diabetes and Metabolism, Department of Medicine, University of Toledo, USA (Laboratory of Dr. Juan C Jaume) “*Immunobiology of human Type I Diabetes and Thyroid Cancers*”
- 2011-2012 **Fulbright Fellow**, Plum Island Animal Disease Center, Agricultural Research Service, United States Department of Agricultural, Greenport, New York, USA (Laboratory of Dr. William T Golde) “*Natural Killer cell responses to FMDV infection*”

AWARDS AND HONORS

2016	Postdoctoral Fellowship Award , Center for Diabetes and Endocrine Research (CeDER) University of Toledo, Ohio, USA
2011	Fulbright Fellowship Award , Department of State's Bureau of Educational
2008	Junior Research Fellowship Award for Ph.D., Council for Scientific and Industrial Research (CSIR), India.
2006	Research Fellowship Award for Masters , Indian Council of Agricultural Research (ICAR), India

TEACHING ACTIVITIES

2012-2024	Undergraduate Courses taught Animal Biotechnology (VBC), Veterinary Laboratory Diagnosis (VLD-421), General Microbiology (VMC-211), Veterinary Immunology (VMC-212), Systemic Virology (VMC-321)
2013-2024	Postgraduate Courses taught Principles of Immunology (VMC-606), General Virology (VMC-604), Techniques in Microbiology and Immunology (VMC-609), Vaccinology (VMC-607), Bacterial Genetics (VMC-707)

STUDENT MENTORING ACTIVITY

Name of Major Advisee	Degree (Year) Institute	Current Position
Dr Showkat Ahanger	MVSc Vet Microbiology & Immunology (2013-2015) SKUAST-Kashmir	District Sheep Husbandry Officer, Kupwara
Dr Rafia Iftikhar Parveen	MVSc Vet Microbiology & Immunology (2013-2015) SKUAST-Kashmir	Research Fellow at KUAST, Riyadh, Saudi Arabia
Ms Iqra Farooq	MSc Clinical Microbiology (2014)University of Kashmir	PhD Scholar, Indian Institute of Integrated Medicine (IIIM)
Dr Zubair A Shah	MVSc (Vet Microbiology & Immunology) (Current) SKUAST-Kashmir	Masters student VMI SKUAST Kashmir
Ms Rabiaya Bashir	MSc Clinical Microbiology (Current)University of Kashmir	Masters student, UoK

*Advisory committee member to more than 20 Masters and 8 PhD students from discipline of Animal Biotechnology, Animal Biochemistry, Veterinary Medicine, Veterinary Public Health etc

RESEARCH SUPPORT

Current

- 2021-2024 “Development of Recombinant Lactic acid Bacteria based vaccine for salmonellosis in poultry”, **SERB India** (INR 4,789,960), Role=Co-PI
- 2022-2025 “Simulation of naturally occurring human varicocele in rat model with an attempt to identify potential pathogenic pathways”, **ICMR India** (INR 12,000,000), Co-PI
- 2021-2026 “Tribal sub-plan of ICAR-Poultry seed project” **ICAR India** (INR 3,000,000), Co-PI

Completed (last 3 years)

- 2015-2020 “Niche area of excellence program on study of *Clostridium perfringens* and *Diclobacter nodusus*” **ICAR India** (INR 39,900,000), Co-PI
- 2018-2021 “Innovative Poultry-Horticulture integrated farming systems for optimum resource utilization and strengthening rural livelihood” **DBT, India** (2,800,000), Co-PI
- 2018-2020 “Propagation of elite backyard birds for enhancing egg production in rural areas” **NABARD India** (INR 3,000,000), Co-PI

PROFESSIONAL SERVICES AND AFFILIATIONS

Membership professional Societies

- 2015-present International Veterinary Vaccinology Network (IVVN), Medical Research Council, UK
- 2016-2018 Associate Member, Center for Diabetes and Endocrine Research (CeDER), University of Toledo, USA
- 2011 Member, *American Association of Immunologists*
- 2017 Member, *American Diabetes Association*
- 2009-present Life Member, *Indian Immunology Society*
- 2006-present Life Member, *Jammu & Kashmir State Veterinary Council*

Journal Reviewer

Vaccine, Veterinary Microbiology, Veterinary Research, Oncotarget, Biologicals, Microbiology and Immunology, PeerJ, European Medical Journal, Frontiers in Immunology

Editorial Board Member

Frontiers in Immunology (Topic Editor)
Frontiers in Immunology (Review Editor)
Comparative Immunology (Review Editor)
Letters in Animal Biology (Associate Editor)

RESEARCH PUBLICATION

1. M. Hafiz, S. Qureshi, M. Gulzar, Z. Kashoo, M. Sharief Bhanday, S. Farooq, M. Altaf Bhat, P. Dar et al (2024) **Virulence profiling of Campylobacter spp Campylobacter jejuni and C. fetus subsp fetus. abortions rise in sheep farms in Kashmir, India.** (Research Article) *Polish Journal of Veterinary Sciences* Vol. 27, No. 2 (2024), 173-181
2. Rasool, A., Farooq, S., Kumar, S., Kashoo, Z., Dar, P., Bhat, M., Qureshi, S., Hussain, I., Shah, R., Taku, A., Khan, I., & Hassan, M. (2023). **Evidence of novel Treponema phylotypes implicated in contagious ovine digital dermatitis and association of treponemes with major lameness causing foot pathogens.**(Research Article) *Microbial Pathogenesis*, 182, 106214. <https://doi.org/10.1016/j.micpath.2023.106214>
3. Iqbal S, Qureshi S, Bhanday MS, Farooq S , Kashoo ZA , Gulzar M , Bhat MA , Pandit A , Hussain MI ,

Dar P , Badroo G , Hafiz M , din Fu , Mehraj J (2023). *Short variable regions flaA gene (SVR-flaA) diversity of multidrug resistant Campylobacter strains from poultry and poultry meat in India.*(Accepted) *Journal of Food Protection*. Preprint Available at Research Square. DOI: 10.21203/rs.3.rs-3443541/v1.

4. Bhat, Shabir A. and Dar, Pervaiz and Kondabattula, Ganesh and Sharma, Gaurav Kumar and Gupta, Vikas and Khorajiya, Jaynudin H. and Singh, Karam Pal and Tiwari, Ashok Kumar and Nandi, Sukdeb (2023), *Enhanced Immune Responses and Protection Against Viral Challenge in Sheep with a Novel Nanoemulsion-Based Inactivated Bluetongue Virus Vaccine.* (Preprint) Available at SSRN: <https://ssrn.com/abstract=4448591> or <http://dx.doi.org/10.2139/ssrn.4448591>
5. Bhat SA, Dar PA (2022) *Emerging and Re-emerging Viral Zoonoses: A Significant Challenge for the Near Future.* (Review Article) *J Antivir Antiretrovir.* S24:003.
6. Imam S, Dar PA, Aziz SW, Zahid ZA, Sarwar H, Karim T, Faisal S, Haseeb I, Naqvi AS, Shah R, Haque A, Salim N, Jaume JC. (2021) *Immune cell plasticity allows for resetting of phenotype from effector to regulator with combined inhibition of notch/eif5a pathways.* (Research Article) *Frontiers in Cell and Developmental Biology* 2021; 9:777805
7. Imam, S., Dar, P., Alfonso-Jaume, M., Al-Khudhair, A., & Jaume, J. C. (2021). *Spontaneous type-1-diabetes humanized transgenics help unveil pathophysiology of human diabetes and allow for disease-reverting CAR-TREG immunotherapy.* (Research Article) Available at SSRN 3778362. <https://dx.doi.org/10.2139/ssrn.3778362>
8. Beigh AB, Darzi MM, Bashir S, Dar PA, Bhat S, Ganaie N, Bhat BA,(2021) *Epidemiological and molecular characterization of echinococcus granulosus isolated from small ruminants in Kashmir Valley, India.* (Research Article) *Iranian Journal of Parasitology* 2021; 16(3) 357-365
9. Bhandary SA, Bhat JA, Ahanger FA, Dar EA, Dar PA, Shakeel B and Mir SM. (2021) *Ethephon - a best alternative for hand thinning to improve fruit set, color and shelf life of apple* (Research Article) *Journal of Krishi Vigyan*, 10(1): 82-85
10. Imam, S., Dar, P., Alfonso-Jaume, M. A., & Jaume, J. C. (2020). 125-LB: *Beta-Cell Antigen-Specific Chimeric Antigen Receptor Tregs for Type 1 Diabetes Prevention and Treatment.* (Research Abstract) *Diabetes*, 69(Supplement_1).
11. Beigh AB, Darzi MM, Bashir S, Dar PA, Bhat BA, Nazki S, Ahmad I, (2020) *Molecular characterization of sheep and human isolates of Echinococcus granulosus from temperate region of India.* (Research Article) *Indian Journal of Animal Sciences* 2020; 90(8)1120-1122
12. Bhat JA, Dar EA, Dar KA, Rashid Z, Ahanger FA, Bhandary SA, Dar PA, Shakeel B and Mir SM, (2020) *Growth, Yield and Economics of Maize (Zea mays L.) Varieties under Front Line Demonstrations in Ganderbal, Jammu and Kashmir.* (Research Article) *Int.J.Curr.Microbiol.App.Sci.* 2020; 9(12): 2750-2755.
13. Imam S, Dar PA, R Paparodis, Almotah K, Al-Khudhair A, Hasan SAM, Jaume JC, *Nature of coexisting thyroid autoimmune disease determines success or failure of tumor immunity in thyroid cancer.* (Research Article) *Journal for Immunotherapy of Cancer*, 2019; 7 (1), 3
14. Ahmed Al-Khudhair, Pervaiz Dar, Shahnawaz Imam et al. (2019) *A Transcriptomic Meta-Analysis Identifies Differentially Expressed Genes across Different Types of Cancer and Their Association with Checkpoint Inhibitor Immunotherapy,* (PREPRINT)available at Research Square [<https://doi.org/10.21203/rs.2.16039/v1>]
15. Imam S, Prathibha R, Dar P, Almotah K, Al-Khudhair A, Hasan SAM, Salim N, Jilani TN, Mirmira RG, Jaume JC, *eIF5A inhibition influences T cell dynamics in the pancreatic microenvironment of the humanized mouse model of Type 1 Diabetes.* (Research Article) *Scientific Reports*, 2019; 9 (1), 1533
16. Dar MA, Ahmed R, Urwat U, Ahmad SM, Dar PA, Kushoo ZA, Dar TA, Mumtaz PT, Bhat SA, Amin U, Shabir N, Bhat HF, Shah RA, Ganai NA, Heidari M, *Expression kinetics of natural resistance associated macrophage protein (NRAMP) genes in Salmonella Typhimurium-infected chicken.* (Research Article) *BMC Veterinary Research*, 2018; 14(1), 180
17. Ahanger SA, Parveen R, Nazki S, Dar Z, Dar T, Dar KH, Dar A, Rai N, Dar P#. *Detection and phylogenetic analysis of Orf virus in Kashmir Himalayas.* (Research Article) *VirusDisease*, 2018; 29 (3): 405-410.
18. Bhat SA, Khorajiya J, Malla BA, Dar PA, SinghKP, Nandi S, Ahmad M. *Detection and Quantification of Bluetongue Virus Serotype 23 by Evagreen Based Real Time PCR,* (Research Article) *Int. J. Livest. Res.* 2018; 8(6): 312-321
19. Dar T, Kamil S, Amin U, Dar PA, Mir M, Kashoo ZA, Nazki S, Ali R, Shah S, *Gross and Pathomorphological Alterations of Infectious Bursal Disease Virus (IBDV) Infection and Its Localization by Indirect Immunoperoxidase in Broilers* (Research Article) *Int. J. Livest. Res.* 2018; 8(5): 313-318

20. Dar AM, HU Malik, SA Beigh, SA Hussain, SU Nabi, AA Dar, Dar PA, AM Bhat. *Clinico biochemical alternation in bovine ketosis* (Research Article) *J Entomol Zool Stud* 2018;6(4):1146-1150.
21. Qadri IA, Ganai IA, Dar PA, Yousuf RW, Kawa MA and Habib R, *Blood Parameters of Horses Maintained Over Pasture under Temperate Climatic Conditions in Kashmir*. (Research Article) *Int.J.Curr.Microbiol.App.Sci.* 2018; 7(7): 282-285.
22. Hajam IA, Dar PA, Shahnawaz Imam, Jaume JC and Lee JH. *Bacterial flagellin—a potent immunomodulatory agent*. (Review Article) *Experimental & Molecular Medicine*, 2017; 49, e373; doi:10.1038/emm.2017.172
23. Hajam IA, Dar PA, Won G and Lee JH. *Bacterial ghosts as adjuvants: mechanisms and potential*. (Review Article) *Veterinary Research*, 2017; 48:37
24. Parveen R, Farooq I, Ahanger S, Nazki S, Dar Z, Dar T, Khushoo Z, Kamil S, and Dar P#. *Genotyping and phylogenetic analysis of infectious bronchitis virus isolated from broiler chickens in Kashmir*. (Research Article) *VirusDisease* 2017;28(4):434-438
25. Nazki Salik, Wani SA, Parveen R, Ahangar SA, Kashoo ZA, Hamid S, Dar ZA, Dar TA, Dar PA, *Isolation, molecular characterization and prevalence of Clostridium perfringens in sheep and goats of Kashmir Himalayas, India*. (Research Article) *Veterinary World*, 2017; 10(12) 1501-1507
26. Akram T, Shah RA, Fazili MR, Mudasar H, Mir BA, Hussain SS, Ahmad SM, Dar P, Ganai N, Shabir N. *Comparative efficiency of goat mesenchymal stem cell isolation from bone marrow and bone chip*. (Research Article) *Small Ruminant Research*, 2017; 153: 87-94
27. Rafia Maqbool, Shakil A Wani, Asifa Wali, Zahid Kashoo, Pervaiz Dar, Sabia Qureshi, Isfaul Hussain, Aazima Shah, Parvaiz Sikander, MY Ganaie, Saba Bukhari. *RT-PCR based assay for detection of Newcastle disease virus isolated from poultry in Kashmir* (Research Article) *J Entomol Zool Stud* 2017;5(4):1835-1839.
28. Hao JB., Imam S, Dar PA, Alfonso-Jaume M, Elnagar N and Jaume JC. *Extreme Insulin Resistance From Insulin Antibodies (Not Insulin Receptor Antibodies) Successfully Treated With Combination Immunosuppressive Therapy*. (Research Article) *DiabetesCare*, 2016,
29. Dar PA #, Hajam IA, Suryanarayana VS, Kishore S, Kondabattula G. *Kinetics of cytokine expression in bovine PBMCs and whole blood after in vitro stimulation with foot-and-mouth disease virus (FMDV) antigen*. (Research Article) *Cytokine*. 2015; 72(1):58-62.
30. Hajam IA, Dar PA#, Appavoo E, Kishore S, Bhanuprakash V, Ganesh K. *Bacterial Ghosts of Escherichia coli Drive Efficient Maturation of Bovine Monocyte-Derived Dendritic Cells*. (Research Article) *PloS one*, 2015; 10 (12), e0144397
31. Razak R, Hussain I, Dar PA, Bashir SM, Bhat SA, Mir MR. *Association of toll-like receptor4 gene polymorphism with the severity of mastitis in crossbred dairy cattle*. (Research Article) *Applied Biological Research*, 2015; 17 (3), 242-249
32. Razak R, Hussain I, Dar PA, Ahmad SB, Mir MR. *Relationship between serum amyloid A3 in serum and milk of Mastitic Cows*. (Research Article) *Applied Biological Research*, 2015; 17 (3), 315-319
33. Dar PA, Patch J, Ryan Waters, Felix Toka, William T. Golde: *Unraveling the role of natural killer cells against foot-and-mouth disease virus in bovines*. (Abstract only). Young Investigators Meet-2015, Gulmarg, India
34. Manzoor R, Shah MI, Wani SA, Asma-ul-husna, Pandit F, Dar PA, *Prevalence, serodiversity and antibiogram of enterotoxigenic Escherichia coli (ETEC) in diarrhoeic calves and lambs of Kashmir valley (J&K), India*. (Research Article) *Journal of Applied and Natural Science*, 2015; 7 (1), 477-481
35. Patch JM, Dar PA*, Waters R, Toka F, Barerra J, Schutta C, Kondabattula G, and Golde WT. *Infection with foot-and-mouth disease virus (FMDV) induces a natural killer (NK) cell response in cattle that is lacking following vaccination*. (Research Article) *Comparative immunology, microbiology and infectious diseases*, 2014; 37(4):249-57
36. Patch J, Dar PA, Ryan Waters, Felix Toka, William T. Golde: *Infection with foot-and-mouth disease virus induces a natural killer cell response in cattle*. (Abstract only) *The Journal Immunology* 2013, Annual meeting of The American Association of Immunologist, Honolulu, Hawaii; 06/2013
37. Dar PA, Kalaivanan R, Sied N, Mamo B, Kishore S, Suryanaryana VS and Kondabattula G. *Montanide ISA™ 201 Adjuvanted FMD Vaccine Induces improved immune responses and protection in cattle*. (Research Article) *Vaccine*, 2013; 31(33):3327-32
38. Dar PA, Suryanaryana VS, Nagarajan G, Dechamma HJ, Reddy GR and Ganesh K, *DNA prime-boost strategy with replicase-based DNA vaccine against foot-and-mouth disease in bovine calves* (Research Article) *Veterinary Microbiology*, 2013;163 (1-2): 62- 70
39. Hajam IA, Dar PA*, ChandraSekar S, Nanda RK, Kishore S, Bhanuprakash V and Kondabattula G.

Co-administration of flagellin augments immune responses to inactivated foot-and-mouth disease virus (FMDV) antigen. (Research Article) *Research in Veterinary Science* 2013; 95(3):936-41.

40. Hajam IA, Dar PA, ChandraSekar S, Nanda R, Kishore S, Bhanuprakash V and Kondabattula G. ***Expression, purification, and functional characterisation of Flagellin, a TLR5-ligand.*** (Research Article) *Veterinaria italiana*, 2013; 49(2):181-6.
41. Dar PA, Ganesh K, Nagarajan G, Sarika S, Reddy GR and Suryanaryana, VVS. ***Sindbis virus replicase-based DNA vaccine construct containing FMDV specific multivalent-epitope gene: Studies on its immune responses in guinea pigs.*** (Research Article) *Scandinavian Journal of Immunology*, 2012; 76: 345-353.
42. Dar PA, Patch J, Kenny M, Waters R, Glabman R, Kondabattulla G and WT Golde (2012). ***Analysis of bovine natural killer cell cytotoxicity following activation by pro-inflammatory cytokines.*** (Abstract only) *The journal of immunology*, 2012, 88, 181.2
43. Waters R, Dar PA, Patch J, Kenney M, Glabman R, Toka F, and Golde WT (2012). ***Analysis of bovine natural killer (NK) cell and $\gamma\delta$ T cell mediated cytotoxicity following infection with foot-and-mouth disease virus (FMDV)*** (Abstract only). European Veterinary Immunology Workshop at Edinburgh Sept 2-5, 2012
44. Kalaivanan R, Kishore S, Kumar H, Dar PA, Selvaraju G, Kannan D, Suryanarayana V V S. ***Cloning and Sequencing of Granulocyte Macrophage Colony Stimulating Factor of Indian Cattle (Bos indicus).*** (Research Article) *Indian Journal of Comparative Microbiology, Immunology and Infectious Diseases.* 2012; 33:14-17.
45. Dar PA and Beituni, S. ***MHC tetramer assay for analysis of virus-specific T-cells*** (Book Chapter) Accepted for publication in Book entitled "Essential Skills in Veterinary Virology" Editor ICAR.
46. Dar PA, Kondabattula G, Kalaivanan R, Kishore S, Reddy GR and VVS Suryanaryana (2010), ***Interferon gamma: an in-vitro correlate of protection against foot-and-mouth disease virus infection in vaccinated cattle.*** (Abstract only), 37th annual conference of Indian Immunology Society, 2010, SI-PP 2.

BOOK/ BOOK CHAPTERS

1. Dar PA, Farooq S, Ahmad MS, Dar AA, **MOLECULAR ASSAY PROTOCOLS**, ISBN: 978-1-63640-774-6 White Falcon Publishers (Book) 2022.
2. Pervaiz A Dar, Farooq A. Ahanger, Shafat A. Banday, Eijaz A. Dar, and J. A. Bhat " ***Vaccination in Broiler Chicken***" in **A GUIDE FOR BROILER POULTRY FARM WORKERS** White Falcon Publishers (Book Chapter) 2022
3. Pervaiz A Dar, Farooq A. Ahanger, Shafat A. Banday, Eijaz A. Dar, and J. A. Bhat " ***Control Measures for Prevention of Disease in Chicken***" in **A GUIDE FOR BROILER POULTRY FARM WORKERS** White Falcon Publishers (Book Chapter) 2022
4. Dar PA. " ***Vaccination in small ruminants and policy considerations***" in **RAISING SHEEP IN KASHMIR CHALLENGES & PROSPECTS**, Kubra SS, Dar AA, M. Shah M, Sakina A, AL FAJAR PUBLISHERS. (Book Chapter) 2022; p121-131.
5. Dar PA. " ***Basics of effective oral presentation***" in **FUNDAMENTAL OF COMMUNICATION IN SCIENCES**, Career Counselling and Placement Cell FVSc & AH (Book Chapter)
6. Dar PA, Allaie IM, Bhat RR. " ***Ribonucleic acid extraction and quantification***" in **MOLECULAR ASSAY PROTOCOLS**, Editors; Dar PA, Farooq S, Ahmad MS, Dar, AA, Publisher; White Falcon Publishers (Book Chapter) 2022.
7. Dar PA, Wani Y, Farooq S. " ***Gene Cloning***" in **MOLECULAR ASSAY PROTOCOLS**, White Falcon Publishers (Book Chapter) 2022.

REFERENCES

1. **Dr. Jaun Carlos Juame**, MD (Supervisor, Postdoctoral Fellowship)
Professor of Medicine; Chief of Endocrinology, Diabetes and Metabolism; Director, Center for Diabetes and Endocrine Research (CeDER), University of Toledo, Ohio, USA
Email: Juan.Jaume@utoledo.edu Phone no: +1 419-383-3707 (Office)
2. **Dr. William T. Golde**, PhD (Supervisor, Fulbright Fellowship)
Principal Scientist, Moredun Research Institute, Pentlands Science Park, Bush Loan Penicuik, Midlothian EH26 0PZ, Scotland, UK
Email: william.golde@moredun.ac.uk, Phone no: +44 0131 445-6251
3. **Dr. Veluvarthi Suryanaryana**, PhD (Advisor MVSc)
Retired Principal Scientist, Indian Veterinary Research Institute, Bangalore, Karnataka-560024, India
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