



**CENTRES OF ADVANCED FACULTY TRAINING  
IN  
VETERINARY MICROBIOLOGY, DEPARTMENT OF VETERINARY  
MICROBIOLOGY  
LALA LAJPAT RAI UNIVERSITY OF VETERINARY & ANIMAL SCIENCES,  
HISAR**

**Introduction:**

Established as Department of Bacteriology & Hygiene in 1965, the department has taken consistent lead role for teaching and research activities in the disciplines of microbiology and immunology. The faculty is trained in modern methods of teaching and research, and keeps updated in knowledge and advances in these disciplines. The department has been consistently making tangible contributions towards prevention and control of infectious animal diseases. The pioneering and first-time lead studies have been made in the fields of poxviruses, salmonellae and other enterobacteria, foot-and-mouth disease virus, blue-tongue virus, equine herpesvirus, bovine rotaviruses, buffalo immunology, experimental vaccines, genetically engineered nanobody production by phage display technology, monoclonal antibody-based and molecular diagnostic tests, etc. The faculty and students have won several awards, honours and recognition, including ICAR Team Award, Rafi Ahmad Kidwai Memorial Prize, Hari Om Trust Award, National Fellows and Professor, Fellows of the national societies, post-doctoral fellowships, Nehru Award for best PhD thesis, etc. for their contributions in the disciplines of microbiology and immunology. Since c. 1995, the department as ICAR Centre for Advanced Studies/Faculty Training has trained in advances in microbiology & immunology faculty from various SAUs and ICAR institutions in India.

**Objectives of CAFT:**

- To impart training(s) on advances in veterinary microbiology & immunology to the faculty/scientists in SAUs and ICAR institutions in India***
- To develop advanced teaching and research methods & tools in the disciplines of microbiology and immunology for strengthening education***

**Faculty: Name & Designation (as on 30.09.2011):**

<b>Sr. No.</b>	<b>Name and Qualification</b>	<b>Designation</b>
1	Dr. Ajit Singh, B.Sc., B.V.Sc. & A.H., M.V.Sc., Ph.D. (India/UK), Post-Doc (UK)	Professor & Head
2	Dr. S. K. Batra, B.V.Sc. & A.H., M.V.Sc., Ph.D. (UK)	Professor
3	Dr. R. Sharma, B.V.Sc. & A.H., M.V.Sc., Ph.D. (UK)	Sr. Scientist
4	Dr. Y. P. Grover, B.V.Sc. & A.H., M.V.Sc., Ph.D. (France)	
5	Dr. Arvind Kumar, B.V.Sc. & A.H., M.V.Sc., Ph.D. (UK)	Sr. Scientist
6	Dr. S. Kapoor, B.V.Sc. & A.H., M.V.Sc., Ph.D. (UK)	Professor
7	Dr. S. Kadian, B.Sc., B.V.Sc. & A.H., M.V.Sc., Ph.D. (UK)	Professor

8	Dr. S. C. Gupta, B.V.Sc. & A.H., M.V.Sc., Ph.D. (India), Post-Doc (Switzerland, UK)	Sr. Scientist
9	Dr. N. K. Kakker, B.V.Sc. & A.H., M.V.Sc., Ph.D. (UK), Post-Doc (UK)	Sr. Scientist
10	Dr. (Mrs) Archana Sharma, B.V.Sc. & A.H., M.V.Sc., Ph.D. (India)	Associate Professor
11	Dr. Jagveer Rawat, B.V.Sc. & A.H., M.V.Sc., Ph.D. (UK)	Associate Professor

### Human Resource Development:

Particulars of Short Courses/ Training program for HRD conducted during XI plan period

S. No.	Name of the Program	Period	No. of Participants		
			Internal	External	Total
1.	Techniques in Murine Monoclonal Antibody Production	Jan. 23. –Feb. 12, 2008 (3 weeks)	1	4	5
2.	Phage Display Technology for Production of Single-domain Antibodies	Sept.25- Oct. 15, 2008(3 weeks)	1	17	18
3.	Current Concepts in Immunoassays for the Diagnosis of Animal Diseases	Jan. 16. –Feb. 5, 2009 (3 weeks)	1	11	12
4.	Modern trends in vaccines and diagnostics for the control of infectious diseases in animals	March 5-25, 2010 (3 weeks)	2	10	12
5.	Molecular and cellular immunology techniques in animal health	Nov. 3-23, 2011(3 weeks)	2	15	17

### Infrastructure development (equipments, etc.):

- Equipments purchased during XIth Plan

Sr. No.	Name of equipment/article	Quantity
<b>A. FOR RESEARCH</b>		
1	Pipette washer	One
2	Micro Pipette controller	Three
3	Electronic Balance	One
4	Computer Operator Chair with Arms	One
5	Water Distillation 10 ltr. Cap.	One
6	Finnpipette India 0.5-10 µl	Four
7	Finnpipette India 40-200 µl	Four
8	Finnpipette Digital 30-300 µl 8 Channel	Four
9	Extension Board	Four
10	Spinco Projection Microscope	One

11	Hot Air Oven 915x610x610mm	One
12	BOD Incubator (SEW)	One
13	Pipette Stand	Four
14	Low Temp. Res. Cabinet - 20°C	One
15	Laminar Flow 4'x2'x2'	Two
16	Voltage stabilizer 5 KVA	Four
17	Voltage stabilizer 1 KVA	One
18	Autoclave 600x450mm	One
19	Refrigerator Kelvinator 310	One
20	Refrigerator Voltas	Two
21	Enameled Tray 12"*15"	Six
22	Enameled Tray 10"*12"	Six
23	Carboys 30 Ltr capacity	Two
24	Carboys 20 Ltr capacity	Four
25	Tray Plastic 24"x16"x15"	Four
26	UPS 1000 VA with Battery	One
27	BOD 375x570x550 NSW	Two
28	GetnerBiolux Research Binocular Microscope	Two
29	Vaccum Pressure Pump	Two
30	Filco Digital pH Meter	One
31	Servo Voltage Stabilizer 5 KVA	Two
32	Servo Voltage Stabilizer 4 KVA	One
33	Weswox inverted Tissue culture Trinocular Microscope	One
34	Laminar Flow 4'x2'x2'	Two
35	Vortex Mixer	One
36	Compact Laboratory Centrifuge	One
37	Electrophoresis Power Supply	One
38	Vertical Gel regular Dual	One
39	Submarine Analytical Model	One
40	Leveling Table 25cmX15cm	One
41	Glass Plates	4 sets
42	Acrylic Clamp Screws (2)	One set
43	Gel Casting unit	One
44	Table Top centrifuge	One
45	Digital Electronic Top Loading Balance MAC-22	One
46	Deep Frezer (Remi), 0-20°C	One
47	Steel Almirah (Big)	Six
48	Steel Almirah (Small)	Four
49	Serological Water Bath	One
50	Air Coolers	Five
51	Air Conditioners	Three
52	Remi Magnetic Stirrer	One
53	Vertical Autoclave 355x550mm	One
54	Thermocyclers	Three
55	CO2 incubators	Two
56	IR concentrator	One
57	MilliQ water purification system	One
58	Vertical & horizontal electrophoresis system with power supplies	Two
59	Western blot system	One

60	Shaker incubator with cooling	One
61	Centrifuge, high speed, cooling	One
62	Microcentrifuge, high speed, cooling	One
63	Biosafety cabinets	Two
64	UV/vistransilluminator, with digital imaging	Two
65	Cryocans, liquid nitrogen cylinders	Four
66	Micropipetting devices	
Twenty		
67	Cryopreservation facilities, -70°C	Two
68	Ultrasonicator	One
69	ELISA reader	Two
70	Nucleic acid & protein quantification system	One
<b>B.</b>	<b>For Teaching</b>	
1	Silver coated Projection Screen wall and mounting	Two
2	Portable 0 HP	One
3	Automatic Slide Projector	One
4	Episcope Model EA-2A	One
5	LCD Projector	One
6	Photocopier machine	One
7	Computer Work Station	One
8	Computer	Three
9	HP Laserjet 6 P	One
10	Modem	One

- **Technologies, products & processes developed:**

1. Monoclonal antibody production by hybridoma technology
2. Monoclonal antibody-based ELISA kit for estimation of immune status of cattle and buffaloes vaccinated against H.S.
3. Monoclonal antibody-based latex agglutination test (called TE-LAT) for detection of *Trypanosoma evansi* antigen ('surra' infection) in animals (*In collaboration with Regional Research Station, Uchani*).
4. Phage display technology for production of recombinant single-domain antibody of Indian desert camel.
5. Phage display library of single-domain antibodies (>10<sup>7</sup> clones) of *E. coli* lipopolysaccharide-immunized Indian desert camel.
6. *E. coli* LPS-binding single-domain antibody clones selected from the phage display library mentioned above & deposited in VTCC, NRCE, Hisar.
7. *Staphylococcus aureus*  $\beta$ -hemolysin-neutralizing single-domain antibody clone selected from the phage display library mentioned above & deposited in VTCC, NRCE, Hisar.
8. DIVA test (3A-NSP antigen based ELISA) as per OIE protocol in collaboration with Freidrich Loeffler Institute, Germany for differentiation of FMD infected and vaccinated animals.

- **Services offered to farmers/general public:**

1. PCR-based confirmatory diagnostic test for H.S.

2. Latex agglutination test for diagnosis of *Trypanosoma evansi* infection in domestic animals (In collaboration with Department of Veterinary Parasitology).
3. PCR-based diagnostic tests for hemoprotozoa infections (In collaboration with Department of Veterinary Parasitology).

**Renovation of Lecture Room/Laboratories:**

1. Lecture room renovated and equipped with LCD & overhead projector.
2. Seminar/Conference room renovated and equipped with LCD projector.
3. Renovation of the office of Head-cum-Director.
4. A well-maintained laboratory for CAFT trainings, headed by a professor in the faculty.
5. UG laboratory renovated, white board and microbiology/immunology display boards fixed.
6. Immunotechnology laboratory established for work on production of monoclonal antibodies and phage display technology for nanobody production.
7. RRC on FMD virus is housed in an air-conditioned building, equipped with all modern facilities.
8. Hemorrhagic septicaemia laboratory is renovated with air-conditioning & modern equipment.
9. Media & cleaning room renovation about to complete.

**Library upgraded:**

- A. Library room renovated: Air-conditioned room having all collections of books, theses, manuals, proceedings of summer institutes, etc.
- B. Computers with Internet facilities to all faculty members.
- C. CeRa access to journals & books from leading publishers via Nehru Library, CCSHAU, Hisar.

**D. List of books added to the departmental library during 2007-2011:**

Sr. No.	Title of the Book	Authors/Editors	Year of Publication
1.	Cell Biology Assays: Essential Methods	G.Kreitzer et al.	2010
2.	The Microbial Challenge	R.I. Krasner	2010
3.	Microbiology: A Clinical Approach	A. Strelkauskas et al.	2010
4.	Immunology: a short course	R. Coico & G. Sunshine	2009
5.	Cell Biology Assay: Proteins	G. Kreitzer et al.	2010
6.	The Protein Hand Book	J. M. Walker	2009
7.	Basic Immunology, Functions & Disorder of the Immune System	A.K Abbas & A.H. Lichtman	2011
8.	Poultry Diseases	M. Pattison et al.	2008
9.	Principles of Molecular Virology	A.J. Cann	2005
10.	Immunology: Understanding the Immune System	K.D. Elgert	2009
11.	Handbook of Microbiological Media	R.M. Atlas	2010
12.	Bacterial Virulence: Basic Principles, Models and Global Approaches	S. Philippe	2010

13.	Atlas of Immunology	J.M. Cruse & R.E. Lewis	2010
14.	Pathological Basis of Veterinary Disease	M. Donald et al.	2007
15.	Molecular Biology of the Cell	B. Alberts et al.	2008
16.	Kuby Immunology	T.J. Kindt et al.	2007
17.	Janeway's Immunobiology	K. Murphy et al.	2008
18.	Veterinary Microbiology	D.C. Hirsh et al.	2004
19.	Cell Biology	S. Tompkins	2010
20.	Microarray Analysis of the Physical Genome Methods & Protocols	J.R. Pollack	2009
21.	Understanding Viruses	T. Schuurs	2009
22.	Comprehensive Source Book of Bacterial Protein Toxins	J.E. Alouf & M.R. Potoff	2006
23.	Black's Veterinary Dictionary	E. Boden	2006
24.	High-yield Immunology	A.G. Johnson & B.L. Clarke	2006
25.	Gene Transfer, Delivery and Expression of DNA and RNA: A Laboratory Manual	T. Friemann & J. Rossi	2007
26.	Immunogenicity of Bio-pharmaceuticals	M. van de Weert & E.H. Muller	2008
27.	Basic Immunology, Functions and Disorders of the Immune System	A.K. Abbas & A.H. Lichtman	2009
28.	Current Protocols: Essential Lab Techniques	S.R. Gallagher & E.A. Wiley	2008
29.	Handbook of Media for Clinical Microbiology	R.M. Atlas & J.W. Snyder	2006
30.	Bacterial Pathogenesis: Methods and Protocols	F.R. DeLeo & M. Otto	2008
31.	Neuroimmunobiology: Natural Immunity	L. Bertok & D.A. Chow	2005
32.	Advanced Techniques in Diagnostic Microbiology	Yi-Wei Tang & C.W. Stratton	2006
33.	Immunology of Fungal Infections	G. D. Brown & M.G. Netea	2007
34.	Principles of Immunology- Students Compendium	B.K. Sinha	2007
35.	Cellular and Molecular Immunology	A.K. Abbas et al.	2007
36.	Janeway's Immunobiology	K. Murphy et al.	2008
37.	The Vaccine Book	B.R. Bloom & P. Lambert	2003
38.	Gene Expression Systems	J.M. Fernandez & J.P. Hoeffler	1999
39.	Methods in Microbiology: Microbiology of Infection	S.H.E. Kauffmann & D. Kabelitz	2002
40.	Physiology and Bio-chemistry of Prokaryotes	David O. White	2007
41.	Immunotoxicology and Immunopharmacology	R. Luebke et al.	2007
42.	Molecular Genetics of Bacteria	L. Snyder & W. Champness	2007
43.	Immunotherapy for Infectious Diseases	J.M. Jacobson	2002
44.	Immunosuppressant Analogs in	C.V. Borlongan et al.	2003

	Neuroprotection		
45.	Cytokine Knockouts	G. Fantuzzi	2003
46.	Alcarno's Fundamentals of Microbiology	J. Pommemlle	2007
47.	Fields Virology Vol. I & II	D.M. Knipe & P.M. Howley	2007
48.	<i>Escherichia Coli</i> in Domestic Animals and humans	C.L. Gyles	1994
49.	Essential Genes	B. Lewin	2006
50.	Kuby Immunology	T.J. Kindt et al.	2007

#### Awards/Recognitions during XI<sup>th</sup> Plan:

S. No.	Award/Recognition	CAFT Faculty member	Conferred by/Agency	Year
1	Commonwealth Academic Staff Fellowship	Dr. Naresh Kakker	Commonwealth Scholarship Commission, London, U.K.	2008
2	Dr. P. Madhusudan Gold Medal Award, IAAVR	Dr. Ajit Singh	Indian Association for Advancement of Veterinary Research	2009
3	Best Teacher Award (ICAR sponsored)	Dr. Ajit Singh	CCS Haryana Agricultural University, Hisar	2010
4	Commonwealth Academic Staff Fellowship	Dr. Ajit Singh	Commonwealth Scholarship Commission, London, U.K.	2010
5	Appreciation Letter, PD, AICRP on FMD	Dr. Naresh Kakker	Project Director, Foot-and-Mouth Disease (ICAR), IVRI Campus Mukteswar, Uttarakhand	2010
6	Fellow, Society For Applied Biotechnology	Dr. Ajit Singh	Society for Applied Biotechnology	2011
7	Ist Prize, Best Regional Research Station, AICRP on FMD	Dr. Ravindra Sharma & Dr. Naresh Kakker	Project Co-ordinator, AICRP on FMD, IVRI, Mukteswar	2011

#### Publications

- **International Journals:**

1. Khemani, T., Rana, Y.S., Sharma, A. and Sharma, R. 2007. Flow cytometry analysis of different T cell markers in mastitic buffalo milk before and after treatment with homeopathic medicine. *Italian J. Anim. Sci.* 6 (suppl. 2):988-990.
2. Kumar, N., Sharma, R. and Kakker, N. K. 2007. Non-structural Protein 3A for differentiation of foot-and-mouth disease infected and vaccinated animals in Haryana (India). *Zoonoses and Public Hlth* 54:376-82.
3. Rayulu, V.C., Singh, A. & Chaudhri, S.S. 2007. Monoclonal antibody based immunoassays for the detection of circulating antigens of *Trypanosoma evansi* in buffaloes. *Italian J. Anim. Sci.* 6 (suppl. 2):907-910.

4. Yadav, V., Sharma, A. and Sharma, R. 2007. Foot-and-mouth disease virus type specific antibodies in milk and serum of buffalo vaccinated with oil-adjuvanted polyvalent FMD vaccine. *Italian J. Anim. Sci.* 6 (suppl. 2):869-871.
  5. Joshi, G., Sharma, R. and Kakker, N. K. 2009. Phenotypic and functional characterization of T-cells and *in-vitro* replication of FMDV serotypes in bovine lymphocytes. *Vaccine* 27: 6656-6661.
  6. Jangra, P. and Singh, A. 2010. *Staphylococcus aureus*  $\beta$ -hemolysin-neutralizing single-domain antibody isolated from phage display library of Indian desert camel. *Asian Pacific J Trop. Med.* 3:1-7.
  7. Herath, C., Kumar, P., Singh, M., Kumar, D., Ramakrishnan, S., Goswami, T.K., Singh, A., Ram, G.C. 2010. Experimental iron-inactivated *Pasteurella multocida* A:1 vaccine adjuvanted with bacterial DNA is safe and protects chickens from fowl cholera. *Vaccine* 28:2284-2289.
  8. Chandrashekhar, K., Singh, A., Sharma, A. and Sanjukta, R. 2010. Understanding and exploiting the T- cell memory. *Vet. World: An Internatl. J.* 3(7):343-345.
  9. Singh, A. (2011). Synthesis and applications of polyacrylamide gels catalyzed by silver nitrate. *J. Appl. Polym. Sci.* 119 (2):1084-1089
  10. Bøtner, A., Kakker, N. K., Barbezange, C., Berryman, S., Jackson, T. and Belsham, G. J. 2011. Capsid proteins from field strains of foot-and-mouth disease virus confer a pathogenic phenotype in cattle on an attenuated, cell-culture-adapted virus. *J. Gen. Virol.* 92:1141-1151.
  11. Kharb, S. and Charan, S. 2011. Mucosal immunization provides better protection than subcutaneous immunization against *Pasteurella multocida* (B:2) in mice pre-immunized with the outer membrane proteins. *Vet Res Communication* (in press).
  12. Bera, B. C., Gnanavel, V., Barua, S., Shanmugasundaram, K., Gadvi, S., Yadav. V., Nagarajan, G., Bhanuprakash, V., Gulati, B. R., Kakker, N. K., Malik, P., Singh, R.V., Sardarilal, Pathak, K. L. M. and Singh, R. K. 2011. Zoonotic cases of Camelpox virus Infection in India. *Vet. Microbiol.* (In Press).
- **Indian Journals:**
    1. Rathi, R., Kadian, S.K., Khurana, B., Grover, Y.P. and Gulati, B.R. 2007. Evaluation of immune response to bovine rotavirus following oral and intraperitoneal inoculation in mice. *Indian J. Exptl. Biol.* 45:212-216.
    2. Gupta, G. and Charan, S. 2007. Exploring the potentials of *Ocimum sanctum* ( SHYAMA TULSI ) as a feed supplement for its growth promoting activity in broiler chickens. *Indian J Poultry Sci.* 42:140-143.
    3. Batra, S.K. 2007. Newcastle disease- poultry farmers to be aware of. *Poultry Line* 7:27-29.
    4. Charan, S. 2007. *Tikka-karan avum paryoshala-janh ka mahtav* Banam Pasuon me Rogon se nijat. [Significance of vaccination and laboratory investigation for the control of the diseases of animals]. *Haryana Kheti* 40:28-30.
    5. Chaturvedi, G.C. and Charan, S. 2007. Fowl-cholera an emerging threat to poultry industry. *Poultry Line* 7:13-14.
    6. Kakker, N. K. and Sharma, R. 2007. Foot-and-mouth disease outbreaks after the launch of FMD control programme in Haryana. *The Haryana Veterinarian* 46:65-68.



7. Kakker, N. K. and Sharma, R. 2008. Retrospective Diagnosis of FMD outbreaks by Liquid Phase Blocking ELISA. *The Haryana Veterinarian* 47:28-31.
8. Kalim, S., Sood, D.R., Singh, A. and Shilpa 2009. Functional properties, flavour precursors and electrophoretic protein banding pattern of potato tubers and peels. *Indian J. Nutr. Dietet.* 46:339-344.
9. Rayulu, V.C., Chaudhri, S.S. and Singh, A. 2009. Evaluation of parasitological and monoclonal antibody based assays in detection of *Trypanosoma evansi* infection in animals. *Indian J. Anim. Sci.* 79(10):978-981.
10. Kharb, S. and Charan, S. 2009. Bacterial diseases of bovines. *Livestock Line* 3(4):4-8.
11. Charan, S. 2009. *Pasuon me Gal-Ghotu ro: Karan and bachao. [Haemorrhagic septicemia in animals; causes and its control]*. *Haryana Kheti* 42:29.
12. Kumar, N., Sharma, R. and Kakker, N. K. 2009. Current concepts in persistent infections in foot-and-mouth disease: A review. *J. Immunol. Immunopathol.* 11:1-14.
13. Sharma, R. and Kakker, N. K. 2009. Distribution of foot-and-mouth disease outbreaks in Haryana during the years 2007 and 2008. *The Haryana Veterinarian* 48:97-99.
14. Sharma, A. and Bhatia, A. K. 2009. Detection of VT2 gene in *Escherichia coli* by polymerase chain reaction. *J. Immunol Immunopathol.* 11(1):68-71.
15. Sharma, A. and Bhatia, A. K. 2009. Haemolytic E-hly positive enterohaemolytic *Escherichia coli* strains associated with bovine calves diarrhea. *J. Immunol Immunopathol.* 11(2):56-60.
16. Minakshi, Prasad, G and Grover Y.P. 2009. Occurrence of dual infection of bovine rotavirus in diarrhoeic calf in Haryana, India. *Indian J. Anim. Sci.* 79:1205-1208.
17. Batra, S.K. 2009. Chicken infectious anemia- an emerging threat to Indian poultry industry. *Poultry Line* 9:21-24.
18. Virmani, M., Kapoor, S., Garg, S. L. and Virmani, N.. 2009. *In vitro* antiviral activity of plant extracts against Infectious Bursal Disease Virus. *J. Immunol. Immunopathol.* 11:48-52.
19. Markam, S. K., Khokhar, R.S., Kapoor, S. and Kadian, S. K. 2009. Molecular characterization of field isolates of *Pasteurella multocida* by polymerase chain reaction in the state of Haryana. *Indian J. Comp. Microbiol. Immunol. Infect. Dis.* 30:31-34.
20. Markam, S. K., Khokhar, R. S., Mahajan, N. K., Kumar, A., Kadian, S. K. and Kapoor, S. 2009. Monoclonal antibody based ELISA for seromonitoring of bovines vaccinated against haemorrhagic septicaemia in Haryana. *Haryana Veterinarian* 48:88-90.
21. Shivshankar, T., Sharma A. and Grover Y.P. 2010. Studies on virulence factors of avian pathogenic *Escherichia coli*. *Haryana Veterinarian* 49:45-49.
22. Kharb, S. and Charan, S. 2010. Immunogenicity of iron-regulated outer membrane proteins of *Pasteurella multocida* B:2 in mice model. *Indian J Exptl. Biol.* 48: 1181-1187.
23. Nehra, V., Kharb, S., Sindhu, N. and Charan, S. 2010. Important viral diseases of bovines. *Livestock Line* 4(1):8-10.
24. Batra, S.K. and Charan, S. 2011. Abortion in cattle. *Livestock Line* 5(2):5-6.

• **Books/E-books & chapters:**

1. Singh, A. (2008). Antibodies. A chapter in Immunology and Medical Microbiology. E-Book published by National Digital Science Library, NISCAIR (CSIR), New Delhi-110067. (URL: <http://nsdl.niscair.res.in/>)
2. Singh, A. (2008). The Complement System. A chapter in Immunology and Medical Microbiology. E-Book published by National Digital Science Library, NISCAIR (CSIR), New Delhi-110067. (URL: <http://nsdl.niscair.res.in/>)
3. Dhama, K., Pawaiya, R.V.S., Bhatt, P. and Kapoor, S. (2010). African Horse Sickness. In: Tropical Viral Diseases of Large Animals Part 1. Editor, Thankam Mathew. Thajema Publishers, West Orange, New Jersey, USA. p. 11-38.
4. Pawaiya, R.V.S., Dhama, K., Kapoor, S. and Bhatt, P. (2010). Borna Diseases in Horses. In: Tropical Viral Diseases of Large Animals Part 1. Editor, Thankam Mathew. Thajema Publishers, West Orange, New Jersey, USA. p. 39-61.
5. Kapoor, S., Dhama, K., Pawaiya, R.V.S. and Gupta, D. K. (2010). Equine Adenoviruses. In: Tropical Viral Diseases of Large Animals Part 1. Editor, Thankam Mathew. Thajema Publishers, West Orange, New Jersey, USA. p. 62-76.
6. Kapoor, S., Dhama, K., Pawaiya, R.V.S. and Gupta, D. K. (2010). Equine Coital Exanthema. In: Tropical Viral Diseases of Large Animals Part 1. Editor, Thankam Mathew. Thajema Publishers, West Orange, New Jersey, USA. p. 77-89.
7. Kapoor, S., Dhama, K., Pawaiya, R.V.S., Mahendran, M. and Mathew, T. (2010). Eastern, Western, and Venezuelan Equine Encephalomyelitis. In: Tropical Viral Diseases of Large Animals Part 1. Editor, Thankam Mathew. Thajema Publishers, West Orange, New Jersey, USA. p. 90-109.
8. Kapoor, S., Dhama, K., Pawaiya, R.V.S. and Mathew, T. (2010). Equine Herpesvirus. In: Tropical Viral Diseases of Large Animals Part 1. Editor, Thankam Mathew. Thajema Publishers, West Orange, New Jersey, USA. p.110-132.
9. Dhama, K., Pawaiya, R.V.S., Bhatt, P. and Kapoor, S. (2010). Equine Infectious Anemia. In: Tropical Viral Diseases of Large Animals Part 1. Editor, Thankam Mathew. Thajema Publishers, West Orange, New Jersey, USA. p. 152-172.
10. Pawaiya, R.V.S., Dhama, K., Kapoor, S. and Gupta, D. K. (2010). Equine Papillomatosis. In: Tropical Viral Diseases of Large Animals Part 1. Editor, Thankam Mathew. Thajema Publishers, West Orange, New Jersey, USA. p. 173-199.
11. Pawaiya, R.V.S., Dhama, K., Kapoor, S. and Mahendran, M. (2010). Equine Rabies. In: Tropical Viral Diseases of Large Animals Part 1. Editor, Thankam Mathew. Thajema Publishers, West Orange, New Jersey, USA. p. 200-223.
12. Kapoor, S., Dhama, K., Pawaiya, R.V.S. and Bhatt, P. (2010). Equine Rhinovirus/Rhinitis Virus. In: Tropical Viral Diseases of Large Animals Part 1. Editor, Thankam Mathew. Thajema Publishers, West Orange, New Jersey, USA. p. 224-239.
13. Kapoor, S., Dhama, K., Mahendran, M. and Pawaiya, R.V.S. (2010). Equine Viral Arteritis. In: Tropical Viral Diseases of Large Animals Part 1. Editor, Thankam Mathew. Thajema Publishers, West Orange, New Jersey, USA. p. 240-260.

14. Pawaiya, R.V.S., Dhama, K., Kapoor, S. and Gupta, D. K. (2010). Equine Vesicular Stomatitis. In: Tropical Viral Diseases of Large Animals Part 1. Editor, Thankam Mathew. Thajema Publishers, West Orange, New Jersey, USA. p. 261-278.
15. Dhama, K., Pawaiya, R.V.S. and Kapoor, S. (2010). Hendra Virus Infection in Horses. In: Tropical Viral Diseases of Large Animals Part 1. Editor, Thankam Mathew. Thajema Publishers, West Orange, New Jersey, USA. p. 292-308.
16. Dhama, K., Bhatt, P., Pawaiya, R.V.S., Kapoor, S. and Mathew, T. (2010). Horse Pox. In: Tropical Viral Diseases of Large Animals Part 1. Editor, Thankam Mathew. Thajema Publishers, West Orange, New Jersey, USA. p. 309-321.
17. Pawaiya, R.V.S., Dhama, K., Kapoor, S., Mahendran, M. and Mathew, T. (2010). Japanese Encephalitis in Horses. In: Tropical Viral Diseases of Large Animals Part 1. Editor, Thankam Mathew. Thajema Publishers, West Orange, New Jersey, USA. p. 322-344.
18. Pawaiya, R.V.S., Dhama, K., Bhatt, P. and Kapoor, S. (2010). Louping Ill In Horses. In: Tropical Viral Diseases of Large Animals Part 1. Editor, Thankam Mathew. Thajema Publishers, West Orange, New Jersey, USA. p. 345-355.
19. Dhama, K., Mahendran, M., Kapoor, S. and Pawaiya, R.V.S. (2010). Rotavirus Diarrhea In Equines. In: Tropical Viral Diseases of Large Animals Part 1. Editor, Thankam Mathew. Thajema Publishers, West Orange, New Jersey, USA. p. 356-371.
20. Dhama, K., Pawaiya, R.V.S., Kapoor, S. and Mathew, T. (2010). West Nile Virus Infection of Horses. In: Tropical Viral Diseases of Large Animals Part 1. Editor, Thankam Mathew. Thajema Publishers, West Orange, New Jersey, USA. p. 372-392.

- **Manuals & chapters in manuals:**

1. Singh, A. (2007). Manual of induction training for post-graduate students on 'Research Methodology in Immunology', The Immunology Section, Department of Veterinary Microbiology, CCSHAU, Hisar, July 2- July 31, 2007.
2. Singh, A. (2007). Intellectual property in academic institutions in India: Tools for evaluation and protection. In: Manual of the Winter School on "Intellectual Property and its Management in Agriculture", held at IPR Cell, Directorate of HRM, CCSHAU, Hisar, Nov. 28- Dec. 18, 2007.
3. Grover, Y.P. (2007) Vaccines for tuberculosis. In: 'Interdisciplinary approach for tuberculosis control. Edited by Garg, S.R., Kumar, A. & Singh, Y. Department of Veterinary Public Health, CCS Haryana Agricultural University, Hisar, p82-87.
4. Charan, S. (2007). Monoclonal antibody based ELISA for sero-monitoring of haemorrhagic septicaemia vaccination. Manual on 'Techniques in murine monoclonal antibody production' by ICAR Center of Advance Studies, Department of Veterinary Microbiology, CCS Haryana Agricultural University, Hisar, Haryana, pp 97-102.
5. Charan, S. (2007). Antibody- Dependent Enhancement of Viral Infections. Manual on 'Methods in virology for disease diagnosis' by ICAR Center of Advance Studies,

6. Department of Veterinary Microbiology, CCS Haryana Agricultural University, HISAR, Haryana (India), pp 42 – 48.
7. Sharma, R. and Kakker, N. K. (2007). Annual Report 2006-07. Regional Research Centre on FMD, Deptt. of Veterinary Microbiology, CCS HAU, Hisar.
8. Rawat, J. (2007). *In vitro* engineered nanobodies generated through phage display technology: The versatile reagent for advanced, automated and field-based diagnosis of viral diseases. Manual on 'Methods in virology for disease diagnosis' by ICAR Center of Advance Studies, Department of Veterinary Microbiology, CCS Haryana Agricultural University, HISAR, Haryana
9. Singh, A. (2008). Editor. Phage display technology for production of single-domain antibodies. Editor: Course compendium published by ICAR Centre of Advanced Studies, Deptt. of Vet. Microbiology, CCSHAU, Hisar, India.
10. Singh, A. (2008). Applications of monoclonal antibodies in the era of modern immunotechnology. In: "Techniques in murine monoclonal antibody production". Training Manual published by ICAR Centre of Advanced Studies, Deptt. of Vet. Microbiology, CCSHAU, Hisar, India, pp.: 3-14.
11. Singh, A. (2008). Latex agglutination test for detection of *Trypanosoma evansi* antigen in the field sera of susceptible domestic animal species. In: "Techniques in murine monoclonal antibody production". Training Manual published by ICAR Centre of Advanced Studies, Deptt. of Vet. Microbiology, CCSHAU, Hisar, India, pp.: 60-61.
12. Singh, A. (2008). Antibody Technology: A perspective. In: "Phage display technology for production of single-domain antibodies". Course compendium published by ICAR Centre of Advanced Studies, Deptt. of Vet. Microbiology, CCS HAU, Hisar.
13. Singh, A. (2008). Methodology of phage display technology for single-domain antibody production. In: "Phage display technology for production of single-domain antibodies". Course compendium published by ICAR Centre of Advanced Studies, Deptt. of Vet. Microbiology, CCS HAU, Hisar.
14. Sangwan, M.L. and Singh, A. (2008). Immuno-bioinformatics of antibody V-domain. In: "Phage display technology for production of single-domain antibodies". Course compendium published by ICAR Centre of Advanced Studies, Deptt. of Vet. Microbiology, CCS HAU, Hisar, pp.: 11-13.
15. Singh, A. (2008). Immunization of camels and collection of peripheral blood for serum and B lymphocyte clones as a source of VHH gene pool. In: "Phage display technology for production of single-domain antibodies". Course compendium published by ICAR Centre of Advanced Studies, Deptt. of Vet. Microbiology, CCS HAU, Hisar, pp.: 1-2.
16. Singh, A. (2008). Extraction of total RNA from camel peripheral blood leukocytes. In: "Phage display technology for production of single-domain antibodies". Course compendium published by ICAR Centre of Advanced Studies, Deptt. of Vet. Microbiology, CCS HAU, Hisar, pp.: 3-4.
17. Singh, A. (2008). RT-PCR of VDJ region of heavy chain antibody mRNA. In: "Phage display technology for production of single-domain antibodies". Course compendium published by ICAR Centre of Advanced Studies, Deptt. of Vet. Microbiology, CCS HAU, Hisar, pp.: 5-7.

18. Pandey, N. and Singh, A. (2008). Ligation of RE-digested VHH with pHEN4 phage display vector DNA. In: "Phage display technology for production of single-domain antibodies". Course compendium published by ICAR Centre of Advanced Studies, Deptt. of Vet. Microbiology, CCS HAU, Hisar, pp.:15.
19. Pandey, N. and Singh, A. (2008). Preparation of chemi-competent amber-suppressor TG1 strain and amber non-suppressor WK6 strain of E. coli. In: "Phage display technology for production of single-domain antibodies". Course compendium published by ICAR Centre of Advanced Studies, Deptt. of Vet. Microbiology, CCS HAU, Hisar, pp.:16-17.
20. Singh, A. (2008). Cloning of VHH gene segments in a sequencing vector. In: "Phage display technology for production of single-domain antibodies". Course compendium published by ICAR Centre of Advanced Studies, Deptt. of Vet. Microbiology, CCS HAU, Hisar, pp.:18-19.
21. Singh, A. and Pandey, N. (2008). Nucleotide sequencing of VHH clones and examination of their molecular biological features using tools & techniques in immuno-bioinformatics. In: "Phage display technology for production of single-domain antibodies". Course compendium published by ICAR Centre of Advanced Studies, Deptt. of Vet. Microbiology, CCS HAU, Hisar, pp.:20-21.
22. Singh, A. and Pandey, N. (2008). Construction of phage display library of single-domain antibody clones and determination of the library size. In: "Phage display technology for production of single-domain antibodies". Course compendium published by ICAR Centre of Advanced Studies, Deptt. of Vet. Microbiology, CCS HAU, Hisar, pp.: 22-24.
23. Pandey, N. and Singh, A. (2008). Colony PCR for assessing the number of authentic TG1 transformants bearing proper sized VHH clones in the phage display library. In: "Phage display technology for production of single-domain antibodies". Course compendium published by ICAR Centre of Advanced Studies, Deptt. of Vet. Microbiology, CCS HAU, Hisar, pp.: 25-26.
24. Singh, A. and Pandey, N. (2008). Panning of phage display library of Indian camel VHH for selection of antigen-specific single-domain antibodies. In: "Phage display technology for production of single-domain antibodies". Course compendium published by ICAR Centre of Advanced Studies, Deptt. of Vet. Microbiology, CCS HAU, Hisar, pp.:27-29.
25. Singh, A. and Pandey, N. (2008). Monitoring selection & determining enrichment of Ag-specific dAb-displaying phages at various rounds of panning. In: "Phage display technology for production of single-domain antibodies". Course compendium published by ICAR Centre of Advanced Studies, Deptt. of Vet. Microbiology, CCS HAU, Hisar, pp.:30-31.
26. Pandey, N. and Singh, A. (2008). Subcloning of antigen-specific VHH in pHEN6c vector using WK6. In: "Phage display technology for production of single-domain antibodies". Course compendium published by ICAR Centre of Advanced Studies, Deptt. of Vet. Microbiology, CCS HAU, Hisar, pp.:32.
27. Singh, A. and Pandey, N. (2008). Expression of soluble dAB with hexa HIS tag in WK6 host cells. In: "Phage display technology for production of single-domain antibodies". Course compendium published by ICAR Centre of Advanced Studies, Deptt. of Vet. Microbiology, CCS HAU, Hisar, pp.: 33-34.

28. Sharma, K. and Singh, A. (2008). Detection of expressed dAb-6xHIS by SDS-PAGE. In: "Phage display technology for production of single-domain antibodies". Course compendium published by ICAR Centre of Advanced Studies, Deptt. of Vet. Microbiology, CCS HAU, Hisar, pp:35-37.
29. Sharma, K. and Singh, A. (2008). Detection of expressed dAb-6xHIS by western blotting. In: "Phage display technology for production of single-domain antibodies". Course compendium published by ICAR Centre of Advanced Studies, Deptt. of Vet. Microbiology, CCS HAU, Hisar, pp.: 38-39.
30. Sharma, K. and Singh, A. (2008). Indirect ELISA for detection of single domain antibodies (dAbs) produced in WK6 clones as dAb.HA/6xHis tag. In: "Phage display technology for production of single-domain antibodies". Course compendium published by ICAR Centre of Advanced Studies, Deptt. of Vet. Microbiology, CCS HAU, Hisar, pp.:40-41.
31. Singh, A. (2008). Purification of dAb-6xHIS by Ni<sup>+++</sup>-chelate affinity chromatography. In: "Phage display technology for production of single-domain antibodies". Course compendium published by ICAR Centre of Advanced Studies, Deptt. of Vet. Microbiology, CCS HAU, Hisar, pp.: 42-43.
32. Sharma, A. and Chandrashekhar, K. (2008). Applications of monoclonal antibodies in bacteriology and mycology. Training Manual- Techniques in Murine Monoclonal Antibody production. CAS Veterinary Microbiology, CCSHAU, Hisar, Pp.85-92.
33. Grover, Y.P. and Kadian, S.K., (2008). Bacterial Immunity .Lecture delivered and published In Training Manual on "Techniques in murine monoclonal antibodies production", (Ed. by S.K. Kadian, A. Singh. B.R. Gulati and A. Kumar). Centre of Advanced Studies, Department of Veterinary Microbiology, CCS Haryana Agricultural University, Hisar, p77-84.
34. Grover, Y.P. (2008). Bacterial Classification and Characteristics. Lecture delivered and published In Manual on "Comprehensive training for JRF in Veterinary Sciences", (Ed. by S.K. Kadian,). College of Veterinary Sciences, CCS Haryana Agricultural University, Hisar, p25- 29
35. Grover, Y.P. (2008). Application of antibodies. In: Manual on "Phage Display technology for production of single domain antibodies", (Ed. A. Singh). Centre of Advanced Studies, Department of Veterinary Microbiology, CCS Haryana Agricultural University, Hisar, p35-46.
36. Charan, S., Batra, S.K. and Kharab, S. (2008). Conventional and non-conventional effector functions of immunoglobulins. In: Manual on "Phage Display technology for production of single domain antibodies", (Ed. A. Singh). Centre of Advanced Studies, Department of Veterinary Microbiology, CCS Haryana Agricultural University, Hisar, pp: 67-77.
37. Batra, S.K. (2008). Virus structure, classification and replication. In manual for JRF training 2008. College of Vet. Sciences, CCS HAU, Hisar.
38. Kapoor, S. (2008). Protective and pathological immunity to viruses.. In: Course manual on, 'Techniques in murine monoclonal antibody production'. (Eds. S.K. Kadian, Ajit Singh, B.R. Gulati). ICAR Centre of Advanced Studies, Department of Veterinary Microbiology, CCS Haryana Agricultural University, Hisar, pp:103-108.

39. Kapoor, S. (2008). Viral diseases of livestock and poultry. In: manual for Junior Research Fellowship (Ed. S.K. Kadian). CCS Haryana Agricultural University, Hisar, pp: 312-319.
40. Sharma, R. and Kakker, N. K. (2008). Monoclonal antibody based ELISA for the detection of FMD carrier. In: Course manual "Techniques in Murine Monoclonal Antibody Production" (Eds.) Kadian, S., Singh, A. and Gulati, B. R. pp: 62-64.
41. Kakker, N. K. and Sharma, R. (2008). Effector Functions of Antibodies. In: Manual on Phage display technology for production of single-domain antibodies (ed.) Singh, A. ICAR Centre of Advanced Studies, Deptt. of Veterinary Microbiology, CCS HAU Hisar, Haryana, India. pp: 61-66.
42. Sharma, R., Kumar, N. and Kakker, N. K. (2008). Molecular and cellular interactions for antibody production. i.b.i.d. pp: 79-86.
43. Sharma, R., Kumar, N. and Kakker, N. K. (2008). Current concepts in the diagnosis of Foot-and-Mouth Disease. In: ICAR Winter School on Immunological and Molecular Techniques for Diagnosis of Infectious Diseases of Domestic Animals and Poultry. (ed.) Saxena, H. M. Deptt. of Veterinary Microbiology, GADVASU, Ludhiana, Punjab. pp: 23-29.
44. Sharma, R., Kumar, N. and Kakker, N. K. (2008). Monoclonal Antibody based ELISA for the detection of Foot-and-Mouth disease carrier animals. i.b.i.d. pp: 30-32.
45. Sharma, R. and Kakker, N. K. (eds.) (2008). Annual Report 2007-08. Regional Research Centre on FMD, Deptt. of Veterinary Microbiology, CCS HAU, Hisar.
46. Sharma, R., Kumar, N. and Kakker, N. K. (2008). Current concepts in the diagnosis of Foot-and-Mouth Disease. In: ICAR Winter School on Immunological and Molecular Techniques for Diagnosis of Infectious Diseases of Domestic Animals and Poultry. (ed.) Saxena, H. M. Deptt. of Veterinary Microbiology, GADVASU, Ludhiana, Pb. pp: 23-29.
47. Sharma, R., Joshi, G. and Kakker, N. K. (2008). Monoclonal Antibody Based ELISA for the Detection of Foot-and-mouth Disease Carrier Animals. In: Course manual on Techniques in Murine Monoclonal Antibody Production. Kadian, S. K., Singh, A. and Gulati, B. R. (eds.). ICAR Centre of Advanced Studies, Deptt. of Veterinary Microbiology, CCS HAU Hisar, Haryana, India. pp: 62-64.
48. Kadian, S.K. and Jangra, P. (2008). Cytokines: Their role in immunoregulation. In Course Manual on "Techniques in murine monoclonal antibody production" Centre of Advanced Studies, Department of Veterinary Microbiology, CCS Haryana Agricultural University, Hisar, January 23 to February 12, 2008, pp 109-120.
49. Grover, Y.P. and Kadian, S.K. (2008). Bacterial immunity. In: Manual on "Techniques in murine monoclonal antibody production" Centre of Advanced Studies, Department of Veterinary Microbiology, CCS Haryana Agricultural University, Hisar, January 23 to February 12, 2008, pp 77-84.
50. Kadian, S.K. (2008). Antibodies: Structure and function relationship. In: Manual on "Phage display technology for production of single domain antibodies" Centre of Advanced Studies, Department of Veterinary Microbiology, CCS Haryana Agricultural University, Hisar, September 25 to October 15, 2008, pp 53-60.
51. Singh, A. (2009). Diagnostic applications of camel single-domain antibodies produced by phage display technology. In 22nd CAS Course compendium on 'Current concepts in immunoassays for diagnosis of animal diseases'. Published by

ICAR Centre of Advanced Studies, Department of Veterinary Microbiology, CCSHAU, Hisar, pp.:17-22.

52. Sharma, K. and Singh, A. (2009). ELISPOT assay for enumeration of IgG-secreting plasma cells in spleen of adult rabbit immunized with Escherichia coli. In 22nd CAS Course compendium on 'Current concepts in immunoassays for diagnosis of animal diseases'. Published by ICAR Centre of Advanced Studies, Department of Veterinary Microbiology, CCSHAU, Hisar, pp.: 127-129.
53. Singh, A. (2009). Phage display technology for production of diagnostic and therapeutic single-domain antibodies of camel origin. Invited Paper published in the Compendium of the Ninth Indian Veterinary Congress held at Bombay Veterinary College, Mumbai, Feb. 20-21, 2009. pp.: 7-11.
54. Batra, S.K. (2009). Immunoassays in the diagnosis of animal viral diseases. . In CAS course manual entitled Current Concepts in immunoassays for diagnosis of animal diseases. N.K. Kakker and R. Sharma (eds), Deptt. of Veterinary Microbiology, CCS HAU, Hisar Dec 16 to Jan.5, 2009.
55. Kapoor, S. (2009). Current concepts for the diagnosis of important poultry viral diseases.. In: Course manual on, 'Current concepts on Immunoassays for the diagnosis of animal diseases.' (Eds. R. Sharma and N. K. Kakker) Published by ICAR Centre of Advanced Studies, Department of Veterinary Microbiology, CCS Haryana Agricultural University, Hisar, pp:45-48.
56. Kapoor, S. (2009). Important of virulence in poultry viruses, their diagnosis, prevention and control. Pp 47-52. In: Course manual on, 'Poultry health and management practice: an update.' (Eds. Narang, G, Mahajan, N. K. and Rakha, N. K.) Published by ICAR Centre of Advanced Studies, Department of VEPM, CCS Haryana Agricultural University, Hisar.
57. Sharma, R. and Kakker, N. K. (eds.) (2009). Course Compendium on "Current Concepts in Immunoassays for Diagnosis of Animal Diseases". Centre of Advanced Studies (ICAR) Course (January 16 – February 5, 2009), Deptt. of Veterinary Microbiology, CCS HAU Hisar, Haryana.
58. Kakker, N. K. and Sharma, R. (2009). Introduction to Enzyme Immunoassay Principles. In: Course manual on Current Concepts in Immunoassays for Diagnosis of Animal Diseases. Sharma, R. and Kakker, N. K. (eds.). ICAR Centre of Advanced Studies, Deptt. of Veterinary Microbiology, CCS HAU Hisar, Haryana, India. pp: 1-5.
59. Kakker, N. K. and Sharma, R. (2009). Immunoassays recommended by OIE for diagnosis of diseases of veterinary importance. i.b.i.d. pp: 23-25.
60. Sharma, R., Kumar, N. and Kakker, N. K. (2009). Recent trends in the diagnosis of foot-and-mouth disease with particular reference to immunoassays. ibid pp: 34-40.
61. Sharma, R. and Kakker, N. K. (2009). Recent advances in immunohistochemical techniques. i.b.i.d. pp: 81-85.
62. Kakker, N. K. and Sharma, R. (2009). Double antibody sandwich ELISA for serotyping of FMD Virus. i.b.i.d. pp: 90-92.
63. Sharma, R., Kumar, N. and Kakker, N. K. (2009). Liquid phase blocking ELISA for detection of antibodies against FMD virus serotypes. i.b.i.d. pp: 93-95.
64. Sharma, R., Kumar, N. and Kakker, N. K. (2009). Monoclonal antibody based ELISA for the detection of Foot and Mouth Disease carrier animals. i.b.i.d. pp: 96-98.



65. Sharma, R. and Kakker, N. K. (2009). Serum neutralization test for detection of antibodies against Foot- and- Mouth Disease Virus. i.b.i.d. pp: 103-105.
66. Sharma, R., Kumar, N. and Kakker, N. K. (2009). Demonstration of 3A-NSP antigen in BHK-21 cells infected with Foot-and-Mouth Disease virus by indirect immunoperoxidase test. i.b.i.d. pp: 108-110.
67. Sharma, R., Singathia, R., Kumar Naveen and Kakker, N. K. (2009). Demonstration of AvCD4+and AvCD8+ T cells by indirect immunofluorescence test. i.b.i.d. pp: 111-113.
68. Sharma, R. and Kakker, N. K. (2009). Annual Report 2008-09. Regional Research Centre on FMD, Deptt. of Veterinary Microbiology, CCS HAU, Hisar.
69. Kakker, N. K. and Sharma, R. (2009). Epidemiological Studies on FMD Outbreaks before and after launch of FMD Control Programme in Haryana, India. In: "OIE/FAO Global Conference on FMD 2009" held at Asuncion, Paraguay, June 24-26, 2009 pp: 67.
70. Sharma, R. and Kakker, N. K. (2009). Sero-monitoring of FMD-Control Programme in the state of Haryana, India. i.b.i.d. pp: 70.
71. Mohapatra, J. K. and Kakker, N. K. (2009). Recombinant 3AB3 NSP ELISA for FMD DIVA strategy. ibid pp: 99-102.
72. Singh, A. (2010). Tools for control of important infectious diseases of domestic animals. In: Manual of the course entitled 'Modern trends in vaccines and diagnostics for the control of infectious diseases in animals', March 5-25, 2010. Centre of Advanced Faculty Training, Department of Veterinary Microbiology, CCSHAU, Hisar; pp.1-5.
73. Singh, A. (2010). Recombinant antibodies in diagnostics of animal diseases. In: Manual of the course entitled 'Modern trends in vaccines and diagnostics for the control of infectious diseases in animals', March 5-25, 2010. Centre of Advanced Faculty Training, Department of Veterinary Microbiology, CCSHAU, Hisar; pp.26-31.
74. Sangwan, Ankita, Singh A. and Khokhar, R.S. (2010). *Pasteurella multocida* B:2 specific polymerase chain reaction. In: Manual of the course entitled 'Modern trends in vaccines and diagnostics for the control of infectious diseases in animals', March 5-25, 2010. Centre of Advanced Faculty Training, Department of Veterinary Microbiology, CCSHAU, Hisar; pp.144-145.
75. Singh, A., Rayulu, V.C. and Chaudhri, S.S. (2010). Latex agglutination test for detection of *Trypanosoma evansi* antigen in the field sera of susceptible domestic animal species. In: Manual of the course entitled 'Modern trends in vaccines and diagnostics for the control of infectious diseases in animals', March 5-25, 2010. Centre of Advanced Faculty Training, Department of Veterinary Microbiology, CCSHAU, Hisar; pp.142.
76. Reema, V., Shyma, K.P., Singh, A. and Chaudhri, S.S. (2010). PCR for detection of *Trypanosoma evansi*, *Theileria annulata*, *Babesia bigemina* in blood samples. In: Manual of the course entitled 'Modern trends in vaccines and diagnostics for the control of infectious diseases in animals', March 5-25, 2010. Centre of Advanced Faculty Training, Department of Veterinary Microbiology, CCSHAU, Hisar; pp. 146-147.

77. Singh, A. (2010). ELISPOT assay for enumeration of IgG-secreting plasma cells in chicken ovalbumin-immunized mice. In: Manual of the course entitled 'Modern trends in vaccines and diagnostics for the control of infectious diseases in animals', March 5-25, 2010. Centre of Advanced Faculty Training, Department of Veterinary Microbiology, CCSHAU, Hisar; pp. 148-150.
78. Singh, A. (2010). Expression of camel single-domain antibody clones selected from phage display library in *E. coli* host. In: Manual of the course entitled 'Modern trends in vaccines and diagnostics for the control of infectious diseases in animals', March 5-25, 2010. Centre of Advanced Faculty Training, Department of Veterinary Microbiology, CCSHAU, Hisar; pp.167-168.
79. Grover, Y.P. and Singh, M (2010) Edible Vaccines, Lecture delivered and published In Training Manual on "Modern trends in Veterinary Vaccines and Diagnostics for the control of Infectious diseases," (Ed. by S. Charan, S. K. Batra and A. Singh). Centre of Advanced Faculty Training, Department of Veterinary Microbiology, CCS Haryana Agricultural University, Hisar, p37-44.
80. Kapoor, S. and Lather, A.. (2010). Field level diagnostic tests for important diseases of livestock and poultry. In: Course Compendium on, 'Modern Trends in Veterinary Vaccine and Diagnostics for the Control of Infectious Diseases'. (Editors S. Charan & S. K. Batra). Published by ICAR Centre of Advanced Faculty Training, Department of Veterinary Microbiology, CCS HAU, Hisar. Pp 118-122.
81. Charan, S. and Batra, S.K. (2010). Editors. Modern trends in veterinary vaccines and diagnostics for the control of animal diseases. Centre for Advanced Faculty Training, Deptt. of Veterinary Microbiology, CCS Haryana Agricultural University, Hisar.
82. Charan, S. and Kharb, S. (2010). Applications, basic and concepts of mucosal immunity. In: Manual on Modern trends in veterinary vaccines and diagnostics for the control of animal diseases. ICAR Center for Advance Faculty Training, Department of Veterinary Microbiology, CCS Haryana Agricultural University, HISAR, Haryana (India), pp 59 - 68.
83. Charan, S. and Kharb, S. (2010). Comparison of efficacy of different adjuvants (alum, CpG) in the mouse model of *P. multocida* B:2 in mice. In: Manual on Modern trends in veterinary vaccines and diagnostics for the control of animal diseases. ICAR Center for Advance Faculty Training, Department of Veterinary Microbiology, CCS Haryana Agricultural University, HISAR, Haryana (India), pp 143.
84. Charan, S. and Kharb, S. (2010). Titration of bacterial multiplication in different organs and levels of antibodies against *P. multocida*B:2 in mice. In: Manual on Modern trends in veterinary vaccines and diagnostics for the control of animal diseases. ICAR Center for Advance Faculty Training, Department of Veterinary Microbiology, CCS Haryana Agricultural University, HISAR, Haryana (India), pp 169 - 171.
85. Batra, S.K. and Charan, S. (2010). Immunoassays in diagnosis of animal viral diseases. In: Manual on Modern trends in veterinary vaccines and diagnostics for the control of animal diseases. ICAR Center for Advance Faculty Training, Department of Veterinary Microbiology, CCS Haryana Agricultural University, HISAR, Haryana (India), pp 26 - 37.
86. Charan, S. and Kharb, S. (2010). Recent trends in diagnosis of pasteurellosis with special reference to immunoassays. In: Manual on Modern trends in veterinary

vaccines and diagnostics for the control of animal diseases. ICAR Center for Advance Faculty Training, Department of Veterinary Microbiology, CCS Haryana Agricultural University, HISAR, Haryana (India), pp 57 - 63.

87. Kakker, N. K. and Sharma, R. (2010). Cellular immunity based diagnostic tests for infectious diseases: Principles and Concepts. Charan, S. and Batra, S. K. (eds.). In: Manual on Modern trends in veterinary vaccines and diagnostics for the control of animal diseases. ICAR Center for Advance Faculty Training, Department of Veterinary Microbiology, CCS Haryana Agricultural University, HISAR, Haryana (India), pp: 22-25.
88. Sharma, R., Lather, A., Nidhi and Kakker, N. K. (2010). Marker vaccines and DIVA tests for the control and eradication of infectious diseases. *ibid.* pp: 82-89.
89. Kakker, N. K., Lather, A., Nidhi and Sharma, R. (2010). Detection of antibodies against foot and mouth disease virus serotypes using liquid phase blocking ELISA. *ibid.* pp: 153-56.
90. Sharma, R., Kumar, N. and Kakker, N. K. (2010). Monoclonal antibody based ELISA for the detection of foot and mouth disease carrier animals. *ibid.* pp: 157-58.
91. Kadian, S. K. and Jangra, P. (2010). Immunodiagnostic tests for infectious diseases of domestic animals: General Principles. In: Manual on Modern trends in veterinary vaccines and diagnostics for the control of animal diseases. ICAR Center for Advance Faculty Training, Department of Veterinary Microbiology, CCS Haryana Agricultural University, HISAR, Haryana (India), pp. 69-75.
92. Sharma, A. and Singh, M. (2010). Diagnostics and vaccines against important bacterial diseases of animals. In: Manual on Modern trends in veterinary vaccines and diagnostics for the control of animal diseases. ICAR Center for Advance Faculty Training, Department of Veterinary Microbiology, CCS Haryana Agricultural University, HISAR, Haryana (India), pp. 45-58.

• **Any other: Compact Disks of Manuals**

1. Singh, A. (2007). Compact District of the manual of training for post-graduate students on 'Research Methodology in Immunology', The Immunology Section, Department of Veterinary Microbiology, CCSHAU, Hisar, Haryana, July 2- July 31, 2007.
2. Kadian, S., Singh, A. and Gulati, B. R. (2008). Editors. Compact Disc of 20<sup>th</sup> CAS Course on 'Techniques in murine monoclonal antibody production', Deptt. of Veterinary Microbiology, CCS HAU Hisar, Haryana, January 23- February 12, 2008.
3. Singh, A. (2008). Editor. Compact Disc of 21<sup>st</sup> CAS Course on 'Phage display technology for production of single-domain antibodies', Deptt. of Veterinary Microbiology, CCS HAU Hisar, Haryana, September 23- October 13, 2008.
4. Sharma, R. and Kakker, N. K. (2009). Editors. Compact Disc of 22<sup>nd</sup> CAS Course on 'Current Concepts in Immunoassays for Diagnosis of Animal Diseases', Deptt. of Veterinary Microbiology, CCS HAU Hisar, Haryana, January 16- February 5, 2009.
5. Charan, S. and Batra, S.K. (2010). Editors. Compact Disc of 23<sup>rd</sup> CAFT Course Manual of the course entitled 'Modern trends in vaccines and diagnostics for the control of infectious diseases in animals', Deptt. of Veterinary Microbiology, CCS HAU Hisar, Haryana, March 5-5, 2010.

***Financial Statement***

***Expenditure under CAFT during XI plan***

Head	2007-08	2008-09	2009-10	2010-11	2011-12*
Operating cost of Training	128170	171000	115198	125000	375000
Recurring Contingency	150000	36089	120000	110963	200000
Non- Recurring Contingency/T. A.	382	-	30000	30000	30000
Library	49905	-	28255	14383	30000
Total	328457	207089	293453	280346	635000* (*allotted)

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