

**Animal Biotechnology Department**  
**College of Veterinary Science and Animal Husbandry**  
**Kamdhenu University, Anand - 388 001**

**Department information in brief :**

**Introduction:**

Biotechnology is very important field progressing at very fast speed with capacity to affect every walk of life and livestock are no exception. Biotechnological progress in animal science has improved health and production of animals, in turn benefiting farmers and making livestock keeping sustainable.

The Department of Animal Biotechnology has state of the art laboratory for animal biotechnology research. Main areas covered under animal biotechnology are Genomic selection, Diagnostics and vaccine development, artificial insemination and embryo transfer, nutrigenomics, and rumen manipulation as well as cancer genetics and gene-based therapies.

Considering its achievements state government has identified this centre as Centre of Excellence in Animal Biotechnology and ICAR has recognised it as Niche Area of Excellence on Rumen Metagenomics. ICAR has also funded project on semen sexing in cattle considering expertise of this centre. The centre has generated whole genome sequences of Gir cattle and Jaffrabadi buffalo, two fish viz. *Labeo rohita* and *Clarius batracus*, several pathogenic and non-pathogenic organisms. More than 1000 metagenome datasets have been generated. The centre has successfully shown down regulation of myostatin gene using shRNA and miRNA in goat. The centre has identified several enzymes that are useful in digestion, from buffalo rumen microbes. The centre has also got research projects with international collaboration (DBT-BBSRC) because of its outstanding contribution in metagenomics.

The centre has also identified mutations responsible for causing progressive retinal atrophy in dogs and horn cancer in bullocks. The centre has generated state-wide and nation-wide network of research collaboration as well as few international collaborations are developed. The centre has also developed software for readily classification of indigenous goat and cattle breeds of Gujarat based on microsatellite analysis.

The centre has published more than 150 publications in scientifically acclaimed and reputed journals, which shows relevance and importance of its outcomes in this advancing field. The centre is actively engaged in generating human resource by way of conducting training programmes regularly on biotechnology and bioinformatics. Animal biotechnology department is also actively involved in training of young minds through its postgraduate programmes. Several students have been trained in the institute and resulted into generation of trained manpower resources in actively growing biotechnology field.

**Present staff position with credentials:**

<b>Name</b>	<b>Designation</b>	<b>Experience</b>	<b>Qualification</b>
Dr. R. S. Joshi	Professor	34 yrs	PhD, Animal Genetics and Breeding
Dr. Prakash G. Koringa	Assistant Professor	16 yrs	PhD, Animal Genetics and Breeding
Dr. Subhash J. Jakhesara	Assistant Professor	11 yrs	PhD Animal Biotechnology

### **Achievements:**

- Completed draft whole genome sequencing of Gir cattle and Jaffrabadi buffalo. The GIRCHIP involving SNPs of Indigenous Gir animal origin is ready for screening SNPs in local population. (First time in World).
- A High-tech Molecular Genetic Laboratory been established having a facility of Whole Genome Sequencing, Transcriptomic, Proteomic, Metagenomics and Metabolomic analysis using advanced technologies like DNA sequencing, 2 D Gel Electrophoresis, Densitometry, PCR, Real-time PCR, Documentation and analysis of data with bioinformatics software.
- Developed a molecular genetic technique for differentiation of Cattle and Buffalo meat. Obtained a patent for the same.
- Identified SNPs associated with Horn cancer in Kankrej bullock. Screening of these SNPs will enable us to predict horn cancer in day old age calf.
- Published 153 research papers in internationally reputed journals like Microbiome, FIGE, Scientific Report, Gene, Genome, Journal of Biotechnology, Journal of Bacteriology, Molecular Biology Reports etc.
- Organized seven workshop (Hands on training) in field of genomics & metagenomics. Trained 128 scientists from national research institutes and state agricultural universities of India.
- Trained more than 600 students and faculties of life science through organizing seminars, symposium, workshop and dissertation at high tech molecular biology.
- A collaboration with international institute has been established. A new international project of UKRI- GCRF entitled “One Health Poultry Hub” got sanctioned with budgetary outlay of 7.4 Crore. The project is multicountry (11 countries) and lean institution is Royal Veterinary College, London, UK.
- A multi-institutional project entitled “Genomic Selection in Cattle” involving NDDB, GBRC, Mehsana Dairy and Banas Dairy and Govt. of Gujarat is sanctioned in 2020.

### **Focused areas of research are:**

- Genomics
- Metagenomics
- Transcriptomic
- Gene mining
- GWAS

### **List of Published Papers: (English ONLY) (APA Style) (Example Below) (Year-wise)**

- Agarwal, D., Gireesh-Babu, P., Pavan-Kumar, A., Koringa, P., Joshi, C. G., & Chaudhari, A. (2020). Transcriptome analysis of *Clarias magur* brain and gonads suggests neuro-endocrine inhibition of milt release from captive GnRH-induced males. *Genomics*, 112(6), 4041-4052. doi: 10.1016/j.ygeno.2020.07.012
- Agarwal, D., Gireesh-Babu, P., Pavan-Kumar, A., Koringa, P., Joshi, C. G., Gora, A., . . . Chaudhari, A. (2020). Molecular characterization and expression profiling of 17-beta-hydroxysteroid dehydrogenase 2 and spermatogenesis associated protein 2 genes in endangered catfish, *Clarias magur* (Hamilton, 1822). *Anim Biotechnol*, 31(2), 93-106. doi: 10.1080/10495398.2018.1545663

- Ahir, V. B., Roy, A., Jhala, M. K., Bhandari, B. B., Mathakiya, R. A., Bhatt, V. D., . . . Joshi, C. G. (2011). Genome sequence of *Pasteurella multocida* subsp. *gallicida* Anand1\_poultry. *J Bacteriol*, 193(19), 5604. doi: 10.1128/JB.05706-11
- Ambalam, P., Pithva, S., Kothari, C., Kothari, R., Parmar, N., Nathani, N. M., . . . Vyas, B. R. (2014). Insight into the Draft Genome Sequence of Human Isolate *Lactobacillus rhamnosus* LR231, a Bacterium with Probiotic Potential. *Genome Announc*, 2(1). doi: 10.1128/genomeA.00111-14
- Amin, S., Shah, B., Jain, K., Patel, A., Patel, N., Joshi, C. G., & Madamwar, D. (2015). Draft Genome Sequence of *Achromobacter* sp. Strain DMS1, Capable of Degrading Polyaromatic Hydrocarbons Isolated from the Industrially Perturbed Environment of Amlakhadi Canal, India. *Genome Announc*, 3(5). doi: 10.1128/genomeA.01264-15
- Aparnathi, M. K., Patel, J. A., Tripathi, A. K., Barvalia, D. R., & Joshi, C. G. (2012). In vitro osteogenic potential of canine adipose derived stem cells. *J Stem Cells*, 7(4), 201-209. doi: jsc.2013.7.4.201
- Arya, G., Roy, A., Choudhary, V., Yadav, M. M., & Joshi, C. G. (2008). Serogroups, atypical biochemical characters, colicinogeny and antibiotic resistance pattern of Shiga toxin-producing *Escherichia coli* isolated from diarrhoeic calves in Gujarat, India. *Zoonoses Public Health*, 55(2), 89-98. doi: 10.1111/j.1863-2378.2007.01093.x
- Bhatia, D., Hinsu, A., Panchal, K., Sabara, P., Jakhesara, S., & Koringa, P. (2020). Molecular portrait of squamous cell carcinoma of the bovine horn evaluated by high-throughput targeted exome sequencing: a preliminary report. *BMC Vet Res*, 16(1), 461. doi: 10.1186/s12917-020-02683-y
- Bhatt, V. D., Ahir, V. B., Koringa, P. G., Jakhesara, S. J., Rank, D. N., Nauriyal, D. S., . . . Joshi, C. G. (2012). Milk microbiome signatures of subclinical mastitis-affected cattle analysed by shotgun sequencing. *J Appl Microbiol*, 112(4), 639-650. doi: 10.1111/j.1365-2672.2012.05244.x
- Bhatt, V. D., Dande, S. S., Patil, N. V., & Joshi, C. G. (2013). Molecular analysis of the bacterial microbiome in the forestomach fluid from the dromedary camel (*Camelus dromedarius*). *Mol Biol Rep*, 40(4), 3363-3371. doi: 10.1007/s11033-012-2411-4
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- Bhatt, V. D., Shah, T. M., Nauriyal, D. S., Kunjadia, A. P., & Joshi, C. G. (2014). Evaluation of a topical herbal drug for its in-vivo immunomodulatory effect on cytokines production and antibacterial activity in bovine subclinical mastitis. *Ayu*, 35(2), 198-205. doi: 10.4103/0974-8520.146254
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- Bhong, C. D., Brahmabhatt, M. N., Joshi, C. G., & Rank, D. N. (2008). Detection of virulence determinants by real time PCR in *E. coli* isolated from mutton. *Meat Sci*, 80(4), 1129-1131. doi: 10.1016/j.meatsci.2008.05.017
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**List of Other Publications: (Book, Book Chapter, Popular Articles, Leaflets, Pamphlets, Booklets) (Including articles in vernacular language)**

- A book is published by Dr. Chaitanya G. Joshi entitled “Whole Genome Sequencing in Animal and Plant Research”. [Publisher: Agrotech Publishing Academy, Udaipur, Rajasthan]. 2012
- Joshi, C.G., Koringa, P.G., Jakhesra, S.J., Nathani, N.M. and Thakkar, J.R. (Eds.). 2015. Metagenomics- Role of Next Generation sequencing and Bioinformatics. Ome Research Facility, Department of Animal Biotechnology, College of Veterinary Science & Animal Husbandry, Anand Agricultural University, Anand, Gujarat, India, pp 1-108. ISBN 9789352360451
- Joshi, C.G., Koringa, P.G., Jakhesra, S.J., Nathani, N.M. and Thakkar, J.R. (Eds.). 2016. Metagenomics- Role of Next Generation sequencing and Bioinformatics. Ome Research Facility, Department of Animal Biotechnology, College of Veterinary

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- Paleja, H. I., Golviya, A. V., Patel, A. B. and Jakhesara, S. J. (2020). MarghaPalan Margdarshika. UKRI-GCRF One Health Poultry Hub. Pages : 132 ( in Gujarati )

**Ongoing Research/Education/Extension Projects: (Projects Ongoing as on 31<sup>st</sup> Aug.,2021)**

Sr. No.	Research Project	Agency	Period	Amount (Rs.in Lakh)
1	Semen Sexing in Cattle	ICAR	2015-2022	600.8
2	UKRI-GCRF One Health Poultry Hub	UKRI-GCRF, Royal Veterinary College, UK	2019-2024	750.00
3	Building a Network of Researchers with expertise in Molecular Diagnostics to Monitor and Investigate Antimicrobial Resistance (AMR) in South Asia	UKRI-GCRF-STARS, UK	2020-2021	53.25

**Research Projects Completed:**

Sr. No.	Research Project	Agency	Period	Amount (Rs. in Lakh)
1	Increasing Milk Production by Recent Biotechnological Approaches	RKVY	2010	27.50
2	PCR based Identification and Genotyping of Prokaryotes and Eukaryotes	MPUH	2010	28.00
3	GGI-WGSq: Gujarat Genomics Initiative - Whole Genome Sequencing Project	GSBTM	2010-2012	10.00
4	Development of Goat having Knocked Down Myostatin Gene through RNA interference Technology to Enhance Meat Production	NAIP – ICAR	2010	93.80
5	Genetic Characterization of Four Indigenous Cattle Breeds found in Madhya Pradesh using Molecular Markers	MLDB	2013-15	9.50
6	High Throughput Exome Sequence Analysis in Four Buffalo Breeds of Gujarat to Detect Single Nucleotide Polymorphisms	DBT	2011-2013	93.86
7	Single Nucleotide Polymorphism in Coding Region of Genome and Its Association with Feed Conversion Ratio in Broilers	DBT	2011-2013	46.36
8	Molecular Characterization of Dangi and Khillar Cattle	MLDB	2012	6.0
9	Molecular Characterization of Kathiawadi Breed of Horse	GLDB	2013	8.0
10	PCR-RFLP and Microsatellite Based Genotyping of Poultry Birds	Marshal Breeder	2014	5.6
11	Molecular Understanding of Progressive Retinal Atrophy in Dog Breeds in India	DBT	2012-15	92.76

12	Transcriptome Profiling of Horn Cancer in Kankrej Bullock	GSBTM	2011-12	15.20
13	Genetic Diversity and Haplotyping of Innate Immune Genes in Indian Cattle and Buffalo	DBT	2012-2016	23.50
14	Centre of Excellence in Animal Biotechnology	AAU Plan	2010-2016	156.00
15	BITvirtual Virtual Learning of Bioinformatics	GSBTM	2010-2015	15.00
16	Niche Area Excellence Project on Metagenomic Analysis of Ruminant Microbes	ICAR	2011-2016	359.00
17	Whole Genome Sequencing and Development of Allied Genomic Resources in Two commercially important Fish Labeo rohita and Clarias batrachus	DBT	2013-2016	128.00
18	Development of Recombinant Poultry Vaccine with HVT (Herpes Virus Turkey) as Backbone	Hester Biosciences	2013-2016	22.00
19	Controlling Enteric Pathogens of Poultry: Host/Microbiota Interaction, Risk Assessment and Effective Management interventions	DBT – BBSRC	2014-2017	344.61
20	Genome Sequencing for the Breeds of Gir Cattle and Jaffarabadi Buffalo.	GLDB	2014-2017	318.00
21	Cytogenetics and Cell Culture Studies in Cattle and Buffalo	AAU Plan	2010-2016	12.00
22	Study on Pattern of Inheritance of Haemoglobin, Transferrin & K Ion Types and their Associations with Production Traits in Cattle and Sheep	AAU Plan	2010-2016	24.00
23	Study on Correlated Response to Selection in Experimental Flock on Poultry	AAU Non Plan	2010-2016	
24	Study on Correlated Response to Selection in Patanwadi and Crossbred Sheep	AAU Non Plan	2010-2016	
25	Metagenomic and Clinical Investigation of Symbiotic Fermented Dairy Product Containing Probiotic, L. Halveticus MTCC 5463 in Geriatric Volunteers	ICMR	2014-2017	48.00
26	Metagenomic Analysis of Virus Associated with Respiratory Tract Infection in Poultry	GSBTM	2015-2017	20.00
27	Isolation, Characterization and Transcriptome Analysis of Nematophagous Fungi – A Potential Bio-Control Agent.	GSBTM	2015-2017	19.50
28	Cloning, characterization and functional screening of industrially important novel cellulose's encoding genes from the Bovine rumen microbial community using metagenomic approach	DBT	2016-2019	28.80
29	Host transcriptomics and gut microbiome analysis in broiler with contrasting feed conversion ratio (FCR)	DBT	2016-2018	60.00
30	Generation and characterization of iPCS from canine fibroblast.	DST	2015-2018	23.76
31	“Metagenomic analysis of virus associated with respiratory tract infection in poultry” (In collaboration with Saurashtra University)	GSBTM	2016-2019	13.20



32	Isolation, Characterization and Transcriptome Analysis of Nematophagous fungi- A Potential Bio-control agent (In collaboration with ARIBAS, SP University)	GSBTM	2016-2019	15.25
33	DST Project (WOS-A) on Generation and characterization of induced pluripotent stem cells (iPSCs) from canine dermal fibroblasts.	DST	2016-2018	10.00
34	Identification of “Molecular Portraits” in Squamous Cell Carcinoma of Horn in Kankrej (Bos indicus) Bullocks	DBT	2016-2020	79.35
35	Host Transcriptomics and Gut Microbiome Analysis in Broilers with Contrasting Feed Conversion Ratio	DBT	2016-2019	65.90
36	Cloning, Characterization and Functional Screening of Industrially Important Novel Cellulose Encoding Genes from the Bovine Rumen Microbial Community using Metagenomic Approach. (In collaboration with ARIBAS)	DBT	2017-2020	64.29
37	Functional metagenomics of camel rumen microbiome for novel key glycoside hydrolases (GH) to benefit animal nutrition and biofuels	DBT	2017-2020	92.46

**List of trainings, seminar, symposiums organized:**

Sr. No.	Name of Event	Year
1	Advanced Training in Animal Management Animal Biotechnology and Animal Breeding	27-11-2006 to 06-12-2006
2	Disease diagnosis by PCR technique	25-10-2008 to 04-11-2008
3	<sup>Mb</sup> EACH Multi-institutional teacher's training programme in molecular biology and bioinformatics-2006	21-02-2006 to 01-03-2006
4	2 <sup>nd</sup> Multi-institutional teacher's training programme in molecular biology and bioinformatics-2007	17-05-2008 to 25-05-2008
5	Pre-conference workshop on techniques for detection of polymorphism in drug metabolizing enzymes and drug transporters	03-11-2009 to 04-11-2009
6	Need based training to students and teachers in field of biotechnology and relevant field	2006-2009
7	Genome Sequencer Awareness Workshop	6 <sup>th</sup> Janu., 2010
8	Need based training to develop Human Resource in field of Molecular Biology	Jan-Dec, 2010
9	National Seminar on “Changing role of Bioinformatician in Next Generation Sequencing Era”	2011
10	ICAR Sponsored Short Course On “Metagenomics : Role of Next Generation Sequencing and Bioinformatics”	16-24th October, 2012
11	Need based training to develop Human Resource in field of Molecular Biology	Jan-Dec, 2012
12	ICAR Sponsored Short Course On “Metagenomics : Role of Next Generation Sequencing and Bioinformatics”	2013

13	ICAR sponsored short course on “Metagenomics: Role of Next Generation Sequencing and Bioinformatics”	15th -24th Oct, 2014
14	Metagenomics: Role of Next Generation Sequencing and Bioinformatics”	26 <sup>th</sup> Oct – 4 <sup>th</sup> November, 2015
15	Metagenomics: Role of Next generation sequencing and bioinformatics	9th Feb-18th Feb 2016
16	Ist Annual Meet cum Conference of One Health Poultry Hub Project	9-15 Feb., 2020
17	Molecular Techniques to Monitor and Investigate Antimicrobial Resistance (AMR)	1 – 10 September, 2021
18	Molecular Techniques to Monitor and Investigate Antimicrobial Resistance (AMR)	14 – 23 Septe., 2021

### Number of Recommendations:

#### • Scientific Recommendations:

#### 2013

1. It is recommended to use following set of fourteen microsatellites for correct breed assignment of either Zalawadi, Gohilwadi or Surti breed of goat with probability of 0.96. Further it is recommended to use “Goaty Le” software for correct breed assignment for the unknown sample of Zalawadi, Gohilwadi or Surti breeds of goat.
2. It is recommended to use following primers, reagents and cycling conditions for PCR based diagnosis of Ehrlichiosis.

Primers:

5`GGGATCCGAATTCTA(T/C)AT(A/T)AG(T/C)GG(A/T/G/C)AA(A/G)TA(T/C)AT3`

5`ACCTAACTTTCCTTGGTAAG3`

PCR Protocol;

Step 1 : 94<sup>0</sup>C for 5 minutes, Step 2 : 94<sup>0</sup>C for 45 seconds, Step 3 : 52<sup>0</sup>C for 1 minutes

Step 4 : 72<sup>0</sup>C for 5 minutes, Step 5 : Step2 to Step 4 to be repeated for 40 times

Step 6 : 72<sup>0</sup>C for 10 minutes, Reagents : Ampli Taq. Gold Hot Start PCR Master Mix

#### 2014

**Recommendation 1 :** A new genotype XIII of Newcastle disease (ND) viruses reported from other parts of the world are also circulating in India as ascertained by molecular phylogeny based on whole genome sequencing. Therefore it is recommended to update currently used ND vaccines

**Recommendation 2:** Artificial micro RNAs under muscle specific promoter is recommended to down-regulate Activin receptor type IIB (ACVR2B) to enhance the muscle mass in goat.

**Recommendation 3 :** Upregulation of KRT6A, KRT6B, KRT6C, KRT14, SFN, KRT84, PI3, CA1, GJB2, COL17A1, ANLN, SERPINB5 genes and down-regulation of BoLA, SCGB1A1, CXCL17, KRT19, BPIFB1, NR4A1, ATF3, LRIG1, TFF3 genes recommended to be monitored in squamous cell carcinoma of horn (Horn Cancer) in Kankrej bullocks.

**Recommendation 4 :** It is recommended to study deregulation of cell cycle pathways; NFκB and MAPKs pathways; LPS signalling pathway; EGF-R and PI3K-Akt pathways for squamous cell carcinoma of horn (Horn Cancer) in kankrej bullocks.

**Recommendation 5 :** It is recommended to use SNP [T→C] at position 63251805 (dbSNP ID rs136870681) in BPIFA1 gene as a genetic marker in squamous cell carcinoma of horn (Horn Cancer) in kankrej bullocks.

**2020**

**Recommendation 1:** It is recommended to use ‘Keratins’ and ‘Interleukins’ groups of genes as potential biomarkers for prognosis of squamous cell carcinoma of horn in Kankrej bullocks.

**Recommendation 2:** It is recommended to use 28 missense variants distributed across 19 genes namely *BOLA*, *CARF*, *EI24*, *FABP2*, *FOXN3*, *HIST3H2A*, *JSP.1*, *KLK4*, *KNG1*, *KRT8* [displayed 7 missense variants (including stop-lost variant i.e. chr10:75129445A>G (T>C)], *LOC616948*, *MDH1B*, *PERM1*, *PPP1R15A*, *SAP18*, *SLC25A36*, *STON2*, *TTC16*, and *YME1L1*/KRT8 as panel of SNVs having prognostic values in horn cancer in Kankrej Bullocks.

**Recommendation 3:** The seven upregulated (XLOC\_000016, XLOC\_002198, XLOC\_002851, XLOC\_007383, XLOC\_010701, XLOC\_010272 and XLOC\_011517) and one downregulated (XLOC\_011302) long non-coding RNAs (lncRNAs) are associated with eleven genes having established role in squamous cell carcinoma of horn in Kankrej bullocks. These lncRNAs are recommended to be used as ‘Molecular Portraits’ of squamous cell carcinomas of horn in Kankrej bullocks.

• **Farmer’s Recommendations:** NIL