

MY JOURNEY TO CAMEL SCIENCE: A LIFELONG ADVENTURE INTO THE WORLD OF DESERT GIANTS

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ABSTRACT

This narrative outlines the professional journey of Dr. Binoy Sebastian Vettical from foundational education in veterinary science in Kerala, India, to a senior scientific role in camel reproductive biotechnology in the United Arab Emirates. Beginning with foundational work in bovine embryo transfer at the Kerala Livestock Development Board (KLDB), he contributed to the establishment of integrated embryo transfer laboratories, optimisation of super ovulation and embryo recovery protocols, and the production of India's first ethylene glycol direct frozen embryo-transfer calf. His academic advancement, including a Master's degree in Animal Reproduction, Gynaecology, and Obstetrics, together with specialised international training in embryo transfer, *in vitro* fertilisation (IVF), Ultra sound guided ovum pick up (OPU) and sex-sorted semen technology, strengthened his technical and research expertise. In 2010, he transitioned to camel reproductive programs in the UAE, where, at the Abu Dhabi Food Control Authority and later at the Central Veterinary Research Laboratory, Dubai, he established and directed Multiple Ovulation and Embryo Transfer (MOET) initiatives in dromedary camels, achieving average embryo recovery rates of six viable embryos per super ovulation and approximately 60% embryo transfer success. While camel embryo transfer and somatic cell nuclear transfer (SCNT) were already being practiced in a limited number of specialised centres, his role focused on strengthening, systematising, and supporting SCNT-related embryo production and transfer programs within structured laboratory and field frameworks. Beyond technical contributions, his work encompasses institutional development, laboratory accreditation, formulation of minimum standard protocols, and capacity building through national and international training, reflecting a career dedicated to advancing applied reproductive biotechnology for genetic improvement and conservation in desert-adapted species.

Key words: Camel, cattle, dromedary, embryo transfer, MOET, reproductive biotechnology, SCNT

Growing up in a small village in the southern state of Kerala, India, my childhood was filled with simple joys – playing with a cat and a dog, speaking to them, and sometimes sharing a quiet nap with my cat curled up beside me. Although I harbored a deep love for animals, I never imagined that one day I would find myself at the forefront of scientific research involving the majestic camel, a creature I had never encountered in my early years beyond the confines of a zoo.

My academic interests as a child were far removed from the world of animals. I was captivated by the abstract beauty of mathematics and physics, disciplines that seemed to offer endless possibilities. Yet, life has a way of leading us down unexpected paths, and my early love for animals gradually shifted toward veterinary science.

The Beginning of My Professional Journey

In December 1984, I joined Kerala Agricultural University, Trichur, India, to pursue a Bachelor of Veterinary Science and Animal Husbandry (B.V.Sc & AH). It was here that the seeds of my professional journey were first planted. The academic foundation I received during those formative years ignited my passion for veterinary science and animal reproduction.

In 1991, I began my professional career as an Assistant Manager at the Kerala Livestock Development Board (KLDB), Mattupatti, Kerala, India, the former Indo-Swiss Project. This marked the true beginning of my exploration into advanced reproductive technologies in livestock.

The KLDB played a major role in strengthening and modernising cattle breeding activities in the state

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of Kerala while also extending technical support to other states.

Pioneering Contributions in Embryo Transfer and Advanced Reproductive Technologies

Recognising the immense potential of emerging reproductive biotechnologies, KLDB took on the challenge of introducing and developing embryo transfer technology to further accelerate genetic improvement in cattle. During this crucial phase of technological transition, I was unexpectedly selected to be part of the initial development team. This opportunity came at a formative stage in my career and proved to be a defining turning point.

Over the years, I had the privilege of undergoing specialised training programs both in India and abroad, which significantly broadened my expertise. Notably, I received advanced training in embryo transfer technology at Swiss Embryo Transfer (SET), Switzerland; the Institute for Animal Breeding and Genetics, University of Veterinary Medicine, Germany; and Holland Genetics, The Netherlands. During my training period in Switzerland, I achieved a 51% embryo transfer success rate in Holstein Friesian (HF), Jersey, Brown Swiss, and Simmental breeds in 1993-94.

Equipped with this global exposure and technical knowledge, I played a key role in establishing a full-fledged laboratory for cattle embryo transfer housing embryo production, cryopreservation, embryo transfer, training, research, and consultancy at the Mattupatti unit under the KLDB in 1995 (Fig 1). This integrated facility enabled the successful implementation of advanced embryo transfer programs and led to the production of India's first ethylene glycol direct frozen embryo transfer calf on 23 June 1996, marking a significant milestone in bovine reproductive biotechnology in the country (Fig 2). This achievement represented a turning point in my career, allowing me to contribute directly to the advancement of reproductive biotechnology in the region (Vettical *et al*, 2002a, 2002b, 2002c, 2002d). Conducted systematic trials and standardised procedures in cattle embryo transfer under tropical conditions, optimising applications to enhance and continuously support existing breeding programs in a cost-effective manner in the region.

In 2002, I had the opportunity to undergo hands-on training in "Sex-Sorted Semen Production Technology" at Big X AG, Switzerland. Working closely with their expert team provided me with valuable insights into the significance and

transformative potential of this advanced technology in accelerating genetic progress and enhancing cattle productivity (Vettical and Das, 2007).

In addition to my primary areas of specialisation, I actively pursued further training in advanced reproductive techniques. I underwent specialised training in "*In vitro* Fertilisation of Farm Animal Oocytes" at Madras Veterinary College, Tamil Nadu, India. I also completed an advanced course in intra cytoplasmic sperm injection (ICSI) at the Centre for Reproductive Medicine (CRM, USA) - EART, Mumbai.

Academic Excellence, Research, and Professional Knowledge Dissemination

My MVSC thesis focused on *in vitro* fertilisation (IVF) of bovine oocytes, which further deepened my expertise in assisted reproductive technologies. The findings from this research led to the publication of three scientific papers in international journals (Vettical, 2016a, 2016b, 2016c). This research built upon my early career work in further possible advancements incorporating *in vitro* embryo production strategies and strengthened my research potential and commitment to advancing veterinary reproductive science.

Transition to Camel Reproductive Biotechnology

Although my early work revolved around bovines, I had yet to encounter the world of camels. It wasn't until later, when I began my professional career, that the true adventure began.

By 2005, I had already established myself as a leader in the biotechnology field, working with KLDB. It was here that I began managing projects in embryo transfer and reproductive technology. Little did I know that this experience would lay the foundation for a future I could never have predicted one that would bring me face to face with the enigmatic and resilient dromedary camel.

In 2010, my career took an unexpected turn when I moved to the United Arab Emirates (UAE) to work as an Embryo Transfer Specialist with the Abu Dhabi Food Control Authority in response to a unique professional opportunity that had arisen. It was here that I first began working with camels, assisting and taking technical leadership in the creation of a laboratory for camel embryo transfer. My work in this new field ranging from hormonal treatments for superovulation to the transfer of embryos soon gained attention for its success (Fig 3,4). Within just a couple of years, I helped the facility achieve a remarkable

60% success rate in embryo transfer in camels, a feat that opened the door to more advanced research and opportunities.

I joined Abu Dhabi Food Control Authority (ADFCA), Abu Dhabi, UAE as Embryo Transfer Specialist / Department Head – MOET in 2010.

Professional and administrative highlights (2010–2012) during this period are given below –

Professional Highlights

- Established a government authorised camel embryo transfer laboratory in Abu Dhabi.
- Achieved an average of 6 viable embryos per super ovulation with a 60% embryo transfer success rate.
- Prepared recipient camels and performed embryo transfers as part of advanced MOET programs.
- Managed infertility and gynecological cases across multiple veterinary clinics: Al Samha, Al Wathba, and Al Wafia.
- Developed and implemented Standard Operating Procedures (SOPs) for camel embryo production and transfer.

Administrative Highlights

- Led the MOET department, overseeing laboratory operations and clinical services.
- Coordinated cross-clinic activities and ensured adherence to government standards.
- Standardised procedures and protocols for reproductive biotechnology in camels.
- Contributed to capacity building within the ADFCA veterinary teams.

This hands-on experience with camels led me to my current role in Dubai, where I am honoured to serve as a Senior Scientist and Head of the Multiple Ovulation and Embryo Transfer (MOET) Department at the Reproductive Biotechnology Centre. Under the vision, support and guidance of His Highness Sheikh Hamdan bin Mohammed bin Rashid Al Maktoum, the Crown Prince of Dubai and the Deputy Prime Minister of UAE, I have been able to contribute groundbreaking research in camel reproductive biotechnology (Fig 5).

My work focuses on advanced reproductive techniques, including MOET, the production of mature oocytes through superstimulation and ultrasound-guided ovum pickup (OPU), and the transfer of both MOET-derived and cloned embryos. The oocytes collected through OPU are primarily utilised for laboratory embryo production via somatic

cell nuclear transfer (SCNT) and various research projects in our well-equipped and modern laboratory at the centre (Fig 6).

One of the highlights of my work in Dubai has been the establishment of state-of-the-art facilities for MOET, where we have successfully collected embryos from prized racing and beauty camels. The work we have done here producing embryos through MOET and SCNT, transferring them to surrogate mothers, and achieving impressive success rates has set new standards for camel breeding programs in the region.

I joined CVRL, Dubai, UAE, as Senior Scientist and Department Head – MOET, Reproductive Biotechnology Centre in 2012.

Professional and administrative highlights (2012–Present) during this period are given below –

Professional Highlights

- Conducted superstimulation protocols in camels and performed ultrasound-guided Ovum Pick-Up (OPU) for *in vitro* embryo production via nuclear transfer.
- Prepared recipient camels with hormonal treatments and successfully transferred cloned embryos, achieving remarkable pregnancy success rates.
- Established MOET facilities at the Reproductive Biotechnology Centre for high value racing and beauty camels.
- Achieved a 60% embryo transfer success rate in MOET programs with elite donor camels.

Administrative Highlights

- Headed the MOET department, overseeing laboratory operations, clinical programs, and research coordination.
- Managed high value donor camels and surrogate programs, ensuring quality and consistency in embryo production.
- Developed and standardised protocols for camel MOET and embryo transfer programs.
- Coordinated multidisciplinary teams, including veterinarians, technicians, and researchers, to ensure smooth operational and research workflows.
- Contributed to the strategic growth and research output of the Reproductive Biotechnology Centre.

With extensive practical experience in administration and management, I sought to strengthen my theoretical understanding of key organisational functions, including production,



Fig 1. Cattle Embryo Transfer Laboratory established at Mattupatti under the KLDB marked a significant milestone in advancing reproductive biotechnology in Kerala. The achievement was reported in Malayalam daily newspapers and magazines (<http://doi.org/10.13140/RG.2.1.2889.0721>, <http://doi.org/10.13140/RG.2.1.3937.6487>)



Fig 2. India's first ethylene glycol direct frozen embryo transfer calf, born on 23 June 1996, marking a major milestone in advanced bovine reproductive biotechnology in India. Reported in Malayalam daily newspapers (<http://doi.org/10.13140/GG.2.1.4724.0802>)

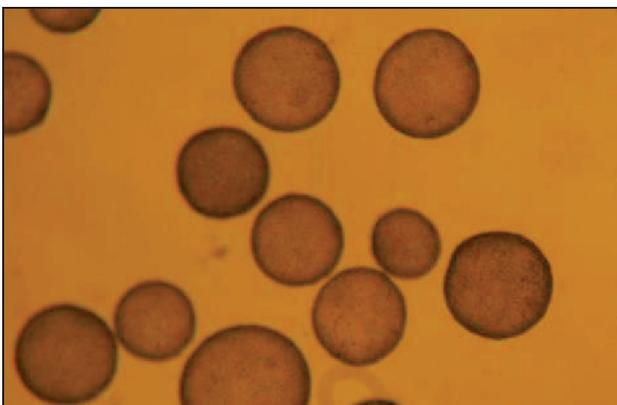
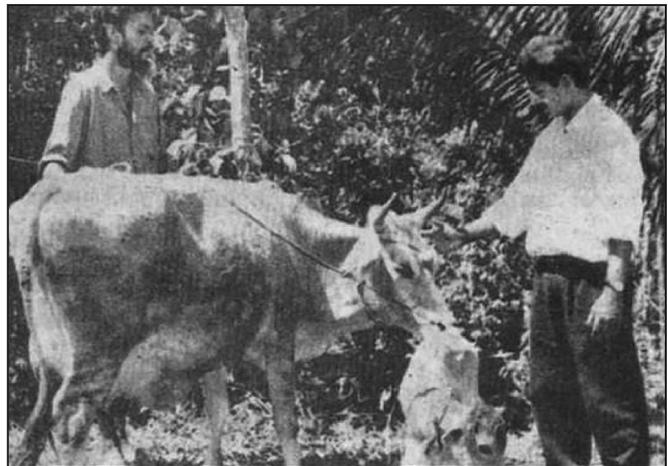


Fig 3. First-ever experience with camel embryos—achieved through meticulous fieldwork, self-training, and protocol standardization, marking a key step in advancing camel reproductive biotechnology.

marketing, finance, and human resources. To achieve this, I successfully completed a Veterinary Practice Management course in the USA. As a scientist, I place great importance on professional ethics. For my course project, I chose the topic of Professional Ethics, and based on the project and subsequent review, I published a manuscript in an international journal, contributing to the discourse on ethical practices in veterinary and reproductive biotechnology fields (Vettical, 2018).

Since 2010, I have led advanced camel reproductive biotechnology programs in the UAE. At ADFCA, Abu Dhabi (2010–2012), I established a government-authorized camel embryo transfer laboratory, achieving 6 viable embryos per super ovulation with 60% transfer success, while managing infertility cases and developing SOPs for embryo production and transfer. At CVRL, Dubai (2012–present), as Senior Scientist and Department Head

– MOET, I established MOET facilities for elite racing and beauty camels, performed super ovulation, OPU, and embryo transfers, consistently achieving 60% success for MOET embryos and significantly improving cloned embryo transfer success, advancing camel reproductive biotechnology in the region. The unexpected nature of my career path has been matched by the remarkable advancements in camel science that I have been privileged to contribute to. My research has led to numerous publications in esteemed journals such as *Reproduction Fertility and Development*, *Theriogenology*, *Animal Reproduction Science*, *Zygote*, and *Journal of Agricultural and Environmental Ethics*. Topics range from the effects of body condition on embryo transfer success in camels to the pioneering work on the first cloned Bactrian camel calf produced



Fig 4. Milestone in camel reproductive biotechnology – first camel calf born via embryo transfer in the newly developed centre, achieved through intensive research and fieldwork in a short span, leveraging prior bovine experience and expertise.

My work with camels has become not just a career but a passion—one that blends the latest in reproductive biotechnology with the age-old traditions of camel breeding in the desert (Fig 7).

Though my path may have been an unexpected one, it has been deeply fulfilling. Today, I proudly stand as a student of the desert giants, learning from these resilient animals while striving to contribute to the scientific understanding and conservation of camels. The journey continues, and I can only look forward to what lies ahead in this exciting and ever-evolving field.

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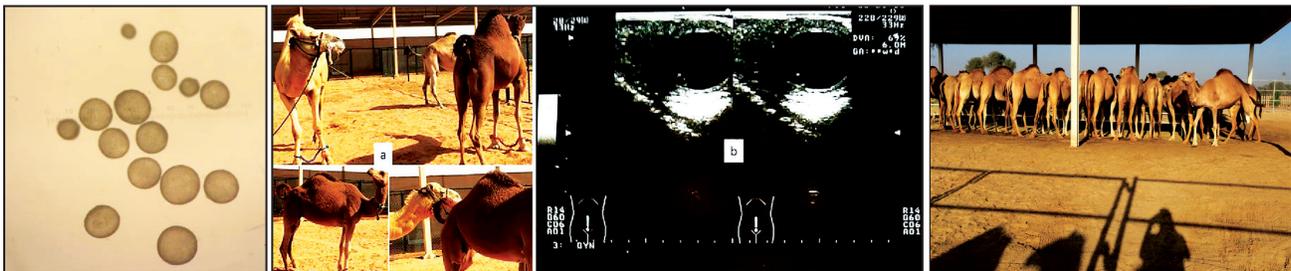


Fig 5. Advancing camel reproductive biotechnology at Dubai's Reproductive Biotechnology Centre – from embryo production and early pregnancy diagnosis by male parade on the seventh day after embryo transfer to subsequent ultrasound confirmation – enhancing the outcomes of MOET and SCNT techniques.



Fig 6. Honoured to share a moment with His Highness Sheikh Hamdan bin Mohammed bin Rashid Al Maktoum, Crown Prince of Dubai and Deputy Prime Minister of UAE – a true animal lover and inspiring leader who beautifully bridges innovation and tradition.

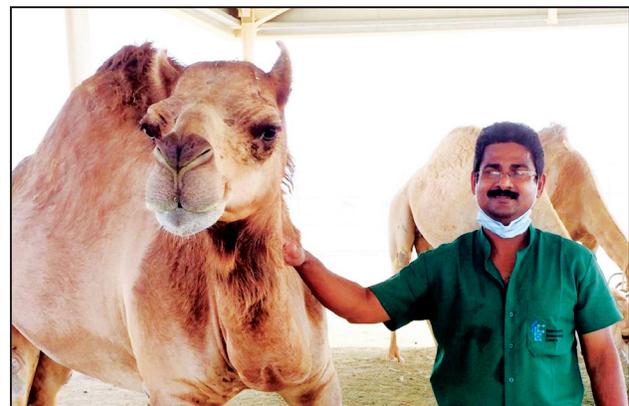


Fig 7. From the lush fields of Kerala to the golden dunes of the UAE, my journey with camels has turned childhood curiosity into a lifelong passion—where science meets desert tradition.

through inter species somatic cell nuclear transfer, a project that holds promise for preserving endangered camel species (Vettical *et al*, 2016; Wani *et al*, 2017a, 2017b; Wani *et al*, 2018; Vettical *et al*, 2019; Hong *et al*, 2020; Vettical and Wani, 2021a, 2021b).

and Minister of Defence and Deputy Prime Minister of the United Arab Emirates, for his visionary leadership, continued support, and funding. I also extend my gratitude to Dr. Ali Redha, Director General, and Dr. Wani NA, Scientific Director, for their guidance and encouragement. I am deeply thankful to my mentors, who have profoundly

Key Achievements & Measurable Results in Cattle and Camel Embryo Transfer Biotechnology.

Program	Period	Key Procedures	Output/ Results
MOET Cattle	1991-2010	350+ Superovulations & Flushings	2,500+ Embryos
		700+ Embryo Transfers	350+ Pregnancies
MOET Camels	2011-2018	70+ Superovulations & Flushings	400+Embryos
		350+ Embryo Transfers	175+ Pregnancies
OPU Camels	Since 2013	1000+ OPU Procedures	10,000+ Usable quality Oocytes Retrieved
Cloned Embryo Transfer	Since 2013	2,800+ Embryo Transfers	250+ Pregnancies

influenced and inspired my career in reproductive biotechnology, particularly Dr. Abraham Mathew (M.V.Sc, FRCVS), a renowned expert in large-scale frozen semen technology in India, under whom I began my career, and Dr. Peter Reichert, whose mentorship was pivotal in refining my expertise in embryo transfer and allied technologies. I also thank Dr. V. Vijayakumaran, Chairman of the Advisory Committee during my post-graduate studies, for his guidance. I extend my heartfelt gratitude to Dr. Tarun Kumar Gahlot for his unwavering support and encouragement, which not only enabled me to serve as a member of the Editorial Board of the Journal of Camel Practice and Research but also made the publication of this article possible. Finally, I extend heartfelt appreciation to all my supportive staff members, without whom these achievements would not have been possible.

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Data Availability

The data generated during the study can be requested from the corresponding author.

Conflict of Interest

The author declare no conflict of interest.

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