COLLECTION | ANNOUNCEMENT
https://doi.org/10.1071/RDv37n1_PA
Reproduction, Fertility and Development

Recipient of the 2025 IETS Pioneer Award: Dr Peter J. Hansen

Peter J. Hansen (Pete) was born 23 November 1956, in Oak Park, Illinois, a suburb of Chicago. Encouraged by his parents, Peter A. and Cathleen (née Forristal) Hansen, he developed an interest at an early age in both science and animal agriculture. A few summers on the farm of his cousin, John Joe Kavanaugh, in County Wexford, Ireland, cemented his love for all things related to livestock. He attended the University of Illinois Urbana-Champaign and received the BS in agricultural sciences in 1978. While at the University of Illinois, he was inspired by several professors, including P. J. Dziuk and F. C. Hinds, but particularly by C. N. Graves in the Department of Dairy Science. Graves gave him the opportunity to conduct a series of undergraduate research projects on topics as diverse as regulation of vaginal contractions in cows (with Asgi Fazleabas, who was an MS student at the time), advancing puberty in rats, and freezing mouse embryos. Freezing embryos was no problem; getting them to survive was another story.

By his sophomore year at the University of Illinois, Hansen knew he wanted to become a reproductive biologist. He entered the laboratory of E. R. Hauser in 1978 in the Department of Meat and Animal Sciences at the University of Wisconsin–Madison, where he obtained MS (1980) and PhD (1983) degrees in the endocrinology-reproductive physiology program. Hauser taught him how to be a scientist; some of the philosophy that he imparted is described by Hansen (2023*a*). While a graduate student, he conducted research on puberty and the postpartum anestrous period in beef cattle. His first refereed scientific publication as first author described how photoperiod altered regulation of LH and FSH secretion by estradiol in prepubertal heifers (Hansen *et al.* 1982). Hauser's laboratory was the first to delineate how photoperiod could modify reproductive function in the cow despite it not being a seasonally-breeding species (Hansen 1985).

A dazzling guest seminar at Wisconsin by Fuller Bazer on embryo-maternal communication led Hansen to apply for a postdoctoral position at the University of Florida. He was accepted and spent 1.5 years in the laboratories of R. M. Roberts and F. W. Bazer. As a postdoc, Hansen conducted research on the function and steroidal regulation of uterine secretory proteins in sheep and pigs as well as on aspects of the biology of conceptus interferons. The atmosphere at the University of Florida was heady in those days, with faculty in animal science, dairy science, obstetrics and gynecology, and veterinary medicine working closely together to elaborate principles of pregnancy biology and with scientists from around the world visiting to hear about the latest discoveries. Among other things, Hansen learned the importance of collaboration, camaraderie, and openness for success in science. It was while a postdoc that Hansen began a collaboration with W. W. Thatcher, a previous Pioneer Awardee. The relationship continues to this day.

In 1983, Hansen thought that he would probably return eventually to the midwestern United States. However, the allure of the academic atmosphere at the University of Florida proved compelling, and he would go on to spend the bulk of his career at the university. His postdoc was cut short when he took an academic position in the Department of Reproduction in the College of Veterinary Medicine in the fall of 1984. There, he studied the reproductive immunology of the mare with A. C. Asbury and M. M. Le Blanc. He then seized a unique opportunity in the Department of Dairy Science when the position previously held by R. J. Collier became open. With encouragement from Collier, Thatcher, Hauser, and others, he applied for and obtained the post. He has been in that position ever since, as the department

(2025) Recipient of the 2025 IETS Pioneer Award: Dr Peter J. Hansen. *Reproduction, Fertility and Development* **37**, RDv37n1_PA.
doi:10.1071/RDv37n1_PA

itself eventually merged with other departments to become the Department of Animal Sciences.

When starting in dairy science, there were two main areas of focus of Hansen's research. Following up on studies he conducted as a postdoc and faculty member in the College of Veterinary Medicine, and largely using the sheep as a model, Hansen identified some of the mechanisms by which progesterone regulates immune function in the uterus. A second area of research was infertility in cattle caused by heat stress. It was this focus that eventually led Hansen to develop a research program focused on the preimplantation embryo. Hansen showed that the preimplantation embryo is initially very sensitive to elevated temperature in the first few cleavage stages but then becomes resistant to elevated temperature as it advances in development. Based on this finding, Hansen and his colleagues W. W. Thatcher and M. Drost demonstrated that effects of heat stress on fertility could be largely eliminated by embryo transfer.

The Hansen laboratory also demonstrated that there is genetic variation in embryonic resistance to heat shock. This finding set in motion a series of research projects to identify genetic variants that cause increased resistance to heat shock at the cellular level (for example, mutations in *HSPA1L*) and the whole animal level. Hansen and colleagues, including T. A. Olson and T. S. Sonstegard, have shown that a mutation in the prolactin receptor gene (i.e. the SLICK haplotype) identified in Senepol cattle can be incorporated into Holsteins to increase ability to regulate body temperature and decrease seasonal variation in milk yield. Hansen has produced registered Holstein bulls carrying the slick gene; slick Holstein bulls marketed around the world mostly derive from these founder animals. Gene-edited slick animals generated by Acceligen are now also being marketed.

The potential importance of embryo transfer for improving fertility during heat stress resulted in research directed toward enhancing the efficiency of *in vitro* production of embryos. See Hansen (2023*b*) for his views that the *in vitro* produced embryo has the potential for becoming a common assisted reproductive technology in cattle production. Hansen's work with the bovine embryo was made possible by a sabbatical in 1993 in the laboratory of W. A. King at the University of Guelph. It was King and his laboratory members who taught him procedures for in vitro production of embryos.

Much effort has been spent identifying maternal cell-signaling molecules that act on the preimplantation embryo to enhance its potential for survival. Hansen coined the term 'embryokines' to refer to these molecules (Hansen *et al*. 2014). One impediment to evaluate embryo competence for survival after embryo transfer is the large number of transfers required to conduct experiments with sufficient power to detect differences in survival. Recently, work with a group including P. Lonergan, M. B. Rabaglino, and M. Hoelker has resulted in the identification of gene markers whose transcript abundance is predictive of an embryo's competence for survival.

Hansen is currently conducting research on molecules in the microenvironment of the preimplantation embryo that can program postnatal phenotype. He was one of the first to demonstrate that developmental programming can occur in the preimplantation period in cattle. The most important finding has been that addition of the methyl donor choline to culture medium of bovine embryos can result in birth of calves with increased weaning weight. Thus, the efficiency and sustainability of beef production can be enhanced by optimizing the environment of the early embryo.

Hansen often states that his accomplishments as a scientist have been dependent on the students, postdocs, and visiting scientists in his laboratory. A total of 33 PhD and 25 MS students have completed degrees in his laboratory. In addition, 16 postdoctoral scientists have worked in his group. He has hosted more than 50 visiting scientists. Many past members of his laboratory remain colleagues today. Collaboration with faculty at Florida and elsewhere has also enhanced his capacity for research. Hansen is kept grounded and supported by his wife Nancy, daughter Meghan, and son-in-law Kristian Nitsch.

References

Hansen PJ (1985) Seasonal modulation of puberty and the postpartum anestrus in cattle: a review. *Livestock Production Science* **12**, 309–327. doi:10.1016/0301-6226(85)90131-9

Hansen PJ (2023*a*) Reflections on a career as graduate mentor—from baby steps at Wisconsin to today. *Journal of Animal Science* **101**, skad136. doi:10.1093/jas/skad136

Hansen PJ (2023*b*) Review: Some challenges and unrealized opportunities toward widespread use of the *in vitro*-produced embryo in cattle production. *Animal* **17**(Suppl. 1), 100745. doi:10.1016/j.animal.2023.100745

Hansen PJ, Kamwanja LA, Hauser ER (1982) The effect of photoperiod on serum concentrations of luteinizing and follicle stimulating hormones in prepubertal heifers following ovariectomy and estradiol injection. *Theriogenology* **18**, 551–559. doi:10.1016/0093-691x(82)90187-x

Hansen PJ, Dobbs KB, Denicol AC (2014) Programming of the preimplantation embryo by the embryokine colony stimulating factor 2. *Animal Reproduction Science* **149**, 59–66. doi:10.1016/j.anireprosci.2014.05.017