

Recipient of the 2010 IETS Pioneer Award: Reuben John Mapletoft, DVM, MSc, PhD

Dr Reuben John Mapletoft was born and raised on Little Pipestone Ranch – the family farm near Fort Pitt, Saskatchewan, Canada. He had an interest in animals from an early age – an interest that led him to enrol in the Ontario Veterinary College at the University of Guelph, where he graduated in 1967. He returned to Saskatchewan and became the first intern at the newly formed Western College of Veterinary Medicine (WCVM) at the University of Saskatchewan. In the fall of 1970, after the internship and a brief stint in private practice, Reuben accepted a position in Reproduction at the Veterinary School at Onderstepoort in Pretoria, South Africa. His 3-year experience in South Africa was very productive and formative for young Mapletoft's future in academia – Reuben is fond of regaling us of his memories from that time.

In August of 1973, Dr Mapletoft moved to the USA where he enrolled in the Reproductive Physiology and Endocrinology Program at the University of Wisconsin, under the supervision of Dr O. J. Ginther. Reuben's thesis research on the utero-ovarian vascular pathways in the reproductive systems of several animal species elegantly demonstrated the pathway of hormonal control of luteolysis. One measure of the significance of this work is that it is now the standard citation in text and reference books for veterinary and animal science students in animal reproduction. Reuben earned his MSc (1975) and PhD (1977) degrees in Wisconsin and in 1977 he returned to the WCVM to accept a professorship in the Department of Clinical Studies, where he has remained to this day. In 1998, he became Head of the Department of Herd Medicine and Theriogenology and, in 2002, he added professional consultancy to his professional repertoire as an advisor to the pharmaceutical industry. Dr Mapletoft maintains a half-time appointment with the University of Saskatchewan and is a consultant for Bioniche Animal Health.

Dr Mapletoft has been active in research in reproductive biology and the application of assisted reproductive technologies in cattle for more than 30 years. Reuben's interest in embryo transfer dates back to 1971 when his father was among the earliest importers of Simmental cattle in Canada. In 1976, during his time at the University of Wisconsin, Reuben participated in studies by fellow classmates Drs Bob Rowe and Marcelo Del Campo that resulted in one of the first publications on non-surgical embryo collection procedures. Embryo transfer practitioners at the time were very secretive and tended to learn by trial and error. In 1977, Dr Mapletoft began to systematically address the complexities of embryo transfer by initiating a research program at WCVM – working primarily with problem breeders (no one else wanted them!). Over the next 3 years, he had some spectacular successes and, by his own admission, many more failures. However, he showed that embryo transfer procedures offer important alternatives in the diagnosis, treatment and salvage of reproductive function in problem cows.



During the late 1970s, Dr Mapletoft also initiated an embryo transfer program at his home farm. This new 'on-farm' technology rapidly garnered the interest of neighbouring breeders, some of which brought cows from as far away as 200 miles to Little Pipestone Ranch for embryo collection and transfer. This was one of the first examples of 'on-farm' collection and transfer of bovine embryos in Canada. It became apparent at that time that the Western Canadian cattle industry needed an 'on-farm' embryo transfer service and, in response, Dr Mapletoft established the Reproduction Research Trust at the University of Saskatchewan. Its primary mandate was to address the demand for embryo transfer and bull fertility services. Revenues from these services were used for post-graduate student support and for research. In short, it was the first on-farm embryo transfer and on-farm embryo freezing service for Western Canadian Beef breeders.

The Reproduction Research Trust provided support for what was to become a very long line of distinguished trainees under Dr Mapletoft's tutelage. The influence of Dr Mapletoft's pioneering work in developing training programs for practitioners, students and post-graduate students, and educational programs for breeders can be felt in almost every corner of the world. As an example, he has conducted embryo transfer courses annually in Saskatoon since 1980, American Association of Bovine Practitioners since 1985 and in Argentina since 1990. Most practitioners of

embryo transfer technology in Western Canada today and hundreds around the world were trained under the supervision of Dr Mapletoft.

Dr Mapletoft is world renowned for his work in the manipulation of ovarian follicular wave dynamics for the purposes of superovulation, oestrus synchronisation and fixed-time breeding in cattle. His pioneer work in establishing protocols that synchronise follicular wave development for the purpose of superovulation has resulted in those protocols becoming the *de facto* standard for clinical use worldwide. He has also been involved with the use of superovulation and *in vitro* fertilisation technology to study oocyte competence and the effect of sperm defects on fertilisation and embryo development. His team has also been researching the use of non-biological additives for the culture of oocytes and embryos, and cryopreservation of spermatozoa, oocytes and embryos. He has patented the use of hyaluronan as a replacement for serum in culture and cryopreservation media, and has developed one of the first practical methods to synchronise oestrous cycles for fixed-time artificial insemination in cattle. More recently, Dr Mapletoft has played a central role in building the University of Saskatchewan's Reproductive Science and Medicine program, the only one in Canada where there is close collaboration between reproduction specialists from the colleges of medicine and veterinary medicine. Reproductive research on animal models has paid dividends in learning how to treat fertility disorders in people.

An enthusiastic mentor, Dr Mapletoft transfers his knowledge and thirst for discovery through training of numerous graduate students. He has contributed more than 300 papers to published conference proceedings in more than 30 countries around the world, and authored more than 130 refereed scientific publications. He was President of the International Embryo Transfer Society (IETS) in 1980, Founding President of the Canadian Embryo Transfer Association (CETA) in 1984 and in 2000 he was awarded status of Founding Member of the Brazilian Embryo Technology Society (SBTE). He was Chairman of the Import/Export Committee of the IETS for 10 years, and in that capacity he helped draft guidelines for inclusion in the Zoo Sanitary Code for the OIE in Paris, France in 1986. He is currently a member of the Certification Committee of CETA and was instrumental in establishing the certification program for embryo transfer practitioners in Canada – a program that has since been imitated by several embryo transfer associations around the world. He is also past-chairman of the Male Evaluation Committee of the Society for Theriogenology.

Dr Mapletoft has received numerous awards including the Saskatchewan order of Merit (2007), DSc (earned) University of Saskatchewan (2005), Honorary Diplomat of the American College of Theriogenology (2006), Agriculture and Agri-Food Canada Gold Harvest Award (2004), Distinguished Researcher Award – University of Saskatchewan (2003), Distinguish Service Award – International Embryo Transfer Society (2000), Industry Leadership Award – Canadian Animal Health Institute (1999), Honorary Life Membership – Canadian Embryo Transfer Association (1998), Visitante Distinguido – Universidad Católica de Córdoba, Argentina (1997), CAAB Award of

Excellence in Genetics and Physiology (1994) and the Canadian Veterinary Medical Association Schering Award (1992).

Dr Mapletoft has a long, distinguished and ongoing career. His work has led to new developments in assisted reproductive technologies to help improve cattle genetics on every continent. In recognition of the significant contributions he has made over the last 35 years, the IETS is proud to award Dr Reuben Mapletoft with the 2010 Pioneer Award.

References

- Bergfelt, D. R., Bo, G. A., Mapletoft, R. J., and Adams, G. P. (1997). Superovulatory response following ablation-induced follicular wave emergence at random stages of the oestrous cycle in cattle. *Anim. Reprod. Sci.* **49**, 1–12. doi:10.1016/S0378-4320(97)00064-X
- Bielanski, A., Schneider, U., Pawlyshyn, V., and Mapletoft, R. J. (1986). Factors affecting survival of deep frozen bovine embryos *in vitro*: the effect of freezing container and method of removing cryoprotectant. *Theriogenology* **25**, 429–437. doi:10.1016/0093-691X(86)90051-8
- Bo, G. A., Pierson, R. A., and Mapletoft, R. J. (1991). The effect of estradiol valerate on follicular dynamics and superovulatory response in cows with syncro-mate-B implants. *Theriogenology* **36**, 169–183. doi:10.1016/0093-691X(91)90376-O
- Bo, G. A., Hockley, D. K., Nasser, L. F., and Mapletoft, R. J. (1994). Superovulatory response to a single subcutaneous injection of follitropin-V in beef cattle. *Theriogenology* **42**, 963–975. doi:10.1016/0093-691X(94)90119-4
- Bo, G. A., Adams, G. P., Pierson, R. A., and Mapletoft, R. J. (1995). Exogenous control of follicular wave emergence in cattle. *Theriogenology* **43**, 31–40. doi:10.1016/0093-691X(94)00010-R
- Colazo, M. G., Kastelic, J. P., and Mapletoft, R. J. (2003). Effects of estradiol cypionate (ECP) on ovarian follicular dynamics, synchrony of ovulation and fertility in CIDR-based, fixed-time AI programs in beef heifers. *Theriogenology* **60**, 855–865. doi:10.1016/S0093-691X(03)00091-8
- Del Campo, M. R., Del Campo, C. H., Donoso, M. X., Berland, M., and Mapletoft, R. J. (1994). *In vitro* fertilization and development of llama (Lama Glama) oocytes using epididymal spermatozoa and oviductal cell co-culture. *Theriogenology* **41**, 1219–1229. doi:10.1016/0093-691X(94)90479-3
- Gonzalez, A., Lussier, J. G., Carruthers, T. D., Murphy, B. D., and Mapletoft, R. J. (1990). Superovulation of beef heifers with follitropin: a new FSH preparation containing reduced LH activity. *Theriogenology* **33**, 519–529. doi:10.1016/0093-691X(90)90509-R
- Lindsell, C. E., Murphy, B. D., and Mapletoft, R. J. (1986). Superovulatory and endocrine responses in heifers treated with FSH-P at different stages of the oestrous cycle. *Theriogenology* **26**, 209–219. doi:10.1016/0093-691X(86)90025-7
- Malhi, P. S., Adams, G. P., Mapletoft, R. J., and Singh, J. (2007). Oocyte developmental competence in a bovine model of reproductive aging. *Reproduction* **134**, 233–239. doi:10.1530/REP-07-0021
- Mapletoft, R. J. (1982). Superovulation and recovery of ova from the bovine. In 'Owners and Managers Workshop – VIII Annual Meeting of IETS, Denver, USA'. p. 37. (International Embryo Transfer Society: Laporte, CO.)
- Mapletoft, R. J., and Ginther, O. J. (1975). Adequacy of the main uterine vein and the ovarian artery for uterine induced luteolysis in the ewe. *Am. J. Vet. Res.* **36**, 957.
- Mapletoft, R. J., Del Campo, M. R., and Ginther, O. J. (1976). Local venoarterial pathway for uterine induced luteolysis in cows. *Proc. Soc. Exp. Biol. Med.* **153**, 289.

- Mapletoft, R. J., Pawlyshyn, V. P., and Johnson, W. H. (1984). Superovulation in the cow using a syncromate-B ear implant. In 'Proceedings of the 13th Congress on Diseases of Cattle, Durban, RSA'. pp. 897–901. (South African Veterinary Association: Pretoria.)
- Martinez, M. F., Adams, G. P., Kastelic, J. P., Bergfelt, D. R., and Mapletoft, R. J. (2000). Induction of follicular wave emergence for estrus synchronization and artificial insemination in heifers. *Theriogenology* **54**, 757–769. doi:10.1016/S0093-691X(00)00388-5
- Miller, D. M., Hrudka, F., Cates, W. F., and Mapletoft, R. J. (1982). Infertility in a bull with a nuclear sperm defect: a case report. *Theriogenology* **17**, 611–621. doi:10.1016/0093-691X(82)90059-0
- Murphy, B. D., Mapletoft, R. J., Manns, J., and Humphrey, W. D. (1984). Variability in gonadotrophin preparations as a factor in the superovulatory response. *Theriogenology* **21**, 117–125. doi:10.1016/0093-691X(84)90311-X
- Nasser, L. F., Adams, G. P., Bo, G. A., and Mapletoft, R. J. (1993). Ovarian superstimulatory response relative to follicular wave emergence in heifers. *Theriogenology* **40**, 713–724. doi:10.1016/0093-691X(93)90207-L
- Palasz, A., Alkemade, S., and Mapletoft, R. J. (1993). The use of sodium hyaluronate in freezing media for bovine and murine embryos. *Cryobiology* **30**, 172–178. doi:10.1006/CRYO.1993.1016
- Palasz, A. T., Gustafsson, H., Rodriguez-Martinez, H., Gusta, L., Larsson, B., and Mapletoft, R. J. (1997). Vitriification of bovine IVF blastocysts in an ethylene glycol/sucrose solution and heat stable plant extracted proteins. *Theriogenology* **47**, 865–879. doi:10.1016/S0093-691X(97)00042-3
- Thundathil, J., Palasz, A. T., Barth, A. D., and Mapletoft, R. J. (1998). Fertilization characteristics and *in vitro* embryo production with bovine sperm containing multiple nuclear vacuoles. *Mol. Reprod. Dev.* **50**, 328–333. doi:10.1002/(SICI)1098-2795(199807)50:3<328::AID-MRD9>3.0.CO;2-L