CSIRO PUBLISHING

Reproduction, Fertility and Development, 2020, **32**, xix–xx
https://doi.org/10.1071/RDv32n2_PA

Recipient of the 2020 IETS Pioneer Award: Eric Palmer, Ingénieur Agronome

Eric Palmer was born in Paris, France, on March 6, 1947. He received his first horse at age 11, and has been training, riding and showing horses since. In 1968, Dr Palmer earned the Engineer of Agronomy (Ingénieur Agronome) degree from the Institut National Agronomique Paris-Grignon, now incorporated in the prestigious AgroParisTech. He joined the Corps of the French State in the National Institute of Rural Engineering, Water and Forestry, to which the French National Studs belonged, in 1970. Dr Palmer began working for the National Studs at the Institut National de la Recherche Agronomique (INRA) at Nouzilly in 1971, under the leadership of renowned reproductive scientist François du Mesnil du Buisson. Dr Palmer starting research on equine reproductive physiology and biotechnology in 1971, and went on to found the Equine Reproduction research unit at INRA in 1981.

Dr Palmer's early work concentrated on mare endocrinology and synchronisation of oestrus and ovulation. Dr Palmer's father was a physician working in obstetrics and gynaecology, who in fact did research with Dr du Mesnil du Buisson on animal models for celioscopy. Through his father, Dr Palmer became aware of the early use of ultrasonography for reproductive evaluation in women. He applied this to the horse, publishing, with coauthor Marc-Antoine Driancourt, the first report on transrectal ultrasonography of the reproductive tract in the mare (Palmer and Driancourt 1980). This procedure went on to revolutionise reproductive research and clinical breeding management in the mare, and to later serve as the cornerstone of more advanced techniques such as transvaginal ultrasound-guided follicle aspiration.

Drs. Palmer and Driancourt went on to explore photoperiodism in the mare, establishing that a pulse of light could serve as well as did continued light to stimulate the onset of ovarian activity in anestrus mares (Palmer *et al*. 1982), a finding that had widespread translation into clinical equine breeding management. With his co-workers, Dr Palmer explored the previously debated effects of hCG administration on antibody production and loss of ovulatory function in mares (Bour and Palmer 1984) and developed alternatives to hCG treatment for stimulation of ovulation in mares (Duchamp *et al*. 1987). Dr Palmer's equine unit at INRA also did pioneering work on preservation of stallion semen, including methods for both cooling and freezing. The semen extenders developed by INRA during that time, notably INRA96 (Batellier *et al*. 1998) have become among the most widespread semen extenders used in the equine industry. With Daniel Lagneaux, Dr Palmer did some of the first work evaluating embryo transfer in pony mares, including the first report on use of anestrus, hormone-treated mares as embryo recipients (Lagneaux and Palmer 1993). With Jean-François Bruyas and others, the group performed some of the first critical studies on the effects of freezing on the equine embryo (Bruyas *et al*. 1993). From these publications, it is apparent that essentially all of the French scientists of that generation who have specialised in equine reproduction trained with Dr Palmer.

Working with Dr Jaqueline Bézard and other colleagues, Dr Palmer started research on equine oocytes, first working with methods for recovery of oocytes from live mares by follicular puncture through the flank (Palmer *et al*. 1987). Using this technique, they established that the equine oocyte was in metaphase II within the preovulatory follicle before ovulation (King *et al*. 1987). This was a breakthrough finding, as it presented data to correct textbook descriptions of the time that stated that equine oocytes were ovulated as primary oocytes.

Continuing with his research on equine oocytes, in 1991, Dr Palmer was senior author on the landmark paper reporting the first successful equine *in vitro* fertilisation resulting in a live foal (Palmer *et al*. 1991). This work was awarded the Hamilton-Thorn Award for scientific advances at the International Symposium on Equine Reproduction (ISER) V in Deauville, France, in 1990. Dr Palmer's presentation of the paper was additionally memorable because it was accompanied by a visit from the foal itself, along with its recipient dam, into the lecture hall at the closing ceremonies of the meeting! Notably, the foal, along with a foal produced via the same IVF techniques from Dr Palmer's group at INRA the next year (Bézard 1992), remain the only two offspring yet produced by conventional IVF in the horse. The reported study incorporated

a massive amount of work, utilising *in vivo*-matured oocytes collected from the single stimulated preovulatory follicle of live mares (211 follicle aspiration attempts) and investigating a wide variety of potential methods for sperm capacitation. The group achieved success only with sperm treated with the calcium ionophore A23187, although the fertilisation rate was low (0–20%). Eight early embryos were transferred surgically to the oviducts of recipient mares, resulting in one pregnancy, which went normally to term. The methods and results of this study continue to be uniquely topical, as conventional IVF remains inefficient in the horse.

Dr Palmer's equine unit at INRA went on to investigate methods for follicle aspiration via TVA, establishing some of basic parameters for its performance, and the first repeatable oocyte recovery rates using this technique (Duchamp *et al*. 1995). Notably, this group established the timing of *in vivo* oocyte nuclear maturation after gonadotropin stimulation (Bézard *et al*. 1997), as well as evaluating factors affecting maturation of equine oocytes *in vitro* (Goudet *et al*. 1997). In one of the only investigations reported on the mechanics of ovulation in the horse, Dr Palmer established that follicular fluid could be essentially completely removed from the equine preovulatory follicle, yet the oocyte could still be ovulated and fertilised (Palmer *et al*. 1997). Dr Palmer's wide-reaching curiosity is evident by the expansive nature of publications coming from the equine unit at INRA during his tenure, extending from sperm to oocyte to embryo to endocrinology, and ranging from in-depth molecular studies to research on basic clinical questions, for example 'Which insemination fertilises when several successive inseminations are performed before ovulation?' (Clement *et al*. 2000).

In 1996, Dr Palmer left INRA to work with the French National Studs, organising the semi-privatisation of the system and going on to manage the Studs' 1200 stallions. In 2002, recognising the potential of somatic cell nuclear transfer as a tool in the equine industry, Dr Palmer formed a private company, Cryozootech, to bank somatic cells from genetically valuable horses, largely geldings that excelled in competition. He contacted and collaborated with laboratories performing equine nuclear transfer to produce some of the first cloned foals (Palmer *et al*. 2008). He has since closed the company and focuses on assessing the economic and genetic value of including cloned horses in breeding programs (Reis and Palmer 2010). He has applied this to his own horses, as he and his family now compete on offspring of several clones of champion horses.

Dr Palmer has been active in the International Committee for the Symposia on Equine Reproduction, being elected as a member (1988–2000) and then Chairman (1992–1996) of the Committee. He organised ISER V, as well as the 4th International Symposium on Equine Embryo Transfer. Dr Palmer has continued to garner honors, including being named Officier de l'Ordre du Mérite Agricole, Gold medal of the National Academy of Agriculture, and being elected as a permanent member of the National Academy of Agriculture in 2018.

References

Batellier, F., Duchamp, G., Vidament, M., Arnaud, G., Palmer, E., and Magistrini, M. (1998). Delayed insemination is successful with a new extender for storing fresh equine semen at 15 degrees C under aerobic conditions. *Theriogenology* **50**, 229–236. doi:10.1016/S0093-691X(98)00130-7

Bézard, J. (1992). *In vitro* fertilization in the mare. Proceedings of the International Scientific Conference on Biotechnics in Horse Reproduction, Agricultural University of Crakow, Poland. p. 12.

Bézard, J., Mekarska, A., Goudet, G., Duchamp, G., and Palmer, E. (1997). Meiotic stage of the preovulatory equine oocyte at collection and competence of immature oocytes for *in vitro* maturation: effect of interval from induction of ovulation to follicle puncture. *Theriogenology* **47**, 386. doi:10.1016/S0093-691X(97)82513-7

Bour, B., and Palmer, E. (1984). Stimulation of seasonally anovulatory pony mares with repeated low doses of hCG. *Proceedings, 10th Int. Congress Anim. Reprod. Artificial Insemination* 310–312.

Bruyas, J. F., Bezard, J., Lagneaux, D., and Palmer, E. (1993). Quantitative analysis of morphological modifications of day 6.5 horse embryos after cryopreservation: differential effects on inner cell mass and trophoblast cells. *J. Reprod. Fertil.* **99**, 15–23. doi:10.1530/JRF.0.0990015

Clement, F., Vincent, P., Mahla, R., Meriaux, J. C., and Palmer, E. (2000). Which insemination fertilizes when several successive inseminations are performed before ovulation?. *J. Reprod. Fertil. Suppl.* **56**, 579–585.

Duchamp, G., Bour, B., Combarnous, Y., and Palmer, E. (1987). Alternative solutions to hCG induction of ovulation in the mare. *J. Reprod. Fertil. Suppl.* **35**, 221–228.

Duchamp, G., Bézard, J., and Palmer, E. (1995). Oocyte yield and the consequences of puncture of all follicles larger than 8 millimetres in mares. *Biol. Reprod.* **52**, 233–241. doi:10.1093/BIOLREPROD/52.MONOGRAPHSERIES1.233

Goudet, G., Bézard, J., Duchamp, G., Gérard, N., and Palmer, E. (1997). Equine oocyte competence for nuclear and cytoplasmic *in vitro* maturation: effect of follicle size and hormonal environment. *Biol. Reprod.* **57**, 232–245. doi:10.1095/BIOLREPROD57.2.232

King, W. A., Bézard, J., Bousquet, D., Palmer, E., and Betteridge, K. J. (1987). The meiotic stage of preovulatory oocytes in mares. *Genome* **29**, 679–682. doi:10.1139/G87-114

Lagneaux, D., and Palmer, E. (1993). Embryo transfer in anoestrus recipient mares: attempts to reduce altrenogest administration period by treatment with pituitary extract. *Equine Vet. J.* **15**, 107–110.

Palmer, E., and Driancourt, M. A. (1980). Use of ultrasonic echography in equine gynecology. *Theriogenology* **13**, 203–216. doi:10.1016/0093-691X(80)90082-5

Palmer, E., Driancourt, M. A., and Ortavant, R. (1982). Photoperiodic stimulation of the mare during winter anoestrus. *J. Reprod. Fertil. Suppl.* **32**, 275–282.

Palmer, E., Duchamp, G., Bézard, J., Magistrini, M., King, W. A., Bousquet, D., and Betteridge, K. J. (1987). Non-surgical recovery of follicular fluid and oocytes of mares. *J. Reprod. Fertil. Suppl.* **35**, 689–690.

Palmer, E., Bézard, J., Magistrini, M., and Duchamp, G. (1991). *In vitro* fertilisation in the horse: a retrospective study. *J. Reprod. Fertil. Suppl.* **44**, 375–384.

Palmer, E., Duchamp, G., Cribiu, E. P., Mahla, R., Boyazoglu, S., and Bézard, J. (1997). Follicular fluid is not a compulsory carrier of the oocyte at ovulation in the mare. *Equine Vet J Suppl* **29**, 22–24. doi:10.1111/J.2042-3306.1997.TB05094.X

Palmer, E., Caillaud, C., Reis, A. P., and Chavatte-Palmer, P. (2008). Efficiency of the different steps of cloning horses: Modelling the number of attempts needed to obtain one healthy foal. In '*Proceedings, 7th International Symposium on Equine Embryo Transfer*'. pp. 28–29. (R&W Communications: Texas.)

Reis, A. P., and Palmer, E. (2010). Expectations and learnings from the inclusion of clones in horse breeding (L'insertion des clones dans l'elevage equin: attentes et enseignement du marche). *Equ'idée (Paris)* **73**, 56–58.