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40th Anniversary Special Issue

Therio-ontology: A personal view of 40 years of farm animal embryo form and function

Keith J. Betteridge*

Department of Biomedical Sciences, Ontario Veterinary College, University of Guelph, Guelph, Ontario, N1G 2W1, Canada

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ABSTRACT

The main purpose of this autobiographical reminiscence of 40 years of embryo research is to provide young theriogenologists with a firsthand account of how career development can depend strongly on early influences that become modified by changing circumstances. With no intention of being didactic, I hope that my experience of coping with enormous changes in techniques and attitudes may be of use to some of those embarking on a further 40 years of change of at least equal enormity.

1. Introduction

One has only to look at the pages of the first volume of *Theriogenology*—on the screen of a computer, pad, or mobile phone—to be reminded of how enormously the journal and its eponymous discipline have changed in 40 years. In 1974, Editor John Kendrick and his pioneering band of 2 consulting and 15 associate editors were soliciting contributions, which is probably why my colleague Douglas Mitchell and I were able to publish our experiences of a mere "24 completed cases" of embryo transfer in cattle at the time when all transfers were done surgically and superovulation with pregnant mare's serum gonadotropin[1] was very much hit or miss [1]. Probably the most enduring part of that article is the acknowledgments section, thanking Mr. L.E.A. Rowson and Dr. R.A.S. Lawson for their help, thereby paying indirect homage to the Agricultural Research Council (ARC) Unit of Reproductive Physiology and Biochemistry, Huntingdon Road, Cambridge, UK—the fount of so much good in the study of embryos and embryo transfer.

Douglas Mitchell (a charter diplomate of the American College of Theriogenologists) and I were employed by the Federal Government at Agriculture Canada's Animal Diseases Research Institute (ADRI), mandated to establish embryo transfer (ET) procedures and then to use them in investigating both the risks of transmitting disease with embryos and the potential of the technique for eliminating those risks [2]. The breadth of that mandate, and the facilities at our disposal, gave us the scope to initiate other studies too, in which the developments of embryos and of theriogenology have intertwined. In response to the invitation of today's Editor-in-Chief of *Theriogenology*, Fulvio Gandolfi, to reminisce about the journal's first 40 years, basing my commentary on two particular articles [3,4], I have been struck by how strongly my years at the ADRI affected my subsequent career. There is seldom the chance to record the socio-scientific equivalent of "developmental origins of health and disease" and so, because my experience might be of interest to colleagues nearer the beginning of their scientific gestations, herein I trace the long-term effects of early influences on just me (n = 1!) during what I have previously described [2] as

* Corresponding author. Tel.: +1 519-824-4120 ext 58258; fax: +1 519-767-1450.
E-mail address: kbetter@uoguelph.ca.

[1] The better term eCG had yet to be adopted

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an "explosive" phase in the development of ET and related procedures.

2. The ADRI years: Cattle

How enjoyable they were—a real manifestation of Carl Hartman's oft-quoted dictum "Research should spell FUN" [5]. There was a sense of improvisation and pioneering as we embarked upon ET, making full use of our veterinary backgrounds in applying surgical techniques developed at the ARC Unit in Cambridge, first to pigs [6] and then to cattle. We produced Canada's first ET calf in May 1972 (Fig. 1A).[2] She was named Tulips, after Ottawa's Tulip Festival that originated around the thousands of bulbs with which Queen Juliana of The Netherlands thanked the city for her refuge during World War II. Our first surgery table was built with four army surplus dentist's chairs by the ever-ingenious Armand Dessureault (who could make anything from anything) and served us well until superseded by an integrated system in which we could perform up to 17 surgeries per day [7]. We put the improved facilities and superb technical help to good use by using surgical ET to proliferate a few Chianina cattle that had been imported into Canada under strict quarantine conditions (Fig. 2), a team effort commemorated in 1974 in bronze castings of a depiction of a 16-cell embryo that my wife, Lois, made in sterling silver by the techniques of chasing and repoussé (Fig. 3).

Another pivotal event of 1974 for me was to travel to Denver, Colorado, to speak at a meeting of a group that became the International Embryo Transfer Society (IETS), the mother ship of ET and related techniques. No history, or even reminiscence, of the past 40 years of *Theriogenology* would be complete without tribute to the journal's early, essential, and long-lasting symbiosis with the IETS.

Surgical embryo recovery and transfer, unthinkable although they may sound now, presented us with one distinct advantage over their nonsurgical equivalents: much more controllable handling of elongating conceptuses that are prone to tangling and fragmentation. Taking

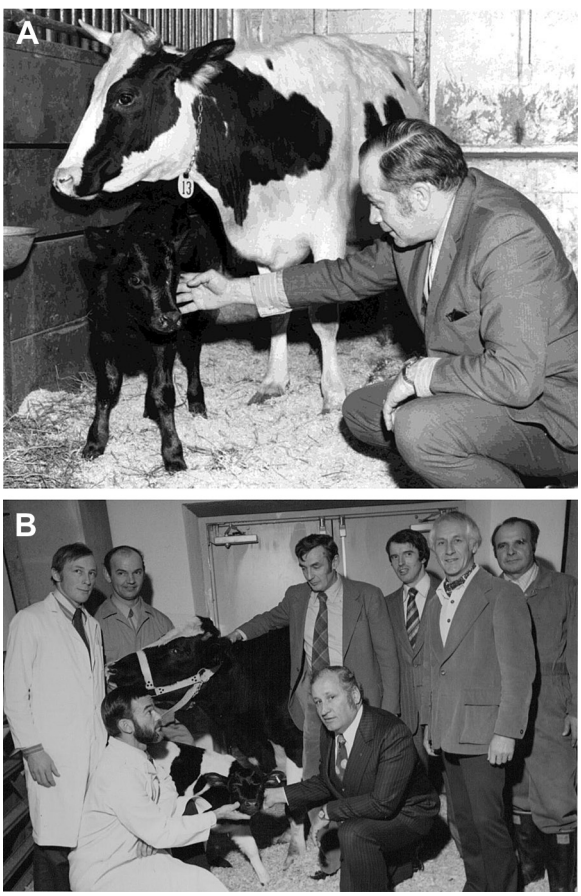

Fig. 1. Two calves and two Canadian ministers of agriculture. (A) Minister C.H. (Bud) Olson with Tulips, Canada's first ET calf born in 1972. (Source: *Two-Mother Calf Admired by Minister*, Ottawa Journal, Agriculture and Agri-Food Canada, 1972. Reproduced with the permission of the Minister of Public Works and Government Services, 2013.) (B) Minister Eugene Whelan (center right) with Eugena Carol, the world's first presexed calf, born on Christmas Day, 1975, surrounded by (clockwise) scientists Keith Betteridge, Geoff Randall, Douglas Mitchell, Bob Eaglesome, and Doug Hare, with attendants Sidney Shearer and Frank at the back.

Fig. 2. How many people did it take to transfer a Chianina embryo, surgically, in 1974? Top. Standing (left–right): Sidney Shearer, Douglas Mitchell, and Yvon Barbeau. Seated: Bob Eaglesome, Geoff Randall, Don Rasmussen, Keith Betteridge, John Shackleton, unidentified student, and Betty Cathcart. Bottom. And then one has to explain the induction procedure to the patient.

[2] But for the inadvertent slaughter of a recipient, the first birth should have been in early July 1971.