

Foreword

Fertility in dairy cows: bridging the gaps

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Dairy cattle are an integral part of agriculture worldwide, providing many products in addition to milk for the human population. The efficient production of these products is of utmost importance and high reproductive performance is absolutely crucial to this. In September 1999, Dr Michael Diskin led a committee (Dr Joseph M. Sreenan, Prof James Roche, Prof Maurice Boland and Dr Diarmuid O'Callaghan) to organize an extremely successful and informative occasional meeting 'Fertility in the High-Producing Dairy Cow', jointly with the British Society of Animal Science (BSAS) in Galway, Ireland, to address the important issue of declining reproductive performance in dairy cattle. The full papers were later published in an occasional publication by BSAS (2001). As discussed by Dr John Robinson in the conference summary, '... delegates, after a starting point of uncertainty about how to deal with the problem [infertility], came away very well informed scientifically and, if perhaps with varying views as to the best way forward, more aware of the multi-disciplinary research and development approach now being used to investigate it'. Dr Robinson concluded his summary by stating 'Reversing this relentless decline in dairy cow fertility, while simultaneously sustaining high yields, is not going to be easy... it is a challenge that will require great interchange of information and ideas between science, practice, research and development. The establishment of contacts and beginning of such interchange has been initiated during this [Galway, 1999] meeting and it is essential that this is sustained.'

Now, exactly 8 years later, it seemed time for those representatives from all disciplines involved in attempting to improve dairy cattle fertility to reconvene. Since 1999, the continued and well-documented decline in dairy cow fertility worldwide (Royal *et al.*, 2000; Lucy, 2001; Mayne *et al.*, 2002; Washburn *et al.*, 2002; Lopez-Gatius, 2003; Swedish Dairy Association, 2005) has prompted new research into diverse aspects of dairy cow reproduction. To name but a few areas and publications, these include aspects such as genetics (Royal *et al.*, 2002a and 2002b; Berry *et al.*, 2003; Haile-Mariam *et al.*, 2003; Philipsson and

Lindhe, 2003; Wall *et al.*, 2003; Holmberg and Andersson-Eklund, 2006; Weigel, 2006; Hayhurst *et al.*, 2007; Petersson *et al.*, 2007; Veerkamp and Beerda, 2007), nutrition (Kadokawa and Martin, 2006; Robinson *et al.*, 2006; Chagas *et al.*, 2007; Friggens and Newbold, 2007; Wathes *et al.*, 2007) Economics (Vargas *et al.*, 2002; Esslemont, 2003; Santarossa *et al.*, 2004; McGuirk *et al.*, 2007), veterinary interventions and management (Refsdal, 2000; Roche *et al.*, 2000; Sheldon *et al.*, 2004; Bertoni *et al.*, 2006; Diskin *et al.*, 2006; Drillich *et al.*, 2006; Mansell *et al.*, 2006; Mee, 2007; Valergakis *et al.*, 2007). It has also prompted the development of new technology and applications in the field. The purpose of this conference and subsequent publications is to provide an update on these activities since 1999 and to provide a forum for 'bridging the gaps' between the different disciplines involved.

Invited and submitted theatre and poster sessions included new, up and coming presenters in addition to keynote speakers from across the globe, recognized as international experts in their field. As was the case at the 1999 meeting, the content is of direct interest to scientists, university lecturers, veterinarians, farm advisors and technical representatives working within the dairy industry as well as many dairy farmers. The following papers are a collection of research published at the conference.

Dobson *et al.* (2008) highlight the factors predisposing to lowered fertility and disrupted oestrus in order to review 'Why it is getting more difficult to successfully AI dairy cows'. The review by Morris and Diskin (2008), considers the current knowledge on embryo growth, development and survival in the cow and how these may be influenced by changes in uterine function and the concentration of systemic progesterone. Leroy *et al.* (2008), continues the investigations into the embryo reviewing a number of possible mechanisms linking negative energy balance to oocyte quality. Furthermore, in the event an embryo is formed after fertilization, the paper investigates whether the quality of early life is impaired. Interestingly, the pre-natal environment is known to have a large impact not only

on foetal development but also health in later life and since its identification in 1986, the developmental origins of adult disease, has been applied to many areas of science. The paper by Gardner *et al.* (2008) reviews specifically for the first time 'Developmental programming of reproduction and fertility in farm animals'.

The average dairy cow survives only three lactations. This severely limits opportunities for on-farm selection of breeding cows in addition to presenting a welfare issue and causing economic loss. Wathes *et al.* (2008) review a range of factors influencing heifer survival and fertility on commercial dairy farms. In their paper titled 'Integration of physiological mechanisms that influence fertility in dairy cows', Garnsworthy *et al.* (2008) review the potential modulating role of additional factors, such as peripheral metabolites, metabolic hormones and locally produced growth factors suggesting that progress towards restoring fertility could be made by an integrated approach that allows for interactions between physiological mechanisms that regulate metabolism and reproduction. Following parturition, contamination of the uterine lumen by bacteria is ubiquitous, and uterine health is impaired in cattle because infection persists. In their paper, Williams *et al.* (2008) discuss the numerous mechanisms underlying uterine disease in cattle from the whole animal to the cell. Finally, developing new research areas in the field of functional genomics, such as epigenetics, RNA interference, variable copy numbers and nutrigenomics, are discussed in the review by Beerda *et al.* (2008), including their promising future value for dairy cow fertility.

The meeting promoted one of the major aims of the BSAS, which is to encourage fruitful exchange of information and ideas between all of those involved in the science and practice of animal production.

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