

## CURRICULUM VITAE

### PERSONAL

Marvin M. Pace  
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Date of Birth: March 11, 1944  
Birthplace: Coalville, Utah  
Married

### EDUCATION

- Ph.D. 1971 University of Minnesota  
Major: Animal Science Minor: Biochemistry  
Thesis: A Study of Cryoprotective Properties of Egg Yolk in Semen
- MS 1968 University of Minnesota  
Major: Animal Science Minor: Biochemistry  
Thesis: The Release of Intracellular Components from the Bovine Sperm Cells and Their Relationship to Fertility
- BS 1966 Utah State University

### PROFESSIONAL EXPERIENCE

- 2007 Retired
- 2002-2007 Senior Scientist, ABS Global, Inc.
- 1998-2001 Senior Scientist, Infigen, Inc.
- 1996-1997 Director of Cryopreservation, ABS Global, Inc.
- 1991-1995 Vice President Production, ABS Global, Inc.
- 1989-1991 Director of ABS Specialty Genetics, ABS Global, Inc.
- 1979-1988 Associate Director of Research, American Breeders Service
- 1971-1979 Research Associate, American Breeders Service

### PROFESSIONAL AFFILIATIONS

- American Dairy Science Association
- American Society of Animal Science
- International Embryo Transfer Society
- Society for Cryobiology
- Society for the Study of Reproduction

## INDUSTRY AFFILIATIONS

- Member on both the Research and Technical Committees of the National Association of Animal Breeders

## PUBLICATIONS

Graham, E.F. and M.M. Pace. 1967. Some Biochemical Changes in Spermatozoa Due to Freezing. *Cryobiology* 4:75-84.

Beisang, A.A., C.H. Mayo, M.M. Pace, R.C. Lillehei and E.F. Graham. 1969. The Rapid Thawing of Extended Semen With Microwaves. In. *Symp. Microwave Power*.

Pace, M.M. and E.F. Graham. 1970. The Release of Glutamic Oxaloacetic Transaminase from Bovine Spermatozoa as a Test Method of Assessing Semen Quality and Fertility. *Biology of Reproduction* 3:140-146.

Crabo, B.G., R.E. Bower, K.I. Brown, E.F. Graham, and M.M. Pace. 1970. Extracellular Glutamic-Oxaloacetic Transaminase as a Measure on Membrane Injury in Spermatozoa During Treatment. *Proc. Int. Fert. Assoc. Current Problems in Fertility*. 1:33-38.

Brown, K.I., B.G. Crabo, E.F. Graham, and M.M. Pace. 1971. Some Factors Affecting Loss of Intracellular Enzymes From Spermatozoa. *Cryobiol.* 8:220.

Bower, R.E., B.G. Crabo, M.M. Pace, and E.F. Graham. 1973. Effects of Dilution and Glycerol on the Release of Glutamic-Oxaloacetic Transaminase from Boar Spermatozoa. *J. Anim. Sci.* 36:319.

Pace, M.M., and E.F. Graham. 1974. Components in Egg Yolk Which Protect Bovine Spermatozoa During Freezing. *J. Anim. Sci.* 39:6, p. 1144-1149.

Pickett, B.W., J.J. Sullivan, W.W. Byers, M.M. Pace, and E.E. Remmenga. 1974. Effect of Centrifugation and Seminal Plasma on Motility and Fertility of Stallion and Bull Spermatozoa. *Fertility and Sterility* 26:2, p. 167-174.

Pace, M.M. 1974. Maximizing Reproductive Efficiency in the Stallion. *Symposium on Equine Reproduction*. 66<sup>th</sup> Annual Meeting of American Society of Animal Science.

Pace, M.M., and J.J. Sullivan. 1975. Effect of Timing of Frozen Stallion Semen Insemination, Numbers Of Spermatozoa and Extender Components on the Pregnancy Rate of Mares. *First International Symposium upon Equine Reproduction in Cambridge, England*. *J. Rep. Fert. Suppl.* 23:115-121.

Pace, M.M., L.L. Peterson, G.A. Van Dellen, E.V. Waterman, R.K. Robbins, and J.J. Sullivan. 1977. Effect of Field Working Storage Upon the Quality of Frozen Bull Spermatozoa Packaged in .5-ml Ampules and .5-ml French Straws. (Abstr.) 69<sup>th</sup> Ann. Meeting Am. Soc. Of Anim. Sci. 486:194

Robbins, R.K., J.J. Sullivan, M.M. Pace, R.N. Berge and F.I. Elliott. 1977. Fertility of Frozen Bull Semen Packaged in .5-ml Ampules and .5-ml French Straws. (Abstr.) 69<sup>th</sup> Ann. Meet. Am. Soc. Of Anim. Sci. 503:202.

- Robbins, R.K., J.J. Sullivan, M.M. Pace, F.I. Elliott, D.E. Bartlett, and P.J. Press. 1977. Timing the Insemination of Beef Cattle. *Theriogenology* 10(2-3) 247-255.
- Pace, M.M., and J.J. Sullivan. 1978. A Biological Comparison of the .5-ml Ampule and .5-ml French Straw Systems for Packaging Bovine Spermatozoa. 7<sup>th</sup> Tech. Conf. on A.I. and Reprod., NAAB. 22.
- Pace, M.M. 1980. Problems Associated in Evaluating Spermatozoa in the Field. 8<sup>th</sup> Technical Conference on Artificial Insemination and Reproduction. 67-70.
- Pace, M.M., and J.J. Sullivan. 1980. Effect of SYNCRO-MATE-B (SMB) and Calf Separation on Beef Cattle Estrus and Pregnancy Rates. (Abstr.) 72<sup>nd</sup> Ann. Meet. Am. Soc. Of Anim. Sci. 499-312.
- Pace, M.M. 1980. Fundamentals of Assay of Spermatozoa, 9<sup>th</sup> Inter. Congress on Ani. Repro. And A.I., Madrid, Spain., Vol. 1, p. 133-146.
- Pace, M.M., J.J. Sullivan, F.I. Elliott, E.F. Graham, and G.H. Coulter. 1981. Effect of Thawing Temperature, Number of Spermatozoa, and Spermatozoal Quality on Fertilizing Capacity of Bovine Spermatozoa Packaged in .5-ml French Straws. *J. Anim. Sci.* 53(3) 693-701.
- Lorton, S.P., A.S.H. Wu, M.M. Pace, W.G. Parker, and J.J. Sullivan. 1983. Fine Structural Abnormalities of Spermatozoa From a Sub-fertile Bull: A Case Report. *Theriogenology*, 20:585-599.
- Lorton, S.P., M.M. Pace, and J.J. Sullivan. 1984. Evaluation of Two Seminal Collection Regimes for Mature Holstein Bulls. *J. Animal Science*, 58(1) 1-5.
- Lorton, S.P., M.M. Pace, and J.J. Sullivan. 1984. Determination of Spermatozoal Concentration in Initially Extended Bovine Semen. 10<sup>th</sup> Inter. Congress Animal Reprod. and Artificial Insemination, University of Illinois.
- Pace, M.M., S.P. Lorton, and J.J. Sullivan. 1984. The Use of Prebreeding Heat Detection in a Synchronization Program. 10<sup>th</sup> International Congress on Animal Reproduction and Artificial Insemination. University of Illinois. III:340.
- Pace, M.M., and Maki-Laurila, M.V. 1984. Use and Significance of Basic Laboratory Equipment. Proceedings 10<sup>th</sup> Technical Conference on A. I. and Reproduction, NAAB. 71-73.
- Pace, M.M. 1985. What Makes A.I. and Synchronization More Profitable? Proceedings of the Annual Conference on Artificial Insemination and Embryo Transfer in Beef Cattle, NAAB and IETS. 28-32.
- Garner, D.L., D. Pinkel, L.A Johnson, and M.M. Pace. 1986. Assessment of Spermatozoal Function Using Dual Fluorescent Staining and Flow Cytometric Analyses. *Biology of Reproduction*, Vol. 34. 127-138.
- Howard, T.H., and M.M. Pace. 1988. Seminal Evaluation and Artificial Insemination. Fertility and Infertility In Veterinary Practice, 4<sup>th</sup> Edition, J.S. Laing, W.I.B. Morgan, W.C. Wagner, Eds. 39-52.
- Pace, M.M. 1994. Implications of Sexed Semen on the Beef Industry. In Factors Affecting Calf Crop Edited by M.J. Fields and R.S. Sand.
- Pace, M.M. 1997. A Quest for the Highest Quality Semen. 9 Meeting Nazionale Studio Della Efficienza Riproduttiva Degli Animal: Di Interesse Zootecnico.

Correa, J.R., M.M. Pace and P.M. Zavos. 1997. Relationships Among Frozen-Thawed Sperm Characteristics Assessed Via the Routine Semen Analysis, Sperm Functional Tests, and Fertility of Bulls in an Artificial Insemination Program. *Theriogenology*. 48:721-731.

Parrish, J.J., G.C. Ostermeier, and M.M. Pace. 1998. Fourier Harmonic Analysis of Sperm Morphology. *Proceedings of the 17<sup>th</sup> Technical Conf. on Artificial Insemination and Reproduction*. 25-31.

Betthausen, J., E. Forsberg, M. Augenstein, L. Childs, K. Eilertsen, J. Enos, T. Forsythe, P. Golueke, G. Jurgella, R. Koppang, T. Lesmeister, K. Mallon, G. Mell, P. Misica, M.M. Pace, J. Pfister-Genskow, N. Strelchenko, G. Voelker, S. Watt, S. Thompson, and M. Bishop. 2000. Production of Cloned Pigs from In Vitro Systems. *Nature Biotechnology*. 18:1055-1059.

Pace, M.M., M.L. Augenstein, J.M. Betthausen, L.A. Childs, K.J. Eilertsen, J.M. Enos, E.J. Forsberg, P.J. Golueke, D.F. Graber, J.C. Kemper, R.W. Koppang, G. Lange, T.L. Lesmeister, K.S. Mallon, G.D. Mell, P.M. Misica, M. Pfister-Genskow, N.S. Strelchenko, G.R. Voelker, S.R. Watt and M.D. Bishop. 2002. Ontogeny of Cloned Cattle to Lactation. *Biology of Reproduction*. 67(1) pp. 334-339.

Forsberg, E.J., N.S. Strelchenko, M.L. Augenstein, J.M. Betthausen, L.A. Childs, K.J. Eilertsen, J.M. Enos, T.M. Forsythe, P.J. Golueke, R.W. Koppang, G. Lange, T.L. Lesmeister, K. S. Mallon, G.D. Mell, P.M. Misica, M.M. Pace, M. Pfister-Genskow, G.R. Voelker, S.R. Watt, and M.D. Bishop. 2002. Production of Cloned Cattle from In Vitro Systems. *Biology of Reproduction*. 67(1): 327-333.

Walsh, M.K., J.A. Lucey, S. Govindasamy-Lucey, M.M. Pace, and M.D. Bishop. 2003. Comparison of Milk Produced by Cows Cloned by Nuclear Transfer with Milk from Non-Cloned Cows. *Cloning and Stem Cells*. 5(3): 213-219.

Pace, M.M. 2003. Has the Fertilizing Capacity of Bovine Spermatozoa Changed? The 2<sup>nd</sup> Bi-Annual W.E. Peterson Symposium. University of Minnesota, Dept. of Animal Science. pp. 13-21.

#### **Patents:**

Strelchenko, N.S., J.M. Betthausen, G.L. Jurgella, M.M. Pace, M.D. Bishop. 2000. Patent Number US6011197. Method of Cloning Bovines Using Reprogrammed Non-Embryonic Bovine Cells.

Strelchenko, N.S., J.M. Betthausen, G.L. Jurgella, M.M. Pace, M.D. Bishop. 2002. Patent Number US6395958. Method of Producing a Polypeptide in an Ungulate.

#### **Internal Confidential Research Publications:**

Conducted over 300 laboratory experiments on semen physiology and cryopreservation of spermatozoa

Conducted 15 fertility trials