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The use of Partial Least Square (PLS) to explore the importance of in vitro sperm characteristics in the prediction of bull fertility

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Abstract

This study aimed to assess *in vivo* fertility and *in vitro* sperm characteristics of different sires and to identify the important sperm variables for the prediction of conception rate. In the field experiment, multiparous Nelore cows (n=191) from a commercial farm underwent the same timed artificial insemination protocol. Three batches of frozen semen from three Angus bulls were used. The same semen thawing protocol was performed in the laboratory to mimic field conditions. The following *in vitro* sperm analyses were performed: Computer Assisted Semen Analysis, Thermal Resistance Test, Hyposmotic Swelling Test (HOST), assessment of plasma and acrosomal membrane integrity, assessment of sperm plasma membrane stability and of lipid peroxidation by flow cytometry, assessment of sperm morphology and assessment of sperm morphometry and chromatin structure by Toluidine Blue staining. For statistical analyses, Partial Least Squares (PLS) regression was used to explore the importance of various sperm variables in the prediction of conception rate. The following *in vitro* sperm variables were determined to be important predictors of conception rate: total motility (TM), progressive motility (PM), TM after 2 h of thermal incubation (TM_2 h), PM after 2 h of thermal incubation (PM_2 h), Beat Cross Frequency after 2 h of thermal incubation (BCF_2 h), percentage of rapidly moving cells after 2 h of thermal incubation (RAP_2 h), intact plasma membrane evaluated by HOST, intact plasma and acrosomal membranes evaluated by flow cytometry, intact plasma membrane suffering lipid peroxidation, major defects, total defects, morphometric width/length ratio, Fourier_0 and Fourier_2 and chromatin heterogeneity. It was concluded that PLS regression is a suitable statistical method to identify *in vitro* sperm characteristics with important relationship with *in vivo* bull fertility.

Biography

In July 2012, Letícia Zoccolaro Oliveira completed her Ph.D in Animal Reproduction, from São Paulo State University. During the last year of her Ph.D studies, she spent 8 months at Michigan State University working with Dr. J. Richard Pursley in the field of Dairy Cattle Reproduction. At the present time she is a professor of Animal Reproduction and Obstetrics at School of Veterinary Medicine in UNIRP (Rio Preto, SP, Brazil) and she is also starting the project of her postdoctoral at University of São Paulo with Professor Dr. Rubens Paes de Arruda. Nowadays, most of her studies are focused on exploring the importance of in vitro sperm characteristics in the prediction of bull fertility with the aim of understand the “bull effect” commonly found in field and laboratory trials of reproductive programs.