

Identification of seminal parameters predictive of conception rates in Angus and Nelore bulls used in TAI

É Nogueira^{1,2}, W B Rodrigues², C Sanches Silva², E V Costa e Silva², J R Potiens³, J C Borges Silva¹, P Sutovsky⁴

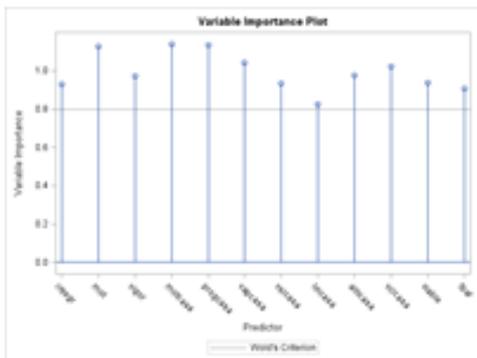
¹Embrapa Pantanal, Corumbá- MS, Brazil, ²Universidade Federal de Mato Grosso do Sul, PostGraduation Program of Veterinary Medicine, Campo Grande-MS, Brazil, ³SELEON, SP, Brazil, ⁴Division of Animal Sciences and Departments of Obstetrics, Gynecology & Women's Health, University of Missouri, Columbia MO 65211, USA, Columbia-MO, USA
eriklis.nogueira@embrapa.br

Application Our data demonstrate that differences in pregnancy rates per artificial insemination (P/AI) are breed-dependent. Seminal parameter analysis has a significantly predictive value for pregnancy in TAI.

Introduction The ability to predict male fertility is highly desirable for bulls used in AI. Timed artificial insemination (TAI) represents a breakthrough in the use of AI in Brazil and other countries. Numerous causes contribute to the wide range of results and/or unsatisfactory pregnancy rates in TAI programs, highlighting the factors inherent in the bovine female in addition to several factors inherent to quality of semen used. Regarding the quality of semen used in AI programs, differences reported in fertility could be attributed to variation in sperm qualitative characteristics. Consequently, the success of bovine AI programs largely depends on the use of good quality semen. When only high fertility bulls are used, better conception rates are achieved, reducing costs of reproductive programs. Thus, some authors have shown that semen used in TAI has great impact on pregnancy rates, and various biomarkers of sperm quality are required to predict the fertility of bull spermatozoa (Oliveira *et al.*, 2013, Holden *et al.*, 2017). Our goal is to correlate different methods of post-thaw semen evaluation with the P/AI of Nelore (zebu) cows subjected to TAI to identify the candidate predictors of conception rate.

Materials and methods P/AI data from 7258 Nelore cows, inseminated in fixed time with protocols using Estradiol, P4, PGF and ECG, with frozen-thawed semen from 35 Angus bulls and 17 Nelore bulls, were used. Pregnancies were evaluated by transrectal ultrasonography 30 days after TAI. Four samples of each semen batch were analysed for physical, functional and morphological aspects, including subjective means [gross motility, thermal resistance test (TRT), morphology, sperm concentration per ml (total and viable)], Computer Assisted Semen Analysis [CASA- total motility, progressive motility, average path velocity (VAP), straight line velocity (VSL), linearity, straight-line path (STR), amplitude of lateral head displacement (ALH) and curvilinear velocity (VCL)], hyposmotic swelling test (HOST), thiobarbituric acid-reactive substances assay (TBARS), assessment of plasma membrane integrity (PI) and mitochondrial membrane potential (JC-1) measured by flow cytometry. Data was analysed using ANOVA (GLIMMIX), Partial Least Squares (PLS) regression with use of Wolds criterion to explore the importance of sperm variables related to fertility (P/AI). Simple regression analysis has been used to correlate variables of interest and pregnancy (P<0.05 being considered significant).

Results The differences between bulls were found in P/AI (P<0.001) and in the pattern of semen quality according to breeds (P<0.05, except for plasma membrane integrity and viable sperm concentration). P/AI in the Nelore group was 55.62%, and in the Angus group 48.06% (P<0.001). The following in vitro sperm variables were determined to be important predictors of P/AI: plasma membrane integrity, gross motility, vigor, CASA variables (total motility, progressive motility, VAP, VSL, linearity, ALH, and VCL, viable sperm concentration, and TBARS (Fig 1). The pregnancy of Nelore cows subjected to TAI was significantly correlated with the following parameters: CASA (Linearity ($R^2 = -0.28$, P<0.001), VAP ($R^2 = 0.207$, P<0.001), VCL ($R^2 = 0.222$, P<0.001), total motility ($R^2 = 0.235$, P<0.001)), gross motility ($R^2 = 0.210$, P<0.001), vigor ($R^2 = 0.240$, P<0.001), TBARS ($R^2 = 0.204$, P<0.001). The other parameters evaluated were not correlated with pregnancy rate.



Conclusion Angus and Nelore bulls differ in P/AI when mated to Zebu cows. While the individual laboratory sperm tests are predictive of pregnancy in TAI, a combination of multiple tests will most likely be needed to increase the accuracy of this prediction. Multiplex test studies correlating seminal parameters and differences in fertility rates observed in TAI and programs are under way.

Acknowledgements – This research was supported by Embrapa (Mais Cria Project) and Fundect-CNPQ

References Holden, S.A., Fernandez-Fuertes, B., Murphy, C., Whelan, H., O’Gorman, A., Brennan, L., Butler, S.T., Lonergan, P., Fair, S. 2017. Relationship between in vitro sperm functional assessments, seminal plasma composition, and field fertility after AI with either non-sorted or sex-sorted bull semen Theriogenology. 87, 221–228
Oliveira, L.Z., de Arruda, R.P., de Andrade, A.F., Celeghini, E.C., Reeb, P.D., Martins, J.P., *et al.* 2013. Assessment of in vitro sperm characteristics and their importance in the prediction of conception rate in a bovine timed-AI program. Animal Reproduction Science. 137, 145–55.

ISSN 2040-4700

MAY 2018

VOLUME 9 PART 2



Advances in Animal Biosciences

Theory to Practice

Proceedings of the International Bull Fertility Conference,
27-30 May 2018, Westport, Ireland



CAMBRIDGE
UNIVERSITY PRESS

Proceedings

Theory to Practice

International Bull Fertility Conference
Castlecourt Hotel, Westport, Mayo, Ireland
27 - 30 May 2018

Advances in Animal Biosciences

This book is part of a series which is a companion to the journal ANIMAL



UNIVERSITY of LIMERICK
OLLSCOIL LUIMNIGH

