subjected to the *in vitro* embryo production process, where embryo production was evaluated for each OPU session. The variables evaluated during the experiment were the quantity and quality of oocytes produced by OPU session. The analysis of the data was performed as follows: the data on oocyte and embryo quantity and quality were analyzed using a General Linear Model (GLM) adjusted to a Poisson distribution. The total number of oocytes recovered by OPU session increased from the third aspiration to the fifth aspiration, obtained an average of 7±1.4 oocytes, increasing to 11.18±1.7 oocytes recovered, respectively (P<0.05). The frequency of aspirations also influenced the quality of the oocytes recovered by OPU, due to the average number of grade I oocytes increased from 3.9±1.0 oocytes recovered in the first aspiration to 7.1±1.4 oocytes in the fifth aspiration (P<0.05). Of the alleged embryos exposed to *in vitro* culture, 35% showed cleavage in the first aspiration, and 58% in the fifth aspiration. Among the cleaved embryos, 16% were at the blastocyst stage in the first aspiration, compared to 33% of blastocysts obtained in the fifth aspiration (P<0.05). In conclusion, the mechanical stimulation provided by the frequency of *in vivo* follicular aspirations in Holstein cows improve the production and quality of oocytes recovered by OPU, and this provides higher oocyte competence for the *in vitro* embryo production process.
Keywords: Follicular aspiration; Oocytes; *In vitro* embryos.

Prevalencia de Haplotipos de Fertilidad en bovinos Holstein Friesian de Uruguay
Prevalence of Fertility Haplotypes in Holstein Friesian cattle from Uruguay

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La raza Holstein Friesian es la raza de leche más numerosa de Uruguay y del mundo, donde se han reconocido 46 enfermedades hereditarias con mutación conocida, la mayoría en menos de 10 años (OMIA, 2024). Veinte de ellas corresponden a haplotipos de fertilidad, es decir, haplotipos con déficits de homocigotas (HH1 al HH17, HH21, HH25 y HH35). Para 10 de ellos (HH1 al HH7, HH13, HH25 y HH35) se ha identificado el gen responsable y la mutación efectora del fenotipo (OMIA 2024). Se ha observado que esas mutaciones en homocigosis recesiva afectan la tasa de preñez y producen un aumento de mortinatos y de abortos espontáneos que agravan la crítica situación de pérdida de fertilidad de la raza. El objetivo de este trabajo fue evaluar la prevalencia de los haplotipos de fertilidad HH1 a HH5 en los catálogos de semen disponibles para su utilización en el país en el año 2023. Asimismo, evaluar la presencia de hembras portadoras para los haplotipos HH1, HH3, y HH4 en una muestra representativa de vacas Holstein, de diferente padre y madre, pertenecientes a varias regiones del país. Los animales de rodeo comercial (n=431) fueron seleccionados mediante registros genealógicos de la Sociedad de Criadores Holando del Uruguay (SCHU). El genotipado fue realizado utilizando array de 64K, contratando el servicio de genotipado de la SCHU. El catálogo de semen se publica anualmente por Mejoramiento y control lechero (MU) y es de libre distribución. Cada toro se analizó utilizando la metodología descrita por Artigas et al. (2020) utilizando las bases de datos abiertas de Holstein Association USA (http://www.holsteinusa.com/), ABS Global (https://bullsearch.absglobal.com/en-us/bull/quick-search), DairyNZ (https://www.dairynz.co.nz/animal/animal-evaluation/bull-team/) y World Wire Sires (http://wwsires.com/). Se identificó en el catálogo de semen una proporción de portadores de 0,85%; 0,42%; 0,21% y 5,7% para los haplotipos HH1, HH2, HH3, y HH5 respectivamente. No se identificaron toros portadores de HH4. En el rodeo comercial, se identificaron vacas portadoras para

HH1 (1,2%) y HH3 (1,2%). No se detectaron hembras portadoras de HH4. En el presente estudio, se demuestra el ingreso de material genético al país de animales portadores para todos los haplotipos de fertilidad analizados, siendo de particular interés el HH5. Asimismo, se demuestra la permanencia de los haplotipos HH1 y HH3 en el rodeo comercial, documentados previamente.

Palabras claves: fertilidad, enfermedades hereditarias, abortos.

The Holstein Friesian breed is the most numerous dairy breed in Uruguay and globally, where 46 hereditary diseases with known mutations have been recognized, most of them in less than 10 years (OMIA, 2024). Twenty of these diseases are associated with fertility haplotypes, which are haplotypes with homozygous deficiencies (HH1-17, HH21, HH25, and HH35). For 10 of these haplotypes (HH1-HH7, HH13, HH25, and HH35), the responsible gene and the mutation affecting the phenotype have been identified (OMIA, 2024). It has been observed that these homozygous recessive mutations affect pregnancy rates and lead to increased stillbirths and spontaneous abortions, exacerbating the critical fertility issues in the breed. The objective of this study was to evaluate the prevalence of fertility haplotypes HH1 to HH5 in the semen catalogs available for use in the country in 2023. Additionally, the study aimed to assess the presence of female carriers of haplotypes HH1, HH3, and HH4 in a representative sample of Holstein cows from different sires and dams across various regions of the country. Commercial herd animals (n=431) were selected using genealogical records from the Sociedad de Criadores Holando del Uruguay (SCHU). Genotyping was conducted using a 64K array, with the SCHU genotyping service contracted. The semen catalog is published annually by Mejoramiento y Control LecheroUruguayo (MU) and is freely distributed. Each bull was analyzed using the methodology described by Artigas et al. (2020) and utilizing open databases from Holstein Association USA (http://www.holsteinusa.com/), ABS Global (https://bullsearch.absglobal.com/en-us/bull/quick-search), DairyNZ (https://www.dairynz.co.nz/animal/animal-evaluation/bull-team/), and World Wire Sires (http://wwsires.com/). A carrier proportion of 0.85% was identified in the semen catalog for HH1; 0.42% for HH2; 0.21% for HH3; and 5.7% for HH5. No bulls carrying HH4 were identified. In the commercial herd, female carriers for HH1 (1.2%) and HH3 (1.2%) were found. No female carriers of HH4 were detected. This study demonstrates the entry of genetic material into the country from carrier animals for all analyzed fertility haplotypes, with HH5 being of particular interest. Additionally, it confirms the persistence of the previously documented haplotypes HH1 and HH3 in the commercial herd.

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