



diagnosis. The reduction in circulating progesterone characteristic of CL regression is temporally associated with a marked decrease in CL perfusion which can be identified using color flow Doppler ultrasonography (CFDU). Thus, CFDU of the CL has the potential to be used for early pregnancy diagnosis in order to improve reproductive efficiency and increase the use of FTAI in beef cattle. A series of experiments were performed to determine the diagnostic performance of CFDU in beef cattle and its utilization in a resynchronization program for FTAI. In experiment 1, beef heifers and cows were submitted to FTAI using a 5-day CO-Synch. At d21, post AI, CFDU of the CL was performed using different settings for Color Flow Mapping (CFM) and Power Doppler (PWD) which differed in pulse repetition frequency (PRF) as follows: CFM720 (720 Hz); CFM960 (960 Hz); CFM1500 (1500 Hz) and PWD960 (960 Hz). Cows and heifers were diagnosed pregnant if color pixels covered >10% of the periphery of the CL, and contained at least two, color internal tracts penetrating towards the center of the CL. Sensitivity and specificity of CFDU were not different ($P>0.50$) between different PRF settings, however, the sensitivity (100%) and specificity (87.7%) for CFM960 was numerically greater. In experiment 2, beef heifers were submitted to FTAI using a 5-day CO-Synch and randomized to receive a CIDR or remain as untreated controls on d15 post AI. Transrectal CFDU of the CL was performed at 15, 17, 20, and 22 d post AI to determine pregnancy status. There was no effect of treatment ($P=0.49$), day ($P=0.99$) or treatment by day interaction ($P=0.99$) on CFDU sensitivity (>95%). Conversely, CFDU specificity was different ($P<0.01$) between days, although no treatment ($P=0.91$) or treatment by day interaction ($P=0.82$) was identified. Specificity was less on d15 (20.5%) and increased to reach its maximum at d22 (74.4%). In experiment 3, we evaluated the reproductive performance of beef cattle submitted to an early resynchronization program for 2nd service using CFDU of the CL for early pregnancy diagnosis. Beef heifers and suckled cows were submitted to a 6-day CO-Synch for 1st service and assigned to begin resynchronization for 2nd service at d16 (Resynch-16) or d25 (Resynch-25). Cattle in the Resynch-16 group received a CIDR at d16 post 1st FTAI. On d22, CIDRs were removed, pregnancy diagnosis was performed using CFDU (CFM960) and non-pregnant cattle were administered PGF. Cattle in the Resynch-25 group received a CIDR and GnRH at d25 post 1st FTAI. On d31 CIDR were removed, pregnancy was diagnosed using B-mode ultrasonography and non-pregnant cattle were administered PGF. In both groups, non-pregnant cattle were submitted to 2nd FTAI and administered GnRH at 60 (heifers) or 72 h (cows) after CIDR removal. First service P/AI at d31 tended to be greater ($P=0.07$) for Resynch-25 (60.9%) than Resynch-16 (53.5%) cows, while there was no difference ($P=0.52$) between groups for heifers (47.2%). Fertility to 2nd service was greater ($P=0.01$) for cows submitted to Resynch-25 (28.6%) than Resynch-16 (10.4%), however, there were no differences ($P=0.25$) between groups for heifers (52.1%). Cumulative P/AI (1st and 2nd service) was greater ($P<0.01$) for Resynch-25 (72.1%) than Resynch-16 (57.0%) in cows and tended to be greater ($P=0.09$) for Resynch-25 (76.5%) than Resynch-16 (66.1%) in heifers. In conclusion, CFDU performed at d22 after FTAI has high sensitivity and moderate to high specificity. Although, use of CFDU and early resynchronization allows for faster re-insemination of non-pregnant cattle, overall fertility is less than with later resynchronization strategies

Buffaloes and Camelids

K17

Development of an alpacas breeding program in Peru

Juan Pablo Gutiérrez García.

UCM, Madrid, Spain.

Alpaca is a South American camelid specie bred mainly to produce noble fiber for the textile industry. Suri and Huacaya are the two genetic types clearly differentiated in their morphology and fiber characteristics, with a higher proportion of the second one due to its higher robustness. The Suri has long and lustrous fibers that hang down against its body, while Huacaya fiber is crimp and grows perpendicular to the skin. Pacamarca is an experimental farm founded to act as a selection nucleus from which basic genetic improvement of alpaca fiber can spread throughout the rural communities in the Peruvian Altiplano. State-of-art techniques in animal science, such as performance recording and genealogical control are applied to demonstrate their usefulness in improvement programs under the Altiplano conditions. Searching for new ways of improving the performance of alpacas both technically and scientifically is continuously carried out while training courses for farmers are organized. Pacamarca has developed useful software (PacoPro) to carry out the integral processing of production and genealogical data. Mating is carried out individually, and gestation is diagnosed via ultrasound. Mechanized shearing is carried out under a specific own developed normative that has been adopted as national norm, so as the animal is protected and the fleece value is maximized. Breeding values predicted from genetic evaluation are used for selection. Selection objective is decreasing or removing the prickling of the alpaca fiber, and decreasing fiber diameter has been used as the main selection criterion during the last decade. Morphological traits have also been partly considered as part of the selection criterion. Genetic parameters have been precisely estimated from the data concerning these and other candidate traits to selection as well as genetic correlations among them. Fiber traits heritabilities estimated were moderate to high, those for morphological traits being moderate, those for reproductive traits low, and those for weight traits high. Genetic correlations among different type of traits were not relevant except those between fiber and weight traits that were high and unfavorable, showing that both productive aptitudes are at odds. Successful genetic trend has been observed by a reduction of fiber diameter from 22.5 to 17.9 microns from 2007 to 2019. Selection objective continues being removing the prickling of the alpaca fiber, but selection criterion has been moved to reducing the percentage of medulated fiber in the last four years. After 20 years of intense selection, the variability among the best 36 sires was still very high concerning different proportions of medullation and fiber diameter, which results promising. Selection work continues while the farm remains involved in high research standards for alpaca genetics.

K18

Assisted reproductive technologies in buffaloes: techniques and outcomes

Pietro Baruselli Sampaio, Lígia Mattos Rebeis, Laís Ângelo De Abreu.

USP, Sao Paulo, Brasil.

Buffaloes present reproductive seasonality and become sexually active with decreasing days (short days) during the late summer to early autumn. The use of assisted reproductive technologies (ART) such as artificial insemination (AI) and embryo transfer (ET) are important alternatives for maximizing the genetic gain and productivity of this species. This review aims to elucidate some aspects of the ART and their outcomes in buffalo production system. The use of AI has already proved to be a reliable technology in increasing genetic progress in buffalo herds. However, the low efficiency of traditional estrus detection system makes this biotechnology difficult to be used in this species. Buffaloes present poor manifestation of the symptoms of estrus, mainly due to low frequency of homosexual behavior. The use of hormonal treatments based on GnRH plus PGF2a (Ovsynch protocol) for timed artificial insemination (TAI) present satisfactory results in cycling buffalo. However, studies have shown that anestrous buffaloes synchronized with Ovsynch have a lower P/AI when compared to cycling buffaloes (20.0 vs. 65.3%). In contrast, research carried out by our group showed that the use of protocols based on P4, E2 and eCG can present favorable P/AI both in the non-breeding (high presence of anestrous) and in the breeding season (66.7 vs. 62.7%), enabling the application of AI throughout the year. ET is an effective technique in accelerating maternal and paternal genetic gain with a consequent increase in herd productivity. In buffaloes, however, the production of *in vivo-derived* (IVD) embryo has low efficiency. Studies carried out by our group show that despite responding to superstimulation (average of 15 follicles > 8 mm at the end of FSH treatment) with a moderate ovulation rate (approximately 60%), the embryo recovery rate (number of embryos and ova recovered per ovulation) is low (34.8%). While IVD present low efficiency in buffalo, *in vitro production* (IVEP) has been studied as an alternative and positive results have been achieved in recent years. Historically, the association of follicular aspiration (OPU) with IVEP presented low results in buffalo when compared to cattle. However, recent studies show that is possible to select buffalo donors using different technologies to improve the ET efficiency. Antral follicle population (AFP) is directly associated with the number of oocytes recovered by OPU for IVEP and the number of embryos produced per procedure. Furthermore, strong relationship between AFP and anti-Müllerian hormone (AMH) was found in buffalo. Studies carried out by our group suggest that AMH can be considered an endocrine marker to predict the performance of IVEP in buffaloes. Recently, superstimulation with FSH prior to OPU has been used successfully in IVEP programs in buffalo, resulting in the increase of total embryos produced per OPU session. We found that FSH treatment prior to OPU increased the proportion of medium and large diameter follicles available for OPU procedure in all buffalo donor categories (heifers, primiparous and multiparous). Furthermore, FSH treatment

increased the proportion of viable oocytes for culture and embryos produced per OPU-IVEP session, suggesting that the use of FSH treatment may be a strategy to improve the efficiency of OPU/IVEP in buffalo. In addition, another fact to be considered when evaluating the efficiency of IVEP is the bull effect. The semen of certain bulls shows high blastocyst rates and improve the efficiency of the ET programs. The use of calves as oocyte donors is an important strategy to accelerate genetic gain by decreasing generation intervals. We compared the embryo production of calves (2 to 4 months) in relation to prepubertal heifers (13 to 15 months) and lactating buffaloes. Although the embryo rate was lower in calves compared to prepubertal heifers and lactating buffaloes, the P/TE was similar between categories (around 35%), which demonstrates the feasibility of this technique for donor buffalo calves. Therefore, synchronization protocols are designed to control both luteal and follicular function and permit fixed-time AI with high pregnancy rates during the buffalo breeding (autumn-winter) and nonbreeding (spring-summer) season. In addition, the application of OPU/IVEP is showing promising results and has become an alternative to superovulation for *in vivo* embryo production. Therefore, nowadays AI and ET can be implemented commercially in buffalo farm to increase the meat and milk production.

K19

Diagnostic and surgical approaches in Italian mediterranean buffaloes in the field

Antonio Natale.

Freelance, Italy.

Objectives: In the last 70 years in Italy, precisely in Campania and in the DOP area “Mozzarella di Bufala Campana DOP” the management and managerial techniques of buffalo breeding (Italian Mediterranean Buffalo) have undergone an intense acceleration, leading to a profound transformation of the buffalo breeding, with a numerical increase and genetic improvement of this species, with appreciable both productive and reproductive results.

It should be noted that the dairy buffalo (Italian Mediterranean buffalo) and the dairy cow belong to the same suborder, but are to be considered as two DIFFERENT SPECIES. For this reason, the approaches to nutrition, reproduction and production require different strategies and operations.

Specifying that buffalo milk represents the most important economic aspect for the farmer, and bearing in mind that the milk itself has dairy processing as its sole destination, it has become necessary in recent years to improve both quantity and quantity in a uniform and substantial way.

To this end, to obtain the protein and lipid increase in milk, a higher yield, it was essential to make a substantial change in the forage / concentrate ratio in the diet, resorting more and more to the concentrates in the ration to meet the needs of the species (Italian Mediterranean buffalo).

This new nutritional concept has led to the appearance of



those metabolic pathologies typical of high-production dairy cattle in the buffalo species (Italian Mediterranean buffalo). That is, technopathies that lead to pathological situations resulting from the alteration of the normal homeostatic balance of the buffalo.

The topics covered by “(BuBoVet srl)” concern the most important pathologies of metabolic origin which have an evolution of surgical interest with the relative operative techniques to be applied in the field: breech pathologies (pododermatitis, phlegmon, white line diseases, etc.)) but above all left and right abomasal dislocation, dilation-dislocation of the cecum, post-partum uterine prolapse, prolapse of the rectum. Furthermore, “(BuBoVet srl)” describes the most commonly used surgical treatments such as: caesarean section, abdominal surgery in heifers and calves, resolution of distal limb fractures in buffaloes (Italian Mediterranean buffalo).

Conclusions: The topics covered by “(BuBoVet srl)” concern the most important pathologies of metabolic origin which have an evolution of surgical interest with the relative operative techniques to be applied in the field: breech pathologies (pododermatitis, phlegmon, white line diseases, etc.)) but above all left and right abomasal dislocation, dilation-dislocation of the cecum, post-partum uterine prolapse, prolapse of the rectum. Furthermore, “(BuBoVet srl)” describes the most commonly used surgical treatments such as: caesarean section, abdominal surgery in heifers and calves, resolution of distal limb fractures in buffaloes (Italian Mediterranean buffalo).

K20

Diagnostic and surgical approached in Italian Mediterranean Buffaloes in the field (II)

Antonio Natale.

Freelance, Italy.

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