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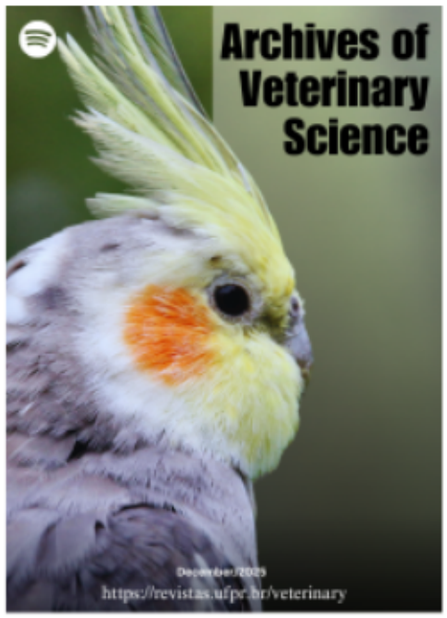

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A preliminary study of the impact of Saccharomyces cerevisiae and Its Cell Wall Supplementation for Dairy cows and the Transfer of passive immunity to calves

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Abstract: Early detection of failed transfer of passive immunity (FTPI) is crucial to prevent neonatal diseases and mortality. This study evaluates the effect of supplementing dairy cows with Saccharomyces cerevisiae and/or yeast cell walls during the last month of pregnancy on passive immunity transfer to calves. Forty-five Montbeliarde dairy cows were divided into four groups. A control group (CON; n=13) with no supplementation, an SC group (n=12) receiving 5 g/day of S. cerevisiae yeast, a YW group (n=10) receiving 5 g/day of yeast wall (20% mannans, 20% β-glucans), and an SCYW group (n=10) receiving a combination of 5 g of SC and 5 g of YW. At calving, colostrum and blood samples were collected to measure calf serum IgG concentration using radial immunodiffusion (RID). The data were compared using a %Brix refractometer. A one-way ANOVA assessed the effects of supplementation type, colostrum quality, and calf sex. A Spearman correlation test evaluated the suitability of the %Brix refractometer as an indirect tool for IgG estimation. The results showed a significant improvement in passive immune transfer with supplementation ($P < 0.001$), particularly in the SC group, which had an average serum IgG concentration of 35.19 g/L, and the SCYW group, with 37.59 g/L, compared to the control group (20.44 g/L). Moreover, 25% of the calves born to non-supplemented cows exhibited failure of passive immune transfer (FTPI), whereas none (0%) of the calves born to cows supplemented with yeast or with the yeast–yeast cell wall mix showed FTPI. Colostrum quality had a significant effect ($P=0.017$), whereas calf sex had no impact. A positive correlation was also found between the IgG values obtained using the refractometer (Brix %) and those determined by the RID reference method. In conclusion, supplementing dairy cows with yeast during the last month of pregnancy enhanced passive immunity transfer to calves. The %Brix refractometer is a viable alternative to the RID method for estimating serum IgG concentration and detecting FTPI cases.

Keywords: Dairy cows; Supplementation; FTPI; Immunoglobulin; RID.

1. Introduction

One of the primary concerns of cattle breeders and veterinarians is to enhance the health of calves during the first few days after calving. In cows, the cotyledonary synepitheliochorial placenta serves as a barrier that prevents the transfer of immunoglobulins during pregnancy (Lichtmannsperger et al., 2023). Calves depend on passive immunity derived from immunoglobulins (IgGs) present in colostrum (Godden et al., 2019). Sufficient transfer of passive immunity (TPI) has long been acknowledged as a key factor influencing calf health and survival up to weaning. The failure of passive immunity transfer (FTPI) results in significant economic losses due to higher rates of illness and death. Moreover, it poses a serious concern for animal welfare (Mee et al., 2013). FTPI may be influenced by various factors, including the duration between calving and colostrum harvesting (Morin et al., 2010), the quality of the colostrum, and cow-specific factors such as parity and genetic traits, such as breed (Reschke et al., 2017; Sutter et al., 2019). Environmental conditions, including the season of birth, temperature, and humidity levels, also affect this relation (Cordero-Solorzano et al., 2022). Therefore, most of the enhancing factors are related to colostrum quality (Cordero-Solorzano et al., 2022).

Several types of supplementation have been used in the last month of pregnancy in dairy cows to improve calf health and, consequently, colostrum quality, thereby reducing the incidence of FTPI (Hue et al., 2021a). Probiotics such as yeast and yeast-derived products have gained particular attention due to their ability to modulate rumen fermentation, enhance nutrient utilization, and strengthen the immune system of dairy cows (Broadway et al., 2015). Additives such as *Saccharomyces cerevisiae* and yeast cell wall components rich in mannan-oligosaccharides and β-glucans have been reported to enhance dry matter intake and improve metabolic stability during the transition period. Furthermore, their immunostimulatory properties may contribute to improved colostrum composition, notably higher immunoglobulin concentrations, which are crucial for the passive transfer of immunity to newborn calves. Therefore, probiotic supplementation during the peripartum period is a promising strategy to enhance both maternal and neonatal health and immune status.

FTPI is identified when a calf's serum IgG concentration or total protein levels drop below specific benchmarks during the initial days following birth. Measuring serum IgG and total protein remains a dependable method for assessing the transfer of passive immunity in calves up to 9 days old (Wilm et al., 2018). The most widely accepted technique for verifying TPI is to measure IgG concentrations in calf serum after colostrum consumption using a radial immunodiffusion assay (RID) (Godden et al., 2019).

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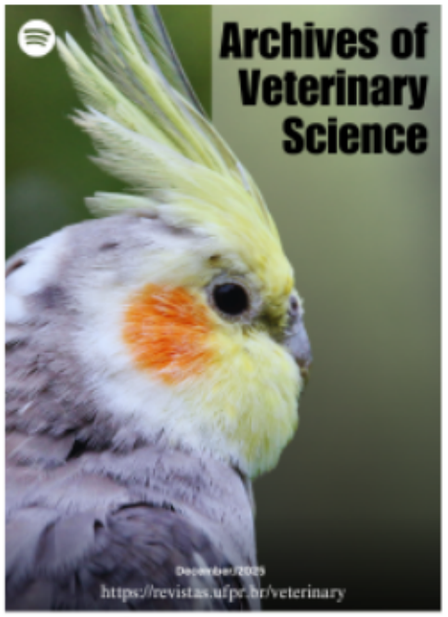

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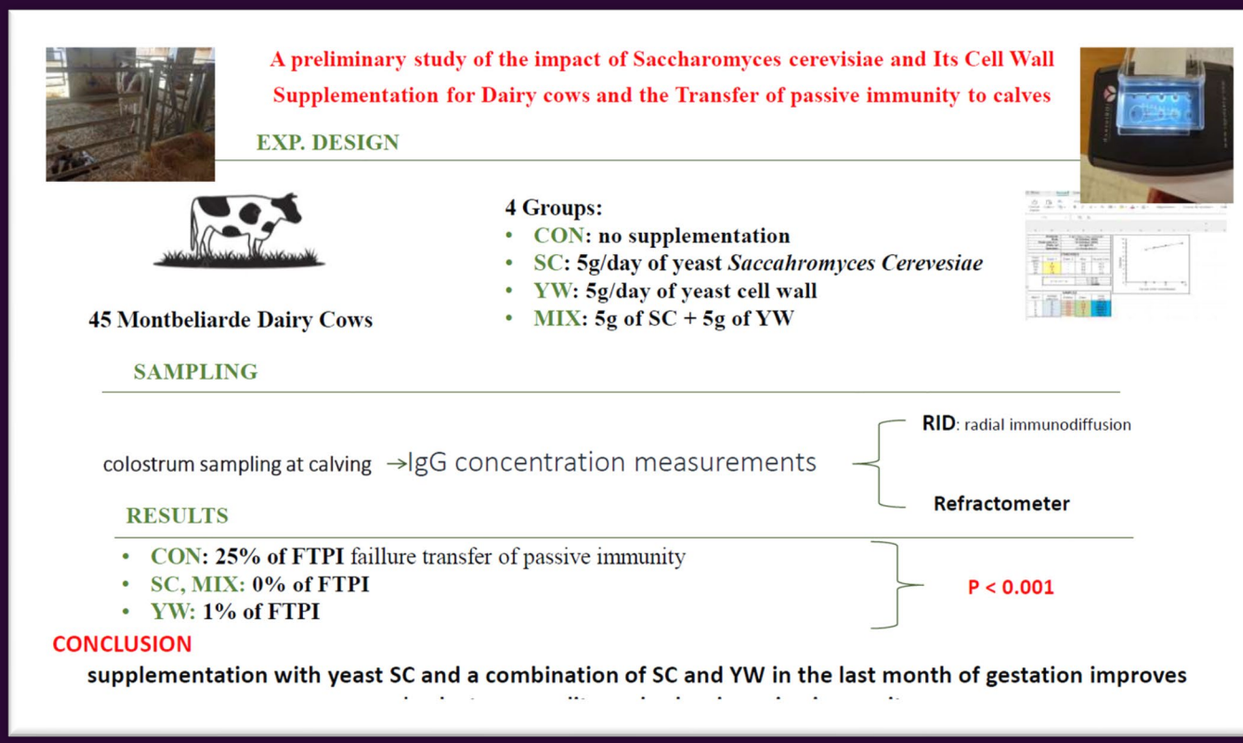
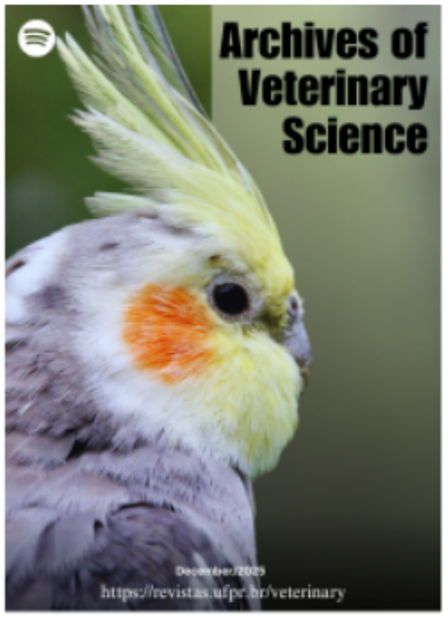
GRAPHICAL ABSTRACT





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