

## Colostrum Immunisation

Ozgul Mukaddes E<sup>1</sup> and Bulent E<sup>2\*</sup>

<sup>1</sup>Department of Agriculture and Rural Development, University of Afyon Kocatepe, Afyonkarahisar, Turkey

<sup>2</sup>Department of Internal Medicine, University of Afyon Kocatepe, Afyonkarahisar, Turkey

**Corresponding author:** Bulent E, Department of Internal Medicine, University of Afyon Kocatepe, Afyonkarahisar - 03200, Turkey, Tel: +90 2722281092; E-mail: elitok1969@hotmail.com

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### Abstract

Consumption of colostrum is associated with passive immunity until the immune system of the calf matures in hypogammaglobulinemic calves. The first 24 h of life is highly crucial and calves must obtain immunoglobulins during the period of macromolecular transport, because the colostrum gradually changes to mature milk during the first two days after birth. During this transition, in milk, although the concentrations of the antibodies decrease, milk volume greatly increases. As long as calves consume colostrum will receive immunological protection against many different viruses and bacteria. Therefore, 4 liters of colostrum is commonly recommended to be fed to large breed calves within the first 12 hours of life.

different proteins, with  $\beta$ -lactoglobulin,  $\alpha$ -lactalbumin, bovine serum albumin (BSA), and immunoglobulins as the major constituents [3].

Nearly all practitioners and their clients are familiar with the three “Q’s” requisite for successful colostrum management:

- Quickness – feed colostrum as soon as possible after birth with a goal of less than 6 hours.
- Quantity – 4 liters of colostrum is commonly recommended to be fed to large breed calves within the first 12 hours of life.
- Quality - Good quality colostrum is commonly indicated as containing >50 g of IgG/liter [4].

Absorption of macromolecules across the intestinal epithelium into circulation is approximately 24 hours after calving by non-selective pinocytosis [5,6]. Maturation of the small intestine, including intestinal cell turnover, increasing abomasa acidity, development of intestinal secretions, and appearance of intra-epithelial digestive vacuoles, begins shortly after birth and the ability of the intestine to absorb macromolecules without digestion is lost by about 24 hours after birth. The exact time of cessation of macromolecular transport (also known as closure) varies by immunoglobulin type but ranges from 20 to 24 hours of age [2]. Cattle placenta does not permit the passive transfer of antibody to the fetus in normally. Therefore, decreases in circulatory IG concentrations are leads to an increase in calf morbidity and mortality. Another important point is mean time to gut closure that occurs 24 h after calving for all the kind of IGs. Morbidity and mortality rates may increase, if calves do not consume a sufficient mass of IGs prior to cessation of macromolecular transport. Colostrum contains high concentrations of IgG, which decrease steadily after calving, with only 78% of the initial IgG concentration present at 12 h, and 48% of the initial IgG concentration present at 24 h [7]. It seems that gut closure in farm animals is related to energy (glucose) availability and maturation of the small intestine. However, the small intestine of fetal lambs absorbs up to 20% of IgG infused for sustained periods of time, with no evidence of closure [8]. Unlike rats, calves absorbed IGs from their small intestines by non-selectively pinocytosis method. Thus, amounts of IGs in circulation is related to the proportion of the molecules in the colostrum consumed [9,10].

**Keywords:** Calves; Colostrum; Immunization; Immunoglobulin

### Introduction

Neonatal dairy animals are naturally born agammaglobulinemic and should be provided immunoglobulin’s (Ig) during the period of macromolecular transport within the first 24 h of calving. Ig requirements are fulfilled by ingesting and absorbing colostrum Igs [1]. Maternal colostrum is the traditional source of Ig. Two consecutive feedings of 2 L colostrum within the first 24 h are common practice in dairy cattle farming. In the U.S., mortality of dairy calves born alive is greater than 10%. The most important factor associated with pre weaning mortality is late or no consumption of colostrum and acquisition of passive immunity within the first 24 hours of birth. It was reported that as high as 50% of mortality that occurred in preweaned calves was directly related to inadequate acquisition of passive immunity [2].

### Importance of Colostrum Consumption

Colostrum is very important for the growth and development of neonatal calves because of colostrum proteins. These proteins can be divided into two main groups: caseins and whey proteins. Cow whey contains more than 200

Since the gut closure occurs by 24<sup>th</sup> hour, new techniques are needed to provide IG to hypogammaglobulinemic calves after cessation of macromolecular transport by the intestinal epithelia. For this purpose, many attempts have been made to artificially augment the ability of calves to attain passive immune support, such as stored colostrum [11], injectable IG solutions [12], dried colostrum [13,14], and concentrated milk whey. Passive immunization can be recommended by parenteral injections, if the period of intestinal permeability to immunoglobulin molecules has passed. Therefore, calves are older than 24 h of age, intravenous colostrum IGs (IVIG) can be given effectively. The increase in circulating IgG concentrations after one IVIG administration may be not enough, multiple doses are required to raise IgG concentrations to a protective level [15].

## Conclusion

The findings from the studies support the fact that passive immunity can be enhanced by early colostrum intake. However IVIG should be considered at the next day of the birth. It was concluded that the awareness of colostrum feeding should be included in the management of dairy farming.

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