CHAPTER I
INTRODUCTION

An abdominal hernia is an abnormal protrusion of a peritoneal-lined sac through the musculo-aponeurotic covering of the abdomen (Malangoni and Rosen, 2007). Abdominal hernias are quite common and are said to occur in at least 2 percent of men (Kingsnorth and LeBlanc 2003a). Abdominal defect such as ventral hernia results from trauma or weakness of abdominal muscles (Kingsnorth and LeBlanc 2003b). Another defect such as umbilical hernia is fairly common in calves (Kawcak and Stashak, 1995). This condition is considered to be hereditary. It is the result of incomplete closure of the umbilicus at birth because of mal-development or hypoplasia of the abdominal muscles. The only effective treatment is surgery to restore the integrity of these abdominal defects and prevent incarceration and strangulation of herniated contents (Ober et al., 2008a). Tight suturing to approximate and close those defects can lead to wound dehiscence, recurrence and non-healing of the wound (Matthews et al., 2003). Literature on human surgery emphasises the use of prosthetic materials for hernioplasty when the size of the hernial ring exceeds 3 cm in diameter (Kingsnorth and Leblanc, 2003b; Venclauskas et al., 2008; Vilar et al., 2011).

The use of synthetic mesh materials for the repair of abdominal hernias is gaining recognition to achieve a tension-free closure and has resulted in a significant reduction in postoperative pain, length of recovery period and hernia recurrence rates (Amid, 1997; Burger et al., 2004; Bellows et al., 2008). Abdominal hernioplasty using polypropylene mesh in cows (Tulleners and Fretz, 1983), polyester mesh in cow (Sagar et al., 2010) and nylon mesh in dogs (Moore and Syderney, 1955), goats (Wilhelm et al., 2007), cattle (Bouisset et al., 1982) and buffaloes (Kanade et al., 1988; Varshney and Singh, 1991; Kumar et al., 2002; Kumar et al., 2014a) have been reported in literature with variable results. However, its non-absorbable characteristic can cause infection and chronic pain (Engelsman et al., 2007). It can even cause serious complications, such as bowel adhesion, obstruction, and fistula formation (Falagas and Kasiakou, 2005; Abdollahi et al., 2010).
Biologic biomaterials are a potential alternative to the synthetic meshes. It is composed of mammalian extracellular matrix (ECM) materials and are currently used for repair and reconstruction of large soft tissue defects including abdominal wall hernias. They are typically prepared by the acellularization of source tissues such as aorta (Kumar et al., 2010; Kumar et al., 2012, Kumar et al., 2013a,b), dermis (Gangwar et al., 2006; Gangwar et al., 2013, Gangwar et al., 2015; Kumar et al., 2013c,d; Kumar et al., 2016), diaphragm (Kumar et al., 2015a), pericardium (Singh et al., 2014), small intestine (Kumar et al., 2013e; Kumar et al., 2014b) and swim bladder (Kumar et al., 2013f; Kumar et al., 2015b). Inadequate acellularization of the source tissue results in retained cellular antigens within the ECM. Those cellular antigens are recognized as foreign by the host and elicit proinflammatory response or overt immune-mediated rejection of the tissue (Gock et al., 2004). The effective removal of antigenic epitopes associated with cell membranes and intracellular components of tissues is necessary to minimize or avoid an adverse immunologic response by xenogenic recipients (Xu et al., 2008; Brown et al., 2009). Therefore, acellularization process is critical determinant of clinical success (Burch et al., 2010; Rice et al., 2010). The ideal acellularization technique removes cells and cellular remnants leaving behind acellular ECM scaffold which can retain the original collagen architecture intact (Deeken et al., 2010). Acellularization of source tissues is most commonly assessed by quantification of remnant DNA (Ricardo et al., 2017). Fourier-transform infrared (FTIR) spectroscopy is another tool for investigation of chemical compounds and shown potential for qualitative and quantitative analysis of biological samples (Makhnii et al., 2016).

Acellular dermal matrix (ADM) has been used for abdominal wall repair in rabbits (Gangwar et al., 2006), rats (Kaya et al., 2006, Srivastava et al., 2001), goats (Kumar et al., 2013c), horses (Kumar et al., 2013d) and dogs (Kumar et al., 2016) with success. Despite having better efficacy, xenogenic ADM has not been investigated for abdominal hernioplasty in buffaloes so far. Hence, present study was performed with following objectives:

1. To optimize a procedure for preparation of caprine acellular dermal matrix (CADM).
2. To evaluate biocompatibility of prepared matrix for abdominal hernioplasty in buffaloes.