Hepatorenal Histological Studies On Bacterial Probiotic Treated Colitis Induced Male Albino Wistar Rats

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Abstract : Ulcerative colitis is an inflammatory bowel disease due to the various reasons. The available chemical therapies are curing the UC temporarily and provoking the disease with more severe aggressive form. Nowadays as an alternative measure, probiotics are used to treat UC without destroying the beneficial microflora in host. Male albino wistar rats were treated with 5% DSS for colitis induction. Histological analysis of hepatic and renal tissues of DSS colitis induced rats showed deleterious damages along with inflammation and blood vessel congestion. Group III (DSS+Probiotic) showed reformed layers with reduced inflammation in glomerulus and hepatocyte regions. This study proved that the oral administration of probiotics, cured the inflammation in DSS colitis wistar rats.

Keywords : Bacillus, colitis, DSS, histology, kidney, liver, Probiotics

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1. INTRODUCTION

Probiotic strains are living microbes obtained from various resources and administration of sufficient doses to the host develops various benefits [1]. Various strains of probiotics such as Streptococcus, Lactobacillus, Enterococcus, Saccharomyces, Bifidobacterium, Leuconostoc, Bacillus and Pediococcus were used to treat innumerable health ailments [2-3] in humans. Among the various strains, the most commonly observed probiotics strains were Bacillus and Lactobacillus [4]. Over five decades, probiotics were used to treat colon ailments such as inflammation, diarrhea, flatulence and constipation. In ulcerative colitis condition, the mucosal and submucosal layers in digestive system showed continuous inflammation [5-7]. Metronidazole and Ciprofloxacin are the common drugs used to treat human UC [8] but nearly 40% of treated patients showed remission of UC with reduction of the beneficial microbiota in colon region [9]. Recently researchers showed a great interest towards the role of probiotics against UC [10]. Dextran Sulphate Sodium (DSS) is the most commonly used chemical for the colitis induction in experimental animal due to its water soluble nature [11-12]. Rat liver and kidney showed various vital activities like xenobiotic detoxification, excretion metabolism, enzymes secretions and storage [13]. Hepatorenal toxicity induced by chemicals developed in models is significantly used as acute drug toxicity study model [14-15]. This study focused on the reformation capacity of the hepatic and renal tissues in DSS colitis induced male albino wistar rats treated with Bacillus coagulans probiotics.

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2. MATERIALS AND METHODS

2.1. Experimental animals

Adult albino male wistar rats, Rattus norvegicus (150-200g) procured from Indian Institute of Science (Bangalore) were maintained in microloan boxes in a controlled environment at 25±2°C and 12h dark/light cycle. Rats were supplied with diet (Sai Durga Feeds and Foods, Bangalore) and water ad libitum. The rats are quarantined for 15 days before the commencement of the experiment. Animal maintenance and experiment are carried in based on the ethical guide lines as BDU/IAEC/2017/NE/15/Dt.21.03.2017.

2.2. Rat treatments

Control group (n=6) rats were maintained separately without any drugs. For colitis induction, 5% dextran sodium sulphate (DSS) dissolved in water was orally administered to twelve rats between 1st and 7th day. Six colitis induced rats (Group III: DSS+Probiotic) were orally administered with B. coagulans (BSCB-2) everyday throughout the experiment. On the fourteenth day, the rats were sacrificed and their organs were fixed for histological analysis.

2.3. Histological analysis

From each group, liver and kidney tissues are fixed in 10% formalin and dehydrated through a series of alcohol and cleared in xylol. Cleared tissues are embedded in paraffin wax. Leica ultra microtome was used to make 5µm thickness sections and stained with Haemotoxylin and Eosin [16]. The sections are mounted in DPX, studied and photographed using photomicrography unit.

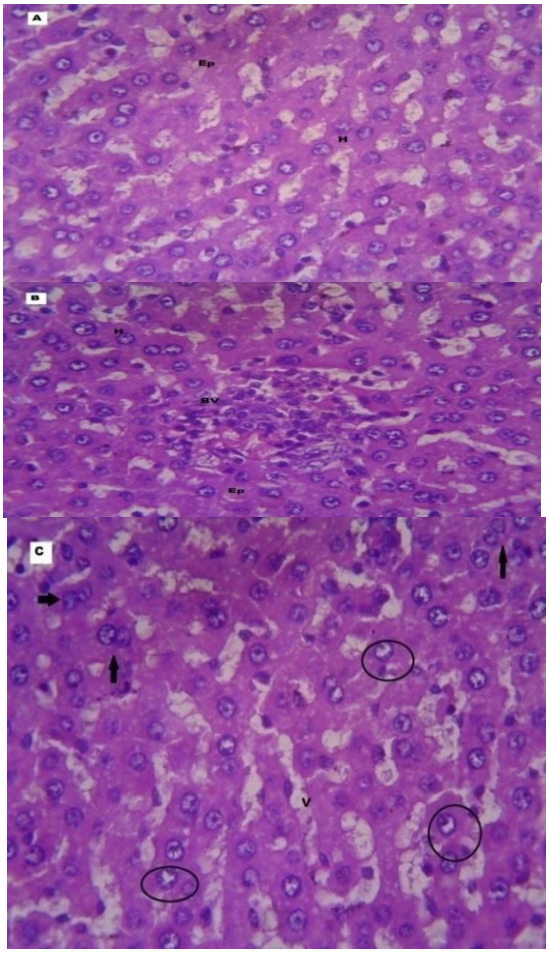
3. Results and Discussion

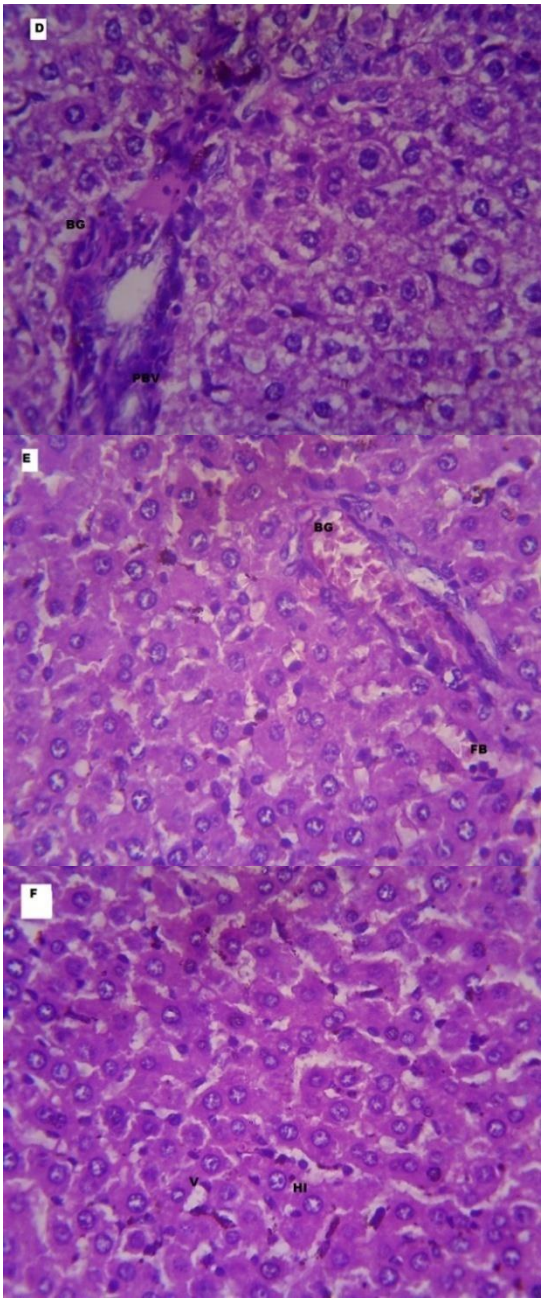
Group I: Control rat liver histological sections showed normal mucosa with intact surface epithelial cells (EP) and properly arranged hepatocytes (H) without any aberrations in portal tract surrounded by hepatic portal blood vessels (BV) (Figure 1A-B). Group II: DSS colitis induced rat liver showed binucleated hepatocytes with interface hepatitis and also sinusoidal dilations. Portal blood vessels (PBV) were congested along with blood cells (BG) and vacuolated cytoplasm as circles (Figure 1C-D). Group III: DSS+ Bacillus coagulans Probiotics (Figure 1E-F) treated rat liver sections

showed blood vessels (BG) surrounded by binucleated and inflammated hepatocytes (HI) along with sinusoidal dilations (DL). Hepatic portal tract (PT) showed vacuolation (V) around the hepatocytes and fibroblast cells (FB) were also present between the hepatocytes. Loren et al. [17] reported the improved histoarchitecture of colitis rat tissues treated with I3.1 combined probiotics. The probiotics Lactobacillus plantarum 21 and Bifidobacterium bifidum 231 treated against chemically induced ulcerative colitis showed anti-inflammatory response and marked macroscopic changes in rat tissues [18-19]. Our results also evidenced the reformation of dilating layers and reduced binucleated and vacuolations in Group III: DSS+Bacillus coagulans probiotics treated hepatic tissues when compared to the DSS colitis induced Group II. Group I: Control rat kidney histological sections showed regularly arranged glomerulus and bowman's capsule (BC) with tubules (T) surrounded by interstitial tissue (IT) (Figure 2A-B). Group II: DSS colitis induced rat kidney showed mild mesengial matrix expansion (MME) in the glomeruli and focal tubular (T) epithelial loss (Figure 2C-D) with elongated tubules (ET) surrounded by disoriented interstitial tissues (DIT), and orientation lost in tubules (OLT). Group III: DSS + Bacillus coagulans probiotics treated rat kidney histological sections showed mild inflammatory infiltrates and reorientation of the interstitial tissue (RIT) surrounded the glomeruli and tubules (RT) (Figure 2E-F).

4. CONCLUSION

A novel probiotics Bacillus coagulans (BSCB-2) was used to treat DSS colitis in male albino wistar rats. Histological analysis of hepatic and renal tissues of DSS colitis induced rats showed deleterious damages along with inflammation and blood vessel congestion. After probiotics treatment, tissues showed reduced inflammation in glomerulus and hepatocytes regions. This study proved that the oral administration of probiotic cured the inflammation in DSS colitis wistar rats. Figure 1. Liver histological sections of control, DSS colitis induced and probiotics treated albino male wistar rat (H&E, 40x)





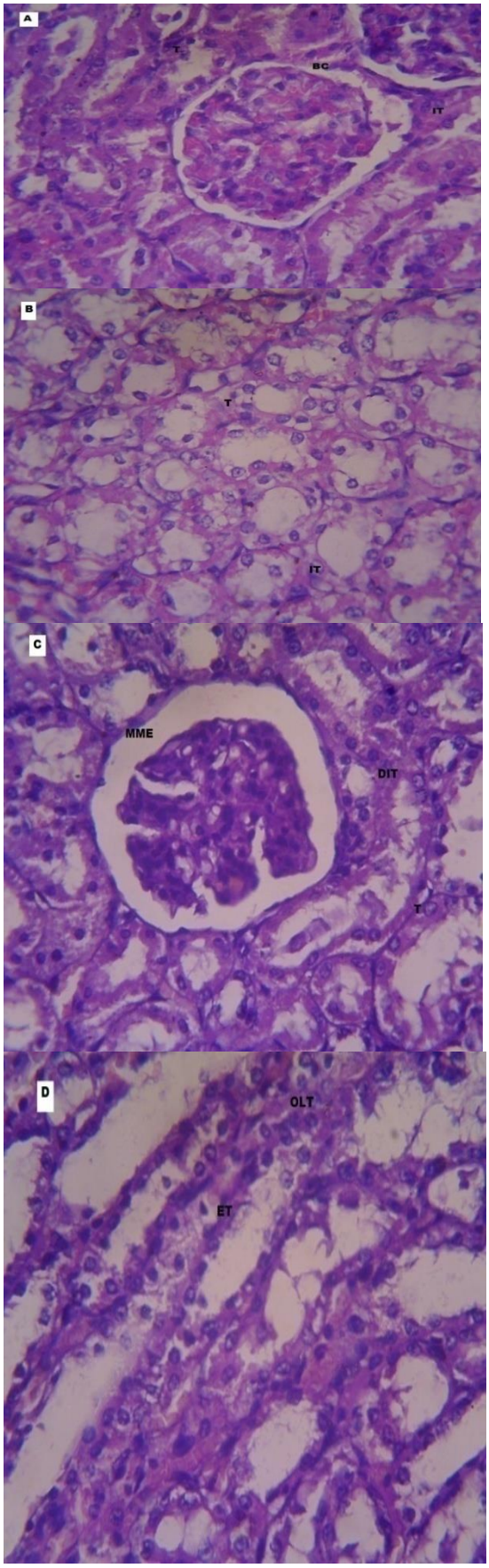
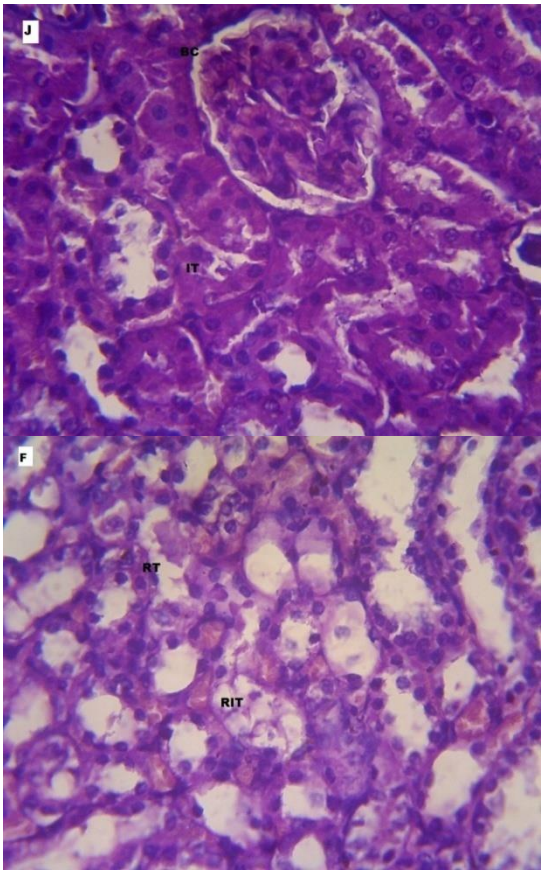


Figure 2. *Kidney histological sections of control, DSS colitis induced and Probiotics treated male albino wistar rat*



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