Oral Presentation (PAT-4)

Histopathological Study of Mice (*Mus musculus*) Digestive Organs Treated with Alkali pH Water

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INTRODUCTION

Water is an important part of the body. As much as 50-60% of an adult's body weight consists of water. Water functions in the body include as a means of transporting substances, regulating body temperature, regulating body pH, forming body structures, solvents for the body's chemical reactions, and helping the body's mechanical functions, such as lubrication (Insel *et al*. 2004; Asamadi 2008). In the event of water deficiency, the body will become dehydrated which able to cause cell death to individual death (Stanfield and Hui 2008). Recently, there are alkaline pH drinking water products that are commercially popular that have pH around 8-10 (alkaline water). Some parties claim that alkaline water can help neutralize the level of acidity (pH) of blood due to free radicals, while also having micro cluster technology that can increase oxygen solubility. According to Shirahata *et al*. (2012) alkaline water is beneficial for health because it can suppress oxidative stress.

This study aims to know the effect of alkaline pH drinking water reviewed through histopathological studies of the digestive organs of mice (stomach, intestine, and pancreatic exocrine glands).

MATERIALS AND METHOD

A total of 15 mice (*Mus musculus*) DDY strains were 4 weeks old, male sex with average weight about 20-25 grams obtained from laboratory animal nurseries in Faculty of Veterinary Medicine Bogor Agricutural University. The drinking water used is commercial mineral water, as well as alkaline pH 9 water and pH 11 produced from Leveluk® SD 501 machines.

Medications used for pretreatment are anthelmintic mebendazole (Vermox® 500 mg) dose of 10 mg / kg BW, antibiotic azythromycin (Azythromycin® 500 mg) dose of 10 mg / kg BW and antiprotozoa metrodinazole (Flagyl® 500 mg) dose of 10 mg / kg BW. The method of giving alkaline water pH 9 is ad libitum for 8 weeks (group B). Group C was given alkaline water pH 9 ad libitum for 2 weeks followed by pH 11 for 6 weeks. The control group (group A) was given pH 9 ad libitum for 6 weeks followed by administration of aquadest for 2 weeks. Alkaline pH 9 and aquadest water administration was 0.1 ml / mice / day using a gastric tube. The intestinal and pancreatic gastric organs were collected and fixed in Formalin's Buffered Neutral solution (BNF 10%). The staining used is Hematoxilin Eosin (HE) and Periodic Acid Schiff / Alcian Blue pH 2.5 (PAS / AB pH 2.5) to see goblet cells (Aughey and Frye 2001). The results of this observation showed an increase in the number of parietal cells in group B (pH9) and C (pH9 + 11); there was a decrease in chief cells in group B (pH9) and C (pH9 + 11) but it was not statistically has significant difference compared to control A. Parietal cells function is to secrete acids for digestive enzymes activation (Raftery 2008). Alkaline pH water treatment increases the number of parietal cells to produce their secretion to maintain the acidic atmosphere in the stomach (Xu and Cranwell 2003).

RESULTS AND DISCUSSION

Observations on chief cells shows decreased chief cell numbers but were not significantly different. The activity of chief cells with parietal cells was interrelated. Hydrochloric acid secreted by parietal cells can induce pepsinogen secreted by chief cells (Engelking 2002). The number of mucous neck cells increased slightly but not significantly in all groups. Mucous neck cells function to secrete mucous. The result of the observation of intestinal villous length shows that there were no significant differences between the control groups with groups B and C. There was a significant intestinal villous length decrease in group C compared with controls. According to Magro *et al.* (2016), there were no significant intestinal histology differences in mice given alkaline pH water for the rest of their lives. The length of the intestinal villi depends on the speed of enterocyte proliferation and the amount of food consumed (Fox *et al*. 2007). There was a significant decrease in the number of goblet cells in group C compared to control A. This was thought to be due to lower intestinal villi than other groups. The

increase and decrease in the number of goblet cells is also influenced by one of its functions as a mucous producer in the digestive tract that protects itself from parasitic or microbial infections (Wang *et al*. 2016). There is a significant decrease in the number of submucosal inflammatory cells in group C. Alkaline water has the benefit of maintaining cell redox balance, thereby reducing the risk of conditions that can alter cell homeostasis, such as inflammation (Franceschelli *et al.* 2016). There was a significant difference in the number of normal pancreatic exocrine cells in group C (pH9 + pH11). There was a significant decrease in the number of normal acinar cells in groups B and C compared to controls A. There are other things that can affect acinar cell numbers include stress conditions such as lack of nutrition or pathogen infection (Antonucci *et al*. 2015). There is an increase in the number of degeneration cells in groups B and C. Degeneration cells are temporary (reversible) cell changes. There was no significant difference in the number of necrosa acinar cells between the control and treatment groups. Degeneration cells are temporary (reversible) cell changes characterized by the presence of vacuoles in the cytoplasm. Necrose cells are cell deaths that are characterized by changes in the nucleus of the cell, called picnosis (nucleus condensed and reduced), cariorexsis (nucleus is broken), or cariolysis (core loss) (Zachary 2016).

CONCLUSION

The effect of water pH 9 and pH 11 treatment for 8 weeks showed better beneficial compared to given pH 9 water only. Histopathological changes in the stomach is increased number of parietal cells; changes in the small intestine is decrease in the number of inflammatory cells; changes in the pancreas are increase in the number of acinar cells degeneration. Based on this study, consumption of the alkaline pH water does not cause interference in the digestive system and safe to be consumed daily.

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