

parameters, enhanced the α_1 -adrenergic-induced vasoconstriction and the cardiac inotropy ($p < 0.01$, $p < 0.05$ group 2 and 3 respectively vs group 1). In this study, we demonstrated the positive effects of cGMP pathway activators on metabolic alterations and cardiovascular reactivity in SHR with metabolic syndrome. These results suggest that cGMP pathway modulation may be a promising therapeutic target in the management of the metabolic syndrome.

P15.5 | Evaluation of the effect of intramuscular injection of butaphosphan on plasma enzymes and interleukins in olive flounder (*Paralichthys olivaceus*)

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Introduction: Butaphosphan in combination with vitamin B12 is commonly used in Korean aquaculture to enhance the growth of olive flounder. The study was designed to investigate the effect of single injection of butaphosphan on the plasma levels of selected enzymes and interleukins (IL) in olive flounder.

Methods: The study was conducted in 80 fish categorized into 4 groups ($n = 20$ per group) including: Group I (treated with butaphosphan in water for injection, 50 mg kg^{-1} , IM) and II (treated with butaphosphan in saline, 50 mg kg^{-1} , IM), group III (treated only with water for injection, 0.5 ml kg^{-1} , IM) and group IV (untreated control). Fish were allowed to acclimatize to the group conditions for 2 weeks prior to the treatment. Measurements of body weight, length, and collection of blood samples were performed every week. Blood samples were obtained from the caudal vein, immediately centrifuged and plasma was separated. The samples were analyzed for the levels of IL-1 β , IL-6, cortisol, and lysozyme and the activity of aspartate aminotransferase (AST), alanine transaminase (ALT) were determined using an ELISA kit according to the manufacturers' instruction. Statistical significance of differences was assessed by one-way and two-way analysis of variance followed by Tukey-HSD test ($p < 0.05$ considered significant).

Results: Despite a slight reduction in the body weights of the water-treated control groups with respect to others, treatment did not result in a significant change in the body weight and length of the fish. Plasma cortisol and AST levels were elevated significantly ($p < 0.05$) in the water-treated control group at the 2nd and 3rd weeks after treatment compared with the other groups. Treatment of fish with butaphosphan in saline significantly reduced ($p < 0.05$) the level of IL-1 β at the 2nd and 3rd weeks after treatment. In addition, more than a threefold reduction in the plasma ALT activity was observed a week after treatment with butaphosphan in water compared with the untreated control. However, neither treatment produced a significant effect on the plasma levels of lysozyme and IL-6.

Conclusion: The suppressive effect of butaphosphan on the release of cortisol, ALT and AST could be beneficial to some extent in preventing stress and tissue damage in olive flounder.

Reference: 1. Park J et al. (2017) *Aquacult Res*; 49: 1060–1070.

P15.6 | A new extract rich in anthocyanin inhibits the progression of diabetic nephropathy caused by oxidative stress in rat

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Introduction: Anthocyanins are a class of flavonoid compounds, showing high anti-oxidant and anti-inflammatory activity since their constant intake seems to correlate with a reduction of global oxidative state and with a reduction of inflammation markers (1). It is well demonstrated that the oxidative stress and kidney inflammation have a key role in the development and in the progression of diabetic nephropathy (DN) (2). DN is a common microvascular complication occurring in approximately 20%–40% of patients with type 2 diabetes mellitus (T2DM). It is characterized by the progressive impairment of glomerular function leading to end-stage renal failure (3).

Materials and Methods: In this study, we have evaluated, in the adult diabetic 30-weeks Zucker fa/fa and in the control Zucker fa/+, the effect of a standardized new extract, obtained by properly mixing anthocyanins and other polyphenols, in the prevention of DN by evaluating the cause-to-effect relationship between the anthocyanins intake ($90 \mu\text{g kg}^{-1}$) and protection from renal damage. Glomerular filtration rate (GFR) measured by the clearance of inulin and the absolute fluid reabsorption (Jv) measured by microperfusion of proximal tubule were evaluated in treated and untreated Zucker fa/fa and Zucker fa/+ rats. Moreover, we have measured the oxidative stress through the dihydroethidium (DHE) assay, superoxide dismutase (SOD) and catalase (CAT) assays. The kidney inflammation levels were measured by western blot analysis for IL-2 and IL-6 before and after treatment. The data were analysed using an analysis of variance (ANOVA).

Results and Conclusions: We have demonstrated in the 30-weeks adult Zucker fa/fa untreated rat a significantly reduction of the GFR and Jv compared to the untreated control group. The analysis of Reactive Oxygen Species (ROS) has shown a significant increase of ROS in the 30-weeks adult untreated Zucker fa/fa respect to its untreated control. Moreover, in the Zucker fa/fa treated group for 30 weeks, we have demonstrated levels of GFR, Jv value and ROS similar to the treated/untreated control group. Underway, we did not noticed significant differences between diabetic rats and control rats in inflammatory markers, before and after treatment. In conclusion, the nephrotoxic effect in DN is clearly related to the production