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Surface-Engineered PLGA Nanocapsules of Resveratrol with improved biopharmaceutical properties attributes against rat peritonitis model: An Anti-inflammatory therapy

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Objectives: Peritoneal dialysis (PD) is consider as the best treatment in children with chronic renal disease due to easily applied at home, allowing regular work with less frequency of blood contamination and anaemia. Therefore, peritonitis is the major drawback of PD and recurrent peritonitis attacks may alter the dialysis competence and also increase the cost of effective therapy. In the pathophysiology of peritonitis, bacterial invasion is followed via the activation of inflammatory cells specific neutrophils with in few hours and start the damage of tissue. Current investigation, we fabricated the PLGA loaded nano-particles of resveratrol and scrutinized against rat peritonitis model.

Methods: Nanoparticles were prepared by ultra-sonication. The rats were divided into groups. Ultrafiltration rates (UF) were estimated and leukocytes and colony counts were estimated in the dialysate. Biochemical parameters such as creatinine, blood urea nitrogen, alanine transaminase (ALT) and glucose level were estimated, respectively. Pro-inflammatory cytokines and prostaglandin E2 (PGE2) were scrutinized in dialysate and peritoneal tissue were used for estimation of anti-inflammatory effect. Antioxidant parameters such as malondialdehyde (MDA), superoxide dismutase (SOD) and nitric oxide (NO) were also assessed in peritoneal tissue.

Results: Resveratrol PLGA nanoparticles exhibited average particle size of 185 nm with polydispersity index 0.18, zeta potential <20 mV, drug loading > 88%. Resveratrol showed the up-regulation of UF rate and down-regulated the leukocytes number in peritonitis rats. Resveratrol showed the reduced level of dialysate glucose (26%), BUN (68%), creatinine (52%) and ALT (42%) as compared to peritonitis group rats. Resveratrol decreased the IL-6 (59%), IL-1β (62%), TNF-α (64%) and PGE2 (51.5%) as comparison to peritonitis group rats. Its also altered the level of MDA (43%), SOD (51%) and NO (36%), respectively.

Conclusions: On the basis of result, we can conclude that resveratrol might be beneficial for peritonitis due to its capability to increasing UF rate via anti-inflammatory mechanism.