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Inflamed site-specific drug delivery system using human serum albumin nanoparticles

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To develop a new strategy for inflamed site-specific drug delivery in the colon for the treatment of Ulcerative Colitis (UC), we focused on the interaction between Myeloperoxidase (MPO) and Human Serum Albumin (HSA) and prepared Nanoparticles (HSA NPs) conjugated with 5-Aminosalicylic Acid (5-ASA), an anti-inflammatory drug. The 5-ASA-HSA NPs (nine molecules of 5-ASA per HSA molecule) were uniform particles with an average particle size of 190 nm, a zeta potential of -11.8 mV and a polydispersity index of 0.35. This was considered a suitable particle characteristic to pass through the mucus layer and accumulate into the mucosa. The specific interaction between the 5-ASA-HSA NPs and MPO was observed using quartz crystal microbalance analysis *in vitro*. In addition, the 5-ASA-HSA NPs group containing one thousandth of the dose of the 5-ASA (75 μg/kg) showed significantly lower disease activity index values and colon weight/length ratios in UC model mice as similar to large amount of neat 5-ASA group (75 mg/kg), indicating that the therapeutic effect of the 5-ASA-HSA NP formulation was confirmed *in vivo*. Microscopic images of tissue sections of colon extracted from UC model mice demonstrated that HSA NPs and MPO were both localized in the colon and this specific interaction between HSA NPs and MPO would be involved the in the therapeutic effect *in vivo*. Furthermore, in the 5-ASA and 5-ASA-HSA NPs groups, some inflammatory damage was observed in the colon, but the degree of damage was mild compared with the control and HSA NPs groups, suggesting mucosal repair and replacement with fibrous granulation tissue had occurred. Therefore, these data demonstrated for the first time, that an HSA NP formulation has the potential to specifically deliver 5-ASA to an inflamed site where MPO is highly expressed.

Biography

Yasunori Iwao has received his PhD in 2006 from Kumamoto University. He has joined University of Shizuoka as an Assistant Professor in 2008, where he started working in the field of Pharmaceutical Engineering. In 2016, he got a promotion to be an Associate Professor at same university and is tackling some research fields such as drug formulation, drug delivery and biomaterials. He is considered a pioneer of many novel drug delivery technologies, especially in the fields of transdermal, oral and targeted systems. He is a Member of AAPS, American Association of Pharmaceutical Scientists and is also Editorial Advisory Board Members of *Journal of Pharmaceutical Sciences*.

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