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Low-Fouling Zwitterionic Polymeric Colloids As Resuscitation Fluids For Hemorrhagic Shock

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Colloids, known as volume expanders, have been used as resuscitation fluids for hypovolemic shock for decades, as they create an increase plasma oncotic pressure and expand intravascular volume. However, recent studies show commonly used synthetic colloids have adverse interactions with human biological systems in vitro and in vivo. In this work, we design a low- fouling amino (N)-oxide based zwitterion polymer as an alternative volume expander with improved biocompatibility and efficacy. We demonstrate that the polymer possesses anti-fouling ability, resisting cell interaction and deposition in major organs, and is rapidly cleared via renal filtration and hepatic circulation, reducing risks for long-term side effects. In vitro and in vivo safety studies showed absence of adverse effects on hemostasis or acute safety risks. Finally, we show that, in a head-to-head comparison with existing colloids and plasma, the zwitterionic polymer serves as more potent oncotic agents for restoring intravascular volume in a hemorrhagic shock model. Our design of N-oxide-based zwitterionic polymers may lead to the development of alternative fluid therapies to treat hypovolemic shocks and for improving fluid management in general.

Biography

Rajesh Kumar has completed his Ph.D. from the Department of Chemistry, Southern Methodist University and postdoctoral studies from the Department of Cardiology, Department of Pediatrics, Boston Children's Hospital, Harvard Medical School, USA. He has been working as a Vice President of R&D in Influunt Vascular Incorporation in USA since 2021. He has published more than 8 papers in reputed journals and has been serving as the reviewer of 6 peer-reviewed journals.

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