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Professor Jae Young Lee's joint research team identifies stem cell delivery and myocardial infarction treatment using antioxidant hydrogels

- GIST (President Kiseon Kim) School of Materials Science and Engineering Professor Jae Young Lee led a research team with School of Life Sciences Professor Darren Williams discovered that graphene/alginate micro hydrogels carrying mesenchymal stem cells help regenerate heart tissue after myocardial infarction.
- Mesenchymal stem cells are known to help cardiac regeneration after myocardial infarction by releasing various growth factors that promote angiogenesis and cytokines involved in immunoregulation and by transplanting them for tissue regeneration.
 - When transplanting mesenchymal stem cells through a syringe, they are exposed to high shear stress during injection, high oxidative stress and immune response after transplantation, reducing the efficacy of treatment due to the low survival rate and accrual rate. Thus, a new process needs to be developed.
 - The research team devised a system to protect stem cells in the oxidative stress environment after myocardial infarction and increase the effectiveness of treatment by embedding the cells in an injectable micro-sized graphene oxide/alginate hydrogels with antioxidant capacity.

- According to the research team, the antioxidant capacity of hydrogels can improve the control of graphene oxide concentration and reduction time. The mesenchymal stem cells supported inside the hydrogels not only showed high survival rate in oxidative stress but also improved survival and maturation of co-cultured cardiomyocytes.
 - To verify *in vivo* efficacy, myocardial infarction was induced in rats, and mesenchymal stem cells carried in the reduced graphene oxide/alginate hydrogel were delivered to the heart. After two weeks, fibrosis of the ventricles was significantly reduced, and echocardiography confirmed the recovery of cardiac function.
- Professor Jae Young Lee said, "The cell delivery system developed in this study will be an effective stem cell delivery platform for the treatment of various diseases, including myocardial infarction."
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