Short Communication

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Greater Plasma Protein Adsorption on Mesoporous Silica Nanoparticles Aggravates Atopic Dermatitis

Sang-Hyun Kim
Kyungpook National University, Republic of Korea

Abstract

Purpose: The protein corona surrounding nanoparticles has attracted considerable attention as it induces subsequent inflammatory responses. Although mesoporous silica nanoparticles (MSN) are commonly used in medicines, cosmetics, and packaging, the inflammatory effects of the MSN protein corona on the cutaneous system have not been investigated till date.

Methods: We examined the greater plasma protein adsorption on MSN leads to serious inflammatory reactions in Dermatophagoides farinae extract (DFE)-induced mouse atopic dermatitis (AD)-like skin inflammation because of increased uptake by keratinocytes.

Results: We compare the AD lesions induced by MSN and colloidal (non-porous) silica nanoparticles (CSN), which exhibit different pore architectures but similar dimensions and surface chemistry. MSN-corona treatment of severe skin inflammation in a DFE-induced in vivo AD model greatly increases mouse ear epidermal thickness and infiltration of immune cells compared with the CSN-corona treatment. Moreover, MSN-corona significantly increase AD-specific immunoglobulins, serum histamine, and Th1/Th2/Th17 cytokines in the ear and lymph nodes. MSN-corona induce more severe cutaneous inflammation than CSN by significantly decreasing claudin-1 expression.

Conclusion: This study demonstrates the novel impact of the MSN protein corona in inducing inflammatory responses through claudin-1 downregulation and suggests useful clinical guidelines for MSN application in cosmetics and drug delivery systems.

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Biography

Sang-Hyun Kim is working at Department of Pharmacology, School of Medicine, Kyungpook National University, Republic of Korea.

