

Visualization for movement of nanomaterials and immune responses to them in epidermis –Toward establishment of a new safety evaluation method for nanomaterials–

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Nanomaterials have been used in various fields, such as cosmetic products. The skin, as the primary interface between the body and the environment, provides the first line of defense against pathogens. We are especially interested in the motion of nanomaterials in the skin. In addition to three dimensional (3D) motion of nanomaterials, their rotational motion is also crucial to reveal their dynamics in tissue. To track nanomaterials at single particle level, first, we synthesized fluorescent probes based on semiconductor nanocrystals. In previous period, we reported on rod-shaped nanocrystals, quantum rods (QRs), for rotational measurement. In present period, we have developed a system that combines nanometry and nanomaterial science to simultaneously measure 3D and rotational motion. Then, we demonstrated simultaneous 3D and rotational single particle tracking of membrane receptors, CD36, in freshly isolated macrophages. The receptors were tracked three dimensionally at nanometer accuracy and had their relative orientations determined simultaneously. The combined technology presented here will be able to provide new information on motion and function of various nanomaterials in tissue, such as skin.