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Title: Graphene may modulate the immune activation and survival of monocytes representative of the innate immunity

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Body: Background: The graphene which is an allotrope of carbon has the honeycombing structure of one-atom-thick planar sheets. It can be produced and chemically modified by chemical vaporization device. it is used in modern electronic, informative technologies including medical device. Graphene oxide (GO) has oxygen functional groups on the graphene plane. We performed this experiment to define the effect of GO on the innate immunologic function. Materials and Methods: GO was prepared by the modified Hummers method using 2g of graphite powder. After sequential procedure, GO in water was used for experiment. U-937 cells were cultivated in RPMI 1640 containing various concentration of GO particle solution. We checked the surviving and dying cells and cell size with the morphologic change with light microscopy. Results: The x-ray diffraction patterns observed for the graphite and GO. The pristine graphite has a peak centered at $2\theta = 26.5^{\circ}$ (d = 0.33 nm). This peak was shifted to $2\theta = 11.3^{\circ}$ (d = 0.78 nm) after applying the Hummers method. This means that the graphite is exfoliated and the d-spacing increased, indicating that GO is formed. As the graphene concentration increased, the cell survival was diminished. U-937 cells were aggregated which might be associated with phagocytosis. Conclusion: GO in water diminishes the cell survival and activates phagocytosis and alters cell fate. as differentiation and molecules in the monocytes representative of the innate immunity. Acknowledgement: This research was supported by Mid-career Research Program (2011-0028752) through the National Research Foundation of Korea (NRF) funded by the Ministry of Education, Science and Technology.