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Morphological study on the interaction between human macrophages and renal calculi crystals with micro technique in vitro

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Macrophages are involved in the crystal-cell reaction in the formation of nephrolithiasis; however, response of macrophages to renal calculi crystals remained unclear. Macrophages were differentiated from U937 human monocytic cell line by activated with phorbol-12-myristate-13-acetate (PMA). Morphological changes were observed from the interaction of U937-derived macrophages and crystals by an inverted phase-contrast microscope, scanning electron microscopy (SEM), and time-lapse imaging technology. The amount of calcium deposition was quantified through the extraction of the Alizarin Red S stain from cell matrix using a cetylpyridinium chloride extraction method. Data were converted into absorbance at 570 nm was determined using a microplate spectrophotometer. With the microscopic imaging technique, the representative results showed the dynamic process that crystals were adsorbed, phagocytized, dissolved, and transported by macrophages. The amount of calcium deposition in HAP+COM group after interacted 24hr was higher than any other group. The difference between HAP group and another group in the same period was statistically significant, except COM group. There was no statistical significance in the control group and COM group at the same time, and the same result showed in between HAP group and COM group. The difference between 12hr period and 24hr period in the same treated group was statistically significant, nevertheless respectively was not in contrast of 6hr period with statistical value. There was no interaction at different times in different treated groups. Our study showed that the macrophages had the activity, which can adhere, phagocytize, and transport the renal calculi crystals. Our findings enlightened the possible role of HAP crystals in enhanced HAP and COM-phagocytized activity of the HAP-exposed macrophages, and even mediated COM-phagocytized activity.