Removal of mercury by inflammatory cells: a study by sem coupled with X ray microanalysis

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Phagocytes remove and store mercury (Hg) that enters the body. Macrophages and granulocytes respond in opposite ways to Hg: macrophages loose cell viability, neutrophils become protected from apoptosis. We have investigated the cytology of early intake of Hg by macrophages and neutrophils after a short period (2-4 minutes) of in vivo exposure to $HgCl^2$. The two types of phagocytes were attracted either to a subcutaneous air-pouch or to the peritoneal cavity of BALB/c mice by in situ BSA injection. BSA caused, 72 hours later, inflammatory exudates where neutrophils (air-pouch cavity) or macrophages (peritoneal cavity) were the predominant cell type. Female BALB/c mice were injected with a pro-inflammation solution of 500 µL of 3% bovine serum albumin (BSA) in PBS, either in the peritoneal cavity or in a subcutaneous air pouch. A lethal dose of $HgCl^2$ (25 mg in 500 µL of PBS) was injected in the peritoneal or air-pouch cavities of the mice 6, 24, 48 and 72 hours after the pro-inflammation inoculation of BSA. The animals died 2-4 minutes after the HgCl2 injection. The samples were prepared and examined in a JEOL JSM-6301F SEM. Cell exudates were harvest and studied by scanning electron microscopy coupled with X ray elemental microanalysis (SEM-XRM). More than half of the phagocytes showed ingested Hg; a higher percentage of macrophages (around 70%) than neutrophils (around 50%) were positive for the metal. Intracellular particles of Hg were spheroid and presented a small diameter (less than 20 nm). They were seen in large numbers inside phagocytes (up to 20-30 Hg dots per cell); they were scattered throughout the cytoplasm of the cells. The ability of phagocytes to ingest Hg decreases as the BSA-induced inflammation progressed. In inflammatory environments, the avidity of macrophages for Hg is higher than that of neutrophils. The intracellular topography of Hg particles indicates that they are taken up by pinocytosis and are not concentrated in large vesicles of the lysosomal compartment of the phagocytes.

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