ORIGINAL ARTICLE

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Augmentation effects of lymphocyte activation by antigen-presenting macrophages on FDG uptake

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Objective: Research on FDG-uptake by blood cells has revealed that FDG is incorporated by macrophages and granulocytes, as well as activated lymphocytes. These characteristics of FDG suggest the possibility of visualizing the distribution of immunocytes in target organs. The aim of this study was to investigate if mouse spleen-derived lymphocytes, activated by macrophages presenting sheep red blood cell (sRBC) antigens, could be traced by FDG. ***Methods:*** One percent of a sRBC suspension was injected into the peritoneal cavity of mice thereby creating immunity to the sRBC antigen. The splenocytes, consisting mostly of lymphocytes, were isolated, and serum containing the anti-sRBC antibody was mixed with sRBC to prepare sRBC-antibody complexes (sRBC-AbCs). Then five percent of a thioglycolate medium was injected into the peritoneal cavity of the same mice, and macrophages of ascitic cell origin were obtained. These macrophages were added to the sRBC-AbCs to induce sRBC antigen presenting macrophages. These were incubated with splenocytes obtained from sRBC immunized mouse (sRBC immunized splenocytes) or non-immunized splenocytes to induce a T cell immune response. [^{3}H]deoxyglucose ([^{3}H]DG) and FDG were incorporated in splenocytes, and the quantity of their uptake was measured. ***Results:*** [^{3}H]DG uptake by sRBC-immunized splenocytes was about eleven times as high as that of non-immunized splenocytes. In contrast, [^{3}H]DG uptake by sRBC-immunized splenocytes, co-cultured with macrophages phagocytizing sRBC-AbCs, was about 40 times higher compared with non-immunized splenocytes. Splenocytes in non-immunized mice picked up very little [^{3}H]DG, despite co-culture with macrophages phagocytizing sRBC-AbCs. Similar tendencies were observed with FDG. ***Conclusions:*** These results suggest that the SUV calculated in PET reflects not only the number of lymphocytes, but also the activation state of the lymphocytes themselves. In addition, the biodistribution of antigen specific lymphocytes, that have been taken up FDG *in vitro* and returned to the body, can be observed through PET.

Key words: lymphocyte, macrophage, FDG-uptake, sRBC immunized splenocyte