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Volumetric changes in phorbol myristate acetate activated neutrophils: a rapid and simple assay using Coulter counter STKR and STKS hematological analyzers.

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BACKGROUND: The aim of this study was to investigate some physical changes (volume, conductivity and scatter) in human polymorphonuclear leukocytes (PMN) activated with phorbol myristate acetate (PMA). **METHODS:** Volume changes in PMA-activated neutrophils were assayed by both STKR and STKS, two Coulter hematological analyzers. Scatter changes in PMN activated by PMA in suspensions containing nitro-blue tetrazolium (NBT) were investigated on STKS scattergrams. **RESULTS:** PMA activation induced PMN volumetric increases that could be assayed with STKR and displayed with STKS. The activation of PMN in suspension containing NBT induced cellular scatter changes on STKS scattergrams. The differences in scatter between resting and PMA-activated neutrophils may thus provide a semiquantitative assay of NBT reduction and superoxide production. Volume changes in PMA-activated neutrophils were due to cellular swelling through water uptake, induced by Na⁺/H⁺ antiport activation and Na⁺ influx. Since volume changes in PMA-activated neutrophils might occur without O₂⁻ production and vice versa, in the cases in which PMA activation of protein kinase C cannot be demonstrated by O₂⁻ production, the effect of PMA on protein kinase C-mediated Na⁺/H⁺ antiport activation, and in turn on PMA volume changes, reflects protein kinase C activation. **CONCLUSIONS:** A screening of neutrophils unresponsive to volumetric changes from PMA activation may be easily performed using both Coulter STKR and STKS analyzers, whereas expected or defective PMA-induced production of O₂⁻ may be semi-quantitatively evaluated by STKS.

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