

EFFECT OF CARBON NANOTUBES ON HUMAN PLATELETS

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Novel materials, such as carbon nanotubes (CNTs) are under investigation for possible use in biomedical applications and research has just begun in order to assess their potential risk for human health. Recently, the biological effects of CNTs have been explored, but in most cases the physico-chemical characterization of the tested CNTs is lacking. Nanomaterial characterization is needed prior to *in vitro* biological evaluation and is imperative for any assessment of their biocompatibility. At present, people exposure to CNTs occurs mainly in laboratories where they are handled for industrial or scientific purposes; in a next future, their use as therapeutic as well as diagnostic agents can imply their interaction with blood and its elements. Here we evaluated the *in vitro* effect on human platelets of three well characterized (X-Ray diffractography) CNTs: single-walled (SWNTs), double-walled (DWNTs), multi-walled (MWNTs) containing different amounts of graphite particles. In order to differentiate the effects due to graphite from those due to CNTs, graphite particles (Univ. of Nancy) were used as a reference material. The influence of these CNTs on platelets has been assessed by measuring platelet aggregation (Born's aggregometer), P-selectin expression (ELISA) and thromboxane (TX)₂ production (RIA). We found that MWNTs decreased platelet response to agonists (arachidonic acid, ADP and collagen) used both at sub-aggregating and aggregating concentrations. Platelet TXB₂ production decreased, while production of P-selectin was not modified after the contact with MWNTs. An increase of platelet aggregating response was, on the contrary, observed with SWNTs and DWNTs. Nevertheless, DWNTs induced an enhancement in platelet production of P-selectin, while SWNTs did not. Platelet TXB₂ levels were not significantly affected by DWNTs and SWNTs. Graphite did not modify platelet responsiveness. In conclusion, we observed that different CNTs tested induced different effects on platelet. It seems likely that the presence of graphite had no influence on their effect. We hypothesized that an increased P-selectin expression is involved in the pro-aggregating effect of DWNTs and that the pro-aggregating effect of SWNTs could be due to the fact that they mimic molecular bridges involved in platelet-platelet interactions. Mechanisms by which MWNTs act as inhibitors of platelet responses are not clear. It is possible that specific surface properties of these nanostructures could be responsible for their unexpected inhibitory effect on platelets.

