Nanomaterials are tiny devices and structures sized at least in one dimension between 1 to 100 nm\(^1\). Engineered nanomaterials are developed for novel applications including drug delivery, imaging, tissue scaffolding, tissue regeneration and medical device systems. Indeed, nanomedicine is one of the fastest growing areas in nanotechnology poised to revolutionize diagnostics and therapeutics of human diseases\(^2\).

Our research focuses on pharmacological and toxicological significance of nanomaterials and the use of nanodevices in the R&D. We have introduced the term nanopharmacology to pharmacological sciences to highlight the importance of nanodrugs and nanodrug delivery systems for therapeutics\(^3\). We have investigated the interactions and biocompatibility of engineered nanomaterials such as carbon nanotubes, amorphous silica and gold nanoparticles in blood platelets, endothelial cells and lung epithelium\(^4\)\(^-\)\(^10\) and currently are studying the effects of surface-bound carbon nanotubes in the extracorporeal circuits\(^11\), \(^12\). Finally, we have used commercially-available and custom-made nanoresolution and microfluidics devices for nanodiagnostics of platelet activation and for studying tumour cell-induced platelet aggregation under flow\(^8\), \(^13\)\(^-\)\(^16\).

As with all medical progress the introduction of novel diagnostics and therapeutics carries some risk. In order to mitigate this risk we apply toxicological principles to nanotechnology. Interestingly, humans have been exposed to nanosized materials such as burned fuels throughout evolutionary stages; however the exposure has greatly increased over the past century mainly due to anthropogenic sources\(^17\). This poses a risk of combined effects of nanomaterials and other xenobiotics (Inkielewicz-Stepniak et al accepted to Int J Nanomedicine). Therefore, establishing the risk-benefit analysis of nanomaterials not only in medicine, but also in other environmental sciences including food and agriculture\(^18\), is crucial for successful R&D.
References:

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