NANO HIGHLIGHT

NIRT: Ink-Jetting of Nanostructured Matrices for Controlled Gene Delivery

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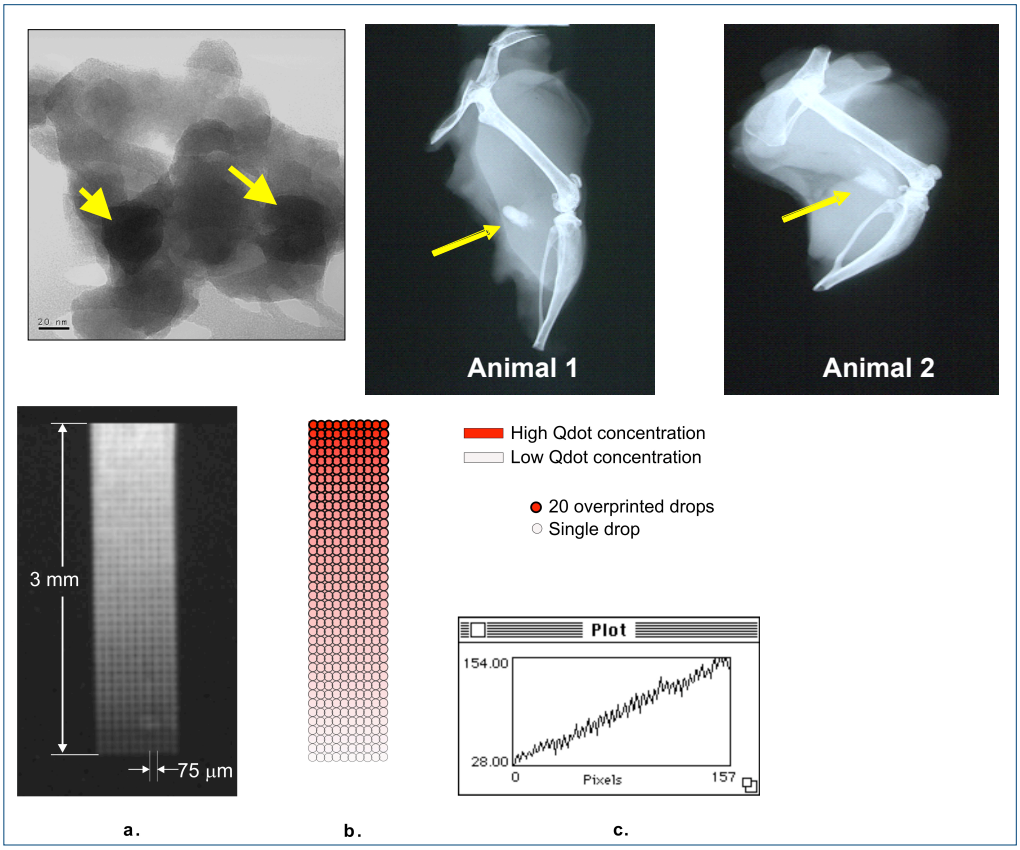
Scientists and Engineers at Carnegie Mellon University and the University of Pittsburgh have developed novel nanostructured calcium phosphate (NanoCaPs) carriers of plasmid DNA for non-viral gene therapy. Gene therapy has tremendous potential for replacing defective organs and tissue in tissue engineering, while also being useful for the treatment of a myriad of genetically transferred diseases such as muscular dystrophy and cystic fibrosis. At present, this has been realized by viral therapy, which has various shortcomings, including limited DNA carrying capacity, high cost and production problems. On the other hand, a non-viral (plasmid) gene delivery system is very attractive due to its significant benefits. The NanoCaPs solutions can be ink-jet printed along with fibrin generating a biomimetic extracellular matrix for controlled gene delivery. The image on the far left shows ~20 nm DNA-NanoCaP particle clusters. NanoCaPs carrying rh-BMP2 when implanted into a muscle ectopic site of a rat shows the formation of a radio dense structure indicative of the formation of bone. By using fluorescent markers such as Qdots along with NanoCaPs it will be possible to study transfection mechanisms enabling the study of DNA binding and transfection into cells for the first time. These studies are currently in progress.



References:

[1] P. N. Kumta, C. Sfeir, D. Choi, J. Hollinger, L. Weiss and P. Campbell, "Methods for manufacturing Hydroxyapatite Structures", Patent Pending.
[2] D. Choi and P.N. Kumta, "Novel Aqueous Approach for Synthesis of Nanostructured Hydroxyapatite", submitted to *J. Materials Science, Materials in Medicine.*