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Ibuprofen and naproxen molecular liquids: An approach to a new drug delivery platform

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One of the major unsolved problems in pharmaceutical drug development is the poor water solubility of many active pharmaceutical ingredients (APIs) and hence reduced bioavailability. Researchers have attempted to minimize the problem by reducing the drug particle size. While, many of these platforms bring unique advantages to the field of drug delivery, an ideal solution would be to remove the problem of solubility entirely, by reducing the API size to clusters of a few molecules, bound by weak, Van der Waal's forces that would readily dissociate into molecules, during enteral or parenteral drug delivery process. In order to have commercial impact, such molecular clusters should also be produced in sufficiently high yield. We have precipitated molecular clusters of two drug molecules, ibuprofen and naproxen, respectively, via supersonic jet expansion of the supercritical CO_2 drug formulation into a collection vessel cooled to liquid N_2 temperatures and capturing the clusters instantaneously in dry ice with up to 80% yield. Gradual dissolution of the dry ice in water, at room temperature, resulted in the true solubilization of these clusters. Drop casting and ambient drying of the solution on a substrate (e.g. silicon) resulted in a stable, viscous liquid film, which we refer to as a nanostructured molecular liquid. This is a significant observation, considering the fact that, normally, ibuprofen and naproxen are solid powders at room temperature and pressure, with melting points of 76 ^{o}C and 154 ^{o}C, respectively. *In vitro* cancer cell viability studies of water-solubilized ibuprofen and naproxen exhibit similar cytotoxicity to that of the original raw materials, thus retaining their potency. Besides its scientific importance, this invention is expected to open up new drug delivery platforms.

Biography

Sudhir Kumar Sharma has completed his Masters in Physics and MTech in Materials from Department of Physics, Barkatullah University Bhopal, India. He has completed his PhD from the Indian Institute of Science Bangalore, India. He as a Post-doctratral Fellow attended Centre for Nano Science and Engineering (CeNSE), IISc. Bangalore, India. He has worked as a research associate at New York University Abu Dhabi, UAE and is currently working as a research scientist. He has more than 90 international journals and conferences publications.

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