Nanomedicine Holds Promise for Personalized Medicine

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Nanotechnology, which is based on discoveries in physics and chemistry, has in the last decade rapidly emerged in the biomedical research arena. This expansion is not all too surprising since the understanding of the physical and chemical properties of molecules or complexes of molecules in biological systems is fundamental to the understanding of cellular processes and the ways to control them. Imagine if you will the possibility of an oncologist having the ability to identify and destroy the very first cancer cells that would otherwise grow and metastasize to other parts of the body.

Nanomedicine is a highly specific medical intervention at the molecular scale for curing disease or repairing damaged tissues. A nanometer is one-billionth of a meter, too small to be seen with a conventional laboratory microscope. It is at this size scale, about 100 nanometers or less, that biological molecules operate inside living cells. Thus by applying nanotechnology, one can manipulate single, individual molecules (rather than an aggregate average population of molecules) and effect changes in biological processes. Current research supported by the U.S. National Institutes of Health include nano-structures or nano-machines that are compatible with living tissues and may serve as models of how they operate inside cells. With this knowledge, we should be able to design better diagnostic tools and engineer structures for more specific treatments of diseases. Along with genomic information, it is entirely possible to envision personalized medicine that is built upon the knowledge of how living cells function at the molecular level.