RNA Nanotechnology To Rescue Cancer Patients In Future

Scientists have now developed tiny delivery vehicles that can carry anticancer therapeutic agents directly into infected cells, using strands of genetic material constructed through nanotechnology, offering a potential wealth of new treatments for chronic diseases. This emerging branch of science is called nanomedicine.

These delivery agents are called nanoparticles, and are assembled from three short pieces of ribonucleic acid. The microscopic particles are designed in such a way that they possess both the right size to gain entry into cells and also the right structure to carry other therapeutic strands of RNA inside with them, where they are able to halt viral growth or cancer's progress.

RNA or ribonucleic acid has immense promise as a therapeutic agent against cancer, and furthermore, it might be possible to deliver multiple therapeutic agents to the cell at the same time, adding versatility and potential to the medical valve of the nanoparticles.

RNA molecules come in many variant forms, and the sort that the team mimicked from the phi29 virus ? called pRNA ?also can be linked to other types of RNA to form longer, hybrid strands with properties the researchers could assign. The nanoparticles have been created by linking together different kinds of RNA, after the successful manipulation of these stringy molecules into different shapes, including rods, triangles and arrays.

An effective agent against cancer needs to accomplish several tasks. It needs first to recognize the cancer cell and gain access to its interior, and then it needs to destroy it. It is also important for the molecule to act like a tracer that can provide valuable information regarding the location and the outcome of treatment.

Particles pass through cell membranes into the cell's interior, and the body has a hard time retaining particles smaller than 10 nanometers. But the tiny triangles fit, and they worked well enough to interrupt the growth of human breast cancer cells and leukemia model lymphocytes in laboratory experiments.

"One characteristic of cancer cells is that they do not stop growing, which is one reason tumors develop," said Guo, a senior researcher. "Once inside, the siRNA essentially instructs the cells to 'stop not stopping.' The nanoparticles had done their work on the breast cancer cell cultures within a few days."

"The results are very promising, but we still have several hurdles to jump before we can test this therapy on people," Guo said. "First and foremost, we must ensure that it is as safe as we think it is. Some RNA can be toxic to noncancerous cells as well, and though our nanoparticles appear to go straight to the cancer cells where we want them to go, we have to be sure they do not go anywhere else before we can inject them into a living person.

Nanotechnology is beginning to pay off here in that it may have provided us with a solution to the problem. We hope to enhance the work we have done so far and refine it for human trials."