GOVERNMENT OF INDIA
MINISTRY OF ELECTRONICS AND INFORMATION TECHNOLOGY
RAJYA SABHA
UNSTARRED QUESTION NO. 2941
TO BE ANSWERED ON 20.12.2024

FEATURES AND APPLICATION OF DNA APTAMER

2941# SHRI NARESH BANSAL:
SHRI MAYANKBHAI JAYDEVBHAI NAYAK:

Will the Minister of Electronics and Information Technology be pleased to state:

(a) the key features and potential applications of the indigenous healthcare technologies, particularly DNA Aptamer for prostate cancer detection and photonic chip-based spectrometric biosensors, which were recently transferred to the industry by Indian Institute of Technology (IIT), Delhi under the Nanoelectronics Network for Research and Application (NNetRA) project; and
(b) the role of the Ministry in facilitating commercialization and adoption of these technologies?

ANSWER

MINISTER OF STATE FOR ELECTRONICS AND INFORMATION TECHNOLOGY
(SHRI JITIN PRASADA)

(a): Key features and potential applications of the indigenous healthcare technologies:

(i) Deoxyribonucleic acid (DNA) Aptamer for prostate cancer detection:

Aptamers:

Aptamers are small molecules that can bind to specific targets such as proteins, carbohydrates and even live cells with high affinity.

Role of Aptamers in Cancer:

In cancer cells, some proteins, specific to the type of cancer, are at abnormally high level as compared to in the normal cells. These proteins can be used to identify the presence of the cancer cells, their localisation throughout the body and for cancer therapy. Since aptamers can bind to specific targets such as proteins, carbohydrates and even live cells with high affinity, therefore they may be used to target this specific protein on the surface of the cancer cells.

Contribution of IITD:

Researchers at IIT Delhi have fabricated DNA aptamers to target the proteins on the surface of prostate cancer cells. It can work as an excellent sensing element for biosensors due to its small size (2 nm), high affinity towards specific ligand/binder and stability.

Potential applications:

Along with the detection, fabricated DNA aptamers at IIT Delhi may provide the functionality to act for prostate cancer cells. For this, the fabricated aptamer has been conjugated / bound with a drug used to treat the prostate cancer. Due to small size,

(approximately one fifth size of antibodies), aptamer has additional advantages as sensing layer for photonic biosensor devices; and can help as drug delivery agent.

Potential applications of this technology are in the development of point-of-care in vitro diagnostics especially in low-resource settings due to its robust nature.

(ii) Photonic Chip-based spectrometric biosensor:

The photonic chip based spectrometric biosensor developed at IIT Delhi are portable, light weight, show quick response, highly sensitive for accurate detection of pathogens. The biosensor utilises Guided Mode Resonance (GMR) technology. The GMR technology entails etching of the special pattern and engrooves on the substrate which uses light waves and sensing layer to make a precise biosensor.

Advantages and Applications of Chips:

The fabricated chips are reusable and provide rapid detection of number of pathogens by using a very low sample volumes required to obtain the information on the presence of pathogens. This sensor may prove useful for food and health industry.

(b): The technologies developed have been transferred by IIT Delhi to private company and start-up. MeitY has schemes such as Technology Incubation and Development of Entrepreneurs (TIDE), Startup Accelerator of MeitY for Product Innovation, Development and Growth (SAMRIDH) and Gen-Next Support for Innovative Startups (GENESIS) to support the startups and industries to commercialise technologies.

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