Advance Diagnosis of Drug Resistance in Cancer: Towards Point-of-Care Electronic Nanodevice

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Editorial

The development of multidrug resistance (MDR) in cancer cells is the main reason of cancer chemotherapy failure. Numerous mechanisms have been found which are responsible in the development of MDR in cancer cells [1]. The most important and well-studied factor responsible for is MDR, is a cell membrane transporter “permeability glycoprotein, (P-gp)” which is encoded by the MDRI gene. P-gp possesses two membrane-spanning domains and two nucleotide-binding which work as energy dependent pump and reduces the transport of drug through the cell membrane. This results in low concentration of these drugs within the cells than the clinically relevant therapeutic levels [2,3]. This leads in the development of resistance in cancer cells towards drugs. In medical science it is extremely important to detect the onset of resistance in cancer cells which will be very helpful to design new therapeutic strategies to cure cancer patients. In the view of such an important clinical condition, numerous methods have been developed for the highly sensitive detection of these cancer cells. These methods include; polymerase chain reaction (PCR) [4], immunohistochemistry [5], flow cytometry [6], and microarray [7]. While these methods have been applied for the detection of drug resistant cancer cells (DRCC), but they are less sensitive, need extremely trained professionals, and lacks the ability to be miniaturized for the onsite medical detection. In recent years, electrochemical nanosensors are found to be the most promising approach to resolve the issues related to sensitivity, rapidity, selectivity, and ability to be miniaturized [8-17]. Thus, in biosensor-based detection technologies have been also attempted for the detection of DRCC. In this regard in mid-2000, Du et al., developed an electrochemical immunosensor for the detection of P-gp expressing leukemia cells [18]. The detection signal was obtained due to the powerful electrocatalytic activity of the sensor was examined by detecting DRCC in serum samples, with the lowest value compared to any other DRCC sensor reported till date. The designed sensor was highly selective and was able detect target cells in presence of drug sensitive and noncancerous cells and other chemical molecules present in the real sample environment. The clinical value of the sensor was examined by detecting DRCC in serum samples, and the results were very promising indicating its real biomedical value.

These studies clearly show that there are huge interest to develop highly sensitive point-of-care diagnostic methods to diagnose drug resistance in cancer cells. More research in this area will surely help the clinicians to design the appropriate therapeutic strategy which will reduce the pain of cancer patients and finally can be able to save their life. Future studies should be directed towards integrating these electronic nanosensors with microfluidic systems to develop a point-of-care nanodevice to address more precise issues related to drug resistance in cancer.

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