Editorial

INDUCED PLURIPOTENT STEM CELLS FOR DEVELOPMENT OF CANCER IMMUNOTHERAPY- A VIABLE IDEA FOR LESS TOXIC TREATMENT

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ABSTRACT
Induced pluripotent stem cells were introduced by Prof. Yamanaka and now being studied in all stem cells related treatment methods. Cancer immunotherapy is now part of targeted therapy and showing promising results, however the cost of treatment and tagged risk of side effects making it difficult for patients. Thus use of induced pluripotent stem cells to grow into plasma cells and produce antibodies against cancer targets will be a breakthrough in cancer management

Key Words: Cancer immunotherapy, Induced pluripotent stem cells, stem cell research

INTRODUCTION

Cancer has remained a deadly disease from the ancient period. The earliest reported information dates back to 3000 B.C. when Edwin Smith Pyparus reported eight breast cancer cases and defined them as an ailment for which there was no treatment(1). Following the establishment of first cancer hospital in France and second in Great Britain in 18th Century, paved a way for organized data collection(1). During early 19th century the clinicians and scientists discovered that there are a number of factors which control the prognosis of the cancer (2–4). This discovery then resulted in exploration of treatment options including local therapy (ie surgery and radiotherapy) and systemic therapy (ie chemotherapy, endocrine therapy and immunotherapy).

The developed countries have now moved towards the translational research where the treatment targets are discovered in the laboratory and are utilized in clinical practice to predict fate of the disease. As a result, cancer is now more manageable in the developed countries with much better prognosis. Since the inception of the concept of Precision medicine now more discoveries in the field of cancer sciences are also expected.

CANCER RESEARCH IN PAKISTAN

Pakistan is still at the primitive stage of cancer research. According to the cancer statistics reported by World Health Organization Project Golobocon 2020 Pakistan is having the highest incidence of breast cancer among Asian countries same is the prevalence of some other forms of cancer too(5). Our local data suggest very high prevalence of oral cancers in interior Sindh contributing to 27% of all cancer reported in the region. Although the incidence of many cancers is lower in Pakistan as compared to the developed countries but the mortality is high(5). The major reason for the high mortality appears to be the lack of any national guidelines based on evidence based local research

conducted on our own patients. It is essentially important to understand the genetics and molecular attributes of cancer cell/ tissues in our own society so that locally appropriate tailored treatment policies can be adopted. With the same token it would also be possible to produce medicines in Pakistan well according to dominant cancer pattern. In future this will not only improve cancer management but will surely help in introducing more effective and economical cancer treatment options.

CANCER IMMUNOTHERAPY

The immunotherapy (ie monoclonal antibodies) widely used in cancer therapeutics and showing great success in controlling the disease even at advance stage. First of its kind medicine in breast cancer was trastuzumab. However, the cost involved is too much on the family as well as pose great economic burden on the country. Currently available immunotherapeutic drugs are being used not only in cancers but other diseases such as autoimmune disorders as well.

Anti-cancer Vaccine development from induced pluripotent stem cells

Cancer antibodies are being produced against the identified targets in the cancer cells such as HER2 receptor, EGFR, VEGF etc. These are being developed from animal sources, with chances of toxic effects and less efficacy. The stem cells on the other hand, have been used for organ generation and showing promising potential of great success in future. Thus production of blood cells from stem cells will be an important landmark.

These are re-programed adult cells to go into pluripotent stage and become plasma cells to produce antibodies(6). The technique was developed by Prof. Yamanaka, who won Nobile prize for this achievement. This technique is absolutely amazing to revolutionize cancer treatment. The work is also underway to look at the potential of induced pluripotent stem cells in hematological disorders(7). There is limited work done on use of induced pluripotent cells to produce antibodies. Though it is a novel idea of developing vaccine from induced pluripotent stem cells where adult B cells will be treated to go into pluripotent stage and then transform into plasma cells having potential of production of specific antibodies targeting cancer proteins. The research is needed for specific methods to develop these human monoclonal antibodies. This will provide precision medicine in its true sense and also reduce the number of side effects produced by humanized antibodies which are actually animal origin.

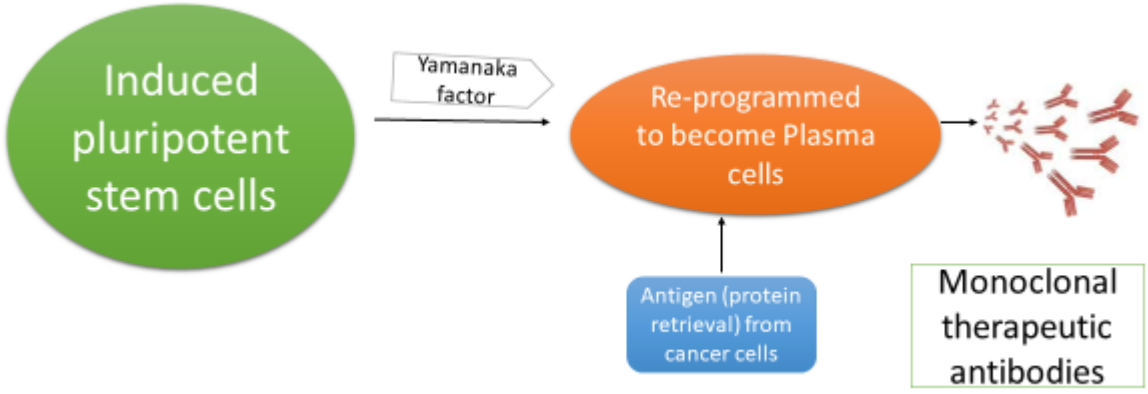

Figure 1: Proposed plan for production of anti-cancer anti-bodies from induced pluripotent stem cells

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