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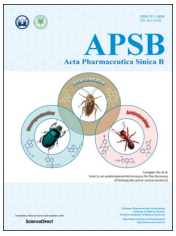

MEETING REPORT

Regulation of immune-related diseases by multiple factors: A meeting report of 2017 International Workshop of the Chinese Academy of Medical Sciences (CAMS) Initiative for Innovative Medicine on Tumor Immunology

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Abstract Immune cells play key roles in cancer and chronic inflammatory disease. A better understanding of the mechanisms and risks will help develop novel target therapies. At the 2017 International Workshop of the Chinese Academy of Medical Sciences Initiative for Innovative Medicine on Tumor Immunology held in Beijing, China, on May 12, 2017, a number of speakers reported new findings and ongoing studies on immune-related diseases such as cancer, fibrotic disease, diabetes, and others. A considerably insightful overview was provided on cancer immunity, tumor microenvironments, and new immunotherapy for cancer. In addition, chronic inflammatory diseases were discussed. These findings may offer new insights into targeted immunotherapy.

1. Introduction

The immune system protects the body against illness and infection. However, an atypical immune response can cause the development of chronic inflammatory diseases including cancer. Understanding the crosstalk between immune cells and disease initiation provides better opportunities for identification of drug targets in the future. This report summarizes the major points presented at the 2017 international workshop on the regulation of immune-related diseases. The International Workshop on Tumor Immunology is sponsored by the Chinese Academy of Medical Sciences (CAMS) Innovation Fund for Medical Sciences (CIFMS) to provide a unique opportunity for investigators and scientists to interact with each other. The 2017 International Workshop was held in Beijing, China, on May 12, 2017 and consisted of 7 keynote lectures and 6 short talks. With a focus on the most recent advances in the fields of immune-related diseases, including cancer, fibrotic diseases and obesity, the programs covered a wide range of important topics, including cancer immunotherapy, tumor immunity, cancer metabolism, tumor dormancy, microparticles, and protein-quality control. Some emerging fields, such as oncolytic vaccines and personalized prophylactic cancer vaccines were also included.

2. Session on "cancer immunity" chaired by Dr. Bo Huang

2.1. Plenary lecture on "hot topics and trends in cancer immunotherapy" by Dr. Xuetao Cao

The Scientific Innovation Program for Medical Sciences and Health (SIPMSH) already has been incorporated in the '*Plan of Health China* 2030' from the state council[1]. Dr. Xuetao Cao, the current President of the CAMS[2], elaborated on "hot topics and trends in cancer immunotherapy" by five categories, including personalized tumor vaccines, antigen-specific immunotherapy, predictive immunotherapy biomarkers, blockade of immune checkpoints, and metastasis prevention.

Dr. Cao first discussed the design and application of immunotherapy by individual oncogenomics. With the high efficacy and low cost of deep sequencing, personalized tumor vaccines have been possible for cancer immunotherapy. The mutational spectrum obtained by next-generation sequencing provided valuable information for the design of vaccination peptides, tumor neoantigen identification, etc.[3]. With the necessary adjuvants, modified synthetic peptides targeting a tumor antigen are used as therapeutic vaccines for cancer[4]. Moreover, autologous antigen-presenting cells (APCs) have been introduced with tandem minigenes or synthetic peptides of all mutations. This technology has led to the discovery of some mutations in APC in the context of the autologous major histocompatibility complex (MHC). Adoptive cell therapy by expansion and training of autologous lymphocytes *in vitro* is promising for cancer patients. Cao mentioned that the future of "omics-driven" oncology may have a multiplatform approach that will allow comprehensive characterization of a tumor at multiple levels[3]. He then moved on to antigen-specific immunotherapies, such as chimeric antigen receptor (CAR)-T therapy and dendritic cell vaccines. Improvements in CAR-T cell delivery to tumor cells will further expand the T cell gene therapies. He pointed out the current focus on efficiency enhancement of dendritic cell vaccines. In the latest issue of *Cancer Cell*, Spranger et al.[5] found that effector T cell migration depends on the presence of $CD103^+$ DCs producing CXCL10, and a lack of $CD103^+$ DC-mediated effector T cell recruitment contributes to immune escape. Dr. Cao pointed out that dendritic cells play a critical role in tumor-infiltration by T cells. He initiated the phase I clinical trial in 2001 with the Chinese Food and Drug Administration (CFDA) approval, and spent ten years in the phase II trial from 2002 to investigate the synergistic effects of DC vaccines with chemotherapy for advanced colon cancer patients. Eradication of inhibitory immune factors by chemotherapy enhances the efficiency of DC vaccines. The therapeutic response rate increased from 23% with chemotherapy alone to 45% with chemotherapy plus DC vaccines. He concluded that the repertoire of tumor-infiltrated T cells and their cytokine profiles tightly link with the efficiency of immunotherapy.

Dr. Cao then talked about predictive signature biomarkers in cancer immunotherapy[6]. Currently there are extensive investigations to find biomarkers from tumor surface proteins, the tumor microenvironment, tumor-adjacent tissues and peripheral blood of cancer patients. Mleenik et al.[7] recently reported that the tumor microenvironment and immunoscore are critical determinants of the likelihood of metastasis. Dr. Cao's laboratory also identified a prognosis predictor for the transformation of normal liver to hepatocellular carcinoma (HCC), and an interferon-α (IFN-α) therapeutic predictor for HCC patients[8,9]. High-level HCC cell expression of micro-RNA 199 (miR-199) is associated with less aggressive disease in patients with HCC. miR-199 delivered by AAV8-based gene therapy inhibited HCC growth by blocking PAK4-Raf-MEK-ERK pathway[8]. Although IFN-α therapy is