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EDITORIAL

Prospects of immunotherapy for cancer

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Cancer is a significant global health problem and remains one of the most challenging threats to human health. Conventional cancer treatments may include surgery, chemotherapy, radiation therapy, targeted therapy, and immunotherapy. Immunotherapy is still considered as a highly exciting field for new discoveries and treatments for cancer [1]. Immunotherapy was cited by *Science* as one of the top 10 breakthroughs in the world in 2013. The 53rd Annual Meeting of the American Society of Clinical Oncology in 2017 stated that immunotherapy has entered the era of cancer immunotherapy version 2.0. In 2018, the Nobel Prize in Physiology or Medicine was awarded to James Allison and Tasuku Honjo, who helped establish this paradigm-shifting approach to cancer treatment. Typically, cancer immunotherapy includes antibody therapy (immunological checkpoints and target blocking) [2], adoptive T cell therapy (tumor-infiltrating lymphocytes, CAR-T, and TCR-T) [3], dendritic cell vaccines, and tumor vaccines, in which T or B lymphocytes play important roles in immunotherapy [4].

To promote the research and development of immunotherapy for cancer, the current issue of our journal contains a special column on this topic, aiming to provide an important platform for international academic and technological exchanges. For this special column, the following review and research articles are included.

To improve the response and efficacy of immunotherapy, Synat Kang *et al.* reported in this issue that NY-ESO-$1_{157\text{-}165}$ HLA-A*02:01-specific high-affinity TCR-transduced cytokine activated T cells (CATs) can specifically kill cancer cells with good efficacy and suggested that TCR-CAT may be a very good alternative to the expensive TCR-T—an effective personalized cyto-immunotherapy. Similarly, to enhance the efficacy of cancer immunotherapy-targeted epidermal growth factor receptor (EGFR), a novel mAb CH12, which specifically recognizes S492R mutation in EGFR, can suppress the growth of colorectal cancer xenografts with S492R EGFR mutations (Qiongna Dong *et al.*, this issue). Zhao Zhang *et al.* (this issue) reported a chimeric antigen receptor T cell targeting EGFRvIII in metastatic lung cancer therapy, which significantly shows efficient anti-tumor activity against lung cancer cells expressing EGFRvIII *in vivo* and *in vitro*.

Establishing predictive biomarkers to maximize the efficacy of checkpoint inhibitors is important given that not all patients are responsive to immune checkpoint inhibitors [5]. To discover biomarkers for the prediction of cancer immunotherapy, Zhen Xiang and Yingyan Yu (this issue) provided methodologies for online database selection, biomarker screening, assessment of the current progress of immune checkpoint blockade in solid tumor treatment, and selection of the indication for cancer immunotherapy. To enhance the efficacy of immunotherapies, Yiwen Cao *et al.* (this issue) analyzed the prognostic value of pretreatment immunologic markers in newly diagnosed patients with diffuse large B cell lymphoma (DLBCL) and demonstrated that patients with multiple ($\geqslant 3$) abnormal immunologic markers exhibit significantly shorter 3-year PFS (52.7% vs. 77.3%, $P < 0.001$) and 3-year OS (68.5% vs. 85.8%, $P = 0.001$), thus providing new insight into the risk stratification of patients with DLBCL. Finally, Min Zhang *et al.* (this issue) reviewed biomarkers that can potentially predict the outcome of immune checkpoint inhibitor treatment, including tumor-specific profiles, tumor microenvironment evaluation, and other factors.

In the current column, we also summarized adoptive cell transfer therapy (ACT) for hepatocellular carcinoma (Renyu Zhang *et al.*, this issue). In contrast with traditional strategies, ACT involves tumor-infiltrating lymphocytes and cytokine-induced killer cells in the treatment of HCC. Furthermore, the current application of ACT, challenges of CAR-T technology for HCC treatment, and possible strategies for future therapeutic research are summarized. Chenfei Zhou and Jun Zhang (this issue) reviewed the

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current status of combining immune checkpoint inhibitors with molecular targeted therapy, chemotherapy, or radiotherapy in the treatment of gastrointestinal cancer.

It is becoming urgent to seek new opportunities in the tide of "immunotherapy version 2.0" with the unique features of "precise, combined, and broad spectrum" to improve anti-tumor efficacy and reverse immune suppression [6]. Despite the obstacles that limit the efficacy and safety of immune checkpoint inhibitors, the ultimate goal of cancer immunotherapy is to cure cancer without traditional therapeutic toxicity [7]. As Bluestone said, "The bottom line is we aren't at the beginning of the end, we're at the end of the beginning."

Compliance with ethics guidelines

Zhinan Chen declares no conflict of interests. This manuscript does not involve a research protocol requiring approval by the relevant institutional review board or ethics committee.

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