ImmuneOncia Therapeutics
www.immuneoncia.com

ImmuneOncia Therapeutics Inc.

Novel immunotherapies to combine with PD-1/PD-L1 treatment

ImmuneOncia Therapeutics is developing antibodies that target novel immune checkpoints, which could enhance drug efficacy when used in combination with agents that block PD-1 or PD-L1.

With an international approach to open innovation, ImmuneOncia Therapeutics was established in 2016 as a joint venture between Sorrento Therapeutics, Inc., an antibody-centric biopharmaceutical company based in San Diego, California, USA, and Seoul-based Yuhan Corporation, one of the largest pharmaceutical companies in South Korea. The new clinical-stage biopharmaceutical company focuses on immuno-oncology and aims to bring safe, effective and novel immunotherapies to patients worldwide.

ImmuneOncia benefits from Sorrento's leading immunotherapy product portfolio and manufacturing capabilities. Yuhan, meanwhile, has committed substantial resources for the development of novel cancer immunotherapies. ImmuneOncia also benefits from Yuhan's experience in research and development (R&D), as well as the history of excellence and efficiency in drug development among South Korean companies.

From its base in Yongin, South Korea, ImmuneOncia operates virtually by forging collaborations with contract research organizations, and utilizes the well-developed clinical trial infrastructure in South Korea. "Early clinical development requires rigorous scientific proof-of-concept studies, and the hospitals in Korea are able to support this," said Yun Jeong Song, CMO at ImmuneOncia.

Thanks to investment from the Korean government since 2004, there are currently 24 clinical trial centers in South Korea, all affiliated with university hospitals and offering world-class facilities, as well as 184 clinical trial sites. The sites have among the fastest study start-up times, with well-defined regulatory and review processes, and have access to highly educated medical and research staff (details available at http://en.konect.or.kr).

Future backbone therapy

ImmuneOncia's portfolio includes immune checkpoint (IC) antibodies to targets for both hematological malignancies and solid tumors. The most advanced molecules in its pipeline target the IC proteins CD47 and PD-L1, a ligand of programmed cell death protein 1 (PD-1) (**Fig. 1**).

It is now well established that antibodies that block the interaction between PD-1 on T cells and PD-L1 on tumor cells can boost T cell activity and proliferation, leading to enhanced antitumor immunity. Clinical candidate IMC-001 is a fully human monoclonal antibody to PD-L1 that retains antibody-dependent cell-mediated cytotoxic activity and shows robust efficacy in vitro and in vivo. The investigational new drug (IND) filing for IMC-001 has been rapidly approved by the Korean Ministry of Food and Drug Safety, and the phase 1 trial is expected to commence by Q1 of 2018. The clinical candidate supports ImmuneOncia's global vision of supplying innovative drugs to a wider population. "It is a high-quality, innovative drug, yet we also aspire to provide this drug at a lower cost than is typically associated with immunotherapies, which will be relevant for market access with our regional partners," said Kwang Ho Cheong, CEO of ImmuneOncia.

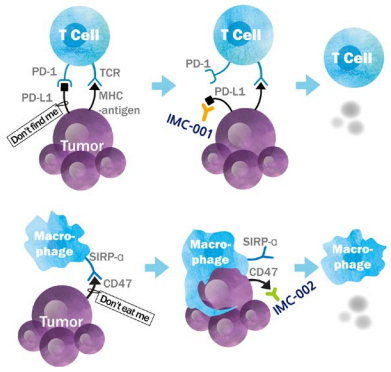

Fig. 1 | ImmuneOncia's portfolio. The portfolio includes immune-checkpoint-targeting antibodies IMC-001 (anti-PD-L1) and IMC-002 (anti-CD47). IMC-001 blocks PD-L1 on tumor cells interacting with PD-1 on T cells, and boosts T cell activity. IMC-002 blocks CD47–SIRP-α interactions between tumor cells and macrophages and promotes tumor phagocytosis by macrophages.

ImmuneOncia is also positioning IMC-001 as the best-in-class anti-PD-L1 antibody. "Although current PD-1/PD-L1-targeting treatments can achieve durable remissions in a proportion of patients, up to 70% of patients or more do not respond," said Song. "One way to improve responsiveness could be to use an improved drug delivery route that would enable IMC-001 to access the immune system more directly. We are exploring this hypothesis with an industry partner who is a leader in that field."

Prioritizing the development of IMC-001 is part of the overarching strategy for ImmuneOncia. "With IMC-001—our backbone therapy—in place, we will be able to move quickly and explore a wide range of therapeutic options with various partnering technologies, including novel combinations with other IC-targeting antibodies in our pipeline," said Cheong.

Anti-CD47

Another advanced candidate in the pipeline targets CD47, which acts as a 'don't eat me' signal that inhibits phagocytosis of healthy cells by interacting with the signal-regulatory protein alpha (SIRP-α) receptor on macrophages. Research shows that CD47 is often overexpressed on cancer cells, which protects tumors from phagocytosis but also presents an opportunity to develop drugs that restore the phagocytic activity of macrophages. Indeed, blockade of the CD47–SIRP-α interaction has been shown to inhibit tumor growth in mouse xenograft models.

IMC-002 is a fully human IgG monoclonal antibody designed to block the CD47–SIRP-α interaction in order to promote the phagocytosis of cancer cells by macrophages. It binds to human CD47 with an optimal affinity that maximizes efficacy, in terms of tumor phagocytosis, without causing hemagglutination, which is linked to side effects seen in the clinic, such as anemia and thrombocytopenia.

Recent evidence shows that tumor-associated macrophages also express PD-1, and suggests that PD-1/PD-L1 therapies may also have a direct effect on macrophages[1]. Combinatorial blockade of PD-L1 and CD47 has been shown to enhance antitumor effects in vivo[1], which presents an interesting opportunity to combine IMC-001 and IMC-002 in the clinic.

The company is also in the early stages of developing a number of other IC-targeting antibodies, as well as bispecific antibody drug candidates. "We are building our pipeline in a way that ensures synergies between the different drug targets, and we also take the patent landscape very seriously," said Cheong.

ImmuneOncia is open to various partnering opportunities, including chemistry, manufacturing and control development, R&D collaborations and business alliances. Because it is a small biotech system run by industry experts and advisors, the company has a quicker decision-making process and more flexible mindset compared with a large pharmaceutical company. At the same time, ImmuneOncia will continue to make the most of its international joint venture in immuno-oncology by forging multinational and regional alliances, and networking with immunological and clinical experts worldwide.

1. Gordon, S. R. et al. *Nature* **545**, 495–499 (2017).

contact
Kwang Ho Cheong, CEO
ImmuneOncia Therapeutics, Inc.
Yongin, South Korea
Tel: +82 31 306 8148
Email: khcheong@immuneoncia.com