Immuno-oncology

Exploring current trends in immuno-oncology biomarker research and where they correlate within the cancer immunity cycle

Immuno-oncology (IO) is a fast-growing area of research in terms of understanding the fundamental mechanisms of how cancer cells interact with the immune system, as well as in identifying novel biomarkers for immunotherapy.

Given the relatively low response rate to immunotherapy [1], the lack of suitable predictive biomarkers being identified, and the challenge of immune-related adverse events (irAEs), the need to identify and verify more reliable IO biomarkers is of utmost importance in the fight against cancer.

This infographic examines three currently trending IO research areas–CAR T cell therapy research, immune checkpoint inhibitor (ICI) research, and cancer vaccine research–and how they correlate within the cancer immunity cycle proposed by Chen and Mellman [2].

Thermo Fisher Scientific is helping facilitate the research of new immunotherapy biomarkers across these three key IO areas.

In addition, we will explore how Applied Biosystems™ and Ion Torrent™ products can help advance biomarker research for future immunotherapies.

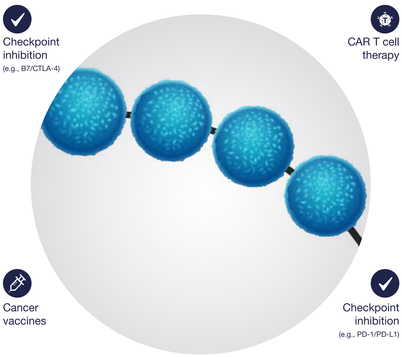
Genetic analysis tools such as NGS, Sanger sequencing, microarrays, and RT-qPCR are extremely important in IO research for biomarker discovery and verification [2]. Various genetic analysis solutions available from Thermo Fisher can facilitate the understanding of how to use the immune system to fight tumors.

CAR T cell therapy

CAR T cell therapy enhances the natural cancer-fighting ability of the body's T cells by removing these cells from the body, growing and/or making changes to them *in vitro*, and then reintroducing them back into the individual [3].

Techniques such as targeted NGS and Sanger sequencing can be effectively used to study T cell repertoire diversity, which is central to biomarker discovery for CAR T cell therapy. **Select the following sections** to discover which Thermo Fisher products can be used to support your CAR T cell therapy research:

- **CAR T cell engineering**
- **Cell authentication and QC**
- **T cell repertoire diversity analysis**



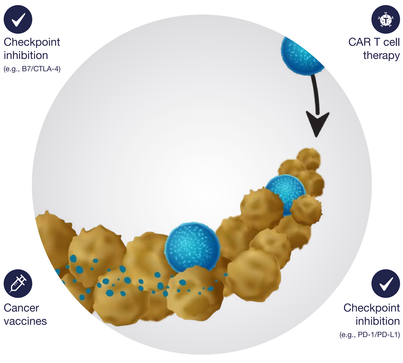
Cancer immunity cycle

Learn more about CAR T therapy products

Immunity checkpoint inhibition

Immunity checkpoint inhibitors (ICIs) are monoclonal antibodies (mAbs) that target immune checkpoints. They work by blocking endogenous inhibitory pathways, effectively releasing the brakes applied to the immune system and unleashing an antitumor immune response, without directly targeting tumor cells or activating the immune system [4].

Robust, accurate, and sensitive genetic technologies can be used to identify ICIs and study the effect on the tumor microenvironment (TME). **Select the different sections** to discover our immunity checkpoint inhibition research solutions.



Cancer immunity cycle

- **Biomarker analysis**
- **Inhibition efficacy**
- **MSI analysis**

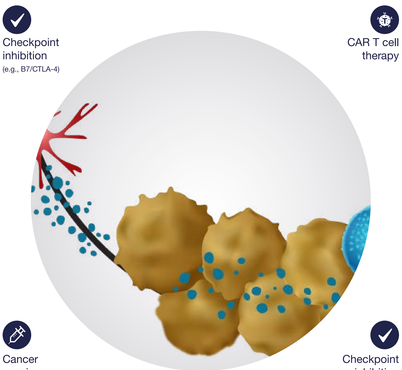
Learn more about ICI products

Cancer vaccines

Therapeutic cancer vaccines work by stimulating the endogenous immune system to recognize and attack certain markers, or antigens, that are present on or in tumor cells. Many vaccines in development aim to use neoantigens–newly formed tumor antigens not yet known to the host's immune system–to generate a long-lasting T cell cancer immunity [5].

Targeted NGS and Sanger sequencing techniques are useful tools in studying neoantigen-specific T cells and hence discovery of biomarkers for therapeutic cancer vaccines. To discover solutions to help you advance your cancer vaccine research, **select the different sections below.**

- **Neoantigen identification**
- **Vaccine engineering**
- **Immune response**



Cancer immunity cycle

Learn more about cancer vaccine products

References

1. Kadelsha C et al. (2019) The role of molecular profiling to predict the response to immune checkpoint inhibitors in lung cancer. *Cancers (Basel)* 11(2):201. doi:10.3390/cancers11020201.
2. Chen S, Mellman I (2013) Oncology meets immunology: the cancer-immunity cycle. *Immunity* 39(1):1–10. doi:10.1016/j.immuni.2013.07.012.
3. Chavez JC et al. (2018) CAR T-cell therapy for B-cell lymphomas: clinical trial results of available products. *Ther Adv Hematol* 10:2040620719841581. doi:10.1177/2040620719841581.
4. Buchbinder E, Desai A (2016) CTLA-4 and PD-1 pathways: similarities, differences, and implications of their inhibition. *Am J Clin Oncol* 39(1):98–106. doi:10.1097/COC.0000000000000239.
5. Mougel A et al. (2019) Therapeutic cancer vaccine and combinations with antiangiogenic therapies and immune checkpoint blockade. *Front Immunol* 10:467. doi:10.3389/fimmu.2019.00467.

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