Immune Function Profiling in Cancer Research

Cancer drugs that harness the power of the patient's immune system have altered the paradigm of cancer care in the past few years. Antibody-based therapies against specific cell surface targets can directly modulate the activity of T cells, reawakening their ability to bind to and kill cancer cells.

CD3-targeted bispecific antibodies bring T cells and tumor targets in close proximity, facilitating T cell mediated killing. Cell-based therapies such as CAR-T, use genetic modifications to redirect T cells to bind to tumor associated antigens, resulting in T cell expansion and enhanced tumor killing.

Additional Immunomodulators

Also being developed for cancer therapy include:

Small Molecules	Antibodies	Vaccines
		

Development of these drugs requires complex cellular models and assays for lead identification and characterization. To thoroughly assess and characterize immune cells, phenotyping and functional assays must be used. Technologies that can robustly and reliably provide high content immunophenotypic and functional data are therefore critical for the rapid development of these new drugs.

"...more than 1,200 new immuno-oncology drugs are being tested, with more than 2,000 others in the preclinical phase."[1]

"In 2017, 11/14 new active substance (NAS) therapeutics developed for cancer received Breakthrough Therapy designation by the FDA."[2]

2019

2024

"The total immuno-oncology market will be worth approximately $34 billion by 2019, rising to $34 billion by 2024." – according to GlobalData[3]

Immune Function Profiling Assays

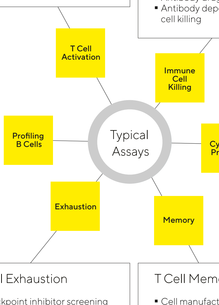
There are numerous areas within the cancer research workflow where these assays are used:

T Cell Activation

- Checkpoint inhibitor screening
- CAR-T functional screeningonal screening
- Tumor infiltrating lymphocyte functional screening
- Bispecific antibody funtional screening
- Cell manufacturing

Immune Cell Killing

- CAR-T functional screening
- T Cell receptor therapy functional screening
- Tumor infiltrating lymphocyte functional screening
- Bispecific antibody funtional screening
- NK CAR functional screening
- Antibody drug conjugates
- Antibody dependent immune cell killing



T Cell Exhaustion

- Checkpoint inhibitor screening
- CAR-T functional screening
- Tumor infiltrating lymphocyte functional screening
- Small molecule and peptides inhibiting exhaustion

T Cell Memory

- Cell manufacturing
- Screening for optimal sera conditions for CAR-T
- Small molecule and peptides impacting T-cell differentiation (CAR-T related)

Traditional Technologies Used to Evaluate Immune Function

		
Cytokine Profiler Used for cytokine analysis	**Flow Cytometry** Immunophenotyping and cell counting at high-throughput	**Plate Reader** Used for cell counting, cell health and function and proliferation

Challenges of Immune Profiling

- Large data set analysis
- Resource constraints
- Low throughput
- Biological complexity
- Physiological relevance
- Time-consuming
- Cost implications (of sample and reagents)
- Semiquantative
- Complexity of traditional techniques
- Cannot collect data on mulitple parameters

Transform Your Immune Cell Profiling

Physiological Relevance	Time Consuming
Low Throughput	Large Date Set Analysis
Cannot Collect Data on Multiple Parameters	Cost Implications
Biological Complexity	Resource Constraints
Semiquantative	Complexity of Traditional Techniques

Advanced flow cytometry platform:

- High throughput
- Detailed biological insights
- Simplified data analysis enables faster time to result
- Assess multiple cell types simultaneously in a single well
- Miniaturization

References:
[1] Tang, J., Pearce, L., O'Donnell-Tormey, J. and Hubbard-Lucey, V. (2018). Trends in the global immuno-oncology landscape. Nature Reviews Drug Discovery, 17(11), pp.783-784.
[2] Anon. (2019). Global Oncology Trends 2018. [online] Available at: https://www.iqvia.com/institute/reports/global-oncology-trends-2018 [Accessed 29 Apr. 2019].
[3] White, V. (2019). Immuno-oncology market to hit $34 billion by 2024. [online] Europea Pharmaceutical Review. Available at: https://www.europeanpharmaceuticalreview.com/news/40547/immuno-oncology-globaldata/ [Accessed 29 Apr. 2019].