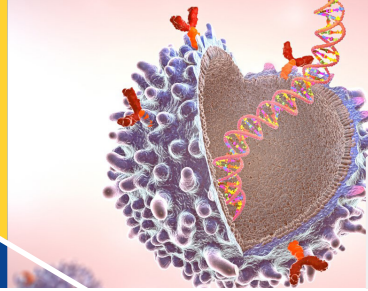


R&D TRENDS: RISING STARS IN IMMUNO-ONCOLOGY



Overview

Immuno-oncology (IO) represents a groundbreaking approach in cancer treatment. By harnessing the body's own immune system to treat or eliminate cancer, IO may offer advantages over conventional anti-tumor agents.

Background: IO has already been successfully applied to the treatment of hard-to-treat cancers such as lung cancer. Established IO agents such as antibody-drug conjugates, checkpoint inhibitors, and antibodies continue to garner interest.

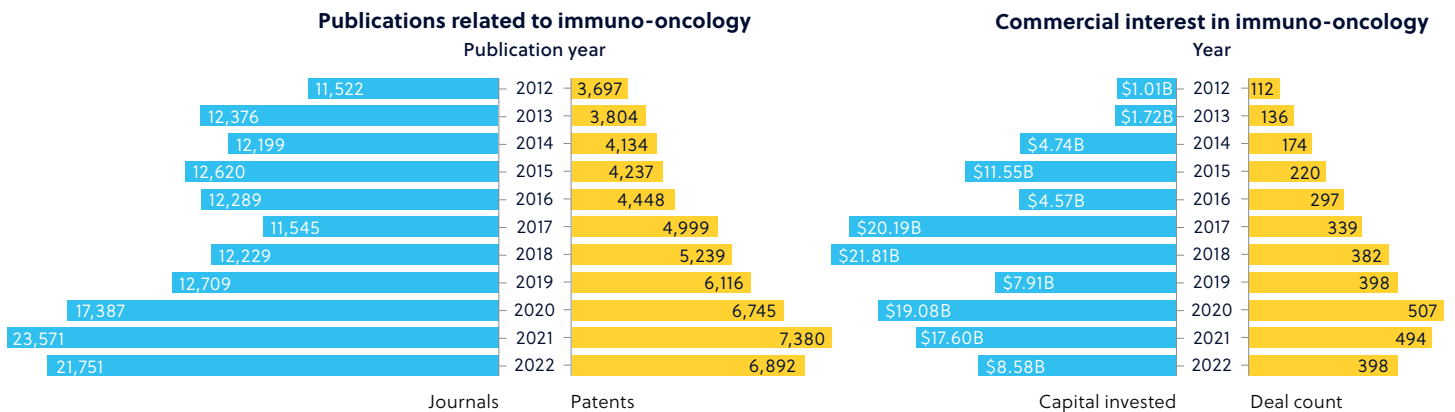
Key benefits: The financial and therapeutic success of IO agents has made these agents a focal point of pharmaceutical research and investment.

Market opportunity: IO therapies selectively target cancer cells and boost the body's immune response against cancer; use in combination with other agents can create a synergistic effect, enhancing efficacy.

Key challenges: Effectiveness of some agents may be restricted to certain subsets of patients. There is also the risk of off-target adverse effects. The high cost of therapy poses affordability challenges.

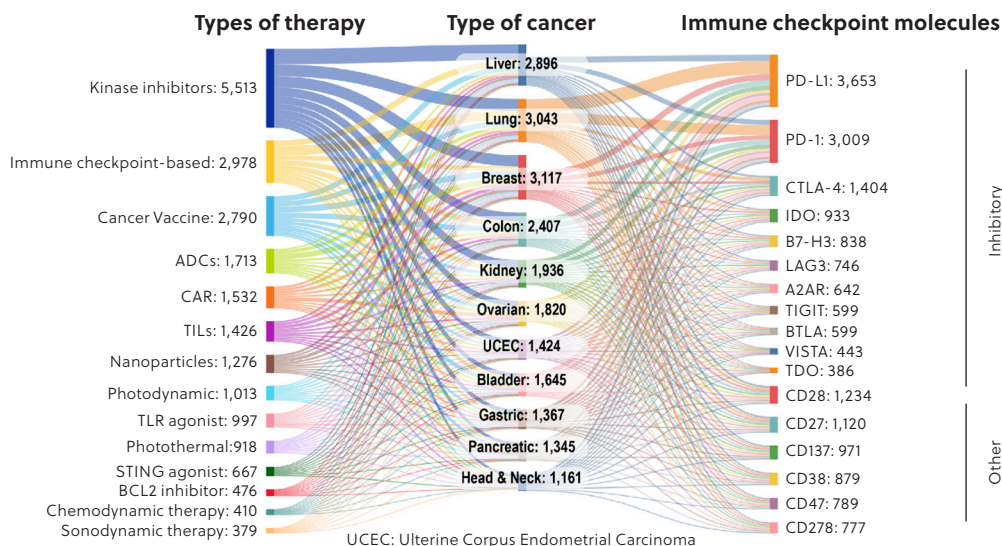
The rise of immuno-oncology research

The immuno-oncology field has experienced consistent, uninterrupted growth since 2000, with signs that this growth is poised to accelerate further. This pattern is paralleled by a gradual increase in commercial interest.



Exploring patterns in IO therapy research

Among the different types of emerging therapies, kinase inhibitors, immune checkpoint-based therapies, cancer vaccines, ADCs, CAR, and TILs appear to co-occur to a greater extent with emerging solid tumors in journal publications related to immuno-oncology.



The rapid rise of CAR therapy

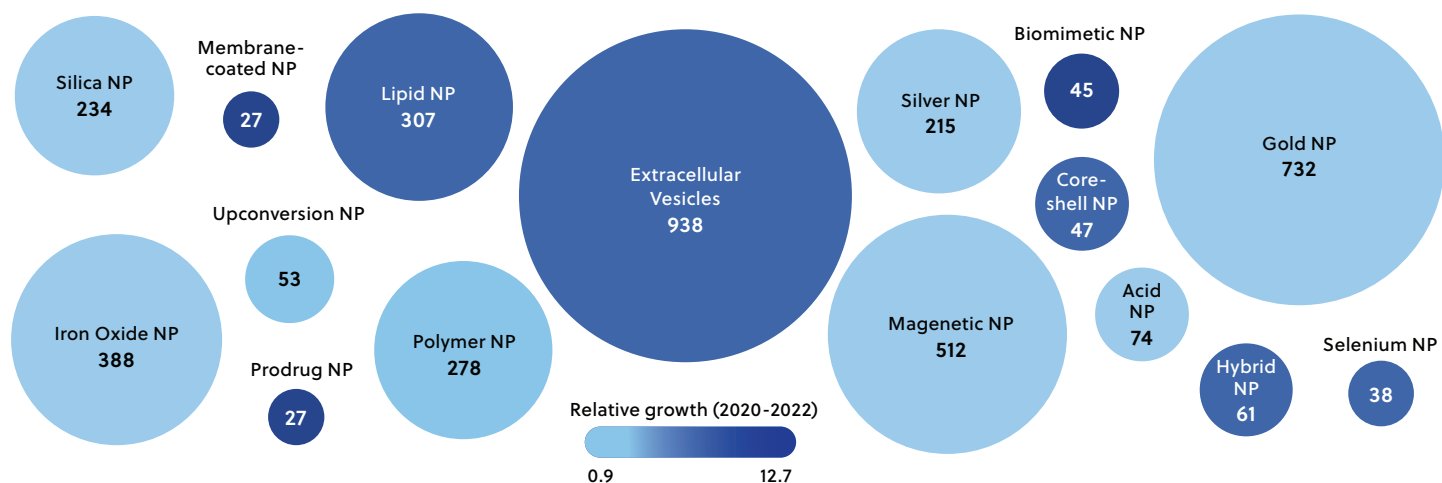
CAR T cells, created by harvesting T cells from the patient's blood and genetically modifying them to attack cancer cells, have shown promising results in treating various cancers. According to our trend landscape analyses, CAR T-cell therapy is a rapidly growing field, with various agents in use and approved by the U.S. Food and Drug Administration (FDA).

Name of drug	Target antigen	Year of approval	Company	Target disease	CAS RN number
Kymriah (Tisagenlecleucel)	CD19	2017	Novartis	B-cell acute lymphoblastic leukemia (ALL) and B-cell non-Hodgkin lymphoma (NHL)	1823078-37-0
Yescarta (Axicabtagene ciloleucel)	CD19	2017	Kite Pharma/Gilead	B-cell NHL and follicular lymphoma	2086142-87-0
Tecartus (Brexucabtagene autoleucel)	CD19	2020	Kite Pharma/Gilead	B-cell ALL and mantle cell lymphoma (MCL)	2691112-12-4
Breyanzi (Lisocabtagene maraleucel)	CD19	2021	Juno Therapeutics, Bristol-Myers Squibb	B-cell NHL	2099722-39-9
Abecema (Idecabtagene vicleucel)	B-cell maturation antigen (BCMA)	2021	Celgene Corporation, Bristol-Myers Squibb	Multiple myeloma	2306267-75-2
Carvykti (Ciltacabtagene autoleucel)	BCMA	2022	Janssen Biotech	Multiple myeloma	2641066-71-7

IO delivery platforms – trends and innovations

Various emerging targeted drug nanocarriers are being explored to facilitate the delivery of IO therapies and enhance their therapeutic efficacy. While extracellular vesicles are the most widely researched, a variety of emerging nanocarriers (e.g., prodrug nanoplatforms) are also being explored.

Drug delivery vehicle uses in cancer immunotherapy



Looking ahead

The continued discovery of new and emerging targets and biomarkers highlights the untapped potential of IO. Challenges such as limited efficacy in certain patients, off-target effects, and high costs underscore the need for ongoing research and a personalized approach to treatment.

Learn more at cas.org/insights

More comprehensive information and references can be found at cas.org/resources/cas-insights

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