THERAVECTYS

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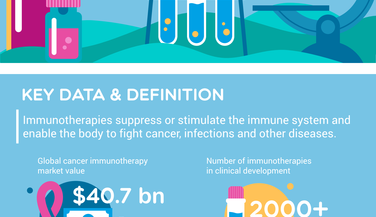
DISCOVERING THE CURRENT LANDSCAPE OF IMMUNOTHERAPIES



KEY DATA & DEFINITION

Immunotherapies suppress or stimulate the immune system and enable the body to fight cancer, infections and other diseases.

Global cancer immunotherapy market value

$40.7 bn

Estimated to surpass $80 bn by 2020

Number of immunotherapies in clinical development

2000+

LOOKING AT THE BIG PICTURE: A TIMELINE OF IMMUNOTHERAPIES

1970s MONOCLONAL ANTIBODIES (mAbs)

KEY ASPECTS
- Types: Naked, conjugated or bispecific mAbs
- MoA: Activate immune system, target specific antigens, destroying cancer cells

ADVANTAGES
- Reproducible & scalable
- Hybridoma cells as unlimited production source
- Highly specific

LIMITATIONS
- Expensive production
- Long production timeline
- Risk of immune reactions & adverse events

APPLICATION OF mAbs

COMMERCIALIZED:
- Various cancers
- Chronic inflammation
- Autoimmune & infectious diseases

IN CLINICAL DEVELOPMENT:
- Various cancers
- Neurodegenerative diseases
- Infectious diseases

1980s CANCER VACCINES

KEY ASPECTS
- Biological response modifiers
- Prophylactic vaccines or therapeutic vaccines
- MoA: Activate cytotoxic T-cells by introducing 1+ antigen(s) into the body triggering an immune response

ADVANTAGES
- Stimulates host immune system
- Limited toxicity
- Low costs, short timeline

LIMITATIONS
- Possible toxicity
- Poor efficacy & limited response
- Therapeutic vaccines short-lived immune stimulation

APPLICATION OF CANCER VACCINES

COMMERCIALIZED:
- Preventive vaccines: human papillomavirus-induced cancer & hepatitis B virus-induced liver cancer
- Therapeutic cancer vaccines: prostate cancer & metastatic melanoma

IN CLINICAL DEVELOPMENT:
- 96+
- Personalized therapeutic vaccines using neoantigens
- Oncolytic virus-mediated anti-cancer vaccines

1980s THERAPEUTIC TUMOR INFILTRATING LYMPHOCYTES

KEY ASPECTS
- Adoptive cell transfer therapy
- MoA: tumor cell lysis

ADVANTAGES
- Broad T-cell recognition of tumor antigens
- Up to 50% tumor reduction of metastatic melanoma

LIMITATIONS
- Resource intensive & costly
- Technically difficult

APPLICATION OF TILs

IN CLINICAL DEVELOPMENT:
- Various cancers

1990s CHECKPOINT INHIBITORS

KEY ASPECTS
- Regulate cell cycle, initiating or deactivating immune response
- Can also be mAbs

ADVANTAGES
- Positive treatment outcomes in chemotherapy-combination
- Natural T-cell function upheld

LIMITATIONS
- Toxicity due to unspecificity
- 40-50% effective
- Increasing treatment costs

APPLICATION OF CHECKPOINT INHIBITORS

COMMERCIALIZED:
- Various cancers

IN CLINICAL DEVELOPMENT:
- 45+
- Various cancers

2000s CAR-T

KEY ASPECTS
- Adoptive cell transfer therapy
- MoA: CARs allow T-cells to recognize antigens on tumor cells

ADVANTAGES
- Personalized treatment
- Remission rates up to 94% in clinical trials
- Promising future

LIMITATIONS
- Lengthy & costly development
- Adverse events: neurotoxicity & cytokine storms
- Effective in limited amount of cancers, need for optimization

APPLICATION OF CAR-T

COMMERCIALIZED:
- Children with acute lymphoblastic leukemia
- Adults with advanced lymphomas

IN CLINICAL DEVELOPMENT:
- 21+
- Various cancers

CHECK OUT THIS FUTURE IMMUNOTHERAPY:

LENTIVIRAL VECTOR VACCINES

KEY CHARACTERISTICS

Code for antigens of viral, bacterial, parasitic or cancerous origin

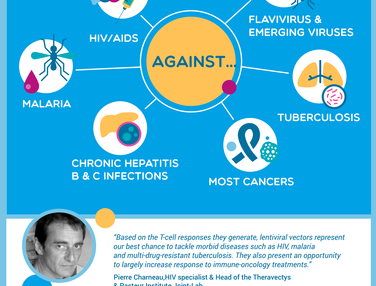
Next generation cancer vaccines

MoA: Endogenous pathway; antigenic protein neo-synthesized within the dendritic cell (DC), presented to T-cells for the entirety of DC life

ADVANTAGES
- Intense, diversified & long-term T-cell response after only 1 injection
- Elicit a physiological & naturally controlled immune response
- Cost effective

LIMITATIONS
- New technology - evolving regulatory environment
- Upscale production capacities are still limited

APPLICATION OF LENTIVIRAL VECTOR VACCINES



"Based on the T-cell responses they generate, lentiviral vectors represent our best chance to tackle morbid diseases such as HIV, malaria and multi-drug-resistant tuberculosis. They also present an opportunity to largely increase response to immune-oncology treatments."

Pierre Charneau,HIV specialist & Head of the Theravectys & Pasteur Institute Joint-Lab

SOURCES

Labiotech.eu, TheraVectys, American Cancer Society, Cancer Research UK, National Cancer Institute

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