

ETH Domain Human Health Day 2026

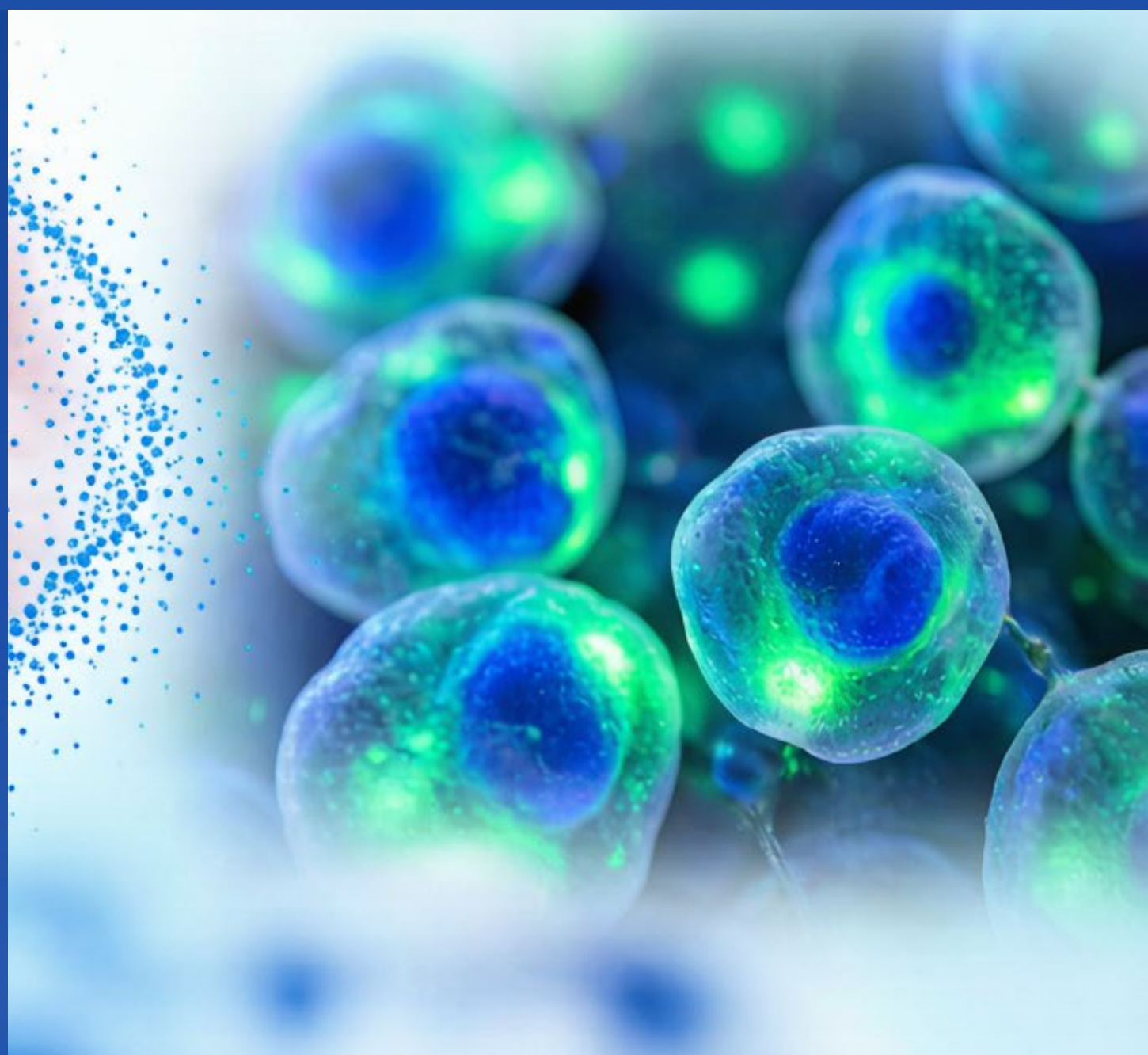
Cell and Gene Therapy (CGT)

An overview of CGT@EPFL

Li Tang

Vice Dean for Innovation, School of Life Sciences

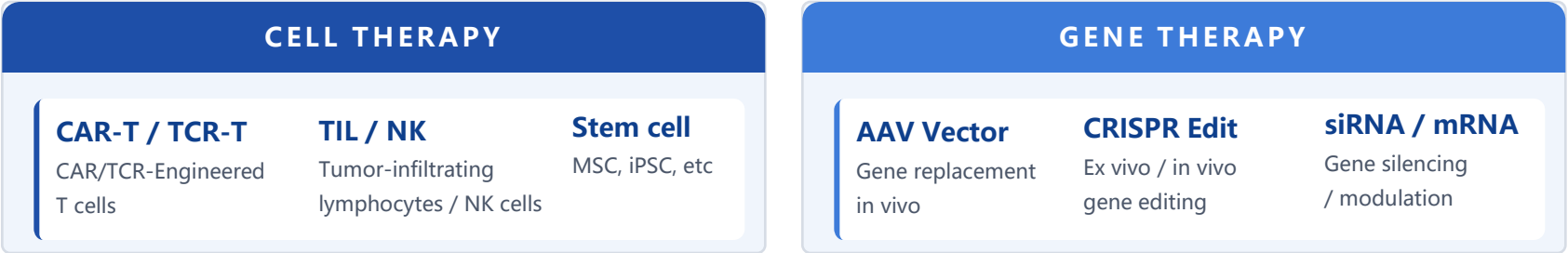
Associate Professor of Bioengineering



What is Cell and Gene Therapy?

CGT

Advanced biologics that use **living cells** or **genetic material** to treat, prevent, or cure diseases at their root cause.



GLOBAL MARKET (2025)

\$12.2B

Projected **\$120.9B by 2035** · CAGR 25.7% (2026–35)

FDA-APPROVED CGTs

48

as of end-2025 · **8 novel** approvals in 2024 alone

ACTIVE PIPELINE

3,000+

programs globally · **~2,500** INDs (FDA OTP, 2024)

A New Era? Challenges & Frontiers

✓ WHY IT IS A NEW ERA

1 Curative Intent

First one-time treatments for previously fatal diseases

2 New Modality of Intervention

Medicine moves from small molecules and antibodies to genes and living cells

3 Convergent Platforms

Gene editing + delivery vectors + cell engineering compounding each other

! OPEN CHALLENGES

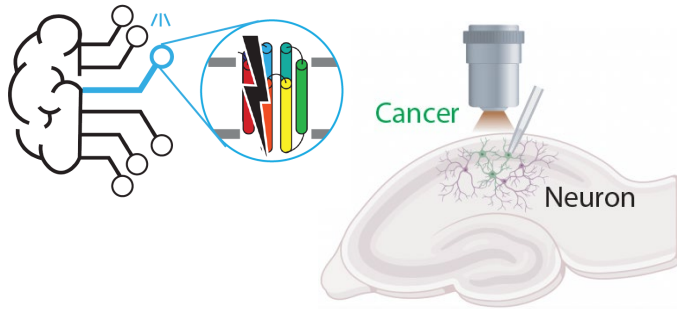
- **Manufacturing** — scalability & CMC complexity
- **Cost** — \$0.5–4.3M per treatment & reimbursement barriers
- **Long-term safety** — > 10-year follow-up required
- **Solid tumors** — efficacy still limited vs. blood cancers
- **Access** — specialized centers & cold-chain logistics

RESEARCH FRONTIER

These advances and open challenges define a **dynamic research frontier** — one that our institution together with collaborators is actively shaping through ongoing research programs in next-generation CAR design, T cell and dendritic cell engineering, targeted gene therapy, RNA delivery, etc.

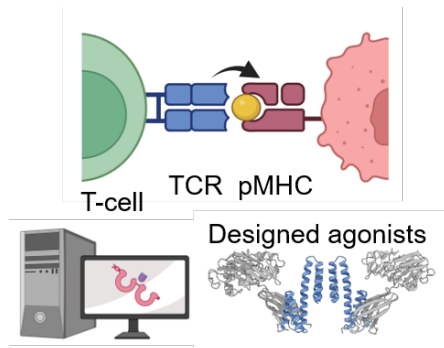
Cell Therapy at EPFL

Engineer cell membrane signaling for brain cancers and neurological diseases - Yoon Seok Kim



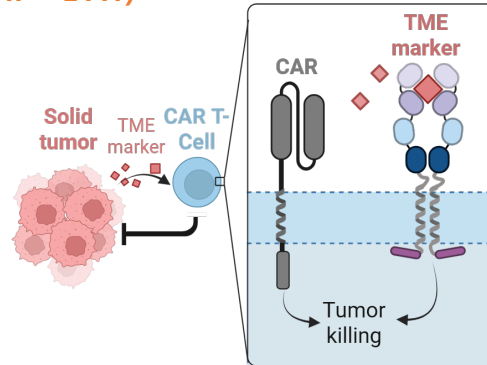
- Kim et al., *Nature Neuro* 2026
- Kim*, Tajima*, *Cell* 2023

Programming immune recognition & receptor signaling - Aerin Yang



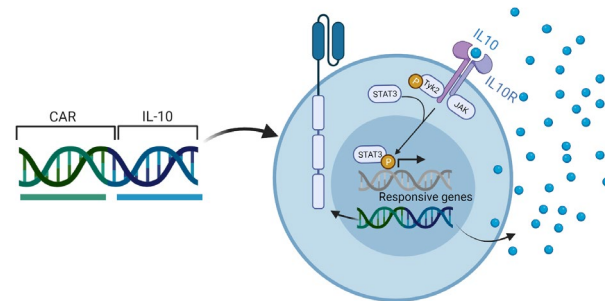
- Schlichthaerle*, Yang* et al., *bioRxiv*

AI-guided design of CAR and biosensors to enhance CAR-T cell therapy - Patrick Barth (collab. Jacob Corn - ETH)



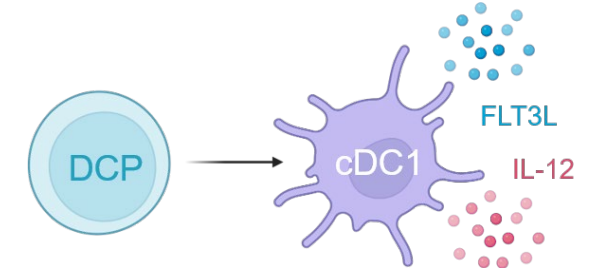
- Rath et al., *Nature Biomed Eng* 2025

Metabolically Armed CAR-T cell therapy - Li Tang



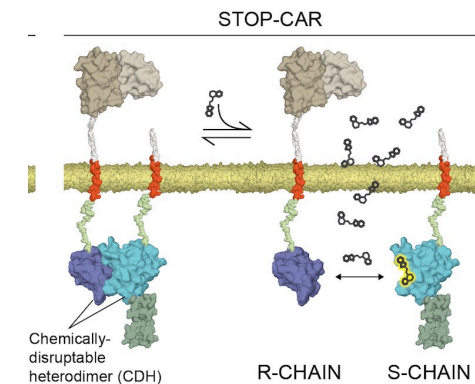
- Feng et al., *Nature* 2024
- Yang et al., *Nature Biotech* 2024

Engineering dendritic cells for cancer immunotherapy - Miki De Palma



- Ghasemi et al., *Nature Cancer* 2024
- Mohammadzadeh et al., *Science Transl Med* 2025

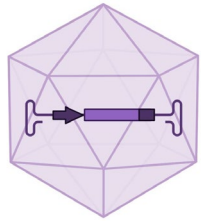
Molecular design to control T-cell activity - Bruno Correia



- Giordano-Attianese et al., *Nature Biotechnology* 2020

Gene Therapy at EPFL

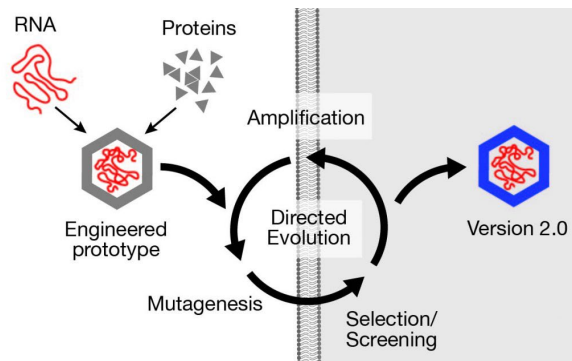
Gene therapies targeting orthogonal modifier mechanisms for neurological disorders - **Brian McCabe**



Adeno-associated virus (AAV)

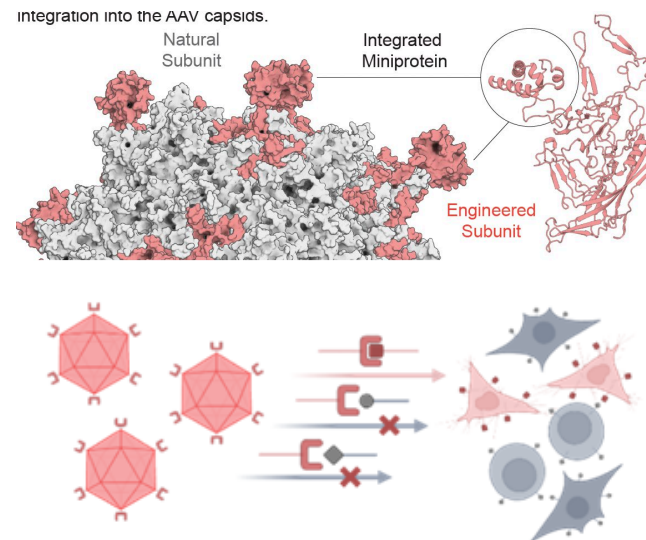
• Patent EP25202290

Nonviral delivery of RNA therapy - **Angela Steinauer**

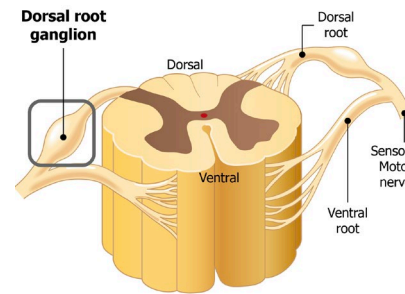


• Hori et al., Nature Comm 2024

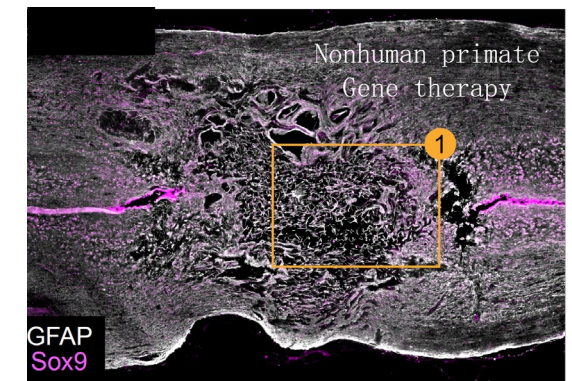
Targeted AAV for Neurological and Neurodegenerative Disorders - **Bernard Schneider, Bruno Correia**



• Pacesa M. et al., Nature, 2025



Multicistronic lentivirus-based gene therapies for spinal cord injury- **Grégoire Courtine**



• SKINNIDER ET AL. Nature 2024

Clinical Trials to Be Launched Soon

CD70 CAR-T cell therapy for acute myeloid leukemia in children and adults (FIAMMA Project)-
Patrick Barth, Caroline Arber, Francesco Ceppi

EPFL



- Phase I clinical trial will be conducted with 6 adults and 6 children
- [FIAMMA Project](#)

IL-10-expressing, anti-CD19 CAR-T cell immunotherapy to treat children with leukemia (CARELEMAN study)-
Li Tang, Francesco Ceppi

EPFL



- The CARELEMAN trial aims first to verify the safety and feasibility of this new therapy (phase I), and then to evaluate its effectiveness in controlling the disease (phase II)
- [CARELEMAN study](#)

Innovation – EPFL Spin-Offs for CGT

| Miki De Palma



EVIR
THERAPEUTICS

- Development, manufacture, production and marketing of modified dendritic cell vaccines for cancer immunotherapy.
- -SV Innovate for Life seed funding
-CHF 2.0M raised from ND Capital
-3 licensed patents
-Phase I clinical trial to be launched

| Brian McCabe /
Bernard Schneider

Avrion Therapeutics



- Gene therapy for a subtype of the fatal neurodegenerative disease Amyotrophic lateral sclerosis.
- -preparing to enter a human clinical trial in France
-More details:



| Joerg Huelsken /
Mathieu Girardin /
Angela Madurga
Alonso



- We advance next-generation CAR-NK therapies for unmet medical needs.
- -[Inkocell Therapeutics: Overview | LinkedIn](#)

| Li Tang / Yugang Guo



- [Leman Biotech](#) is a clinical-stage biotechnology company dedicated to the development and commercialization of next-generation metabolic cancer immunotherapies for cancer and auto-immune diseases.
- -IL-10-mediated metabolic reprogramming platform to reverse T-cell exhaustion
-100% CR in cancer and SLE patients at infusion doses as low as 1% of standard CAR-T cells
-> \$60 million USD raised in total
-Phase I clinical stage with IND clearance (USA-FDA: IND 32454, IND 32750; Swissmedic: pending; China-NMPA: pending)

Future Directions for Collaboration

New biology and new technologies for improved spatiotemporal control of CGT therapy: AI for discovery and design, novel delivery vehicles, new devices, etc

Combine different technologies: e.g., in vivo CAR-T, CAR-T + DC vaccines

Clinical translation and back: scientists team-up with clinicians

Bench to bedside and to product is resource heavy: broad fundraising is necessary

Thank You

Questions & Discussion

Prof. Dr. Li Tang

Vice Dean for Innovation · School of Life Sciences (SV)

Associate Professor · Institute of Bioengineering (IBI) / Institute of Materials (IMX)

School of Engineering (STI)

École polytechnique fédérale de Lausanne (EPFL)

Station 9 · CH-1015 Lausanne (Switzerland)

li.tang@epfl.ch

Laboratory of Biomaterials for Immunoengineering — EPFL



Vue aérienne de l'EPFL © Jamani Caillet / EPFL