CAR-T: Continuation in a Revolution of Cancer Therapeutics

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Medical Director, BMT and Cellular Therapeutics
Division Director, Hematologic Malignancies and Cellular Therapeutics
Disclosures

- Kite
- AlloVir
- Novartis
- Nektar
- BMS
- Envision
- Caribou
- Sana
- Legend Biotech
- CRISPR
T Cell Activation

- Signal 1: Recognition: TCR binds to MHC (or HLA):antigen
- Signal 2: Co-stimulation: CD28 binds to its ligand on APC
Activated T Cells: Effector CD8 CTLs

- CTLs induce apoptosis through multiple mechanisms, including:
  - Release of cytotoxic granules containing perforin and granzyme B
  - Surface receptor engagement such as Fas/FasL
CAR T Cells: Mechanism of Action

Viral DNA Insertion

Expression of CAR

CAR enables T cell to recognize tumor cell antigen

Antigen

CAR T cells multiply and release cytokines

Tumor cell apoptosis
Chimeric Antigen Receptors
T-Cell Therapies - KU CAR HUB Team

1. Leukapheresis
2. T-cell activation/transduction
3. Modified T-cell expansion
4. Chemotherapy
5. Modified T-cell infusion

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Rationale for CD19 as a CAR T-Cell Therapy Target

• CD19 is expressed on precursor and mature B-cells
• Not expressed on BM stem cells or other tissues
• Present on a wide range of B-cell malignancies
On-target, off-tumor side-effects of CD19-targeted CAR T-cell therapy

The Revolution of Immunotherapy

CAR T-Cell Immunotherapy: The 2018 Advance of the Year
Poor Prognosis of Relapsed ALL in Adults

MRC UKALL2/ ECOG2993 Study (n=609)

Outcome of patients after 1st relapse
5-yr OS: 7%


LALA-94 Study (n=421)

Outcome of patients after 1st relapse
2-yr OS: 11% & 5-yr OS: 8%

Outcomes for Adults with Relapsed ALL after Allogeneic SCT

Poon, et al. BBMT 2013;19, 1064
### Survival Rates

#### Tisagenlecleucel in Children and Young Adults with B-Cell Lymphoblastic Leukemia

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>N</td>
<td>75</td>
<td></td>
</tr>
<tr>
<td>Median F/U</td>
<td>31.1 months</td>
<td></td>
</tr>
<tr>
<td>Allo-SCT</td>
<td>61%</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>CR</th>
<th>61/75</th>
<th>81%</th>
</tr>
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<tbody>
<tr>
<td>RFS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 months</td>
<td>80%</td>
<td></td>
</tr>
<tr>
<td>12 months</td>
<td>59%</td>
<td></td>
</tr>
</tbody>
</table>

| EFS    |       |       |
| 6 months | 73%   |       |
| 12 months | 50%  |       |

| OS     |       |       |
| 6 months | 90%   |       |
| 12 months | 76%  |       |


#### Long-Term Follow-up of CD19 CAR Therapy in Adult Acute Lymphoblastic Leukemia

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<table>
<thead>
<tr>
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<tbody>
<tr>
<td>N</td>
<td>53</td>
<td></td>
</tr>
<tr>
<td>Median F/U</td>
<td>29 months</td>
<td></td>
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<tr>
<td>Allo-SCT</td>
<td>36%</td>
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<table>
<thead>
<tr>
<th>CR</th>
<th>44 (83%)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Median EFS</td>
<td>6.1 months</td>
<td></td>
</tr>
<tr>
<td>Median OS</td>
<td>12.9 months</td>
<td></td>
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</table>


#### Brexucabtagene Zuma-3 Adult Acute Lymphoblastic Leukemia

<p>| | | |</p>
<table>
<thead>
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<tbody>
<tr>
<td>N</td>
<td>116</td>
<td></td>
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<tr>
<td>Median F/U</td>
<td>16.4 months</td>
<td></td>
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<tr>
<td>Allo-SCT</td>
<td>45%</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>CR</th>
<th>71%</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Median DOR</td>
<td>12.8 months</td>
<td></td>
</tr>
<tr>
<td>Median OS</td>
<td>18.2 months</td>
<td></td>
</tr>
</tbody>
</table>

Shad, BD, et al. The Lancet
Emily is now 8 years cancer free after successful CAR T cell therapy treating her leukemia

emilywhiteheadfoundation.org
SCHOLAR-1: The First and Largest Patient-Level Meta-Analysis of Chemorefractory DLBCL

SCHOLAR-1: is a retrospective analysis of 636 patients with refractory DLBCL

<table>
<thead>
<tr>
<th>Integrated data from:</th>
<th>Median OS was 6.3 months (95% CI, 5.9-7.0)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Two large phase 3 studies</td>
<td></td>
</tr>
<tr>
<td>− LYSARC-CORAL</td>
<td></td>
</tr>
<tr>
<td>− Canadian Cancer Trials Group-LY.12</td>
<td></td>
</tr>
<tr>
<td>• Two observational cohorts</td>
<td></td>
</tr>
<tr>
<td>− MD Anderson Cancer Center</td>
<td></td>
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<tr>
<td>− Mayo Clinic/University of Iowa</td>
<td></td>
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</tbody>
</table>

The pooled CR was 7%
# Multicenter CD19 CAR T-cell Trials in Aggressive NHL

<table>
<thead>
<tr>
<th>Study / Sponsor</th>
<th>ZUMA1 / Kite</th>
<th>JULIET / Novartis</th>
<th>TRANSCEND / Juno</th>
</tr>
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<tbody>
<tr>
<td>CAR T design</td>
<td>CD19/CD3ζ/CD28</td>
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<tr>
<td>CAR T dose</td>
<td>2 x 10^6/kg</td>
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<td>DLBCL/PMBCL/TFL/FL Gr 3B</td>
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<td>Treated/Enrolled</td>
<td>101/111 (91%)</td>
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<td>268/342 (78%)</td>
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<td>83 / 58</td>
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ZUMA-1 (Axicabtagene): Overall Survival

Median OS (95% CI), mo
25.8 (12.8-NE)

5 Years

No. at risk (censored)
101 97 93 80 74 69 61 54 53 51 50 50 50 47 47 46 45 44 42 42 41 41 41 41 26 14 6 1 0
(0) (0) (0) (0) (0) (0) (0) (0) (0) (0) (0) (0) (0) (0) (0) (0) (0) (0) (1) (2) (2) (2) (17) (28) (36) (41) (42)
JULIET (Tisagenlecleucel): Overall Survival

![Graph showing overall survival data with Kaplan-Meier curves and survival probability percentages at month 24 (40%) and month 36 (36%).]

- **Survival Probability, %**
  - Month 24: 40
  - Month 36: 36

- **Censoring Times**
  - CR as BOR (n=11/145)
  - CR at Month 3 (n=8/137)
  - CR at Month 6 (n=5/34)
  - All Patients (n=70/115)

- **Kaplan-Meier medians**
  - CR as BOR: NE, 95% CI NE
  - CR at Month 3: NE, 95% CI NE
  - CR at Month 6: NE, 95% CI NE
  - All Patients: 11.07 mo, 95% CI 6.64-23.85

- **No. at Risk**
  - CR as BOR: 45, 45, 44, 42, 39, 37, 36, 34, 33, 30, 29, 26, 17, 0, 4, 1, 0
  - CR at Month 3: 37, 37, 37, 35, 32, 32, 31, 29, 28, 26, 26, 22, 13, 6, 3, 1, 0
  - CR at Month 6: 34, 34, 33, 33, 31, 31, 30, 28, 26, 25, 25, 25, 22, 13, 5, 2, 0
  - All Patients: 115, 95, 85, 79, 71, 47, 46, 43, 41, 38, 35, 34, 31, 19, 19, 4, 1, 0

Juliet 40-Month ASH 2020
TRANSCEND (Lisocabtagene): Overall Survival

Abramson, J; et al, The Lancet, Vol 396, Sept 19, 2020
Real-world efficacy and safety outcomes with axi-cel in patients with r/r large B-cell lymphoma comparable to the ZUMA-1 clinical trial

68 yo M with DLBCL-GCB

Prior therapies – 7
• R-CHOP
• ICE → Zevalin
• R-ESHAP
• R-Hypercytoxan
• Gemcitabine
• Bendamustine
• R-Hypercytoxan

Co-morbidities
• ECOG PS 3
• EF – 45%
• Pulmonary embolism
• GI bleed
• Obstructive jaundice → Biliary catheter
Axicabtagene Ciloleucel CD19 Chimeric Antigen Receptor (CAR) T-cell Therapy for Relapsed/Refractory Large B-cell Lymphoma: Real World Experience

Response Post Axi-Cel Infusion

• **Complete response**
  – By day 30 for CNS disease
  – By 3 months for systemic disease

• **He remains in CR 1 year post infusion**
Patterns of Use, Outcomes, and Resource Utilization Among Recipients of Commercial Axicabtagene Ciloleucel and Tisagenleucel for Relapsed/Refractory Aggressive B-Cell Lymphomas

Real-World CAR T Adoption has been slow in US

Number of patients treated with axi-cel in 2018 ~700

Jacobson, et al. 2019 ASH Abstracts 4107
Access Barriers to Autologous CAR T therapies

3L DLBCL - United States

Patient Share by Class: 2020-2030

CAR T-cell therapies

2L DLBCL – United States

Patient Share by Class: 2020-2030

CAR T-cell therapies

Source: Clarivate Analytics
CD19 CAR T in NHL: Current Management of DLBCL

**Aggressive B-cell NHL**

- R-CHOP or similar
- Relapse / Progression

- ~60% cured

**Relapse / Progression**

- 2nd line chemo
  - Chemo-sensitive
  - HDT + ASCT

- CD19 CAR T

**Future Directions:**

- CD19 CAR T in high-risk aggressive B-cell NHL
- Randomized trials of CD19 CAR T vs. ASCT
- CD19 CAR T in high-risk iNHL, MCL; Off the shelf CAR Ts Exploiting Mechanisms of Resistance
Global Randomized CAR T Studies in R/R DLBCL

ZUMA-7

TRANSFORM

BELINDA

VS

Autologous Stem Cell Transplant
# CD19-Directed CAR-T Cell Therapy Versus Standard of Care in 2L

<table>
<thead>
<tr>
<th></th>
<th>Lisocabtagene Maraleucel (Breyanzi®)</th>
<th>Axicabtagene Ciloleucel (Yescarta®)</th>
<th>Tisagenlecileucel (Kymriah®)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Trial</strong></td>
<td>PHASE 3 TRANSFORM</td>
<td>PHASE 3 ZUMA-7</td>
<td>PHASE 3 BELINDA</td>
</tr>
<tr>
<td><strong>Median Follow-up (months)</strong></td>
<td>6.2</td>
<td>24.9</td>
<td>10</td>
</tr>
<tr>
<td><strong>Bridging Therapy</strong></td>
<td>Yes</td>
<td>Yes Optional Steroid-Only Bridging (No Chemotherapy)</td>
<td>Yes Bridging chemotherapy as needed</td>
</tr>
<tr>
<td><strong>Crossover Allowed</strong></td>
<td>Yes</td>
<td>No</td>
<td>Yes, if no response at week 12</td>
</tr>
<tr>
<td><strong>Treatment Arm</strong></td>
<td>Liso-cel (n=92)</td>
<td>Axi-cel (n=180)</td>
<td>Tisa-cel (n=162)</td>
</tr>
<tr>
<td><strong>EFS Definition</strong></td>
<td>Time from randomization to death from any cause, PD, failure to achieve CR or PR, or start of new antineoplastic therapy due to efficacy concerns, whichever occurs first</td>
<td>EFS: time from randomization to the earliest date of disease progression per Lugano Classification, new lymphoma therapy, or death from any cause</td>
<td>Time from the date of randomization to the date of the first documented disease progression or stable disease at or after the week 12 (+/- 1 week) assessment</td>
</tr>
<tr>
<td><strong>Median EFS (months; 95% CI)</strong></td>
<td>10.1 (6.1-NR)</td>
<td>8.3 (4.5-15.8)</td>
<td>3.0 (2.9-4.2)</td>
</tr>
<tr>
<td><strong>HR (95% CI); P-value</strong></td>
<td>0.349 (0.229-0.530); P&lt;0.0001</td>
<td>0.398 (0.308-0.514); P&lt;0.0001</td>
<td>1.07 (0.82-1.40); P=0.69</td>
</tr>
</tbody>
</table>

**FDA Approved**
R/R Mantle Cell Lymphoma in younger patients

OS for patients with early progression of Disease

[Graph showing survival rates over time for different treatments]
Median PFS and median OS were not reached after a median follow-up of 12.3 months.

ML Wang, et al, NEJM, April 2, 2020
Representative PET Scans of Complete Response

- 50-year-old male patient with 3 prior therapies who presented with multi-compartmental MCL
- With KTE-X19, he achieved PR at month 1 and CR at month 3 and remains in remission 18 months
ZUMA 5: Follicular Lymphoma R/R

Jacobson, et. al.; The Lancet, Vol 23, January 2022
ZUMA 5: Progression-Free Survival and Overall Survival

FDA Approved

Jacobson, et. al.; The Lancet, Vol 23, January 2022
## ELARA (Tisagenlecleucel): Overall Response and Complete Response Rate

<table>
<thead>
<tr>
<th>Response Rate, %</th>
<th>Patients Evaluable for Efficacy$^a$ (n=52)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CR</td>
<td>65.4$^a$</td>
</tr>
<tr>
<td>PR</td>
<td>17.3</td>
</tr>
<tr>
<td>ORR (CR + PR)</td>
<td>82.7</td>
</tr>
</tbody>
</table>

ELARA

DOR

OS

PFS

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ZUMA 12: Newly Dx HR DLBCL

High-Risk LBCL
- High-grade B cell lymphoma, with MYC and BCL2 and/or BCL6 translocations, or
- LBCL with IPI score ≥ 3 any time before enrollment

Systemic Therapy
- 2 Cycles of an anti-CD20 mAb + anthracycline-containing regimen

Dynamic Risk Assessment
- Positive interim PET (DS 4 or 5)

Additional Key Inclusion Criteria
- Age ≥ 18 years
- ECOG 0 – 1

89% ORR
78% CR (n=29)
11% PR (n=4)
8% (n=3)
3% (n=1)

Neelapu, et. al.; ASH 2021; Abstract 739
Representative Images of a Complete Response

- 23-year-old male with HGBL-NOS per investigator (MYC rearrangement), IPI 3, and tumor burden (SPD) 7424 mm²
- After axi-cel infusion, he achieved a CR at Month 3 and remains in response 7 months later

Baseline | After Initial Chemotherapy | After Initial Chemotherapy | Week 4 Postinfusion | Month 3 Postinfusion
---|---|---|---|---
Cycle 1 | Cycle 2 | Postinfusion | Postinfusion

Neelapu, et. al.; ASH 2021; Abstract 739
Duration of Response, Event-Free Survival, Progression-Free Survival, and Overall Survival

**DOR**
- Median follow-up (range), mo: 15.9 (6.0–26.7)
- Median DOR (95% CI), mo: NR (NE–NE)
- 12-mo DOR rate (95% CI), %: 80.8 (59.3–91.6)

**PFS**
- Median PFS (95% CI), mo: NR (NE–NE)
- 12-mo PFS rate (95% CI), %: 74.6 (54.8–86.7)

**EFS**
- Median EFS (95% CI), mo: 72.5 (53.1–84.9)
- 12-mo EFS rate (95% CI), %: NR (NE–NE)

**OS**
- Median OS (95% CI), mo: 24.5 (NE–NE)
- 12-mo OS rate (95% CI), %: 90.6 (73.4–96.9)
Myeloma Survival Rates

BCMA Target

**BCMA expression in PC**
- In normal physical functions
  - Support survival of long-lived PCs
  - Production of antibodies
  - Class switch of immunoglobulin
- In MM
  - Promote proliferation and survival of MM cells.
  - Associated with immunosuppressive BM microenvironment.
  - Increased sBCMA level is associated with disease progression and poorer outcome.

[Diagram showing BCMA signaling pathways and cellular distribution]
Idecabtagene Vicleucel in Relapsed & Refractory Multiple Myeloma

- Relapsed after at least three previous regimens
  - Proteasome inhibitor
  - Immunomodulatory agent
  - Anti-CD38 antibody
- Primary end point was an overall response (partial response or better)
- Secondary end point was complete response or better

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<td>13.3 months</td>
</tr>
<tr>
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<td>73%</td>
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<tr>
<td>Median PFS</td>
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Munshi, N et al. NEJM 384;8, February 25, 2021
Idecabtagene Vicleucel in Relapsed & Refractory Multiple Myeloma

Tumor Response, Overall and According to Target Dose

Overall response, 50 (150 \times 10^6 (N=4))

Overall response, 69 (300 \times 10^6 (N=70))

Overall response, 81 (450 \times 10^6 (N=54))

Overall response, 73 (Total (N=128))

CR or sCR, 25

CR or sCR, 29

CR or sCR, 39

CR or sCR, 33

CR or sCR and MRD-negative

CR or sCR and MRD could not be evaluated

VGPR

PR

FDA Approved

Munshi, N et al. NEJM 384;8, February 25, 2021
Ciltacabtagene Autoleucel, an Anti-B-cell Maturation Antigen Chimeric Antigen Receptor T-Cell Therapy, for Relapsed/Refractory Multiple Myeloma: CARTITUDE-1 2-Year Follow-Up

- MFU = 27.7 months
- $\geq$ 3 prior lines of therapy or:
  - double refractory to a proteasome inhibitor & immunomodulatory drug
  - prior proteasome inhibitor, immunomodulatory drug, & anti-CD38 therapy
- ORR = 97.9%
- sCR = 82.5%
- Median duration of response was not estimable
- Median PFS was not reached
- PFS = 54.9%
- OS = 70.4%
- ORR high across all subgroups
- Duration of response, PFS and/or OS were shorter in patients with:
  - high-risk cytogenetics
  - ISS Stage III
  - High tumor burden
  - Plasmacytomas

Martin, T, et al. JCO, July 2022
Ciltacabtagene Autoleucel, an Anti-B-cell Maturation Antigen Chimeric Antigen Receptor T-Cell Therapy, for Relapsed/Refractory Multiple Myeloma: CARTITUDE-1 2-Year Follow-Up

### Table 1: Overall Response Rates

<table>
<thead>
<tr>
<th>Variable</th>
<th>Total (N = 97)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall response</td>
<td></td>
</tr>
<tr>
<td>Patients with a response, No.</td>
<td>95</td>
</tr>
<tr>
<td>Rate, % (95% CI)</td>
<td>97.0 (92.7 to 99.7)</td>
</tr>
<tr>
<td>Best overall response rate, % (95% CI)</td>
<td></td>
</tr>
<tr>
<td>sCR</td>
<td>82.8 (73.4 to 89.4)</td>
</tr>
<tr>
<td>MRD-negative sCR^a</td>
<td>44.3 (34.2 to 54.8)</td>
</tr>
<tr>
<td>CR</td>
<td>0 (NE to NE)</td>
</tr>
<tr>
<td>VGPR</td>
<td>12.4 (6.6 to 20.6)</td>
</tr>
<tr>
<td>PR</td>
<td>3.1 (0.6 to 8.8)</td>
</tr>
<tr>
<td>Minimal response</td>
<td>0 (NE to NE)</td>
</tr>
<tr>
<td>SD</td>
<td>0 (NE to NE)</td>
</tr>
<tr>
<td>PD</td>
<td>1.0 (0.0 to 5.6)</td>
</tr>
<tr>
<td>Not evaluable</td>
<td>1.0 (0.0 to 5.6)</td>
</tr>
</tbody>
</table>

### Table 2: Median Duration of Response

<table>
<thead>
<tr>
<th>Variable</th>
<th>Total (N = 97)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median duration of response, months (95% CI)</td>
<td>NE (23.3 to NE)</td>
</tr>
<tr>
<td>Median time to first response, months (range)</td>
<td>1.0 (0.9 to 10.7)</td>
</tr>
<tr>
<td>Median time to best response, months (range)</td>
<td>2.6 (0.9 to 17.8)</td>
</tr>
<tr>
<td>Median time to CR or better, months (range)</td>
<td>2.9 (0.9 to 17.8)</td>
</tr>
<tr>
<td>MRD negativity, No. (%)</td>
<td></td>
</tr>
<tr>
<td>No. of patients evaluable for MRD at 10^-6</td>
<td>61</td>
</tr>
<tr>
<td>Rate, %</td>
<td>56 (91.8)</td>
</tr>
<tr>
<td>No. of patients evaluable for MRD at 10^-5</td>
<td>52</td>
</tr>
<tr>
<td>Rate, %</td>
<td>39 (75.0)</td>
</tr>
</tbody>
</table>

### Figure: Progression-Free Survival (PFS)

- **All patients:** Median PFS: not reached (95% CI, 24.5 to NE)
  - 27-month PFS rate: 64.0% (95% CI, 44.0 to 64.4)
- **sCR patients:**
  - 27-month PFS rate: 64.2% (95% CI, 51.9 to 74.1)

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Martin, T, et al. JCO, July 2022
Problems

• **ACCESS**
  – Production Capabilities (lack of clinical window for leukapheresis)
  – Long manufacturing times
  – Need for bridging therapy

• **Lack of Response/Relapse**
  – Suboptimal construct/T-Cell exhaustion
  – Antigen loss
  – Fas Receptor Loss
Activated T Cells: Effector CD8 CTLs

- CTLs induce apoptosis through multiple mechanisms, including:
  - Release of cytotoxic granules containing perforin and granzyme B
  - Surface receptor engagement such as Fas/FasL
Risk assessment with low-pass whole-genome sequencing of cell-free DNA before CD19 CAR T-cell therapy for large B-cell lymphoma

Cherng, H. et al., Blood, Vol 140, August 2022
Rationale for Allogeneic CAR T-Cell Therapy

• Potential to improve efficacy as the T-cell fitness is expected to be better than autologous products and ability to select specific t-cell subsets
• Consistent product quality
• No wait period as they are off the shelf
• Precise placement of the gene construct in the genome
• Long-term risk of insertional mutagenesis unlikely
• Problem! Rejection or GVHD
T-cell intrinsic fitness in apheresis product may affect CAR T efficacy

Determinants of response and resistance to CD19 chimeric antigen receptor (CAR) T cell therapy of chronic lymphocytic leukemia


Freiutta et al, Nat Med Apr 2018

- Increased frequency of CD27+CD45RO-CD8+ T cells before CAR T generation associated with durable remission in CLL
- CD27+PD-1+CD8+ CAR T cells associated with response

• Rationale for allogeneic CAR or banking T cells when healthy
Precise Gene Editing-CRISPR
Precise and Simple Gene Editing

CRISPR/Cas9

Cas9

sgRNA

Cut site

PAM site

Double stranded break

NHEJ

HDR

Donor external DNA

InDel

New DNA
Potential Applications

- Curing inherited genetic disease
- GMO plants and food
- GMO organisms
- Creation of new genetic variations in the nature
- Personalised gene manipulation
- Gene suppression
- Therapeutic drugs
Gene-Edited Allogeneic Anti-CD19 CAR-T: Mitigating Rejection and GVHD

McGuirk ASCO 2021, June 4-8, 2021
CAR-T Toxicities

(A) Cytokine release syndrome
- Excess inflammatory cytokines result in cytokine storm
- Precipitates multi-organ failure

(B) Neurotoxicity
- Headaches
- Mental status changes
- Cranial nerve palsies
- Seizures
- Cerebral edema

(C) On-target/off-tumor crossreactivity
- Cardiotoxicity due to antigen similarity between MAGE-A3 and antigen from heart muscle protein, Titin

(D) Solid tumor targeting
- Shortage of known tumor-specific antigens
- Difficulty homing to solid tumor sites

(E) Tumor escape
- Downregulation of target surface antigens
- Loss of β2M component of HLA

(F) Induction of resistance
- Incidental insertion of CAR gene into cancer cell during manufacturing process
- CAR-mediated masking of surface antigen in cis gives rise to resistance to CAR-T therapy

The University of Kansas Cancer Center
Continued Advances

Cell & Gene Therapies

- Bi-specific, multi-specific CARs
- New target molecules (CD30, SLAMF7, BCMA, CD123)
- T-cell specific receptors (TCR)
- Chimeric antigen receptor (CAR T cells)
- Gene editing (CRISPR, CAS)
- Chimeric costimulatory receptors (PD-1/CD28, CD200R, CD28)
Cell Therapy Clinical Trials at KUCC

*Does not include Biomarker, EAP, MAP, LTFU protocols, CAR-T Ancillary Studies*
University of Kansas Cancer Center Current State

- **NCI Comprehensive Cancer Center Designation**
- Cambridge Tower expansion (3 floors)
- Expand Cellular Therapeutics program
  - Including solid tumors
- Increase the availability of clinical trials and increase clinical research trials accruals
- Development of novel clinical laboratory research
- Collaboration with NCI & CMH on Tri-Specific LAR CD19, 20, 22
Where cancer meets its match.

The University of Kansas Cancer Center