

June 21-24, 2021

Regeneration of killer T cells using the iPS cell technology

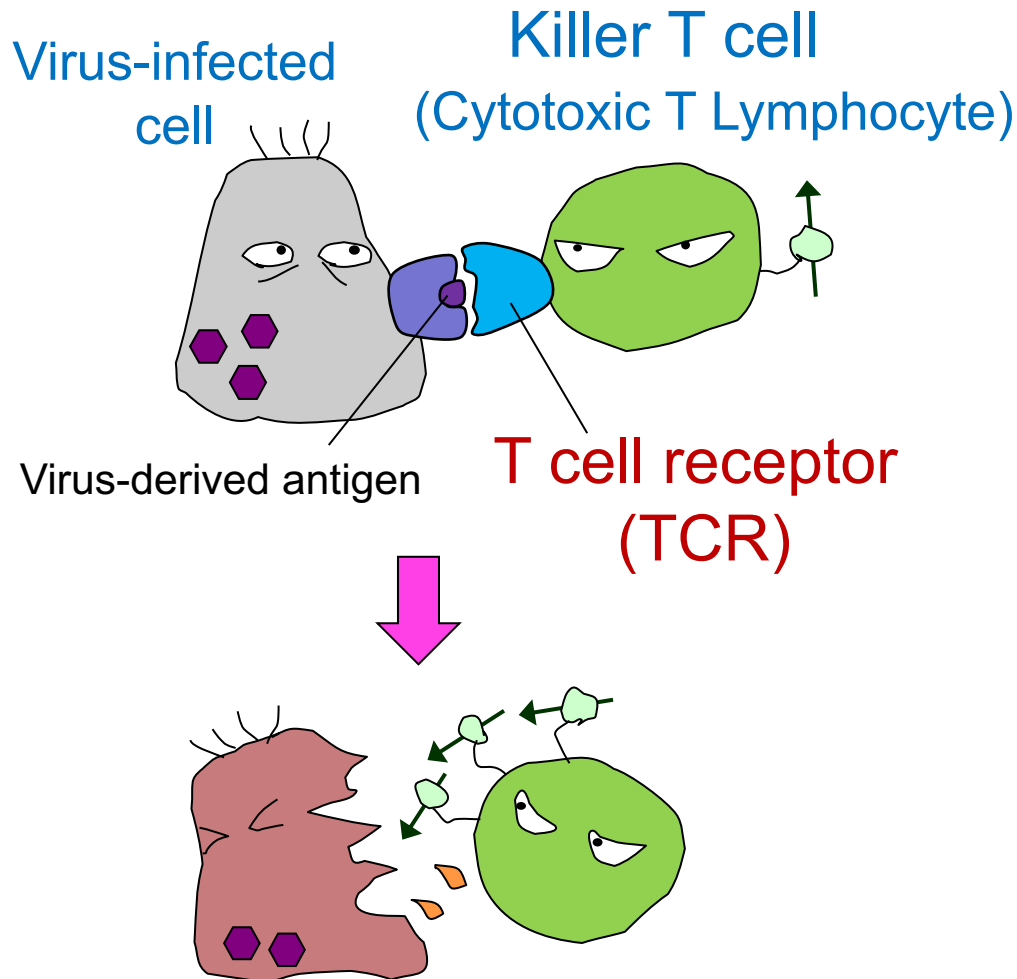
Development of “off-the-shelf T cells”
for cell therapy
targeting cancer and viral infection

Hiroshi Kawamoto

Laboratory of Immunology
Institute for Frontier Life and Medical Sciences
Kyoto University



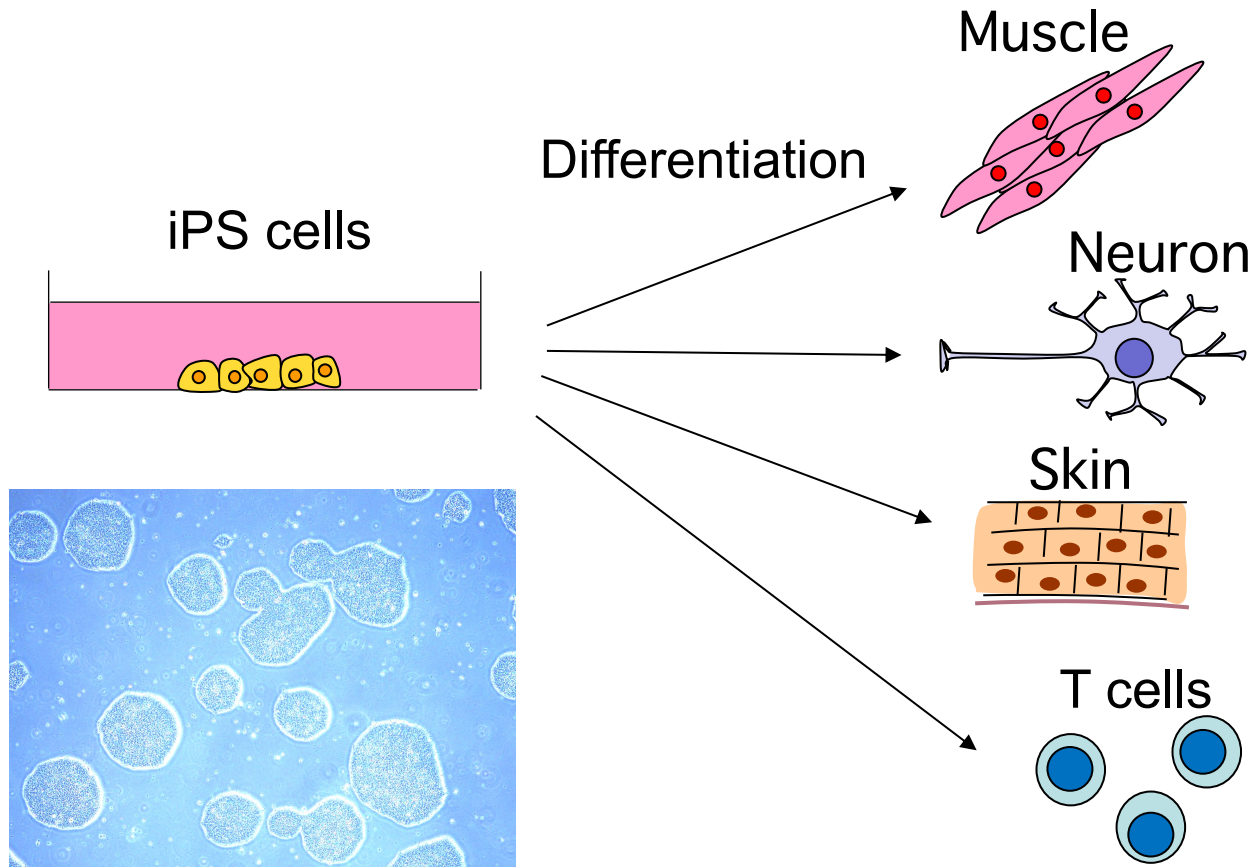
Killer T cells kill virus-infected cells or cancer cells



J Exp Med (2015) 212 (3): 307–317

Introduction 2

iPS cells (induced pluripotent stem cells) are the cells that can generate any types of cells/tissues



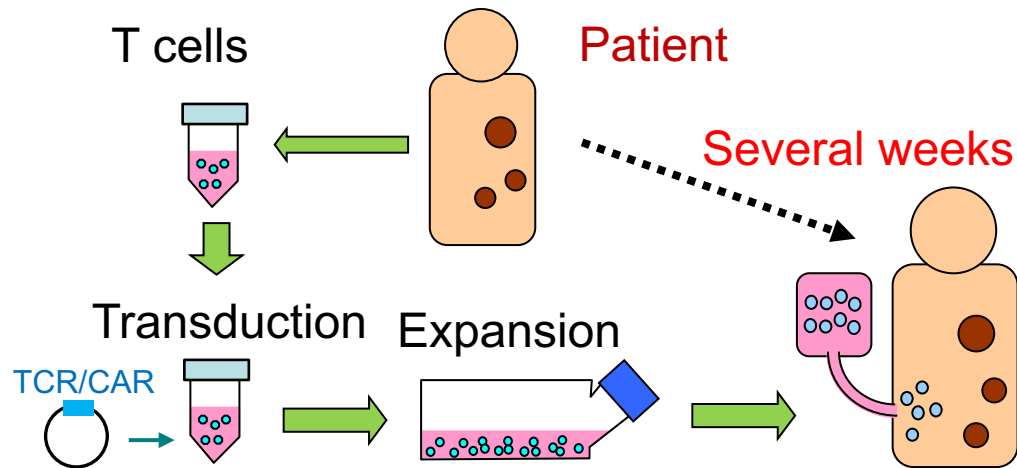
....invented by Nobel prize winner Sinya Yamanaka



Background and summary

Issues in current T cell therapy and solution by allogeneic T cells

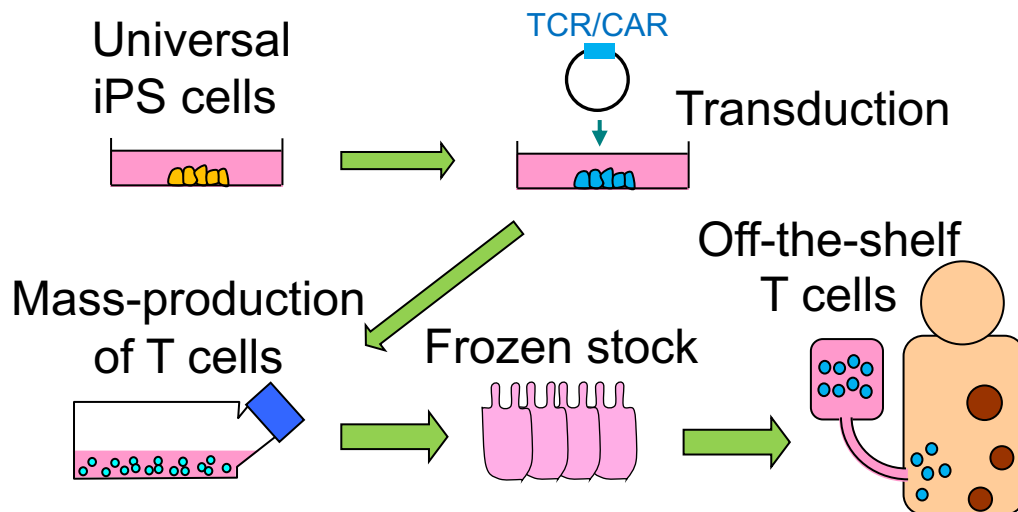
Ongoing “autologous” T cell therapy



Issues :

- Time-consuming
- Costly
CAR-T (Kymriah) costs > 0.5 M USD
- Heterogenous in quality

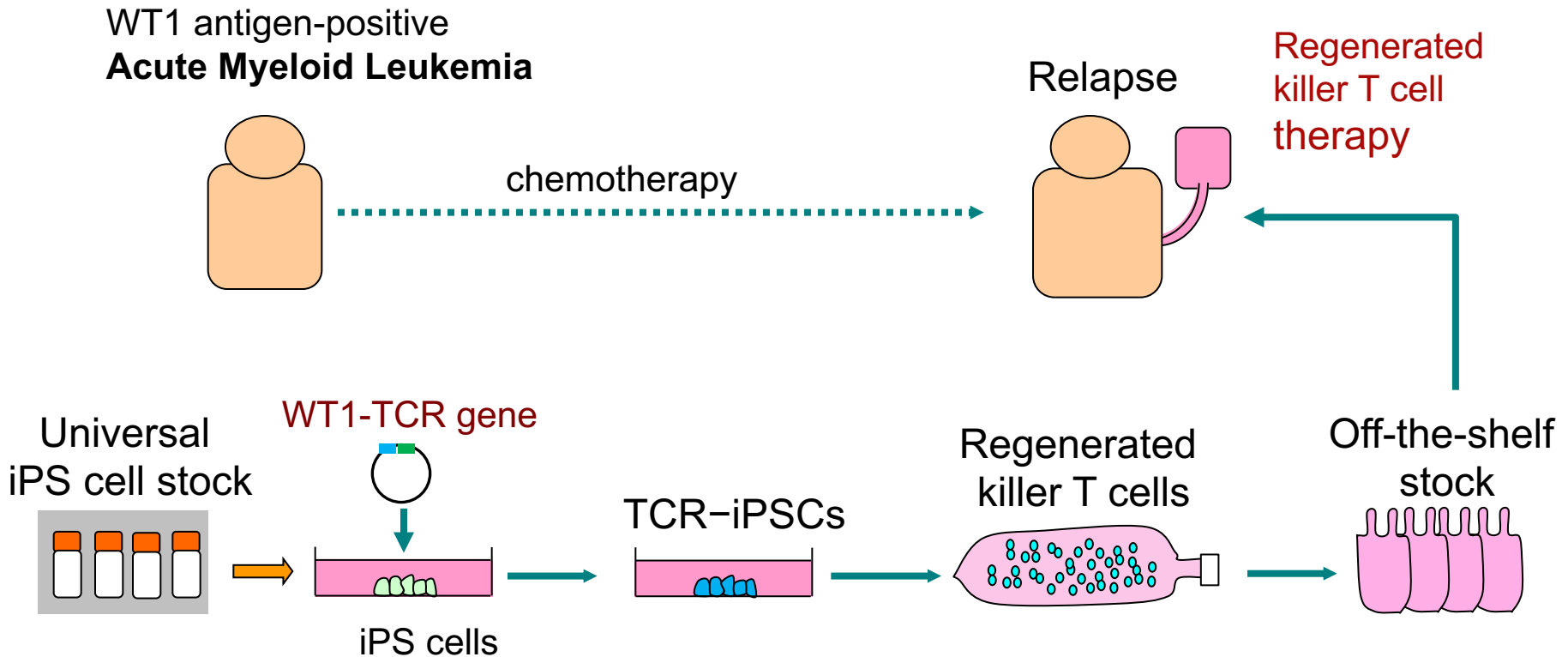
iPSC-derived “off-the-shelf” T cell therapy



- ✓ Universal
- ✓ Rapid
- ✓ Low cost
- ✓ High quality

Actual plan for the first clinical application

....Aiming to realize in 3 years



• In collaboration with **Kyoto University Hospital**

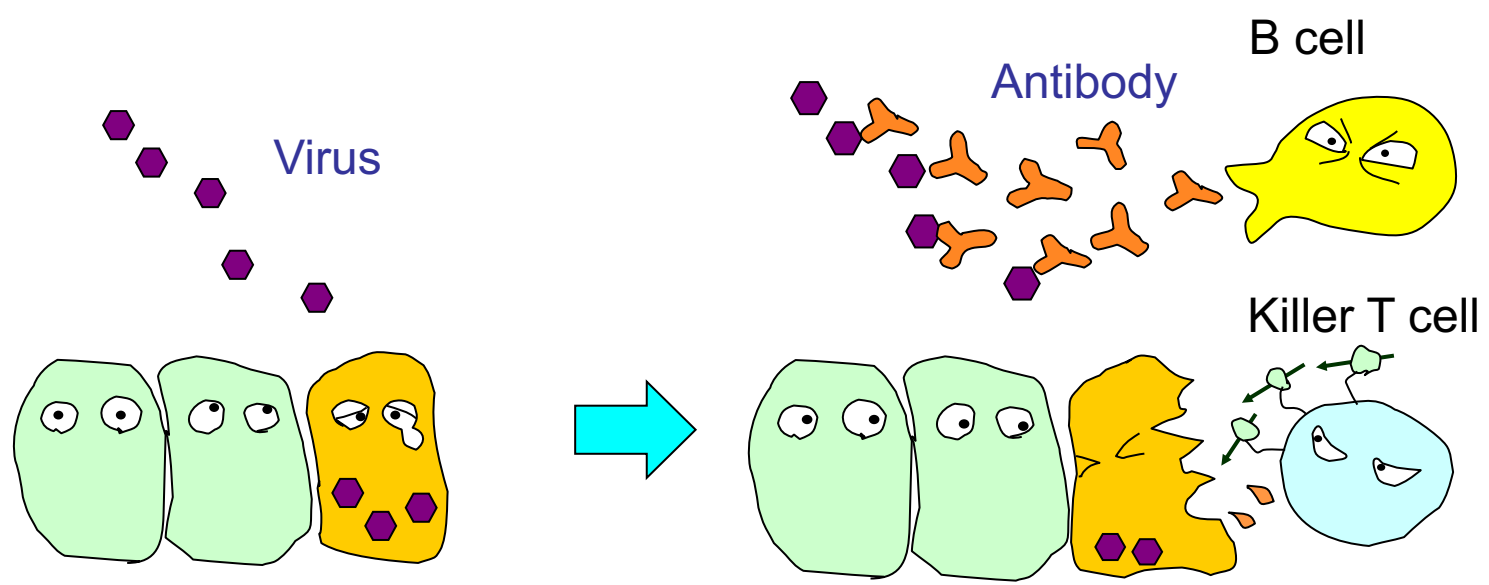
Department of Hematology and Oncology

Department of Transfusion Medicine and Cell Therapy

Is it possible to use the regenerated T cells
for COVID-19?

Background

Antibody and killer T cell play important roles in viral infection



Anti-viral killer T cell strategy will provide a new strategy against COVID-19

Anti-viral medicine



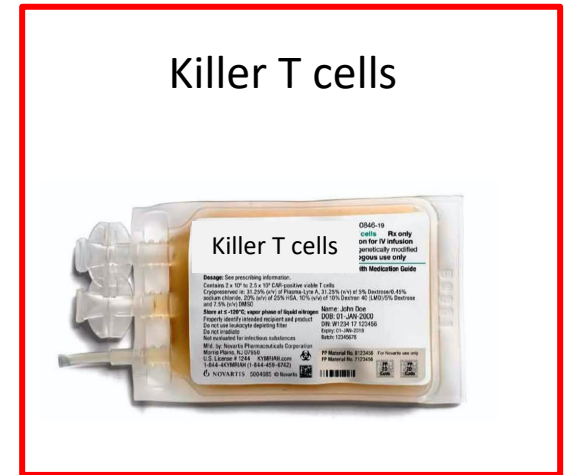
Vaccine



Antibody/Plasma



Killer T cells



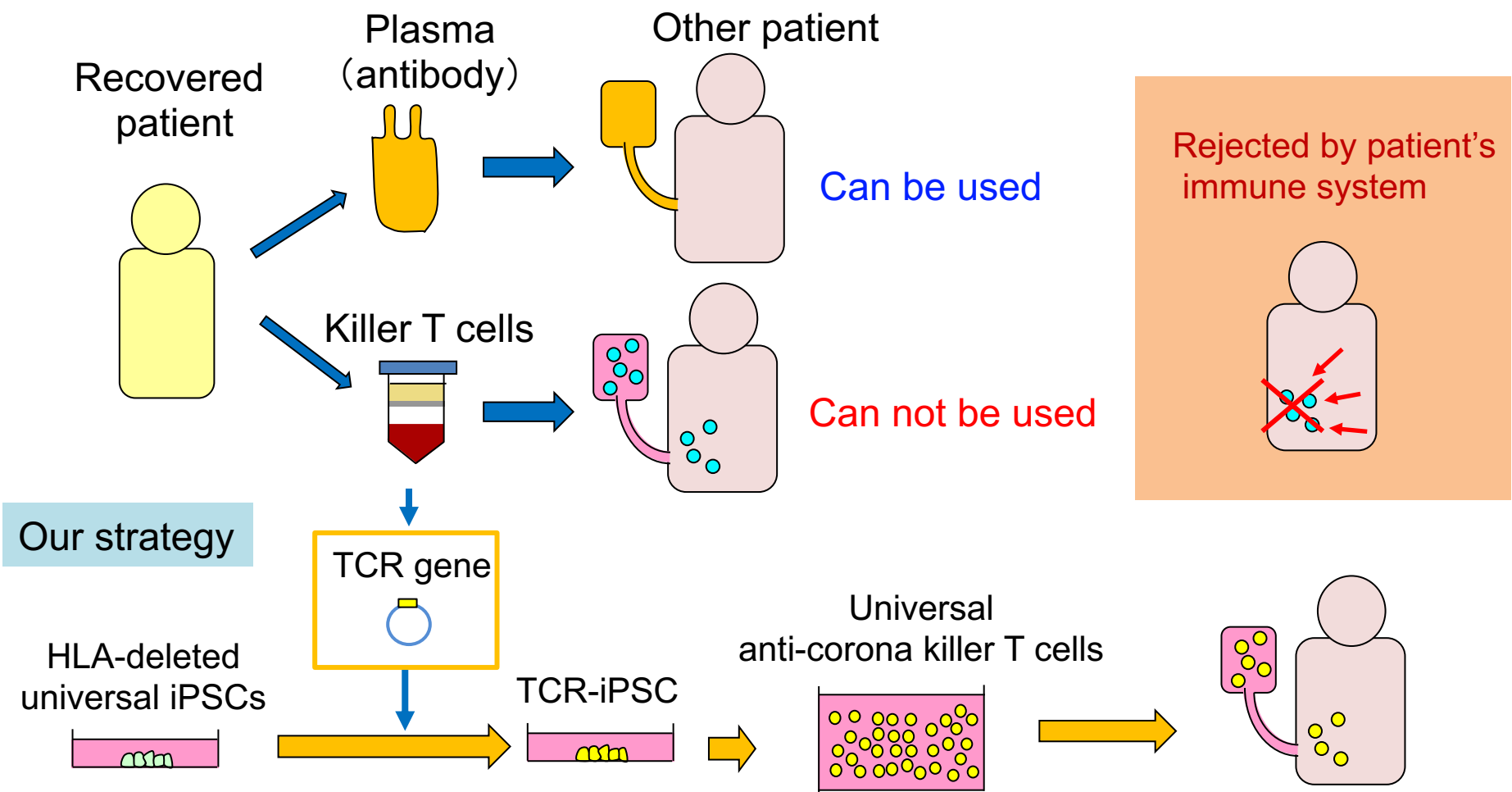
At present, our group is the only one in the world that is going to develop universal off-the-shelf killer T cells for COVID-19

Background and summary

Why killer T cells have NOT been used for COVID-19 ?

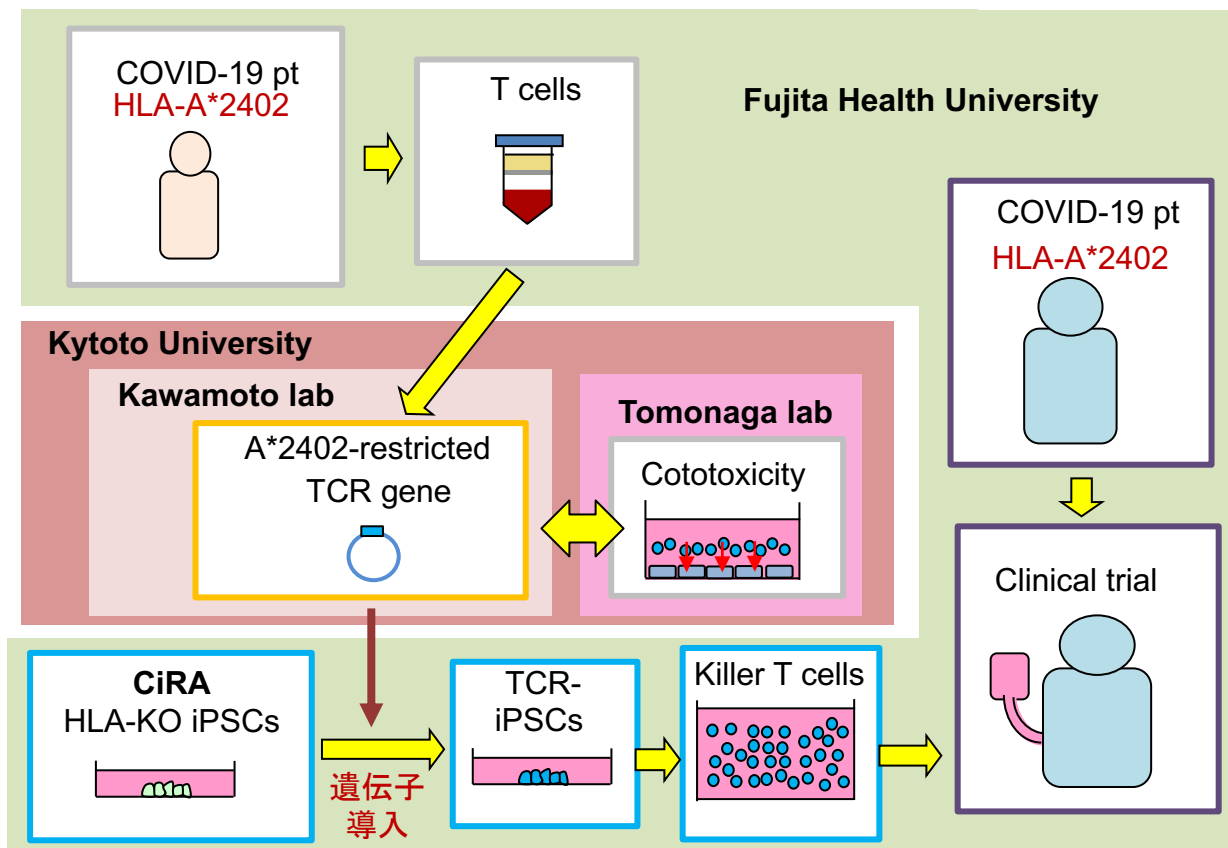
..Because they will be rejected by patient's immune system

→When we use TCR-iPSC method, it will become possible

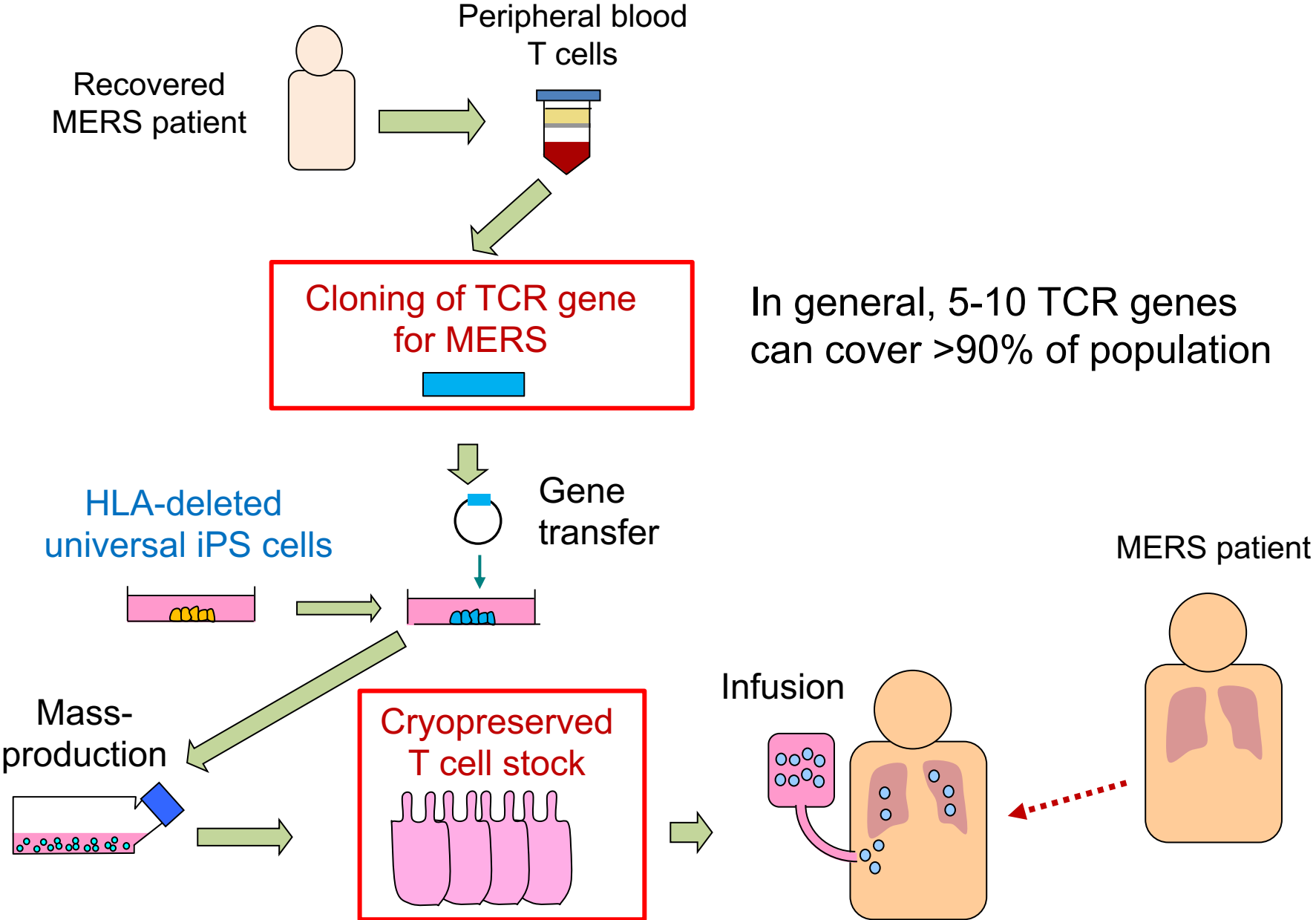


Development of T cell therapy against COVID-19

- To clone a TCR gene restricted to HLA that is frequent in Japanese people
- A single TCR (HLA-A*2402-restricted) can cover 60% of Japanese people
- Such TCR will be transferred into iPSCs, and killer T cells are regenerated
- We plan to conduct clinical trial in Fujita Health Univ (aiming to realize in 2024)
- This approach can be applied to other viral diseases
(SARS, MERS, Ebola, Bird flu...)



Proposal: TCR-iPSC method can be applied for MERS



Exhibited object

iPS cells bearing
WT1-specific TCR



Regeneration



2 months

Regenerated killer T cells
specific for
tumor antigen WT1

