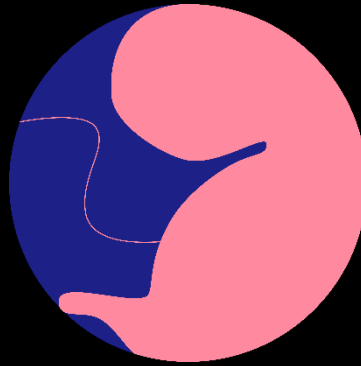


# Development of Method for Complex Tissue Regeneration via Tissue Embryonization



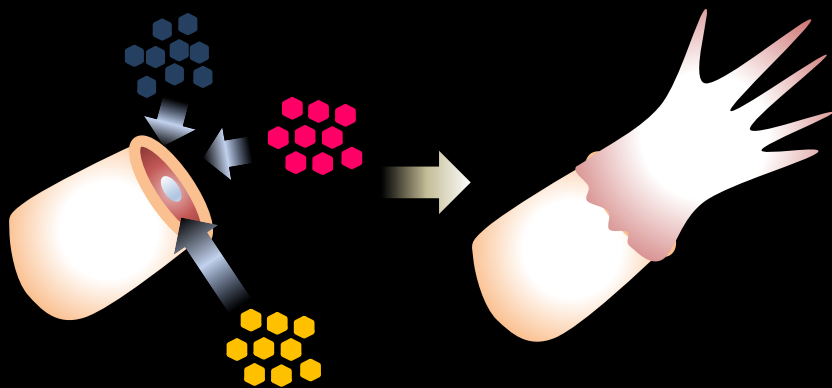
Department of Plastic Surgery  
University of Tokyo Hospital  
Masakazu KURITA

# Society 2040

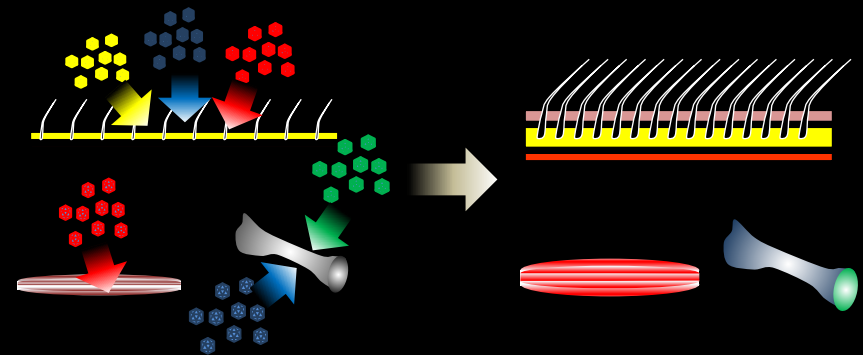
Aimed at this research project

## Tissue Embryonization

Inducing tissue similar to embryonic status  
via *in vivo* gene transduction



Limb regeneration



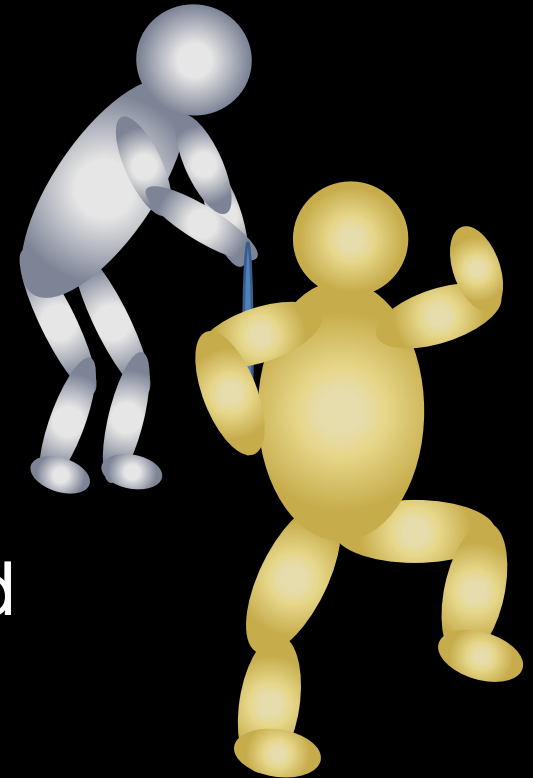
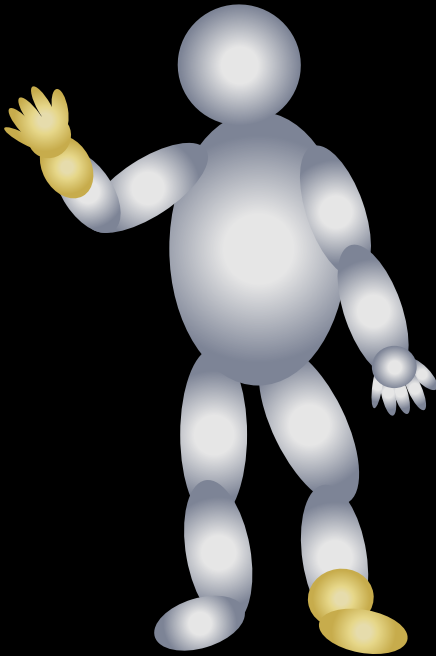
Skin & Muscle & Bone  
Rejuvenation

# Society 2040

Aimed at this research project

Lost tissue and organ  
Lost youth

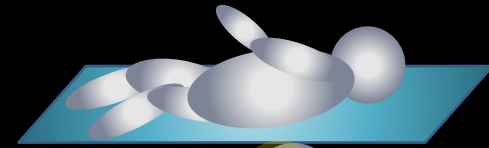
Pave the way towards  
reacquisition of  
irreversibly lost  
quality of life-associated  
functions.



# Society 2040

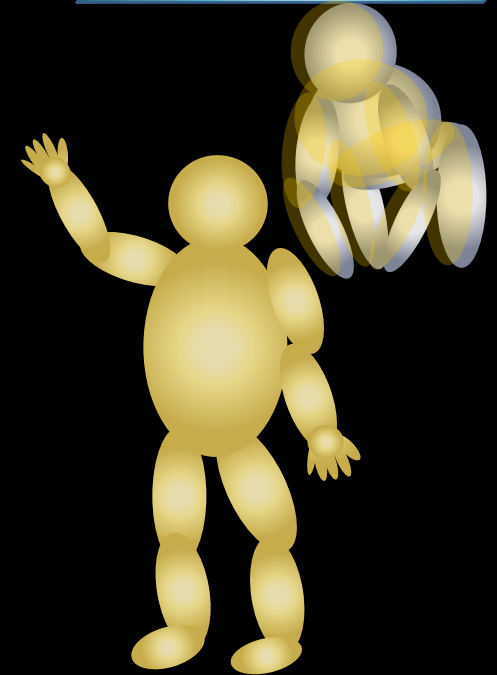
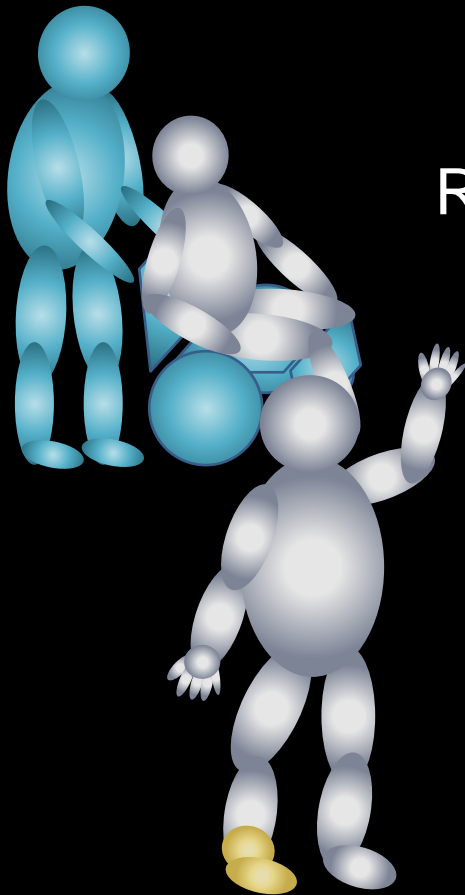
## Aimed at this research project

Limb regeneration  
Rejuvenation of skin & fat  
Rejuvenation of muscle & bone



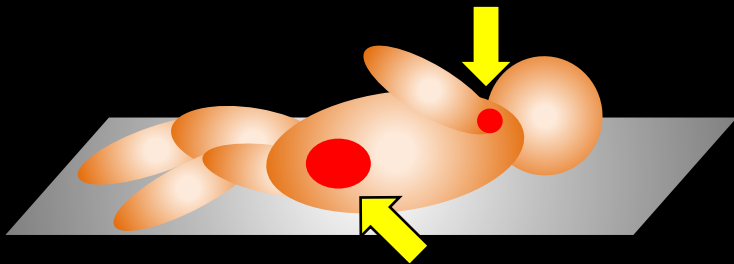
↓  
Increase personal activity  
&  
chances for participation

↓  
Increase activity of society !!

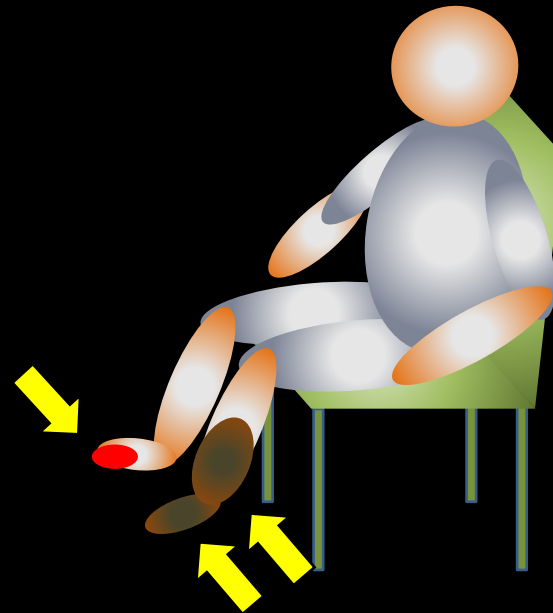


# Skin Ulcer

Pressure ulcer



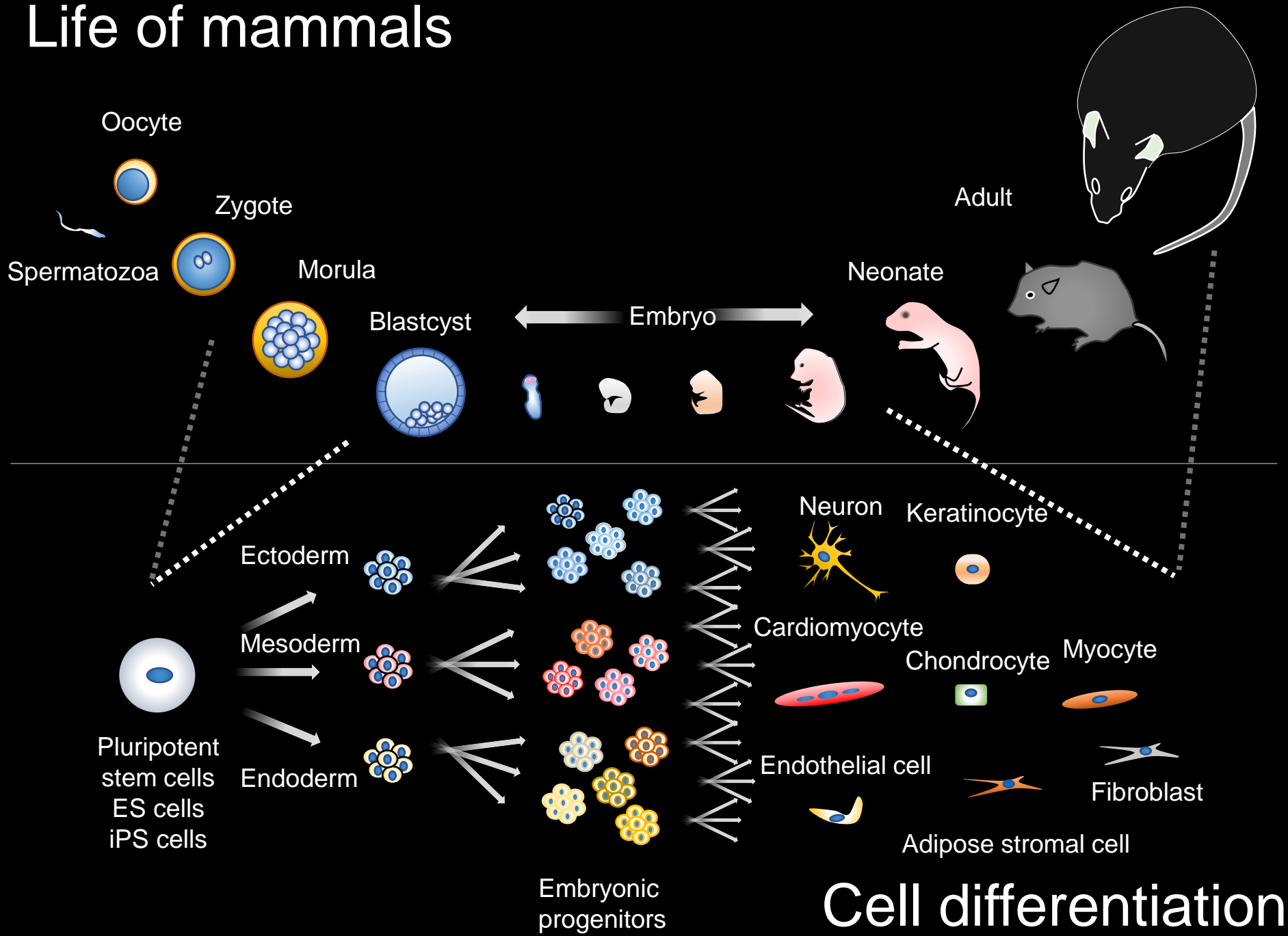
Limb necrosis  
(ex. Vascular insufficiency)



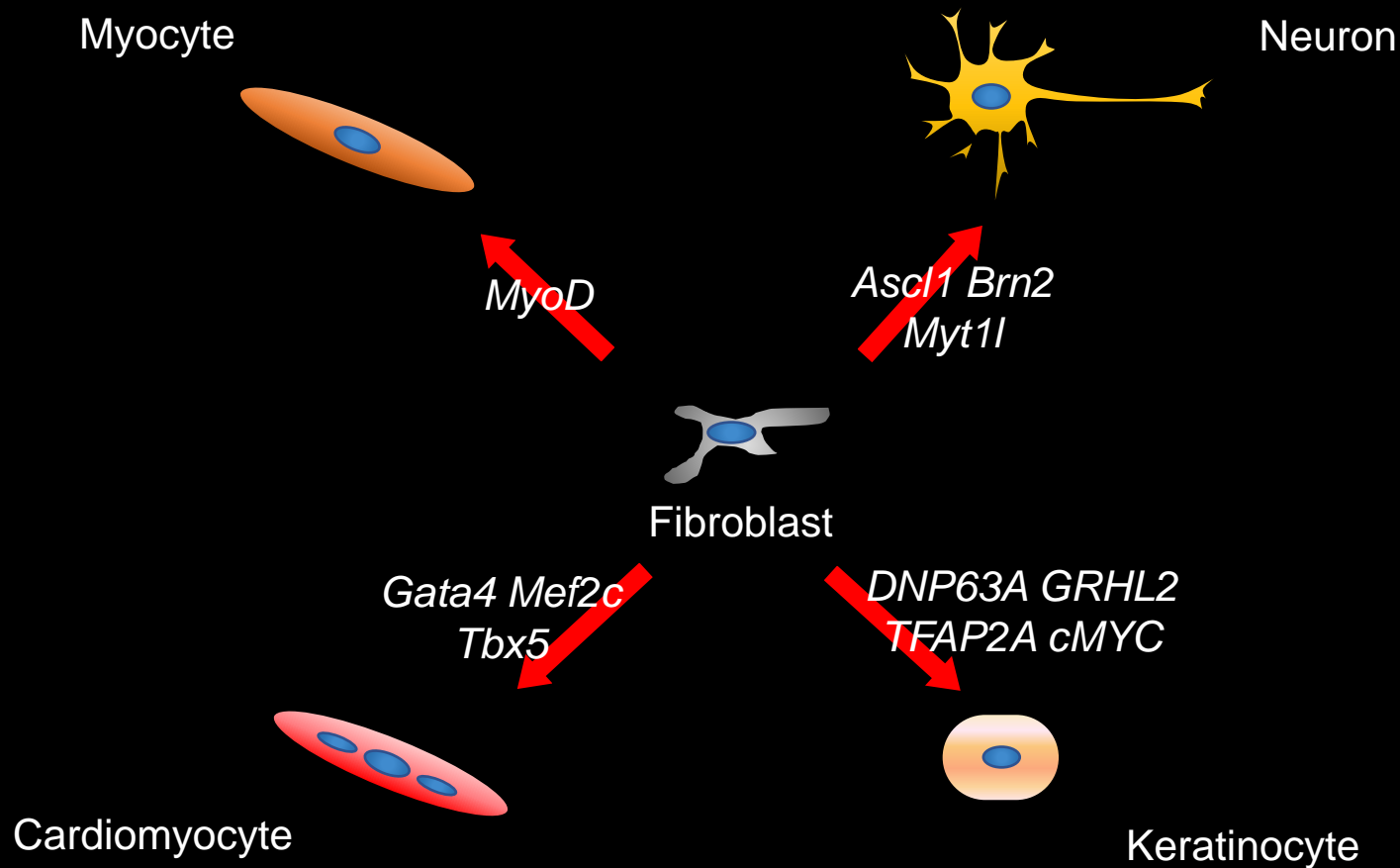
Official character of Japan Society of Plastic and Reconstructive Surgery  
and Japan Society for Surgical Wound Care  
Fairly of Bandage named **NAORUN**



# Life of mammals

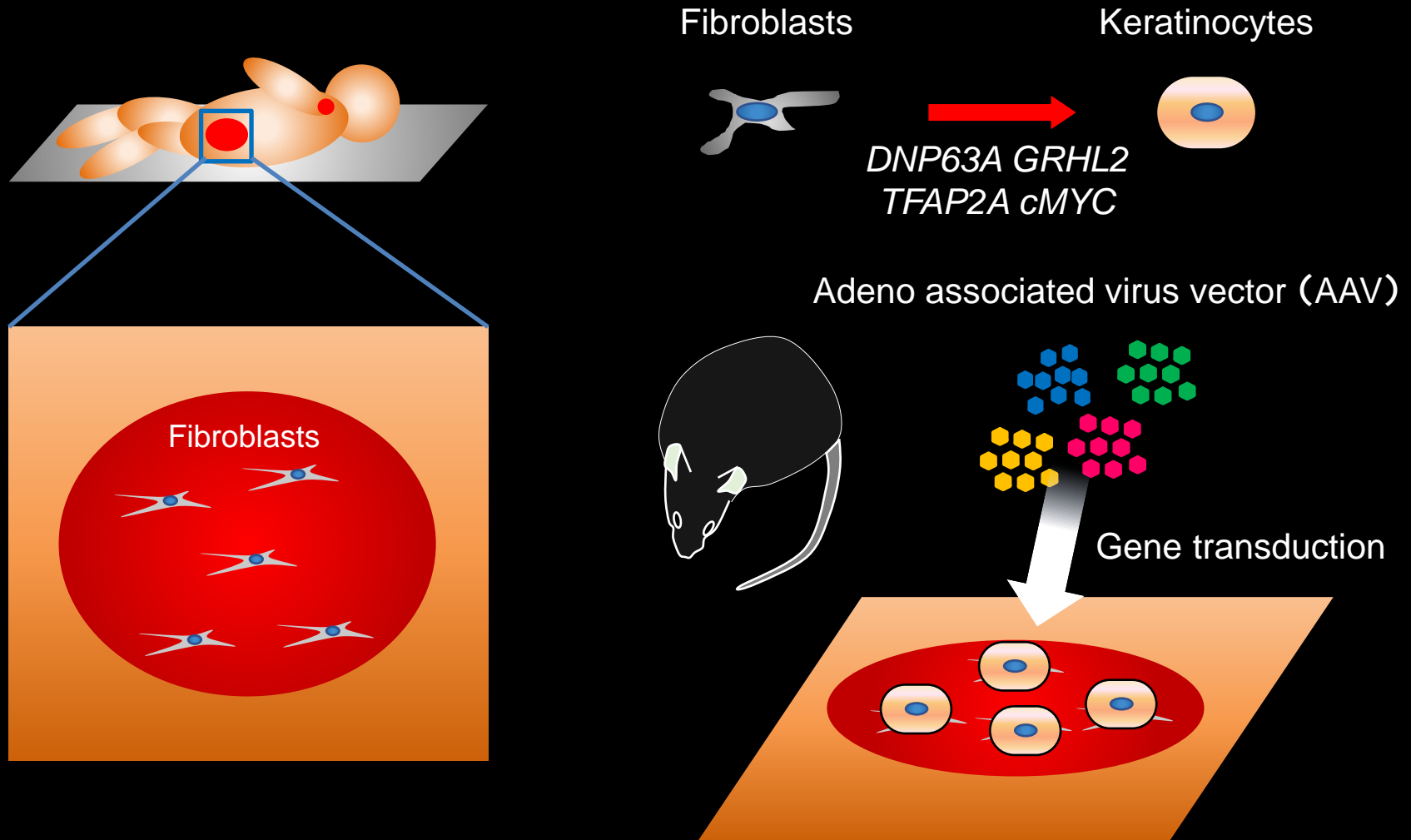


# Direct reprogramming (Direct conversion)



(from Kurita et al. IGAKU-NO-AYUMI 2020 modified)

# Direct reprogramming for prompt wound closure

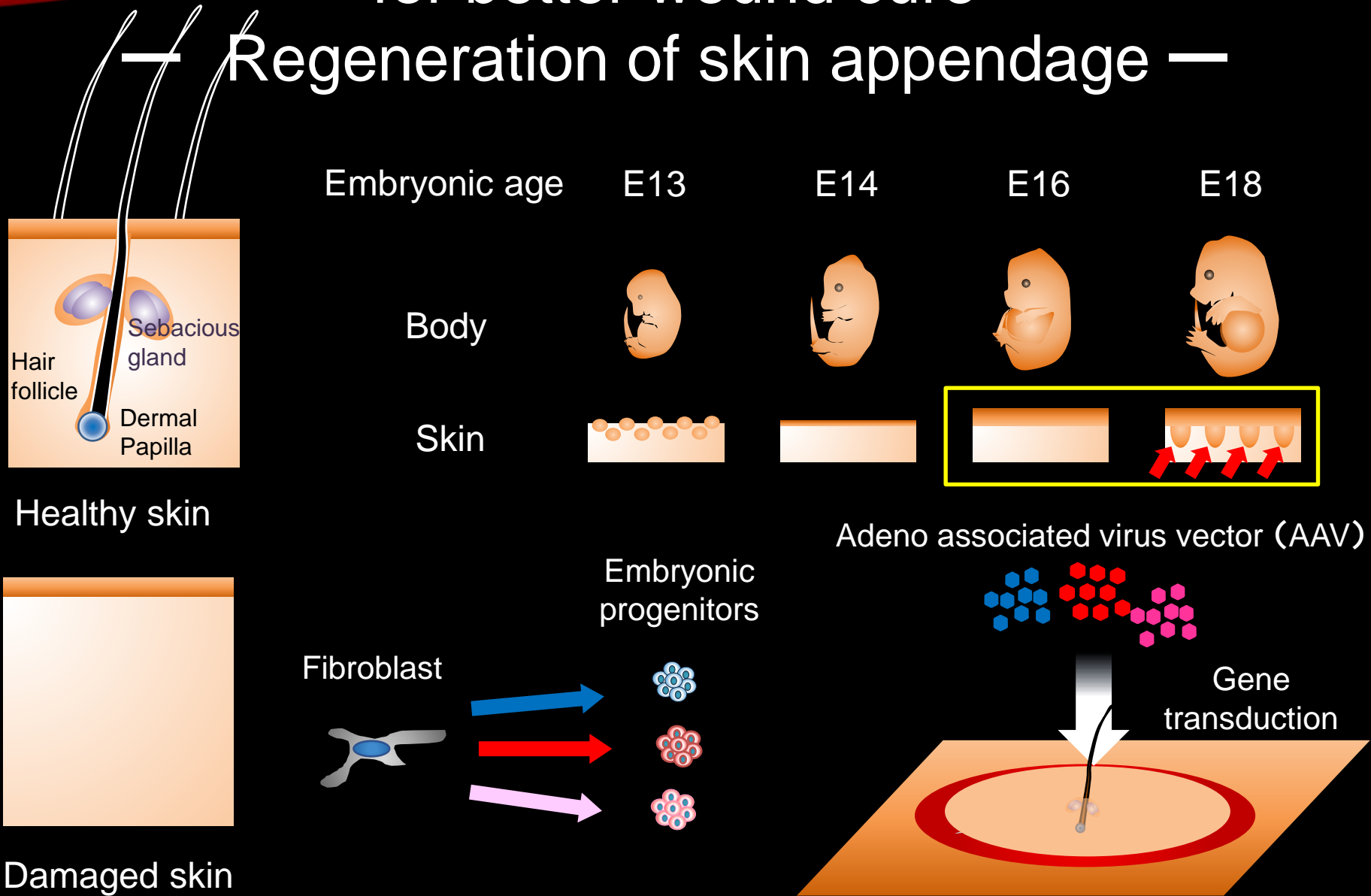


(Kurita et al. 2018 *Nature*)



# Direct reprogramming for better wound cure

## Regeneration of skin appendage



# Limb regeneration via tissue embryonization

Embryonic age

E9

E10

E11

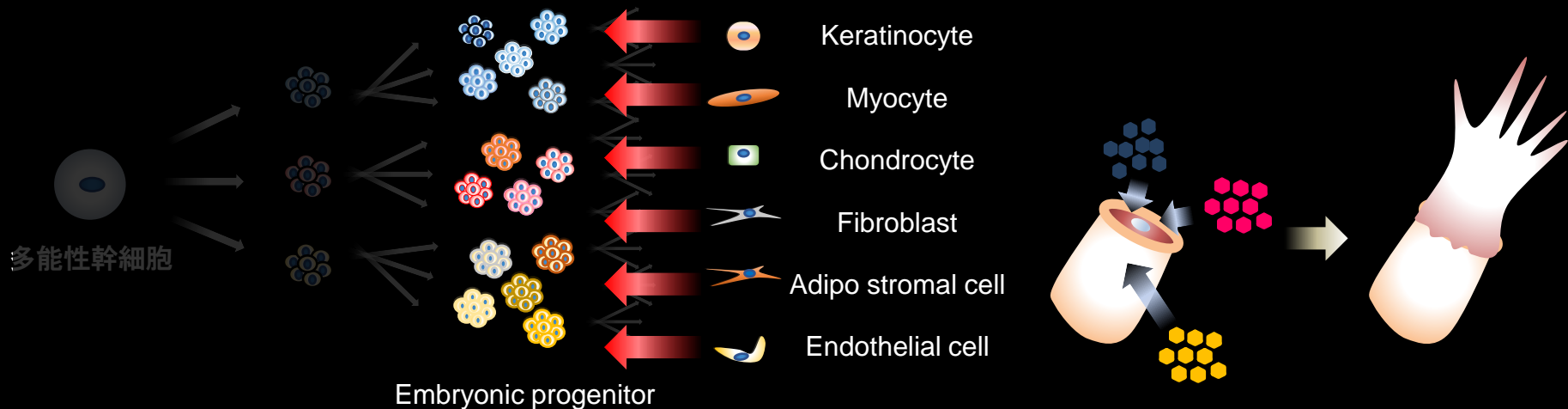
E12

E13

Body

Limb bud

← Appearance of limb bud →



# Summary of progression

- ① Search for reprogramming factors
- ② Development of new gene  
transduction method
- ③ Establishment of screening system  
  
➔ Try & error
- ④ Establishment of system for  
skin rejuvenation

# Searching for reprogramming factors

Embryonic age

E9

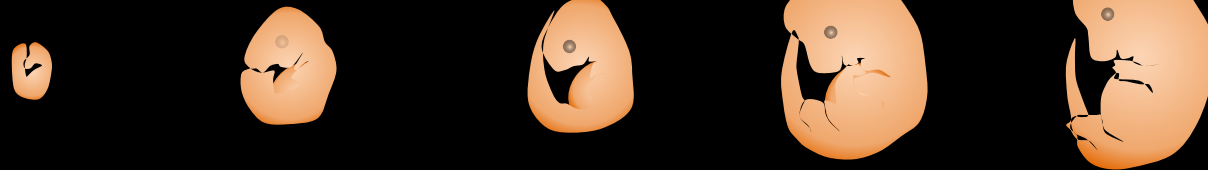
E10

E11

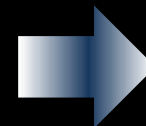
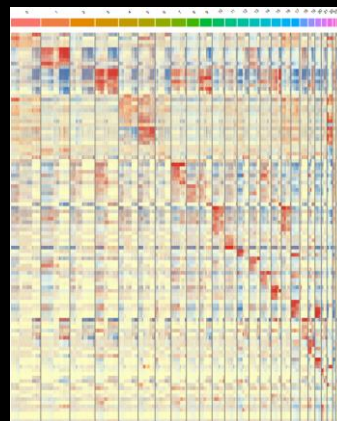
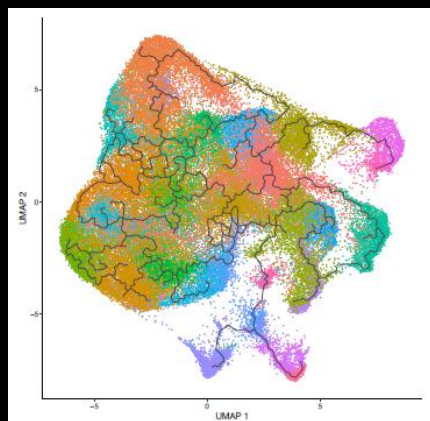
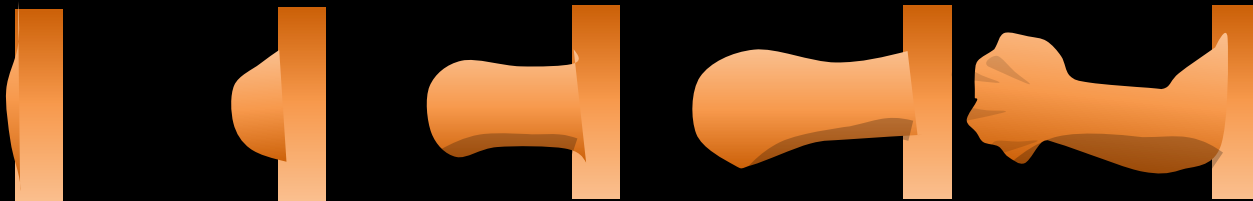
E12

E13

Body



Limb bud

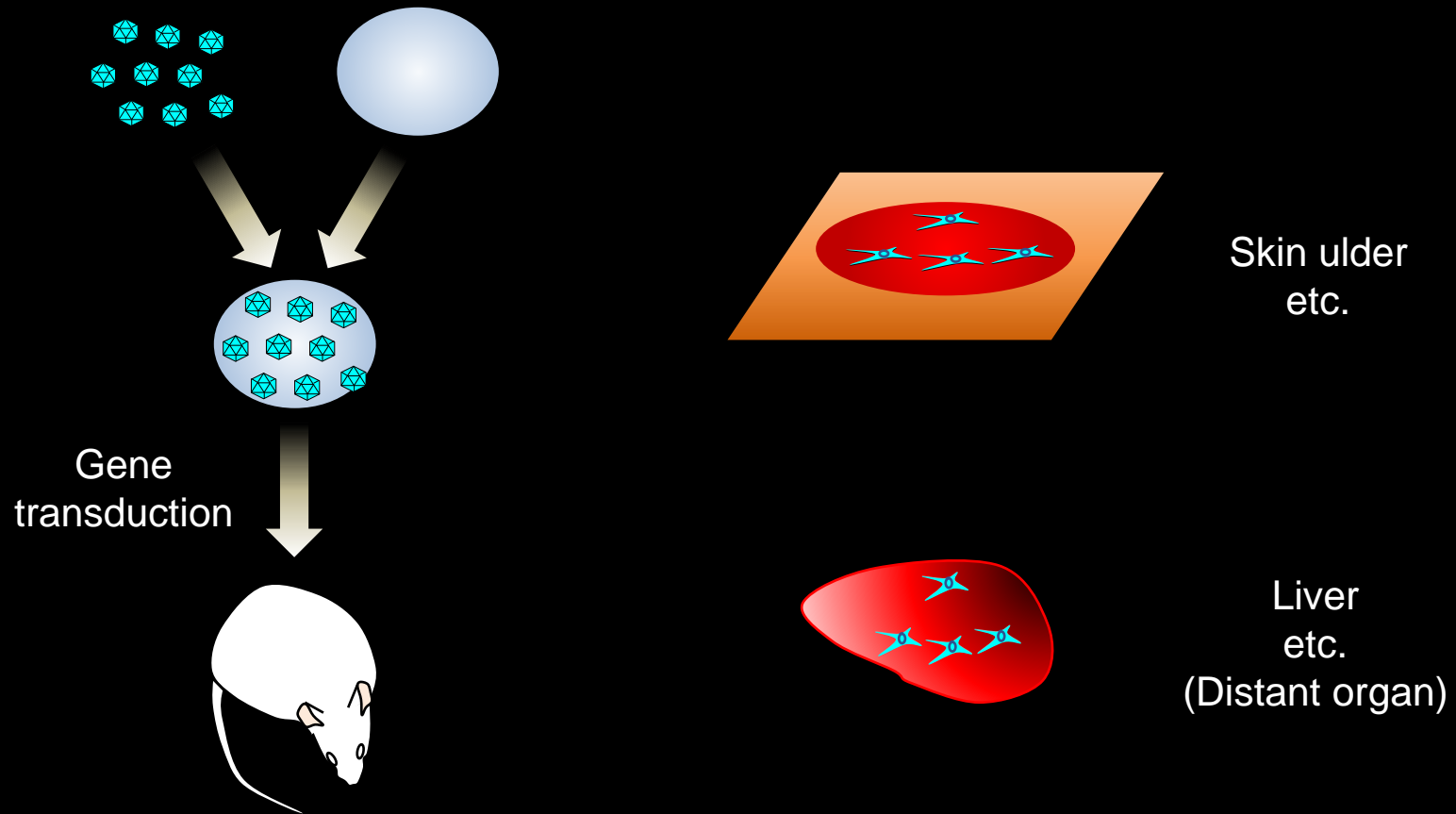


69 genes

Single cell RNA-seq analysis



# New gene transduction method -Biocompatible carrier-

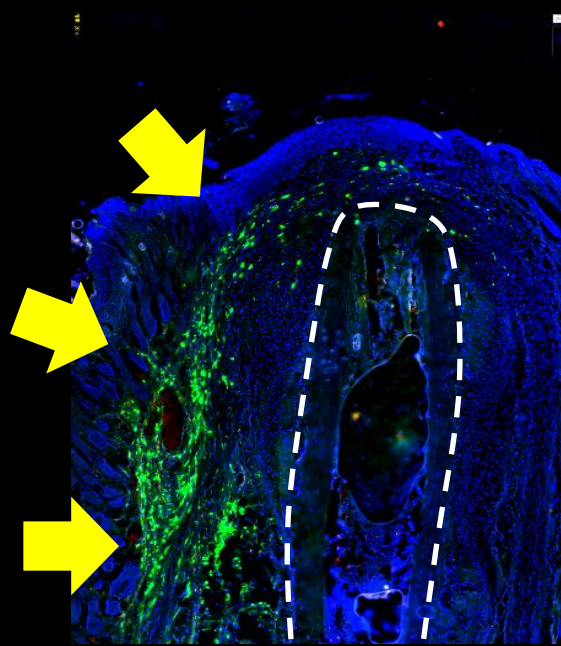
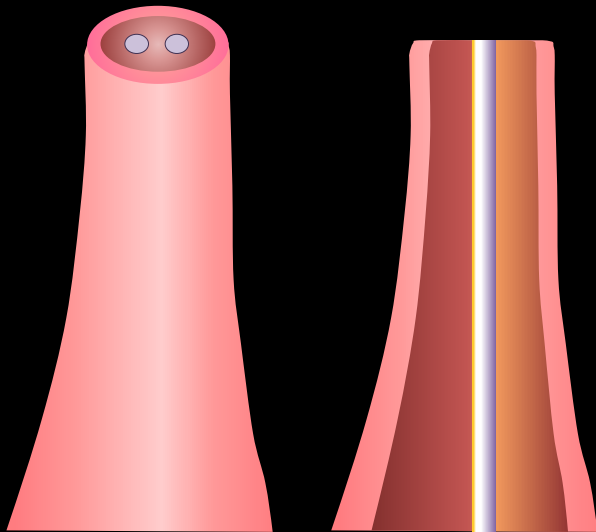




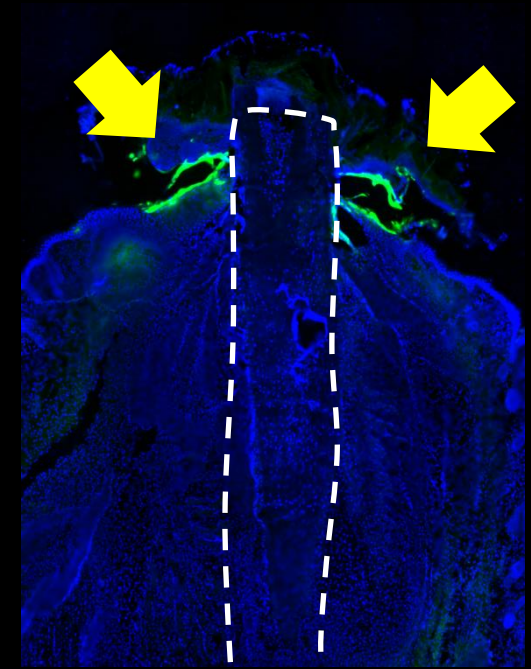
# New gene transduction method

GFPNLS DAPI

GFP DAPI

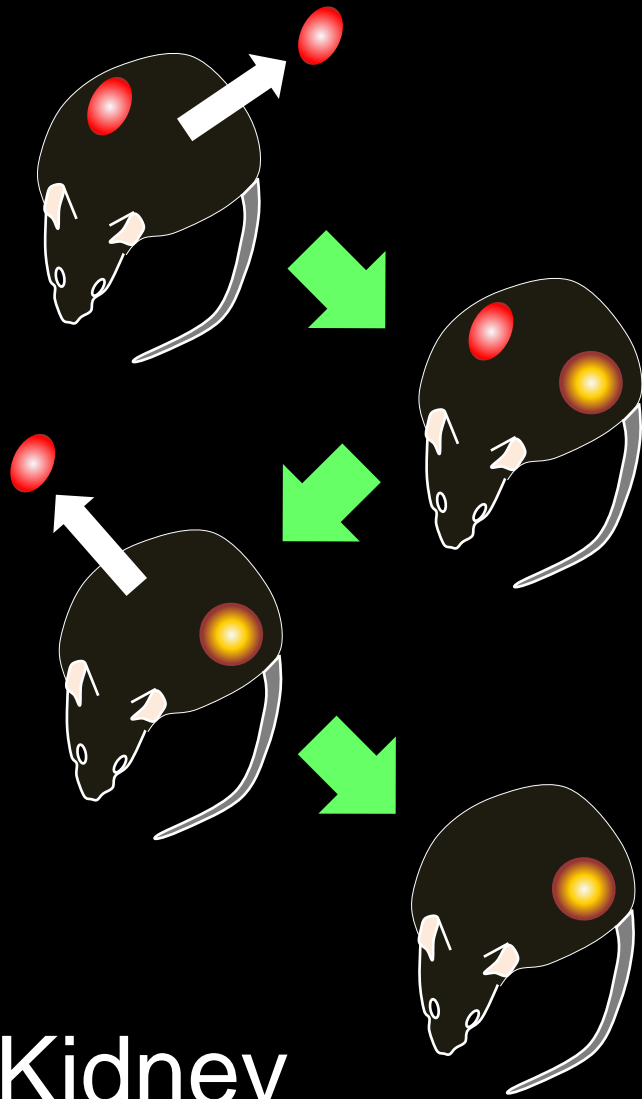


Bone

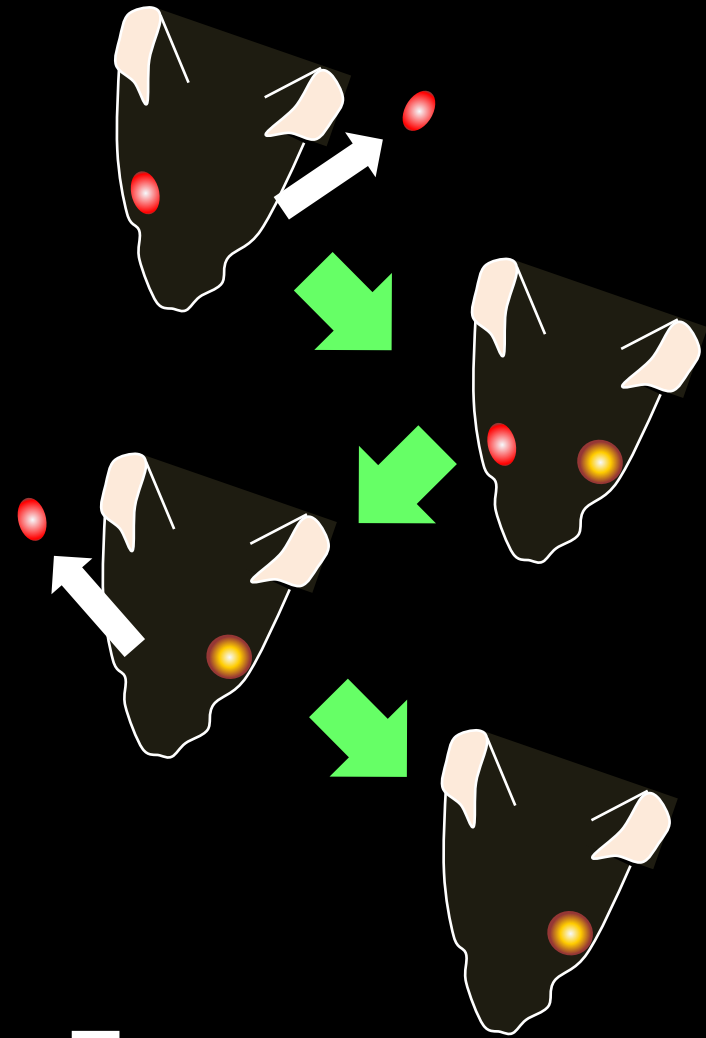


Bone

# Future perspective



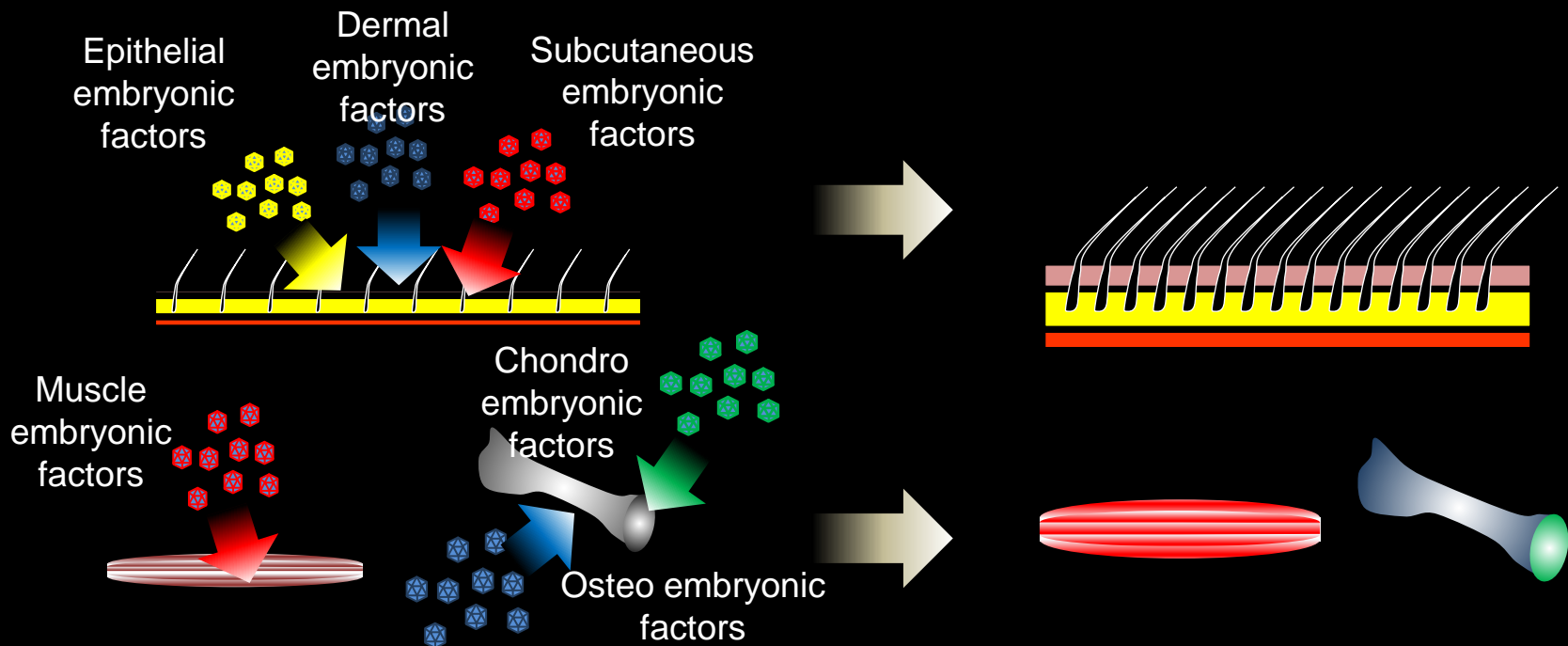
Kidney



Eye

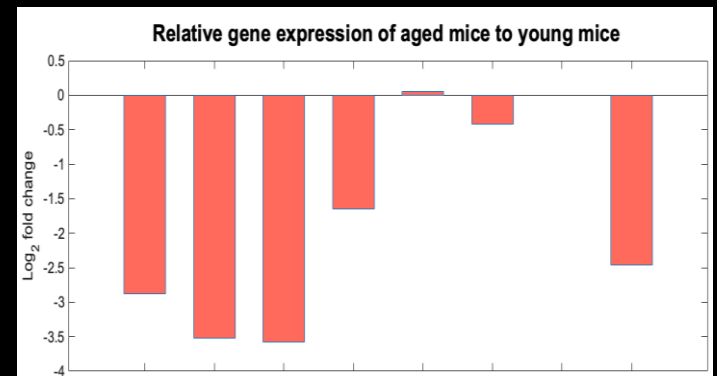
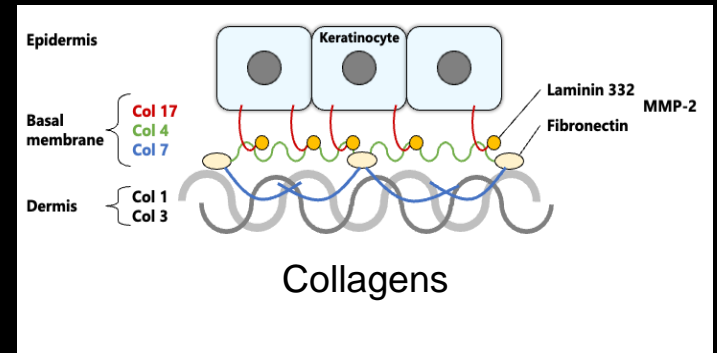
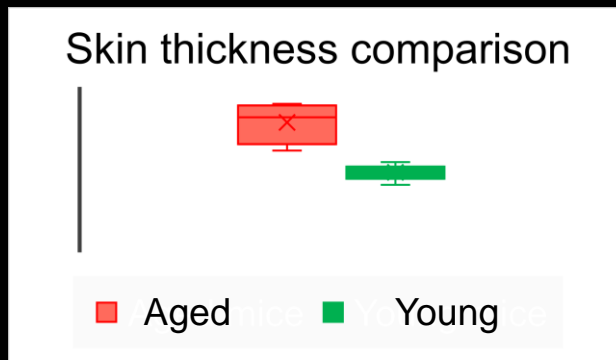
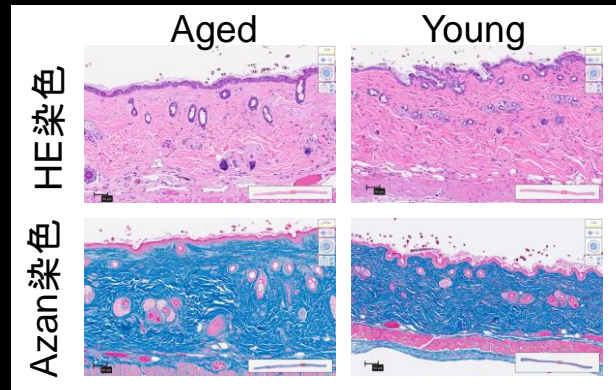
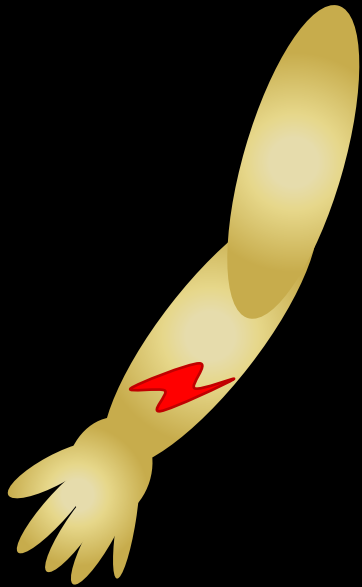


# Tissue embryonization for rejuvenation



# Analyses of aged skin

Skin Tear



# Collaborator

University of Tokyo  
Faculty of medicine



Hironori Hojo

Bone regeneration  
Bioinformatics

Hiroiyuki Okada

University of Tokyo  
Faculty of engineering



Takamasa Sakai

Bio material

Takuya Katashima  
Shohei Ishikawa

University of Tokyo  
Faculty of medicine



Gojiro Nakagami

Geriatric nursing  
Nursing science  
and engineering

Qin Qi  
Daijiro Haba  
Mao Kunimitsu

Osaka University  
Institute for Advanced  
Co-Creation Studies

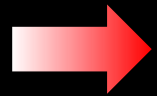


Keiichiro Suzuki

Genome editing  
Molecular Biology

# Outcome of this project

Regeneration of motor organ



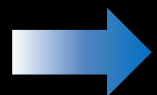
Participation of disabled



Promotion of gene therapy  
Expansion to other integral organs



Recovery from age related changes



Participation of aged people

