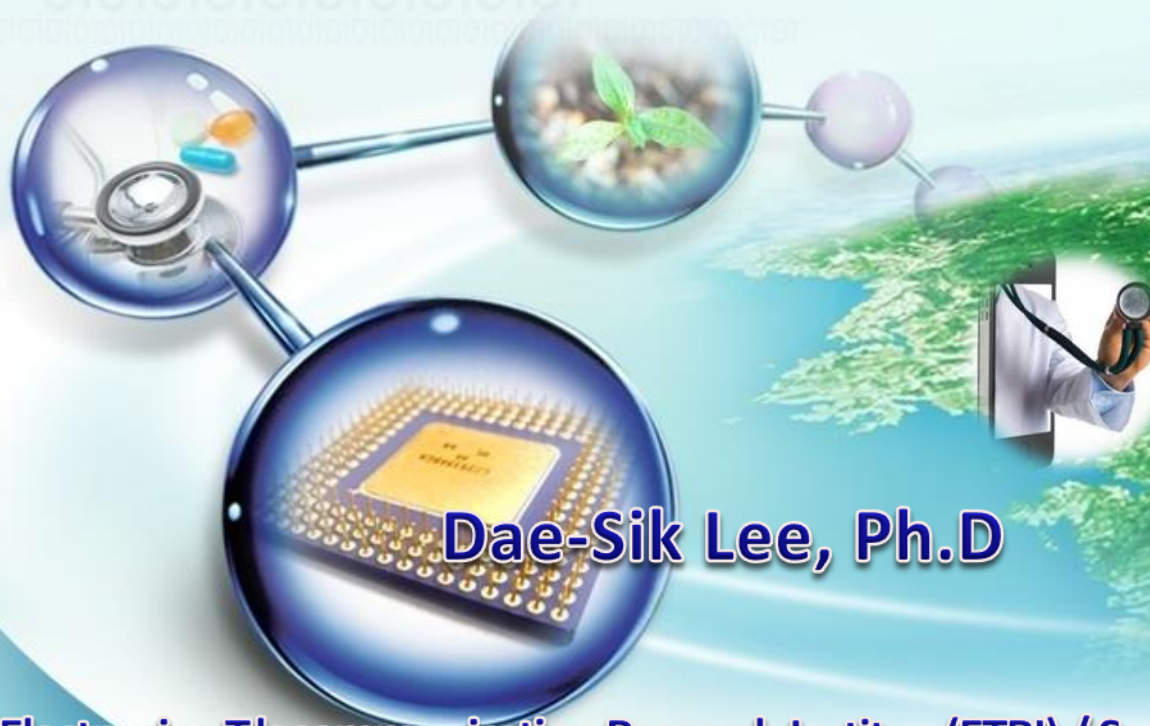


Nanomedicine Focusing on Single Cell Level

Biomedical Device Technologies for Point of Care ; Single Cell Level Circulating Tumor Cells Trapping Device



Dae-Sik Lee, Ph.D

Electronics Telecommunication Research Institute (ETRI) / Senior Researcher

Our Research Scopes in Biomedical Device Part

Biomarkers-based Healthcare Devices for POC

Biological liquid markers

Chemical gas markers

Healthcare/medical MEMS

Healthcare/medical MEMS

Health/disease
diagnostics and
treatment based on
biomarkers



POC : Point-of-care

Goal: BioMEMS Tech. R&D → Prototyping → Creating Biz.

Lab-Made

Portable realtime PCR system

Digital pregnancy & ovulation tester

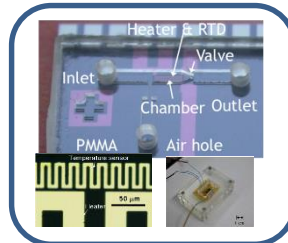


'2015

'2012

Prototyping
(Tech. Transfer, ETRI's
Start-up company)

Commercialization, ETRI's Start-up
company, KOSDAQ '2019



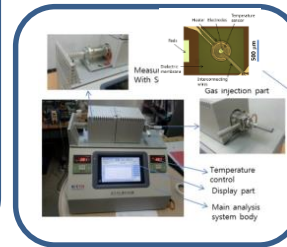
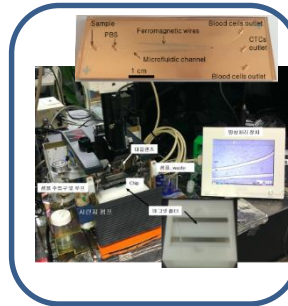
Personal urine analyzer



CTCs separator

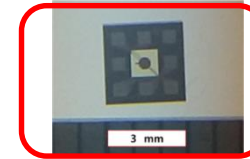
Commercialization,
tech. transfer

'2010



Early screening of lung cancer

Prototyping (tech. transfer, ongoing FDA)



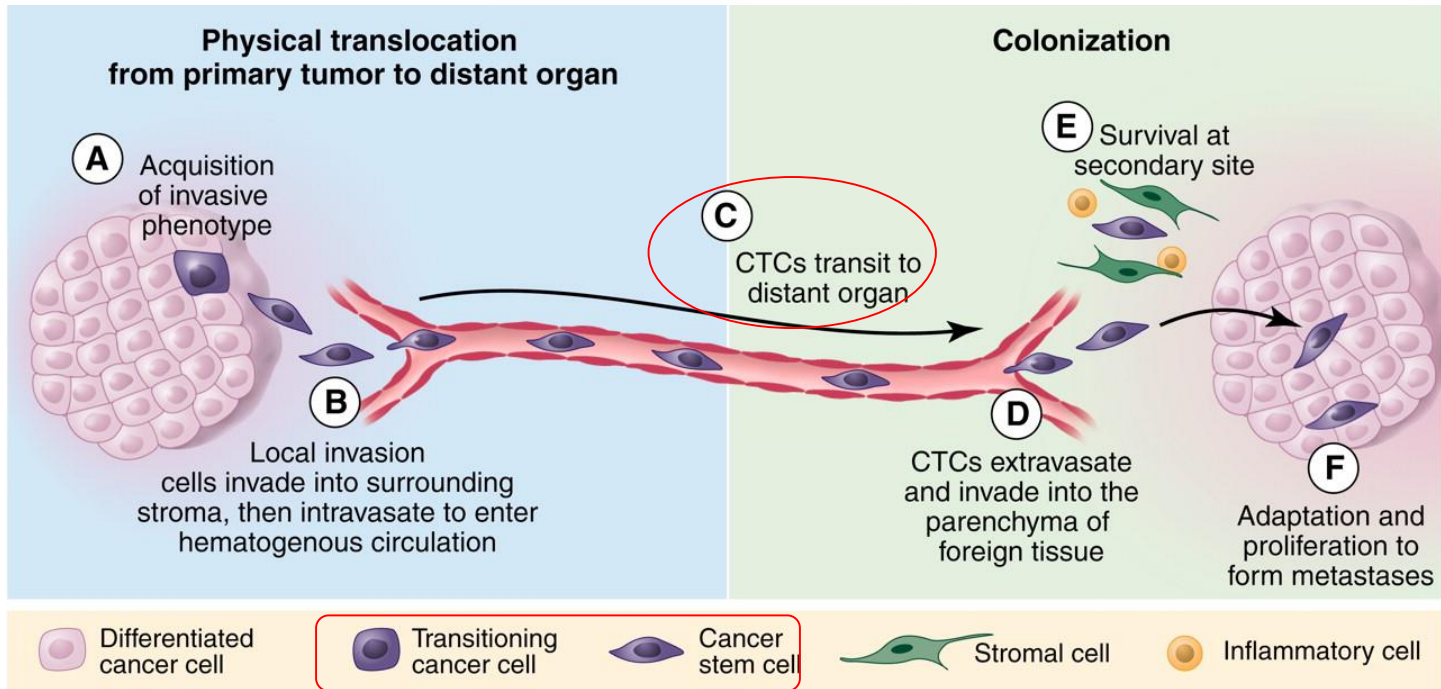
'2016

Prototyping of Micro hot plate
(tech. transfer)

'2014

CTCs : Circulating Tumor Cells

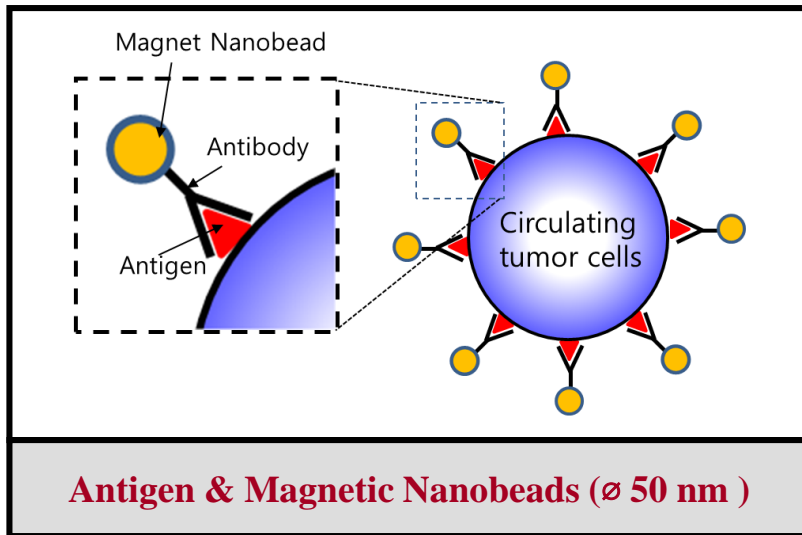
- Tumor Cells are released from tumors into blood stream
- Having a key role in future metastasis



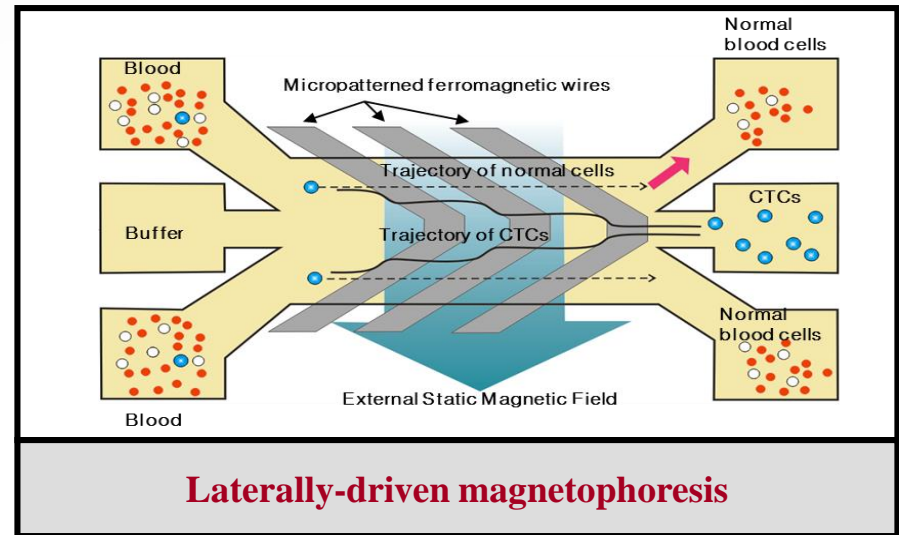
Source: Chaffer C.L. and Weinberg R.A. Science, 2011

Concept

A Lateral Magnetophoresis and Immunomagnetic Nanobeads and Its Integration with Microfluidic control System

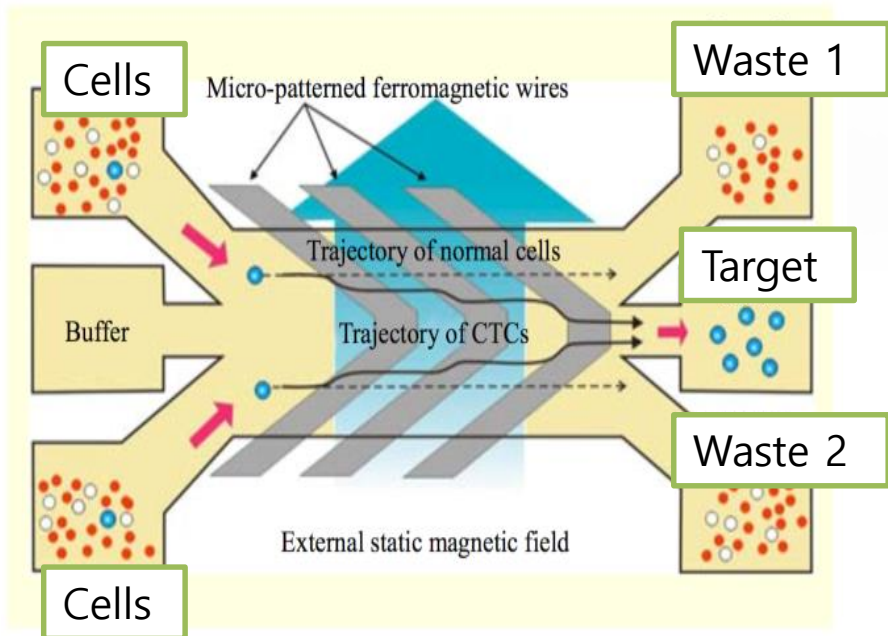


- Rapid isolation speed
- Selective isolation of cancer cells
- Strong magnetophoretic forces
- Universe applicable for cell isolations



- Possible to use whole blood
- Simple structure and easy to use
- Low fabrication cost with mass production protocol
- Easy to integrate with other functional units

Defining of Terminology and calculation formula



- Output cells = Target line cells + Waste line 1 + Waste line 2

Separation rate

$$\frac{\text{Target line cells}}{\text{Output cells}} \times 100$$

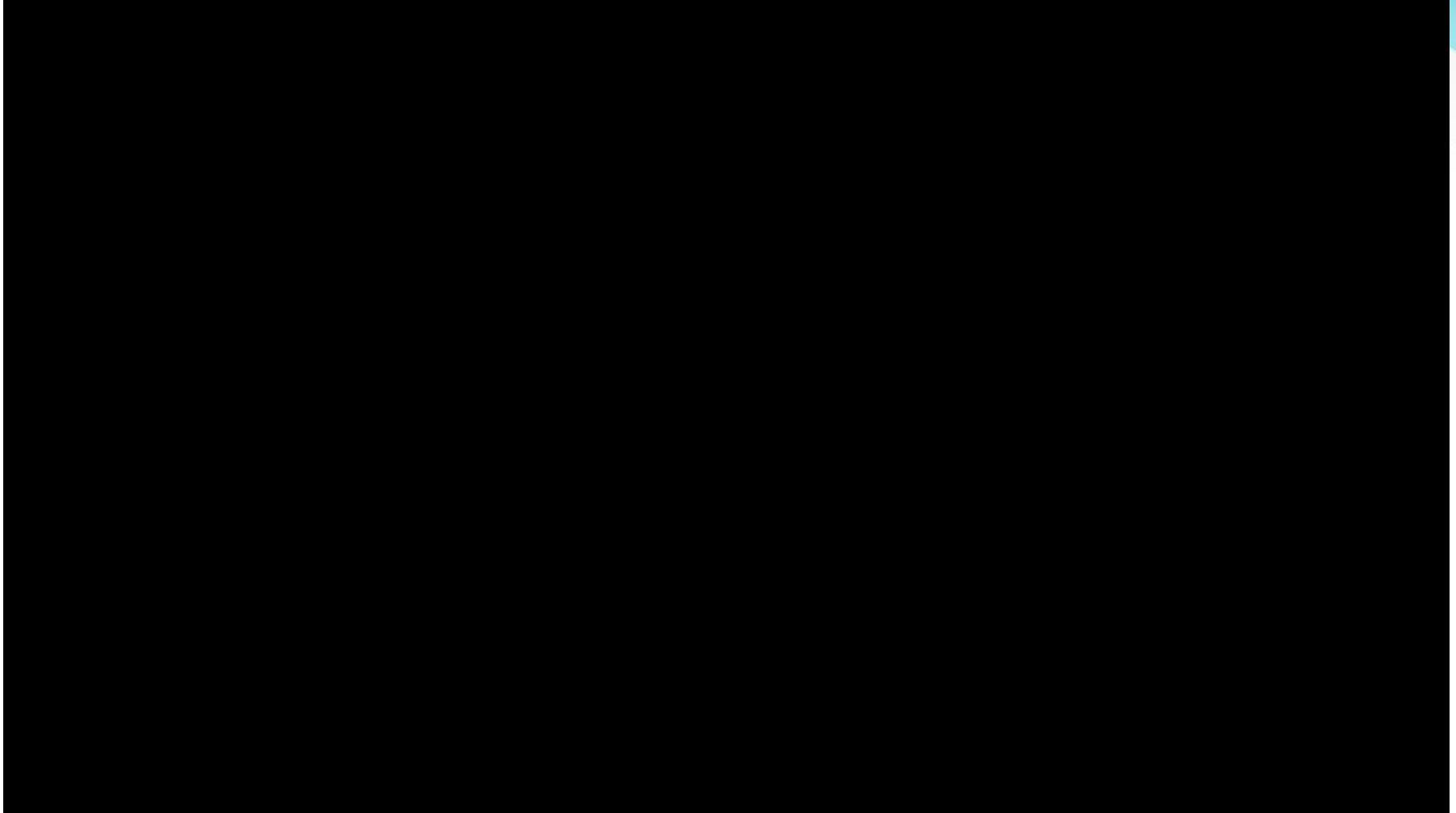
Recovery

$$\frac{\text{Output cells}}{\text{Input cells}} \times 100$$

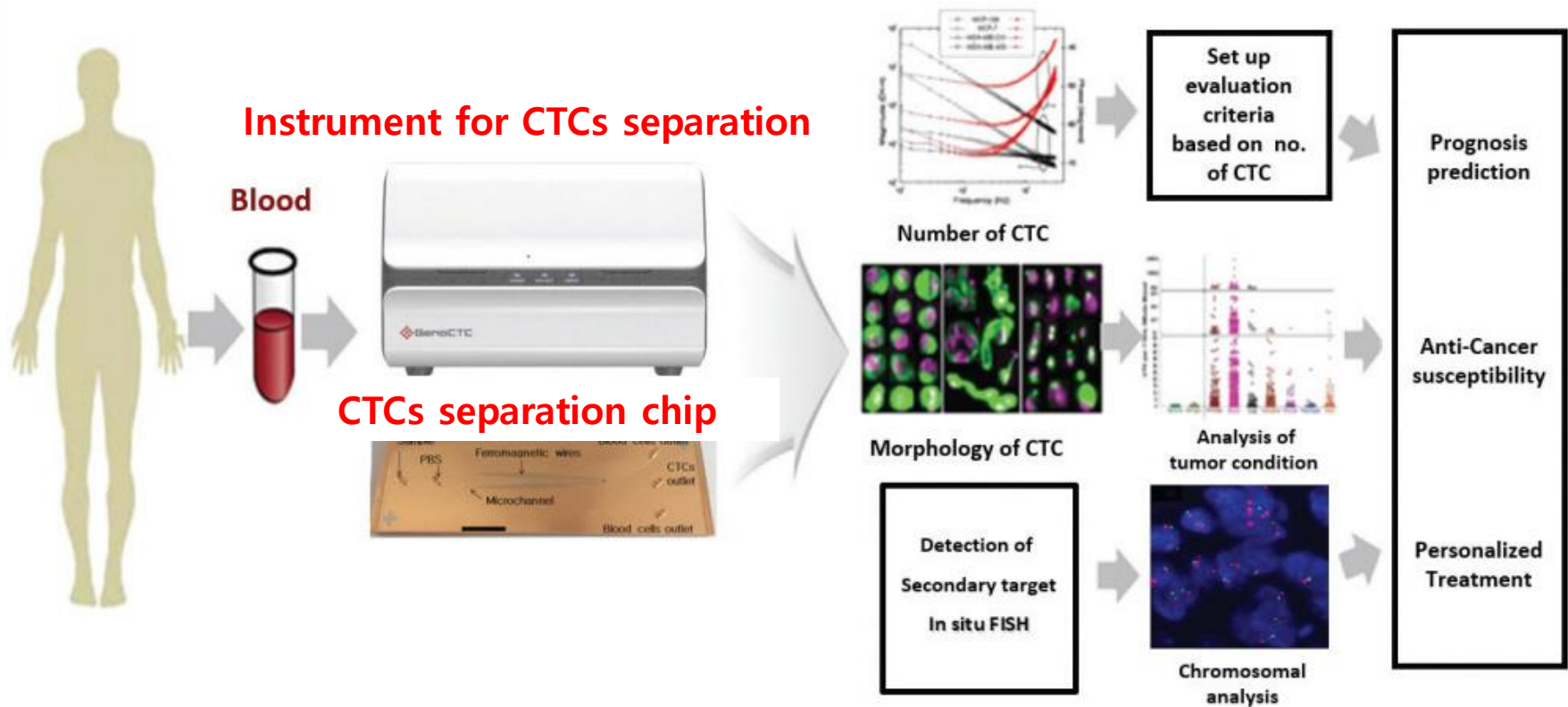
Purity

$$\frac{\text{CTCs}}{\text{Target line cells}} \times 100$$

Movie (concepts showing how it works)



Microdevice for Separation of CTCs

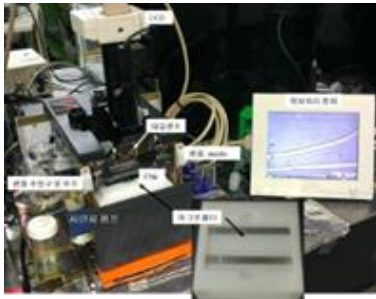


Confidential ~ Not published

Microdevice for Separation of CTCs

- ✓ *Technology Transfer, 2014*
- ✓ *ETRI Journal, 2015*
- ✓ *CE, FCC certification acquisition, 2016*
- ✓ *US patent registration, 2017*
- ✓ *Clinical test going (Samsung Hospital, Seoul National University)*
- ✓ *FDA submission processing,*
- ✓ *Preparing for KOSDAQ registration,*

ETRI



Company D



Company D



Future International cooperation method ?

Area of concern hoping co-operations,

- AI-based Nano-Bio Sensors
- Bio-inspired Nano-Bio Devices

International Cooperation program

- Boosting and expanding of U.S.-Korea joint research programs
- Developing new cooperation programs
 - Industrialization of Customer oriented nano-bio technologies
 - Joint clinical effectiveness evaluation of nano-bio devices
 - Joint projects between Korea-U.S. national labs

Acknowledgements

- *Dr. J.W. Park, Dr. H.J. Park, Dr. M.Y. Jung, Dr. S.H. Kim (ETRI)*
- *Prof. K.H. Han (Inje University)*
- *Prof. Y. K. Shin (Seoul National University)*
- *Ms. D.H. Kim, H.S. Lee (GenoBio Corp.)*
- *Prof. C. Ihm (Eulji University)*
- *Dr. M. J. Sohn (Sugentech Corp.)*
- *Dr. Y. J. Seo (Genesystems Corp.)*
- *Dr. J.-E. Chang, Prof. S.H. Jheon (Seoul National University)*
- *Prof. S.W. Ban (Dongguk University)*

Funded by:

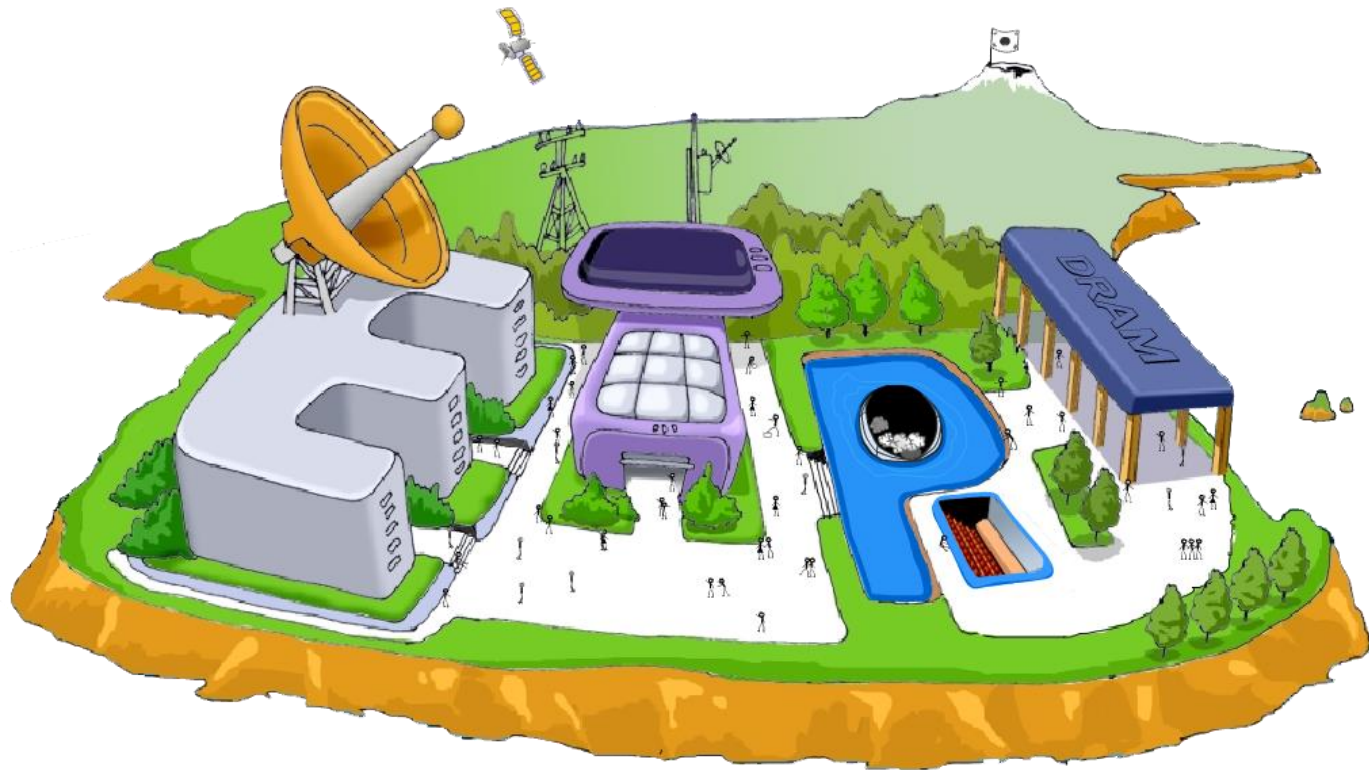


과학기술정보통신부
Ministry of Science and ICT



Ministry of Trade,
Industry and Energy

ETRI



**Thank you for your
kind attention !**