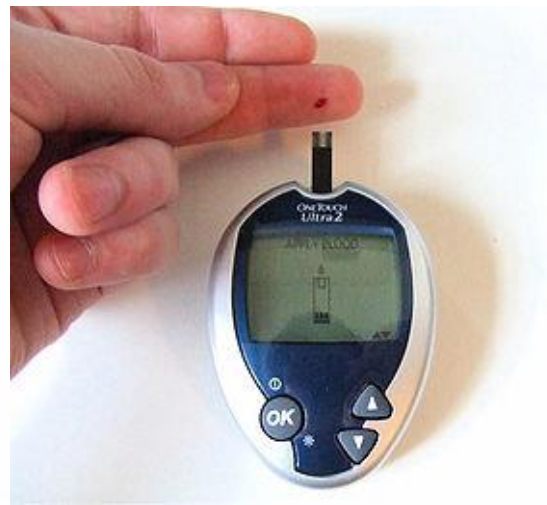


# Biosensors



# What are biosensors?

- Devices that analyze biological samples to better understand structure and function and for diagnostics
- Uses for biosensors
  - Molecule analysis (DNA and proteins)
  - Food safety
  - Diagnostics
  - Medical monitoring
  - Detection of biological weapons
  - Rapid analysis and detection

# Types of biosensors

- Electrochemical
- Temperature sensitive
- Photosensitive
- Pressure sensitive
- Motion sensitive
- Chemical sensitive

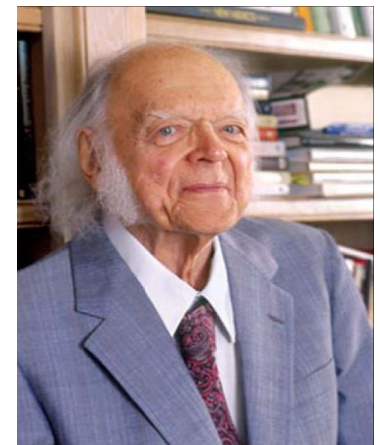
# Common biosensors

- Blood glucose monitors
- Heart and blood pressure monitors
- Pacemakers
- HIV and pregnancy tests



# History of Biosensors

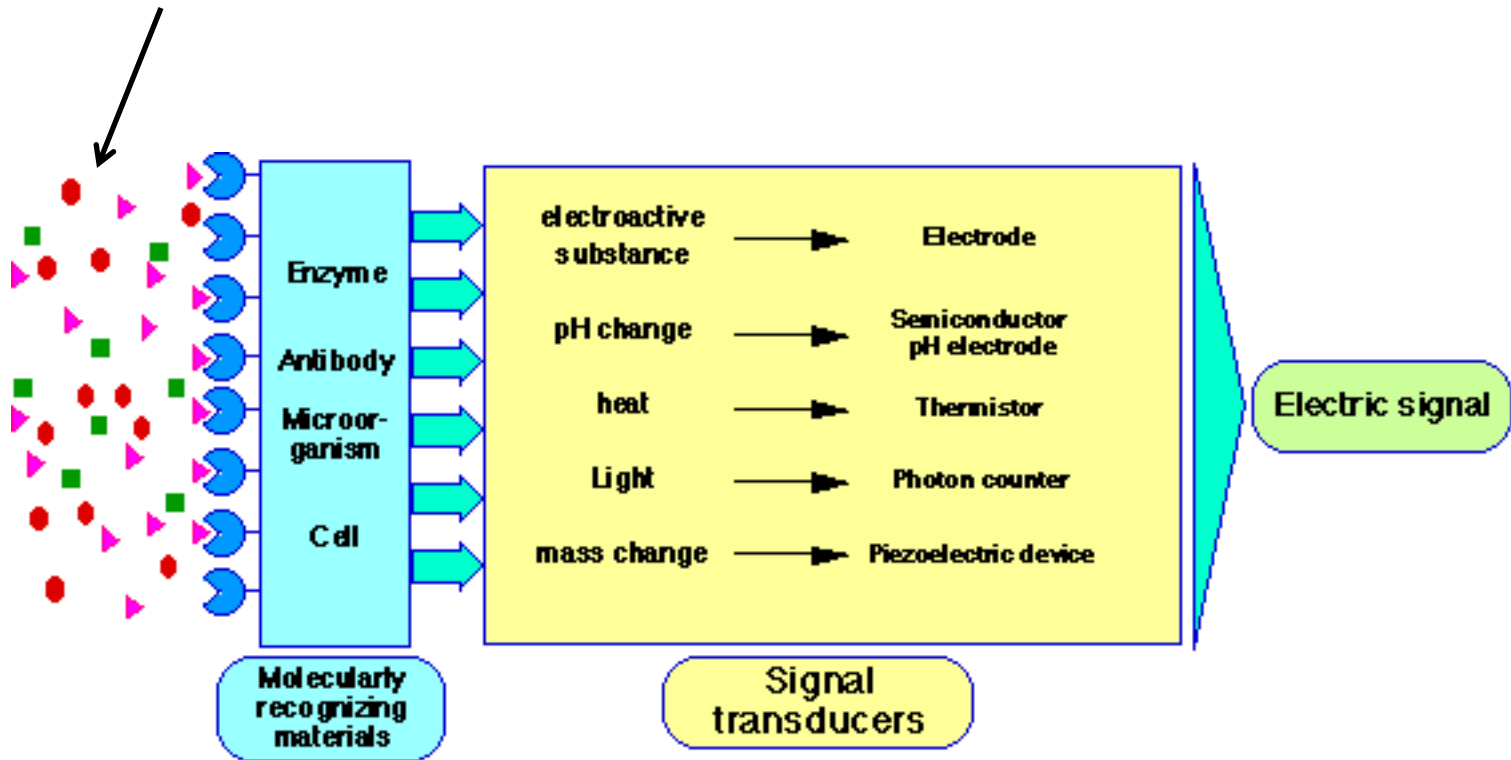
- First described in 1962 by Dr. Leland Clark
- 1969 a sensor was invented to detect urea
- 1972 the first glucose biosensor commercialized by Yellow Springs Instruments



Dr. Leland Clark Jr  
“Father of the biosensor”

# How biosensors work

Sample (blood, saliva, DNA, proteins)

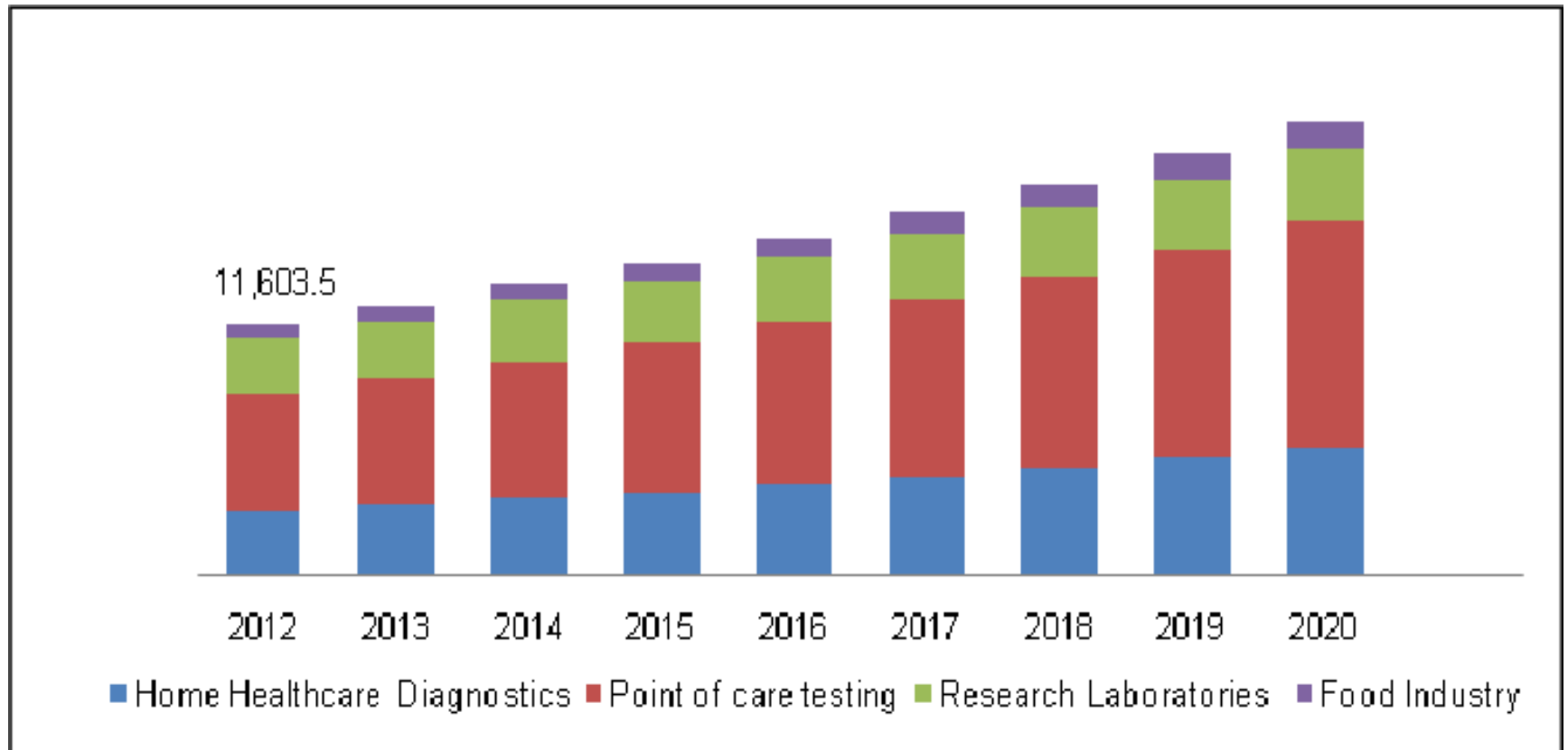


**Principle of Biosensors**

# Biosensors

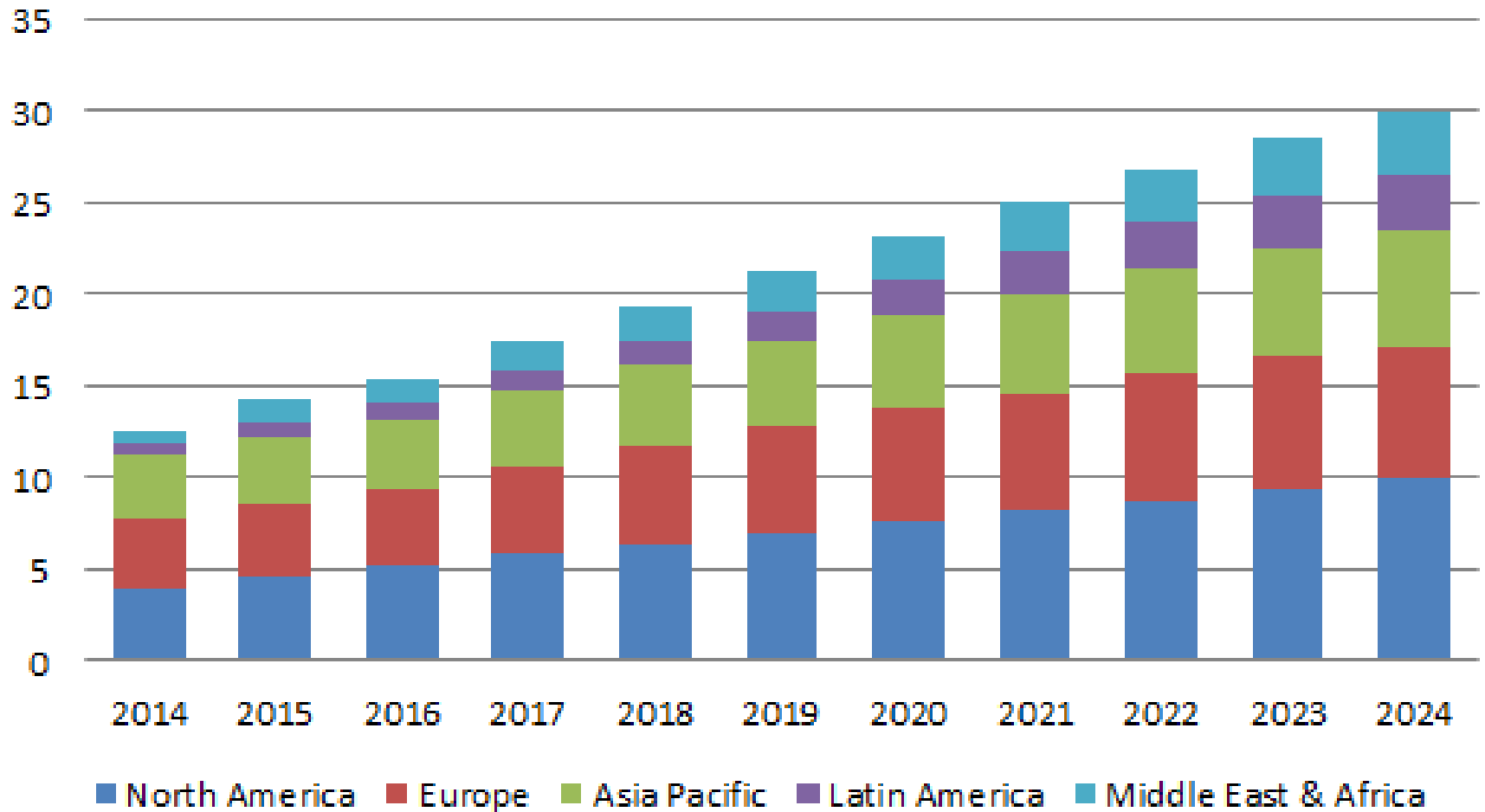
- Advantages
  - Rapid detection
  - Small volumes of samples needed
  - Can be used by the patient (blood glucose monitor)
- Disadvantages
  - Cost
  - May require expertise to use
  - Sample collection can be painful

# Biosensor Global Market (billion USD)



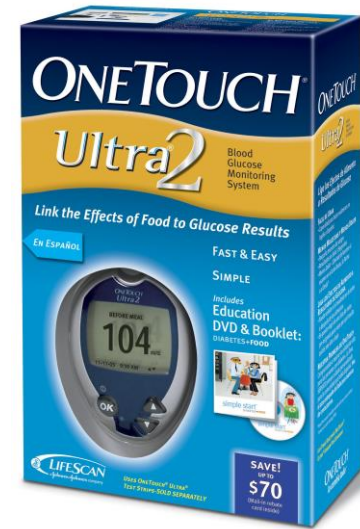


## Global Biosensors Market, by Region, 2014-2024 (in BN USD)



# Closer Look

- Blood glucose monitor
- Lab on a chip



# Diabetes

- Metabolic disease characterized by lack of insulin production (Type I)
- Without insulin, cells cannot use glucose for energy
- Can be treated by frequent monitoring and insulin injections
- Death will occur if untreated



# Blood glucose monitors

- Used by diabetics to measure blood glucose concentration
- Helps patients determine their insulin dose
- Uses electrochemistry for detection



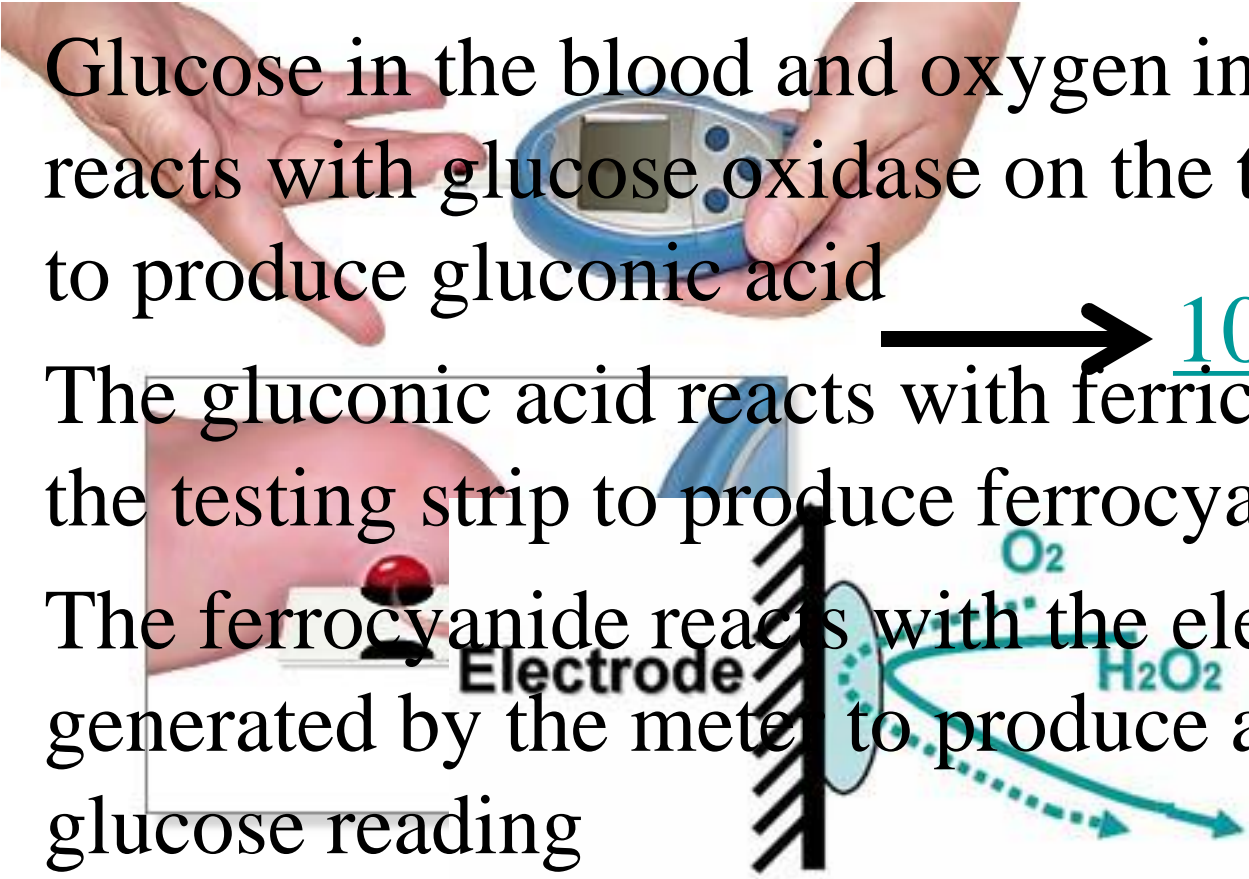
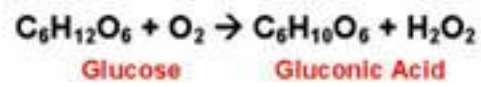
# How does it work?

- Glucose in the blood and oxygen in the air reacts with glucose oxidase on the testing strip to produce gluconic acid
- The gluconic acid reacts with ferricyanide on the testing strip to produce ferrocyanide.
- The ferrocyanide reacts with the electricity generated by the meter to produce a blood glucose reading

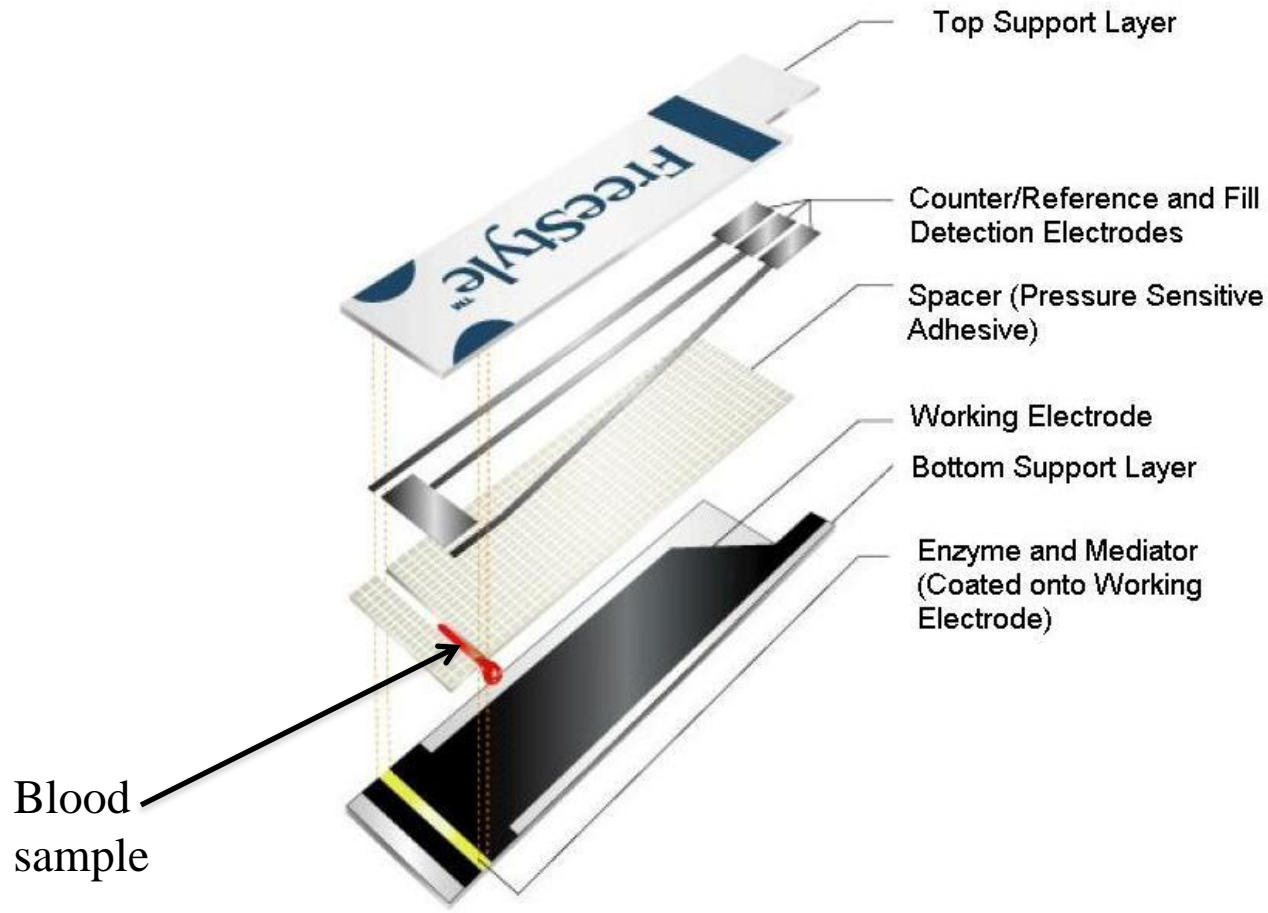
100 mg/dL

Blood glucose concentration

Electrode

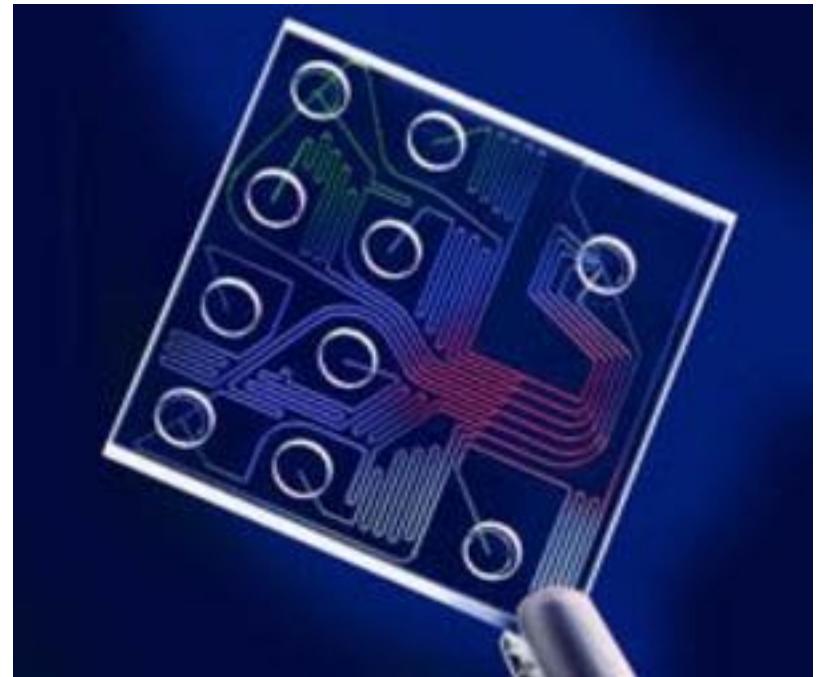


# Glucose test strips



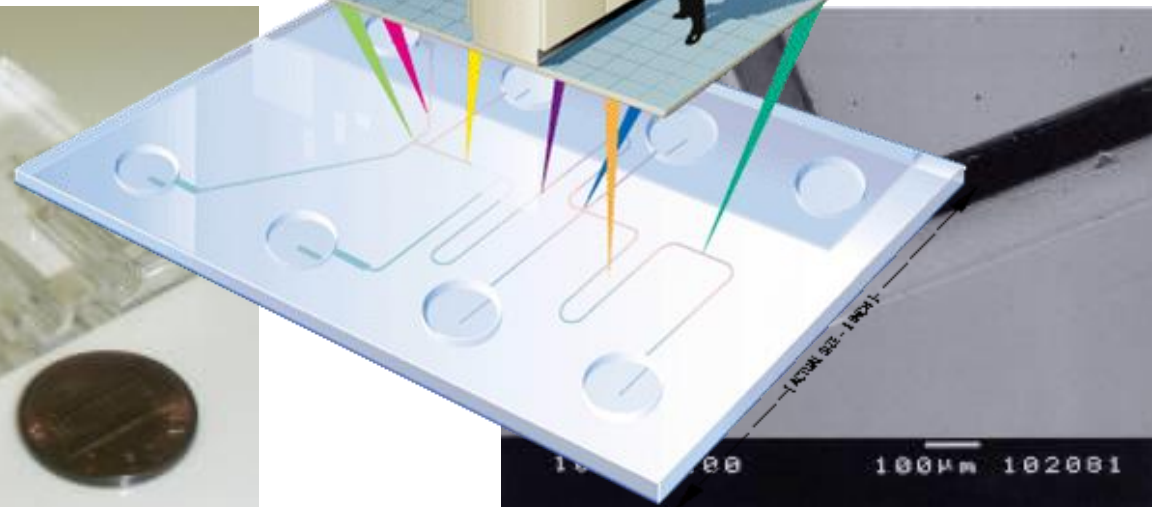
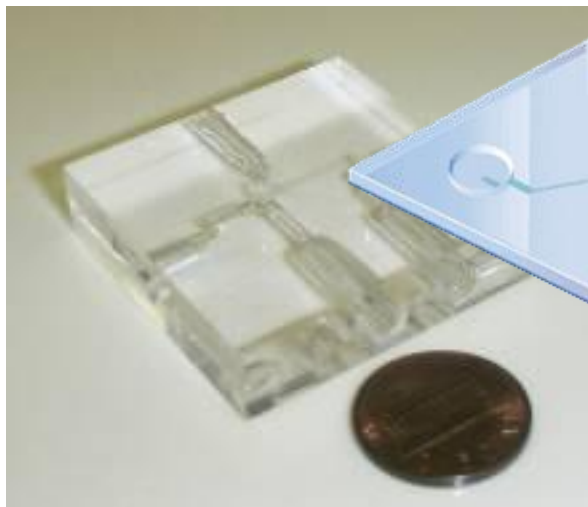
# Lab-on-a-chip

- Micro-size device that is used to manipulate and analyze
  - Cells
  - Proteins
  - DNA
  - Gene expression
  - Chemical reactions



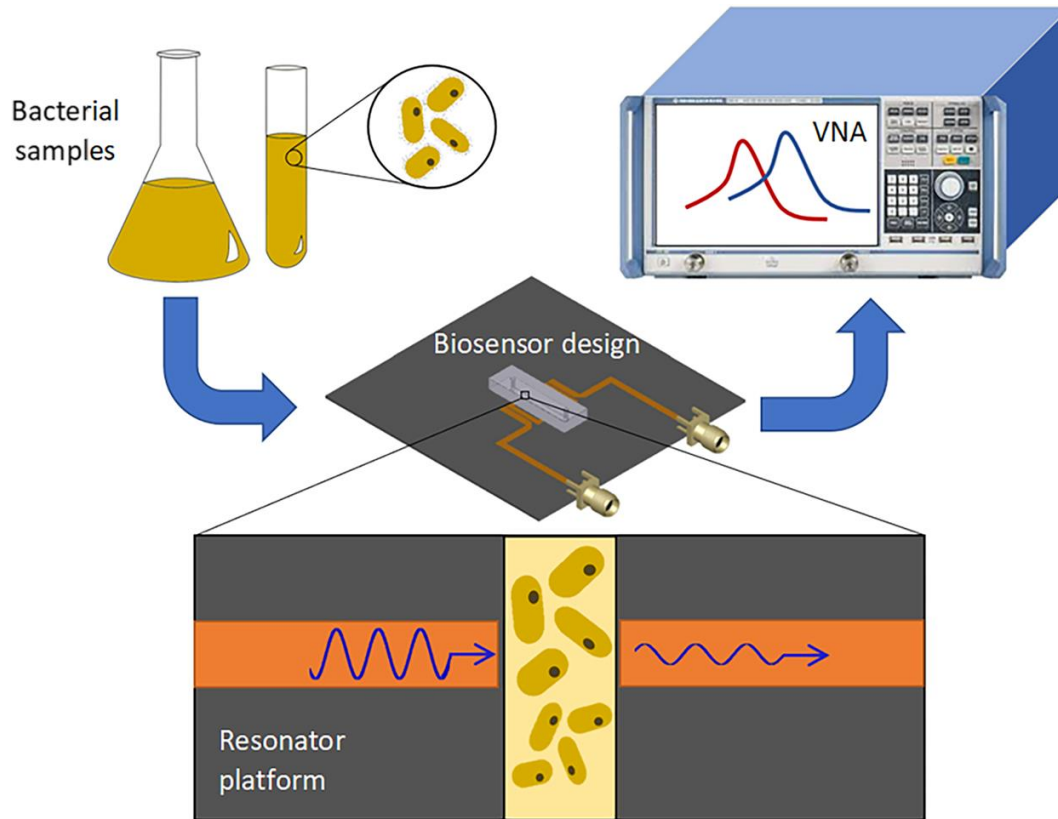
# Lab-on-a-chip devices

- Reduces the need to have several devices
- Uses small sample size
- Rapid re
- Used for handling liquids





# Biosensor for microbial detection



# PEMBUATAN BIOSENSOR MIKROBA TERIMOBILISASI PADA KARAGENAN UNTUK DETEKSI DAGING DAN LEMAK BABI

-- Hibah Desertasi Doktor Ristek DIKTI tahun 2017 --

Syarif Hamdani



Promotor :

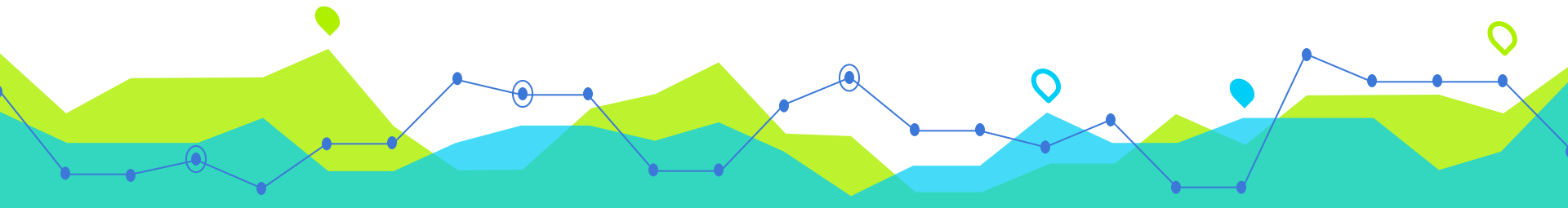
Ketua : Prof. Dr. Slamet Ibrahim S.

Anggota : Dr. Marlia Singgih W.

# Tujuan Penelitian



*Membuat alat deteksi cepat  
untuk deteksi daging dan lemak babi  
yang mudah digunakan dan murah*



# Masalah yang dikaji

## Mikroba

- Spesies yang memberikan reaksi spesifik untuk daging atau lemak babi

## Imobilisasi

- Metoda yang sesuai
- Senyawa penjerap

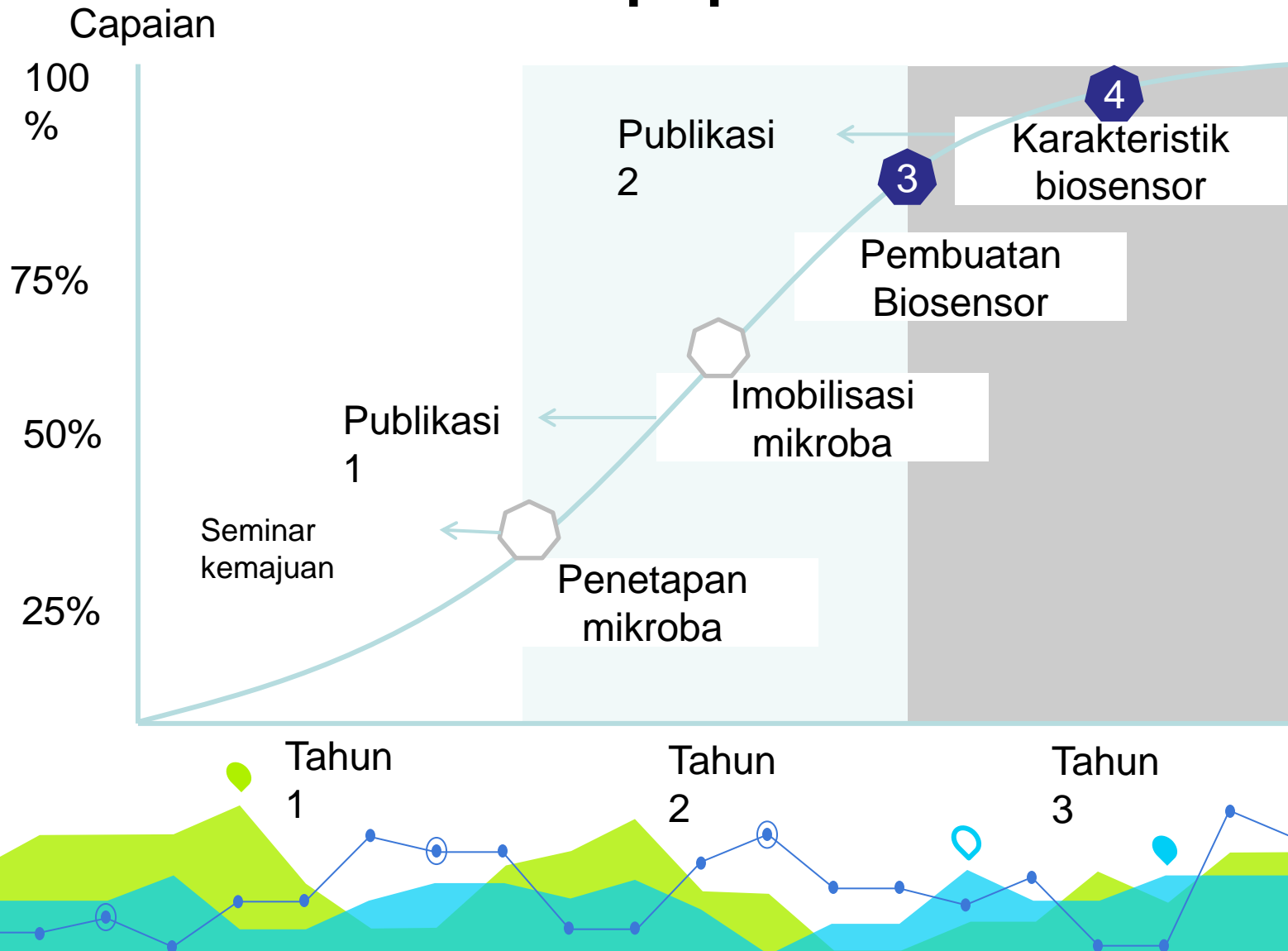
## Tranducer

- Jenis tranducer yang akan digunakan

## Biosensor

- Selektivitas
- Sensitifitas
- Stabilitas

# Roadmap penelitian



# Thank You

Next... immunochromatography

