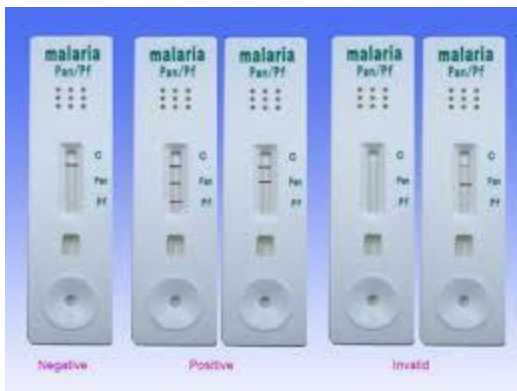


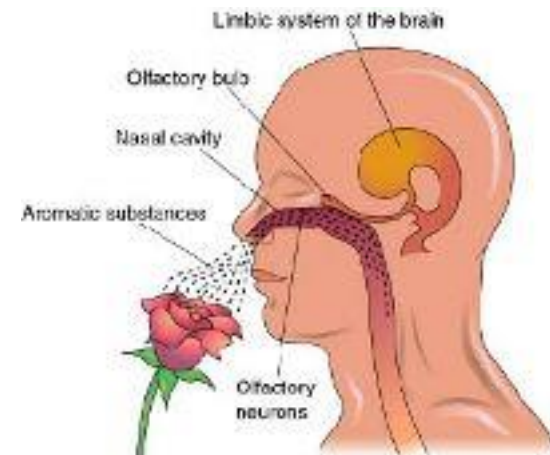
INTRODUCTION to BIOSENSORS



Analytical tool... small (portable), simple (capable of using by semi-skilled operators or patients themselves), and inexpensive (preferably)

Performance factors

- ☐ Selective
- ☐ Fast response
- ☐ Sensitive (sub-milli molar),
- ☐ Accurate (better than $\pm 5\%$)
- ☐ Reproducible
- ☐ Independent of physical parameters
- ☐ Short recovery time
- ☐ Functionally Stable (operation and storage).



- Decentralized testing facility : PoC, home diagnosis, & onsite applications.
- Suitable for remote locations in resource limited environments.

CRITERIA THAT SUPPORT COMMERCIAL SUCCESS

- Multiplex detection facility (simultaneous detection of different analytes from a single specimen) for PoC applications.
- Non-invasive clinical samples: Saliva, sweats, tears, etc.
- Integration of wireless technology... mobile phone, WiFi, blue tooth, IOT etc

For disease diagnosis in underdeveloped and developing countries:

- WHO suggested **ASSURED** (Affordable, Sensitive, Specific, User-friendly, Rapid and Robust, Equipment-free, Deliverable to end-users) criteria, particularly for PoC applications.

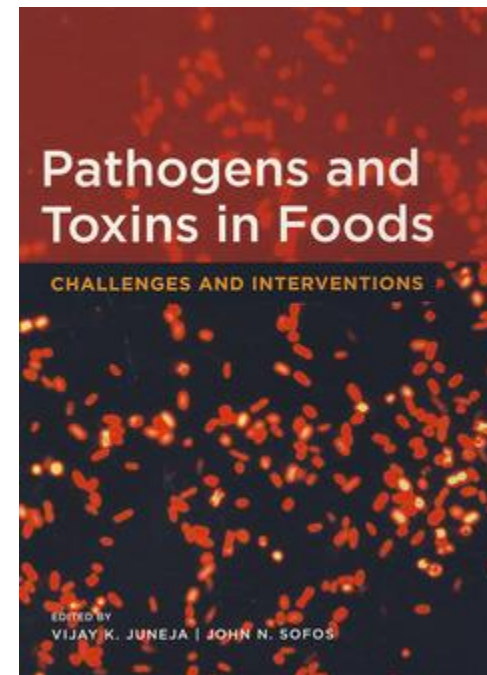
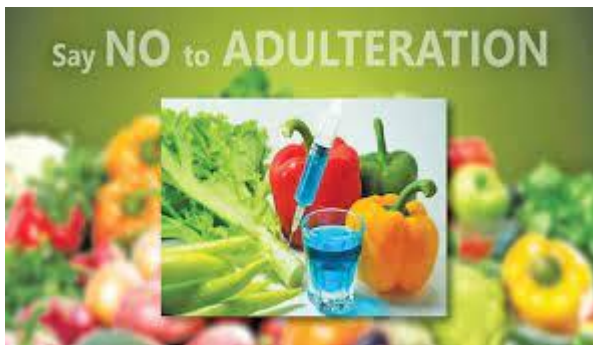
APPLICATIONS



CLINICAL APPLICATIONS



Potential target / analyte	Diagnosis/Analysis
Glucose	Diabetes
Albumin, creatinine, protein, urea etc	Kidney function
Alk. phosphatase, aspartate transaminase, lac.dehydrogenase etc	Liver function
Calcium, magnesium, phosphorus etc	Health of bone
Lipid, cholesterol, HDL, LDL and triglycerides etc	Cardiovascular status
Sodium, potassium, chloride, etc	Nerve conduction, muscle contraction etc
Mutation in gene	Genetic disorder & prediction of various genetic diseases etc



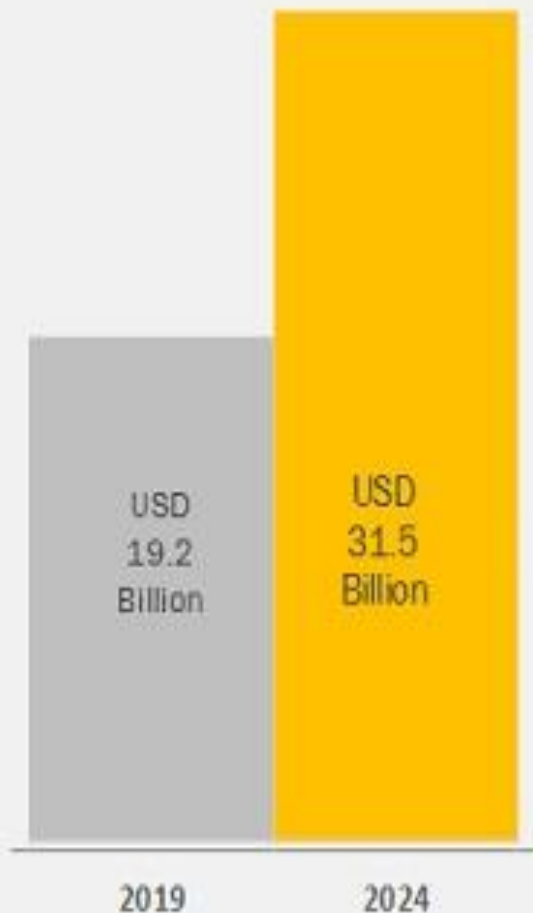
Food & agri products:

Testing tea, coffee, spices (currently electronic nose by using pattern recognition algorithm methods), residual agrochemicals, pesticides, fungicides, herbicides, pathogen, toxins, adulteration,

Water quality: toxic metals, compounds, pathogenic organisms, toxins etc.

Detection of plant and animal diseases, Fermentation industry, Military (Biological warfare, explosive etc).

Attractive Opportunities in Bio-sensors Market



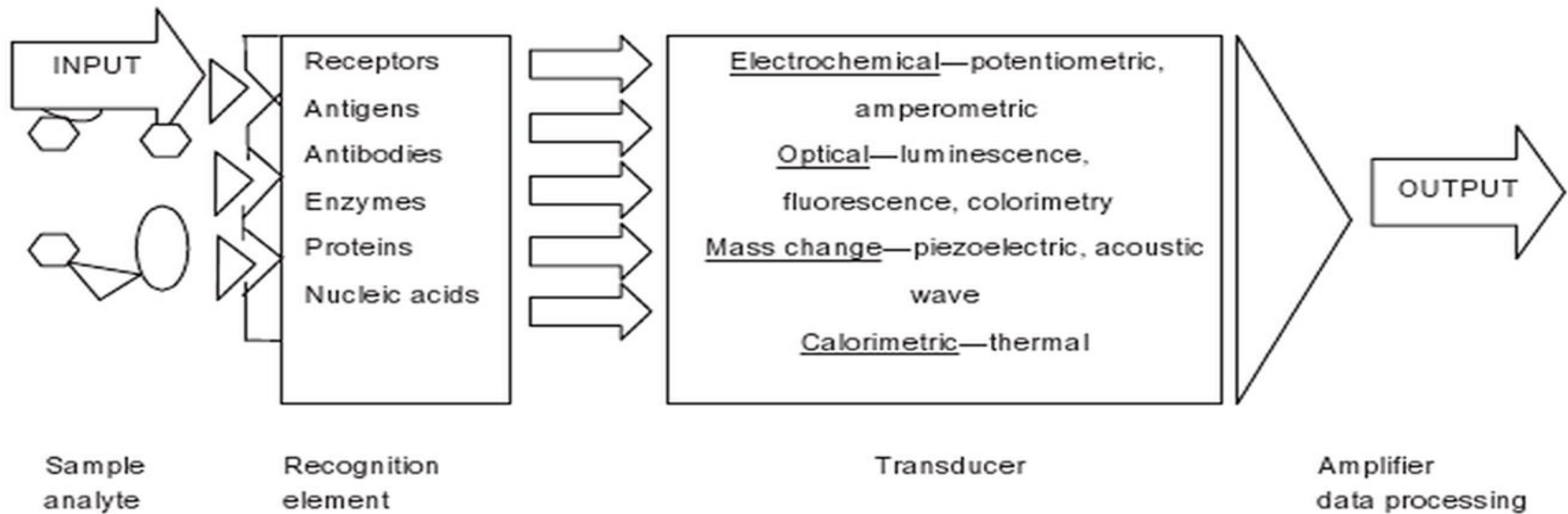
CAGR
8.3%

Compound annual growth rate

- The biosensors market is projected to grow from USD 19.2 billion in 2019 to USD 31.5 billion by 2024, at a CAGR of 8.3% during the forecast period.
- The growing demand for glucose monitoring systems is a major factor driving the growth of the overall biosensors market.
- North America contributes to the largest market share in 2019. Prevalent chronic diseases and conditions, such as heart diseases, stroke, cancer, type 2 diabetes, obesity, and arthritis, are among the most common, costly, and preventable of all health problems that are influencing consumers to adopt biosensors for the regular detection of pathogenic activities.

**For under developed and developing countries additionally:
Infectious diseases such as, TB, malaria, diarrhea etc.**

General Configuration of Biosensors



Classification of Biosensors

Different way of classification:

1. BIORECOGNITION PRINCIPLES:

- ✓ *Catalytic biosensor &*
- ✓ *Affinity biosensor*

2. BIORECOGNITION ELEMENTS:

- ✓ Enzyme-Based Biosensors,
- ✓ Immunosensors,
- ✓ Nucleic Acid/DNA Biosensors,
- ✓ Cell-Based Biosensors,
- ✓ Biomimetic-Based Biosensors.

3. TRANSDUCER ELEMENTS:

- ✓ Calorimetric Biosensors,
- ✓ Electrochemical Biosensors,
- ✓ Optical biosensors,
- ✓ Piezoelectric Biosensors.

THANKS