OPEN ACCESS
Scholars Bulletin
Abbreviated Key Title: Sch Bull
ISSN 2412-9771 (Print) |ISSN 2412-897X (Online)
Scholars Middle East Publishers, Dubai, United Arab Emirates
Journal homepage: https://saudijournals.com

Subject Category: Microbiology

Review on Biological Techniques, Microbial Food Testing Approaches, Biosensors Principles and Applications

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DOI: 10.36348/sb.2021.v07i04.003 | **Received:** 24.01.2021 | **Accepted:** 08.02.2021 | **Published:** 13.04.2021

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Abstract

In the body with the high specificity and the sensitivity the ability of to detect the physiological and the pathogenic related molecules offers a opportunity which is very powerful and helpful in the treatment of the disease with the early diagnosis. The optical base biosensor in which the optical fiber cable is used in the different research and in many other medical fields. Bacteriophages are ubiquitous viruses, found wherever bacteria exist. It is estimated there are more than 10^{31} bacteriophages on the planet, more than every other organism on earth, including bacteria, combined. In recent years it has become widely recognized that bacteriophages have several potential applications in the food industry. They have been proposed as alternatives to antibiotics in animal health, as biopreservatives in food and as tools for detecting pathogenic bacteria throughout the food chain. Phages play a key role in maintaining microbial balance in every ecosystem where bacteria exist, and they are part of the normal microflora of all fresh, unprocessed foods. Interest in various practical applications of bacteriophages has been gaining momentum recently, with perhaps the most attention focused on using them to improve food safety.

Keywords: Bacteriophages, Food safety, techniques, Food nutrition, biological testing.

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INTRODUCTION

It is well known that biosensors play very important role in the detection of the biological molecule and have been working under development more than for over to 35 years and more than 15 years ago that in this field of area the research become very popular. The oldest one breed of the biosensor was the biosensor of the electrochemical and the glucose analyte detector was the only biosensor which achieved the success at commercial level and some of the perspective of the which is biosensor for expectations and science funding and lot of big difference in the gap in the commercial and academic achievement of the bio sensor [1, 2].

In the body with the high specificity and the sensitivity the ability of to detect the physiological and the pathogenic related molecules offers a opportunity which is very powerful and helpful in the treatment of the disease with the early diagnosis. The many diseases can be can control with the help of early diagnosis and patient get cured and have minimum chances of the cost of patients which is related to the many advance stages of disease [3-5].

Bacteriophages are among the most common and diverse entities in the biosphere. Bacteriophages are ubiquitous viruses, found wherever bacteria exist. It is estimated there are more than 10^{31} bacteriophages on the planet, more than every other organism on Earth, including bacteria, combined. Viruses are the most abundant biological entity in the water column of the world's oceans, and the second largest component of biomass after prokaryotes, where up to $9x10^{8}$ virions per millilitre have been found in microbial mats at the surface, and up to 70% of marine bacteria may be infected by phages[6,7].

In recent years it has become widely recognized that bacteriophages have several potential applications in the food industry. They have been proposed as alternatives to antibiotics in animal health, as biopreservatives in food and as tools for detecting pathogenic bacteria throughout the food chain. Bacteriophages are viruses that only infect and lyse bacterial cells. Consequently, they display two unique features relevant in and suitable for food safety. In the era of the development of organic foods and with rising awareness of healthy eating, non-chemical measures for food protection are becoming increasingly popular. Phage cocktails meet all the criteria to be recognized as a green technology for combating food-borne pathogenic and spoilage bacteria [8-10].

Food is the primary route of transmission for more than 200 known diseases. The leading bacterial food-borne pathogens of concern are Salmonella, Campylobacter, Shiga toxin-producing E. coli, and Listeria monocytogenes [3]. Each of them can be associated with serious gastrointestinal infections. Food-borne diseases remain a major cause of hospitalization and death worldwide, despite many advances in modern technologies including food sanitation techniques and pathogen surveillance [11].

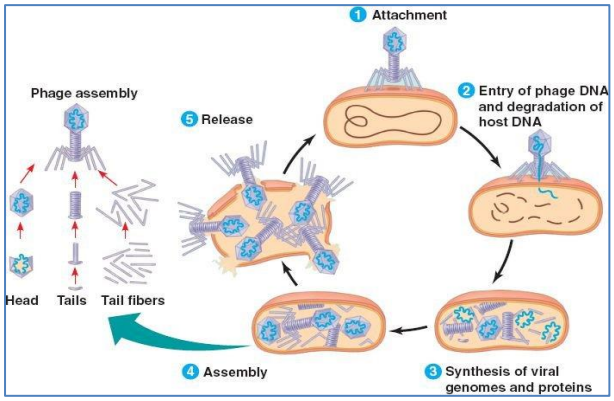

Fig-1: Shows the nature and mechanism of action of bacteriophages

Application of Bacteriophages in Food Industries

Bacteriophages are viruses that infect and lyse bacteria. Interest in the ability of phages to control bacterial populations has extended from medical applications into the fields of agriculture, aquaculture and the food industry. Bacteriophages (also called 'phages') are viruses that kill bacteria. They are arguably the oldest (3 billion years old, by some estimates) and most ubiquitous (total number estimated to be 10(30) - 10(32) known organisms on Earth. Phages play a key role in maintaining microbial balance in every ecosystem where bacteria exist, and they are part of the normal microflora of all fresh, unprocessed foods. Interest in various practical applications of bacteriophages has been gaining momentum recently, with perhaps the most attention focused on using them to improve food safety [12].

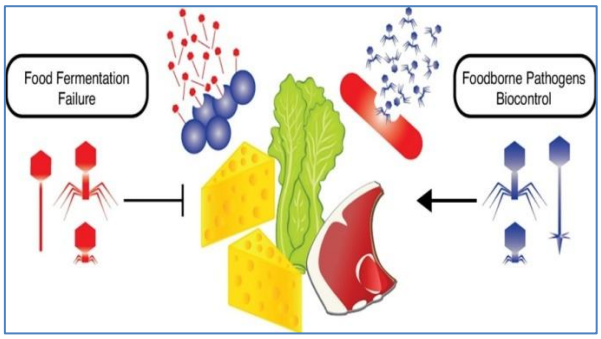

Fig-2: Shows the applications of bacteriophages in food industries

In the bio sensor system the 20 medically different fluids is often determine by the help of the test based on electrochemical detection. Just example a test is performed which is highly specific which take place between the reagent and the analyte and that is mostly of the enzyme based and in this reaction the stage of oxidation of the enzyme may change. The concentration of the analyte which play important role in the changing of the reaction and changing take place in the reaction which mean the charge is transfer on the surface of the electrodes and the DC voltage is applied to the electrode to just measure the charge transfer on the surface of the electrodes [13, 14].

The classification of the biosensor on the base of the bio signaling mechanism in which the signal is utilized for detection and any other types of the bio sensors which is given below.

Biological signal based biosensor

This type of biosensor in which the biological recognition or bioreceptors element is highly significant features of the biosensors and the biosensor consist of the sensor which sense and recognize the element in the solution and target get achieved. Normally this is very crucial for the bioreceptors to be a sensitive and selective for their specific kind of target that may be any analyte and mostly this prevent from any kind of interference by some other molecule or substance which is present in the matrix sample. Normally the classification of the biosensor on the base of the biological signal or the mechanism used by that specific molecule and there are the five major mechanism on which the biological signals can be divided [15].

Enzyme Based biosensor

The first biosensor was based on the enzyme and that was firstly introduced by the Lyon and Clark around 1962 which is an amperometric in nature and the enzyme which is placed on the electrode for the detection of the glucos. From than to now the enzyme based bio sensor have the great applications and enzymes are protein in nature and act as a catalyst and

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for each of the enzyme the specific substrate and converted into transformation in the form of product, and enzymes which is use as the very powerful tool for the detection of the various substance. For the detection Michaelis menten equation is used and GOD glucoseoxidase and the HRP horse reddish peroxidase are the enzyme both of these enzymes used in the detection in the biosensor which is reported in the various literature. There are many other enzyme used to detect the cholesterol, monitoring of the environment, food quality, heavy metals and the pesticides [16-18].

Nucleic acid /DNA based biosensor

The early use of the DNA/ Nucleic acid sequence in the diagnostic applications started in the 1953 and growing in the positive way. The high affinity of each of the single standard DNA of the Double standard DNA is used in the biosensor of the nucleic acid and the nucleic acid element use as the recognition. DNA based sensnor promote the development of new methods for the coupling of the some electrophoretic separations and other separations which is at high cost such as the radio isotropic and are the very consuming [19].

Nucleic acid biosensor work on the base of the hydrogen bonding between the one strand of the DNA that make interaction with the new coming DNA molecule which bind with each other give the signals in the form of the fluorescence which glow up and indicated that reaction is completed. To make complete this reaction a probe is used which act as the complementary DNA which makes interaction with the single standard DNA molecule. The hybridization is completed between the probe and the ssDNA in the result a biochemical reaction take place in which reaction allow to amplify the signals that is converted into electrical signals[20,21,22].

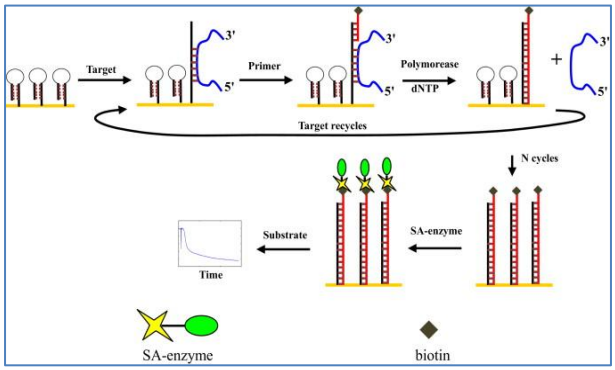

Fig-3: Shows the components and principle of nucleic acids based biosensors

Bio transducers based

The classification of the biosensor has been done on the basis of the transduction method which they follow to complete their action. In the bio sensor a system or the component is present which play very important role in the detection of the signals and amplify that signals significantly that its can be measure easily so definition of the transducer can be the it the instrument or the system which convert the biological, physiological and the chemical signal into the detectable form such as the electrochemical signals which show the maximum sensitivity and the very less chance of the disturbance in the measurement [23-25].

Electrochemical Based

Electrochemical based biosensor is based on the principle in which an electrode is attached which acts as the transducer that detects the signal and amplify this which can be easily measured and this is very important subclass of the biosensor [26, 27]. In the 1999 with the recommendation electrochemical device is the self, contained and is integrated device in which biological signals can act as a analyte give information in the quantitative or the semi quantitative[28, 29].

Optical based transducer

In the recent years there are many advances take place in the field of the optical bio sensor and many other important other areas such as the safety of the food, environment monitoring, medicine, and the life science [30, 31]. The plasmonreson surface and the fluorescence that is attached with the optical and this most popular method for the bio sensing of the optical. The optical base biosensor in which the optical fiber cable is used in the different research and in many other medical fields [32, 33].

CONCLUSION

Biological techniques are used to study living things. They include experimental and computational methods, approaches, protocols and tools for biological research. The goals of biotechnology is to produce drugs by using living organisms such as bacterial cells, yeast, mammalian cells, etc., that are placed in culture to produce substances with pharmacological activity, such as monoclonal antibodies for the treatment of tumors.

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