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Biosensors

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Short Commentary

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ABSTRACT

Biosensors have been making considerable progress in the technology world. Biosensors are used for many purposes such as for detection of important components of considerable concentrations. The motto of using a biosensor is to make use of the signal of the biological component, combine it with the physiochemical element and comprehend the signal. The basic parts of a biosensor are the biological sensitive material (such as microorganisms, cell organelles, enzymes, antibodies etc), the transducer or the identifiable material (can work in an electrical or physiochemical manner) and the signal reader that associates itself in translating the signal or codes in a user friendly manner.

INTRODUCTION

Biosensors have been making considerable progress in the technology world. Biosensors are used for many purposes such as for detection of important components of considerable concentrations. The motto of using a biosensor is to make use of the signal of the biological component, combine it with the physiochemical element and comprehend the signal. The basic parts of a biosensor are the biological sensitive material (such as microorganisms, cell organelles, enzymes, antibodies etc), the transducer or the identifiable material (can work in an electrical or physiochemical manner) and the signal reader that associates itself in translating the signal or codes in a user friendly manner.

Biosensors are becoming diversified day by day with correlation to both microelectronics and biotechnology. The biological material used will have its own physical and chemical properties. We have to develop the biosensor in such a manner that by comprehending the properties of biological material. The biological material will have its own temperature and pressure requirements at which it can display optimum output. Metals such as gold are being used to make the biological material [1]. We need to indentify the properties of the biological material that suits our needs. We have to choose a transducer in such a manner that it should be able to communicate the impulse or sense generated by the biosensor without any modification or alteration of the original. The biosensor needs to be of a suitable size and shape. The shape of the transducer should be effective in transferring the signal of the biological material without hindering the biological material in any manner. Biosensor should perform like a reliable analytical device that can execute rapid and accurate analytes [2].

At the time of the transfer the external factors should be kept in check. Any minor change in concentrations, pH value, temperature, pressure can change the results of the operation. We need to have a smooth flow of the entire process for concrete results. Biosensors are known for their simplicity and specificity [3].

The biological material should be tested at various concentrations and the result should be cross checked to obtain optimum performance. It should be portable and user friendly. It should be reliable, precise and extensively usable without any hassles. Biosensors have been used in environmental research due to its qualities such as minimizing the sample pretreatment, cost and time reduction etc [4]. On contact with other materials it should not produce any toxic or adverse effects that hinder the progress of the operation. It should be specific and easy to use. The biological material should have affinity towards the transducer and should cooperate in binding with the transducer. The stability and integrity of the biological material should not get wavered on integration with the transducer. Surface design of biological materials is shifting from micro and nano electronic devices to genetically modified materials such as polypeptides, nucleic acids etc [5]. Nanomaterials have high surface area to volume ratio [6]. The specificity of a biological material has led to the development of highly selective biosensing device [7]. Biosensors are used to detect biological molecules such as proteins or pathogens [8].

The transducer material used in the biosensor should posse's extensive qualities that can manage the situation in extreme conditions. The transducer basically functions by accelerating the physical change by transferring the impulses or signals in a user friendly manner. Some of the instances where the transducer has to counter tough conditions are when the heat output of the reaction is surplus; rapid movement of the charges alters the electrical potential of the process, light absorbance difference between the reactant and the product, change in the mass of the reactants and the products. The transducer should possess a high degree of adaptability and compatibility. It should have the ability to rein in its function even under drastic conditions. For instance an electronic transducer should possess qualities such as low and superimposed without getting affected by the electrical components. Biological transducer such as cholinesterase serves as a sensitive biological element [9]. It should e able to amplify the resultant signal difference and electronically filter out the unwanted signal noise. It should be able to convert the analogue signals into the digital signals and pass it out to the microprocessor where the data gets processed to user friendly concentration units and gets displayed to an output device. This helps the biosensor achieve high sensitivity and specificity with low non-specific binding in biological samples [10]. The interactions between the antibody, antigens, proteins, enzymes determine the performance of the sensor [11].

Biosensors are said to be fragile and delicate. Due to its fragility and delicateness we cannot use the biosensors in large scale. Why should we produce biosensors if we cannot use it in a large scale?

On integration of the biological material and transducer the system gets miniaturized. Miniaturized system includes the making of the integrated systems smaller, should be mass produced with cheaper components. This makes the biosensor portable, cost effective and provides rapid response with high sensitivity [12]. Not all biosensors are cost effective, than why should we manufacture the biosensors that are not cost effective?

Once the output or the data gets generated from the transducer it has be amplied, processed and displayed in a resolute manner. Various electrical and physiochemical devices are used to do this activity with immense precision. The entire integration process can be custom designed as per our requirements. The materials used in biosensors should not affect the humans or the environment, nonmaterials are considered to be risky for humans and environment [13].

Many types of biosensors have invaded in our day to day life and are playing an active role in our day to day life.

Blood Glucose Biosensor: It consists of two parallel plates, electrodes, reagents such as ferrocyanide and a small gap between them. In this integrated system the blood enters by capillary action, lead to the reaction between the reagents and glucose to ferrocyanide. Ferrocyanide turns into ferricyanide and ultimately to glucose. In this way biosensors are used to detect diseases, useful in pretreatment [14]. Why Biosensors are used to detect few diseases, we should be able to use biosensors to detect numerous diseases, why is it not happening? We have to develop biosensors in such a way that we can detect many more diseases and more beneficial to mankind.

Biosensors are used in the waste water treatment plant: In waste water treatment plant the level of activated sludge can describe the quality of the water. This can provide us vital information regarding the plant performance. The measurement devices used for this purpose can be a small probe or a complicated flow injection analysis system. By processing and interpreting the data on timely basis we get an idea of the sludge present in the water system. The processing and interpretation of the entire process can be done in a lucid manner through simple regression analysis or advanced model system can be used. Biosensors are known to have high conductivity and high integration systems [15].

CONCLUSION

Biosensors have picked up in the market through various applications such as in In vivo monitoring, blood monitoring, food quality testing, water quality etc. Biosensor consists of biological material that is fragile and delicate. By making more durable and malleable biological materials we can expand the market the make substantial gains in the research and production of biological materials

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