



Nano Sensors and Nano Devices Contribution in Medical Application

N.Nandakumar^[1], R.Thangavel^[2], Karthikeyan.S^[3], K.Shanmugasundaram^[4]
nnandaprime@gmail.com, rtvelsrkv@gmail.com, karthikeyanlogesh@gmail.com, keerthyas@yahoo.co.in
Research Scholar^[1], Associate Professor and H.O.D^[2], Assistant Professor^[3], Assistant Professor^[4]
^{[1][2][4]} Department of Electronics, Sri Ramakrishna Mission Vidyalaya College of Arts and Science,
^[3] Department of Electronics, KG College of Arts and Science,
Coimbatore, Tamilnadu, India

Abstract-The Biomedical devices perform the important role for diagnosing the diseases sensitively and giving appropriate treatment to the patients by the Medical Professionals. Now days some diseases are not able to find in initial stage or in next stages with existing devices, so that we are in the need to design and develop the devices and sensors in nano size. For example to find the different type of cancer in initial stage is very difficult, to overcome this problem we are forced to develop the nano device or sensors. In medical field currently using many nano devices like nano pacemaker, nano syringe and nano endoscope. Micro and nano sized sensors can make use of a wide range of technologies that most effectively detect a targeted chemical or physical characteristic. Using polyethylene glycol beads coated with fluorescent molecules to monitor diabetes blood sugar levels. The beads are injected under the skin and stay in the interstitial fluid. At the time the glucose in the interstitial fluid drops to reach the dangerous levels, glucose displaces the fluorescent molecules and creates a glow. This glow is seen on a tattoo placed on the arm. Implantable nano sensors can also work with a series of medical devices that administer treatment automatically if required. A nano medical device must do a few functions well, so it must contain particular molecules that do these functions well, cell targeting, cell entry, intracellular targeting, controlled drug delivery. Nano devices must catch up with the technology level of the human body to become an indeed effective. The result will be the ability to analyze and repair the human body as we can repair a conventional machine today. In the nano concept holds together, it could be the ground work for a new industrial revolution.

Key word- Nano Sensors, Smart Sensor, Nano Devices, Medical Application

INTRODUCTION

I.Nano Scale

Nanotechnology's the study of extremely small structures, having size of 0.1 to 100 nm. Comparison of Macro, Micro and Nano scale show in figure 1.

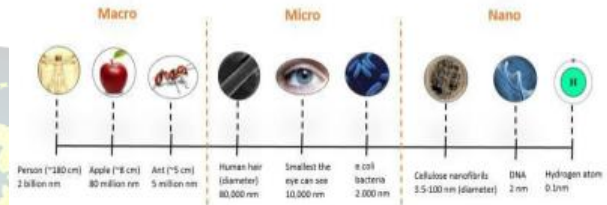


Fig. 1 Macro, Micro and Nano scale

II. Nano Sensors

Nanosensors are chemical or mechanical sensors that can be used to detect the presence of chemical species and nano particles, or monitor physical parameters such as temperature, on the nanoscale. They also find use in medical diagnostic applications. Nano sensors show in figure 2 which is placed on finger. There are many types of nanosensors such as Chemical nanosensors Synthetic nanosensors. How the nano sensors are injects in human body is shown in figure 3.



Fig. 2 Nano sensors

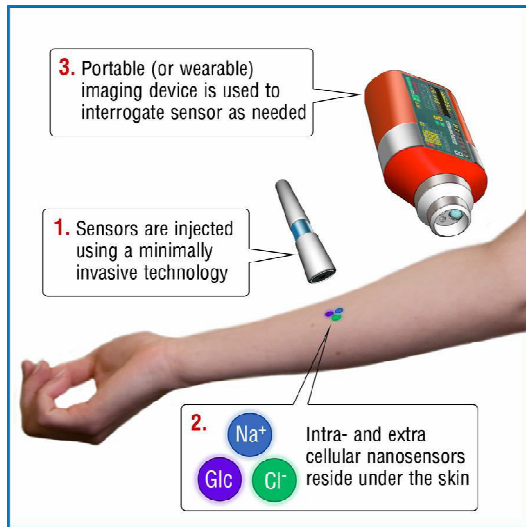


Fig. 3 Nano Sensor injected in human body

III. Smart Sensor

A sensor that includes a microprocessor / microcontroller that conditions the signals before transmission to the control network. It restricts out noise and compensates for errors before sending the data. Few sensors can be custom programmed to produce alerts on their independently when critical limits are reached. Block diagram of smart sensor shown in figure 4.

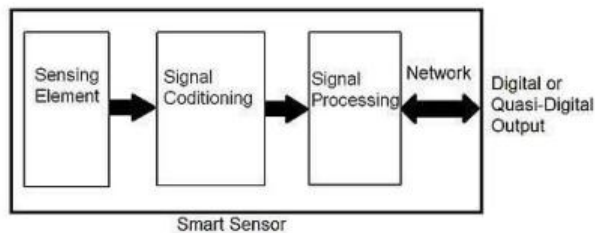


Fig. 4 Smart sensor block diagram

IV. Nano Device

Device which is in nano size is called nano device.

A. Tattoo method of nano sensors

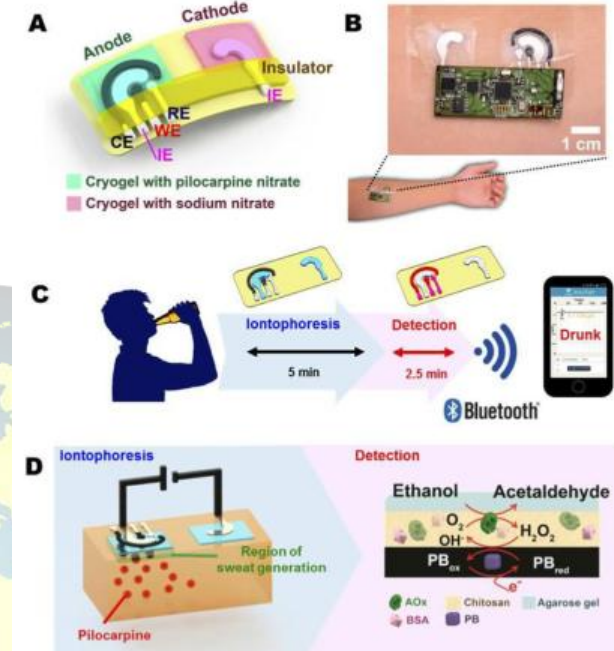


Fig. 5 Tattoo Sensors

Research is going on developing a variety of wearable and non-invasive sensors in current years. Electronic skin patch measures blood alcohol concentration. wearable, tattoo-like patch figure 5 that can detect alcohol concentrations in a person's sweat in real time. The device can send results wirelessly to a smart phone in a matter of minutes.

V. Nano packmaker

A small cylindrical pacemaker is smaller than a AAA battery and compare to current pacemaker is consider as nano size; it monitors human heart rhythm, stimulates heart when needed and can provide information to physician regarding heart's performance. But other type of standard pacemakers, it resides entirely in the right ventricle of human heart. This nano pacemaker figure 6 are unleaded, no scar, no chest incision, and non permanent lump under the skin where the pacemaker placed.



Fig. 6 Pacemaker and nano pacemaker

VI. Nano Endoscopy Devices

Nano endoscopy is a way to record images of the digestion path for use in the form of capsule medicine. The nano endoscopy figure 7 is the size and shape of a pill and contains a very small camera with nano devices. A patient swallows the capsule, it takes pictures of the inside of the gastrointestinal tract and send the signal to out side sensor which is fixed in computer.

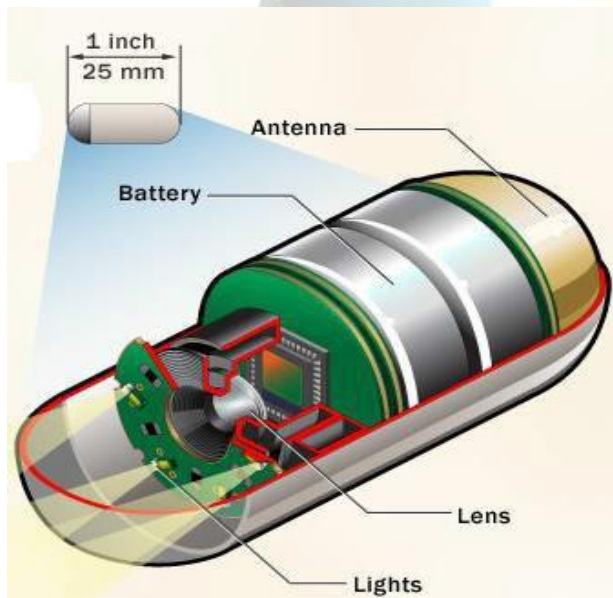


Fig. 7 Nano Endoscopy

VII. Nano Robotic Inner Medical Devices

Technology is constantly evolving. The medical field is one of the oldest fields and having something so new like technology can pose a problem especially when it comes to human life. Figure 8 and 9 shows the inner robot which is using to inject

the medicine when glucose level goes low.



Fig. 8 Nano Robot

The rapid growth of technology has given many fields a chance to grow. However, the medical field has no really embraced its tetchy roots. Humans are skeptical when it comes to machines for fear that it can be used for the wrong reasons or that the machines lack a conscious. Regardless, it has not stopped developers and programmers from trying. Nano technology is the future and according to some scientists, it has potential to change the medical field forever.



Fig. 9 Nano Robot

VIII. Nano mosquito Devices in Medical Application

No, this isn't a real mosquito. It's an insect spy drone for urban areas. Already in production, and funded by the US Government. It can be remotely controlled and is equipped with a camera and a microphone. It can land, and even has the potential to take a DNA sample or leave RFID tracking nanotechnology on your skin. It can fly through a slightly open window, or it can attach to clothing until unwittingly take it into home. It can then be guided to the top of a curtain or other invisible location where it can scope entire rooms and

monitor everything being said. Given their propensity to request macro-sized drones for surveillance, one is left with little doubt that the government has big plans for these micro gadgets. Figure 10 shows the mosquito which use to inject medicine with out pain.

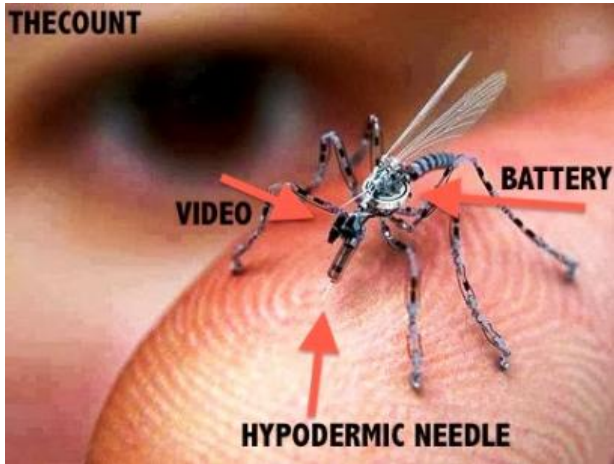


Fig. 10 Mosquito Devices

IX .Wearable sensors system

Advances in material science have enabled the development of e-textile based systems. These are systems that integrate sensing capability into garments. The example shown in Figure 11 demonstrates how sensors can be embedded in a garment to collect, for instance, electrocardiographic and electromyographic data by weaving electrodes into the fabric and to gather movement data by printing conductive elastomer-based components on the fabric and then sensing changes in their resistance associated with stretching of the garment due to subject's movements. Rapid advances in this field promise to deliver technology that will soon allow one to print a full circuit board on fabric. Example of e-textile system for remote, continuous monitoring of physiological and movement data. Embedded sensors provide one with the capability of recording electrocardiographic data (ECG) using different electrode configurations as well as electromyographic (EMG) data. Additional sensors allow one to record thoracic and abdominal signals associated with respiration and movement data related to stretching of the garment with shoulder movements.

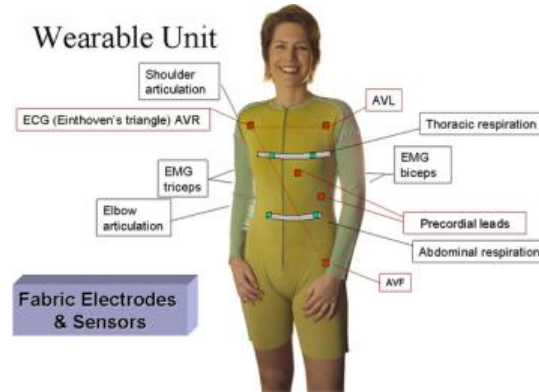


Fig. 11 Wearable sensors systems

VII.Conclusions

Nano Sensors and nano devices is still in developing stage. To conclude, there are several steps that in necessity to take in order to further the use and development of nano sensors and nano devices in medical field and general. The development and international adoption of safety standards the object of task-specific, as opposed to general-purpose, nano sensors and devices the education of the medical community in the acceptance and integration of medical devices.

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