



## Design Of Biosensor based on $P^H$ as a electrochemical transducer for early detection of Cancer

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**Abstract:** The  $P^H$  means the concentration of Hydrogen ion at particular  $P^H$  for desired cancer aetiologies of patient. Biomimicking Behavior of Electronicnose-tongue[6], biosensor the  $P^H$  is the Tongue taster which tastes the food mixed with Saliva. The biomimick features of Dog & biosensor of smell is compared and found very similar and the characteristics in sniffing and detecting toxin, contamination of food, but still exact properties is need to be developed, E-Nose Biosensor the input signal will be energy converting transducer and the output is the voltage, alarm sound, in  $P^H$  meter the biological signal transduction takes place in the form of ATP, Hydrogen ion transfer via electron transport system occurring in the mitochondria of the cell thus converting into electrical signal which can be detected by the CMOS SCC circuit. The electron transport chain is related with  $P^H$ , standard Gibbs free energy, phosphorylation in which the transfer of phosphate group is proportional to the no. of electrons transferred, thus the principle equation helps us to monitor the energy balance with redox potential, and the cancer patient ability to produce the energy is calculated in the form of phosphorylation with change in  $P^H$  and electron transfer giving output in m Volts vs Volts in normal person, so the signal becomes very weak due to less transfer of charged phosphate group, and less energy. From this we can determine whether the reaction is aerobic or anaerobic hence the free energy change in cancer cell is determined, with electrochemical biosensor  $P^H$  with mVolt.  $P^H$  is highly sensitive paper to react with biological samples like saliva, Urine. on both sides, so the measurement of  $P^H$  is calculated with  $P^H$  vs time vs voltage, early stage cancer detection at every steps is monitored with standard buffer &  $P^H$ .

**Keywords:** E-Nose Biosensor, Electrochemical transducer, Gibbs free energy, Neural stress

### I. Introduction

Cancer is detected with the help of  $P^H$  paper with changing color, which is done manually, but to make it smart & automated if connected with CMOS circuit, and to amplify the signal conditioning circuit with ADC & DAC is combined and interfaced with system to get the output signal. Most of the cancers can be detected by  $P^H$  paper, among them Oral cancer, Stomach Cancer, Bladder Cancer, Prostate is easily detected with proximation. The patient become cancerous, hence this pattern determines our gastric system of normal vs cancer. Time for the pattern is developed previously we are fuzzy about taking food so we take random intake with out measuring time, so we develop the symptoms but once the symptoms appeared care is more towards developing a systematic fooding pattern, to make a healthy life style. The comparative chart of fooding pattern gives the details pattern of the diet the patient should follow while stabilizing the  $P^H$ , this also shows the lifestyle behavior of patient. Here it shows that the patient wt is decreasing, this is the case study of a patient, he is tobacco users, so the things which we should also follow simultaneously with food is the physical exercise with practice of Yoga, so that our time of eating is controlled we donot have to rush for food, which is the neural stress on stomach, this can lead us to unconsciousness, feeling of dizziness because our hunger is controlled with time and Pranayam, this all actions can be performed and the  $P^H$  is monitored at the regular interval.  $P^H$  after 3 hrs – it was going down to 6 so to stabilize and balance the condition of the stomach small Break fast with Water + food, or else the  $P^H$  6 tends to more acidic to demand Water and enzyme amylase to react with food, but due to lack of food intake at proper time Enzyme inhibition and deactivation of Enzyme amylase due to more hydrochloric acid produced in the stomach and might have lead to Colon cancer. Which is proved by detection method of  $P^H$  as the only electrochemical transducer.



Patient used to takes Tobacco for the past one year is detected with  $P^H$  - 6 showing white lesions inside the chin is the early screening of Oral cancer.

This figure also shows its importance, that the tobacco mixed with saliva, can become very infectious when comes in contact, with any other persons saliva while making Tobacco with Hands the tobacco gets contaminated and it can also has the chance of causing Tuberculosis. In mining area the workers suffers from T.B but they do not show that they are having disease, for some it may suppress, for some it become dominant as per the immunity is concern and memory T-Cells. The Doctors remain confuse in such clinical history, because once the workers gives his history he has to take medical unfit and get half paid salary so to manage this financial problem, they do not come infront as they require money for the family. The workers sacrifice a lot in such fashion, as they are the only earning member. The mass studies among the miners working under Coal mines, gives such result.

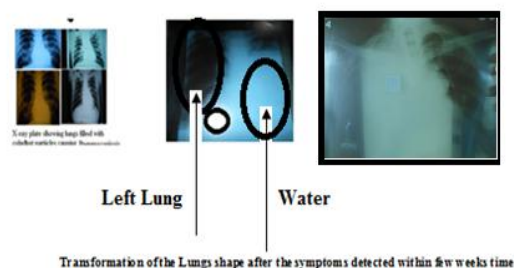


Figure.A Lung Pneumoconiosis with Alveoli shrunken in shape  
Figure.B Lung Tuberculosis 1.Normal Left Lung 2. Right Lung covered with water  
Figure.C Lung Tuberculosis 1.Left Lung is not clear in the image completely filled with water 2. Right Lung is distinct

So, The  $P^H$  paper not only screens the Oral benign cells from spreading the infections but also alerts as to take proper treatment at right time. In Tuberculosis the water composition increases in Lungs, if the water is not ejected out at appropriate time the lungs system would damage, problem in breathing is observed. The equation which governs the free energy changes in cancer is derived from

## II. The basic and standard equation

$$\Delta G^0 = -n F \Delta E' \quad \text{Eqn.1}$$

Derived equation so the  $\Delta E$  calculates no. Of electron transferred with kilocalories of food we take again this equation can be correlated with  $p^H$  & enzyme activity. The basic and standard equation is

$$\Delta G^0 = -n F \Delta E' \quad \text{Eqn.2.}$$

$$\text{Derived equation } \Delta E' = \frac{-NF}{\Delta G} \quad \text{Eqn.3.}$$

F is the Faraday constant, so the  $\Delta E$  calculates no. Of electron transferred with kilocalories of food we take again this equation can be correlated with  $p^H$  & enzyme activity. Output of the biosensor detects the electron transfer with change in  $p^H$  which is directly proportional to the Enzyme activity, more acidic  $P^H$  the cell is more cancerous lead to metastasis stage.

$$\Delta E' = -n F \log p^H \quad \text{Eqn.4.}$$

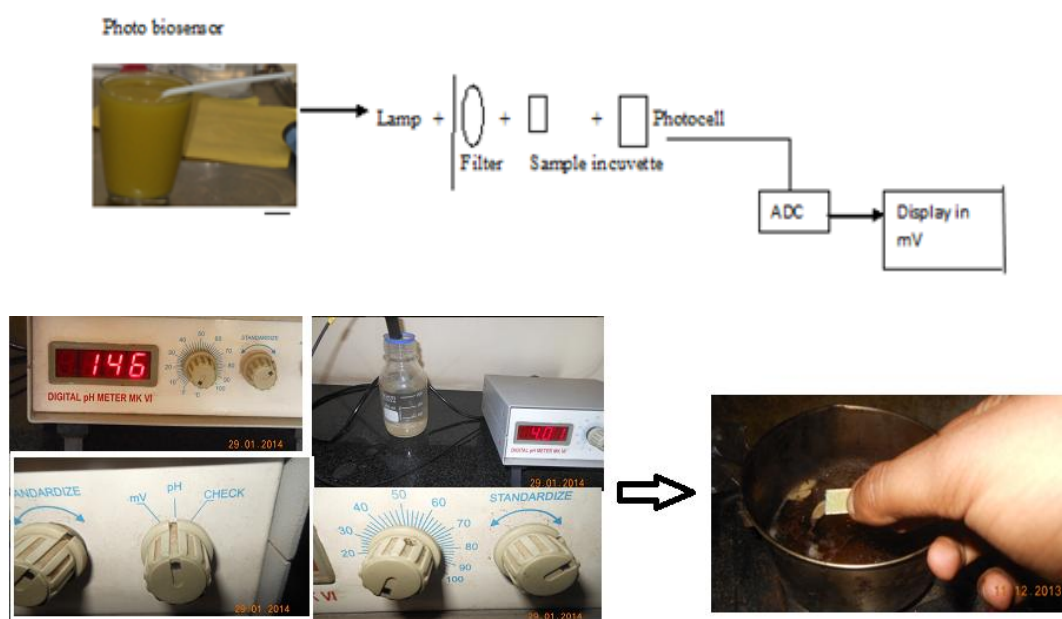
Output of the biosensor detects the electron transfer with change in  $p^H$  which is directly proportional to the Enzyme activity, more acidic  $P^H$  the cell is more cancerous lead to metastasis stage. Higher  $P^H$  is more enzyme – substrate complex, depending on the status of stomach. Increase in  $P^H$  more substrate low KM (affinity to bind with enzyme is less), compared to acidic  $P^H$  with High KM strong affinity for substrate energy requirement is more,

$$\Delta E' = -n F \log p^H \quad \text{Eqn.5.}$$

$P^H$  changes rapidly in cancer patients so they need to be alert, to monitor the change in  $P^H$  the basic equation derived for detection of cancer with change in  $P^H$ . This is the very critical indicator AND governed by the following equation, follows the logic expression, of AND & OR logic.

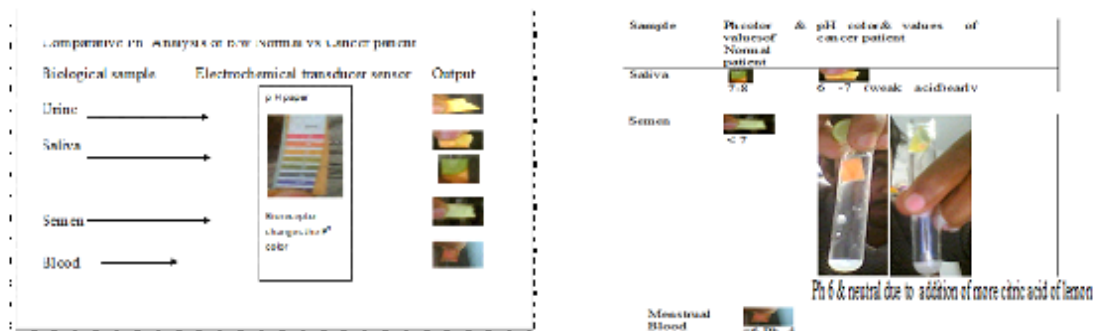
$$\text{Log } \frac{[H \text{ In}]}{[In-]} = p^H - p \text{ Kin} \quad \text{Eqn.6.}$$

Citation(Wikipedia)



The PH probe inserted into the sample to monitor the electrochemical parameters the  $P^H$  of the sample is monitored with  $P^H$  paper.

The  $P^H$  meter shows the Knob or switch which monitors the  $P^H$ /millivolt/Checks the error of reading, First it is standardized with distill water, but here the water is contaminated. The  $P^H$  of the Tea is 7, this shows that it stabilizes our stomach and works like buffer, resist any further change in  $P^H$  either acidity or alkaline. Hence the  $P^H$  works like E-Tongue as a Taster also indicate the status of the Tongue so with the change in tongue color the  $P^H$  also changes. Cigarette smoke, tobacco, Ganja, Gutkha sample is fed into the electronic Nose Biosensor and monitored with  $P^H$  paper check for acid – base balance, smoke use piezo resistive sensor because when we smoke cigarette we inhale the smoke with Pressure, which is more than normal breathing intake of Oxygen, Thus this circuit has the ability to detect the presence of  $HCO_3$  (Carbonic acid + Hemoglobin= Carbaminoglobulin), the voltage output is converted into PPM value. Thus the lung cancer is detected at early stage when the buzzer sound horns, due to more pressure in the lungs.



The prostate analysis of the semen is done with  $P^H$  paper and observed that normal  $P^H$  is more than 7- 7.5, that means the zinc is stable according to the literature suggests, and citric acid is less, but as the  $P^H$  is less than 6  $P^H$  it turns the color yellow orange, suggests the abnormality of  $P^H$  the semen viscosity is very less and thin, compared to high  $P^H$  condition. The urination soon after the Prostate ejaculation is normal as observed, so water intake is important, to stabilize after the ejaculation of sperm, again the dieting here also plays an important role to monitor the prostate status, as the age increases. Say the age limit is 40 years, for normal Prostate after this age regular screening of Prostate cancer is compulsory. So the citric acid is Biomarker for Prostate cancer detection[6].

### III. The Mathematical modelling

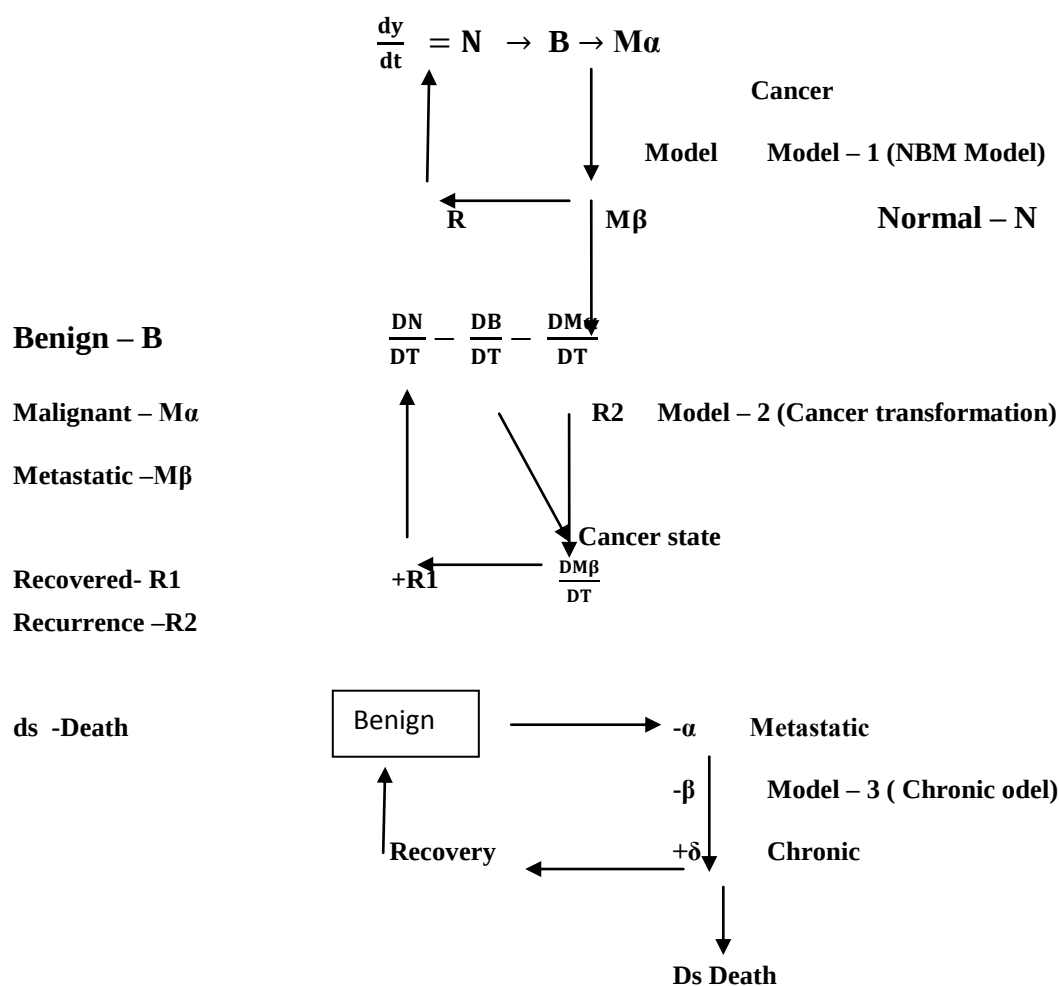


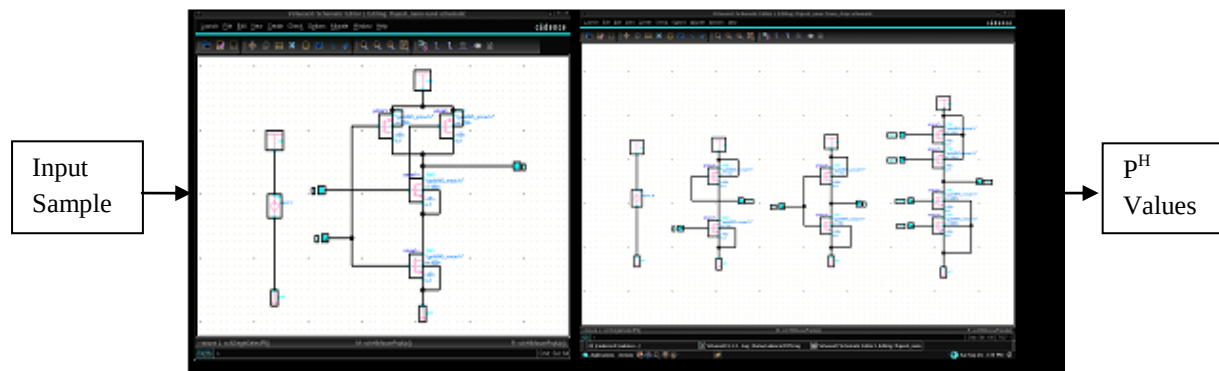
**Table 1.**

The rate of detection of cancer[6] in early stage, its formation of tumor, spread of the cell to other cells, due to late detection, and improper care, rate of recovery after chemotherapy and radiation chances of re-occurrence of cancer, is modeled by mathematical formula. will be implemented in the Biosensor[9] development. This mathematical modelling monitors our system and gives the cancer stages by different modelling, in the similar fashion we can create a new model of Tuberculosis, the new type of disease, which leads to Lung can shrink our Lungs system. The above above mathematical model for determining the probability of cancer risk, with the help of differential equation, might solve the risk of cancer and any new disease arising out of cancer. This equation shows the transformation of the benign cell to cancerous and then to malignant, with time. Boolean Operator system in detection of  $P^H$  for early monitoring of cancer. The  $P^H$  system mentioned in the table forms different Logic, of CMOS becoz the values of  $P^H$  changes in accordance with our fooding pattern, mainly we find NAND Logic control the fooding pattern of our stomach system, so is correlated. The delay time factor for logic associated with the  $P^H$  system is the main controlling parameter to monitor the changing in  $P^H$  value, delay time for variation in  $P^H$  is observed in nanosecond range, if the logic is accurately correlated with the  $P^H$  value then in 1 & 20 nSec time is given in the input parameter, to get the waveforms of the logic expression. Here CMOS is applied to  $P^H$  to get the output in low power and less time.

#### Experimental Set-Up

| Boolean Logic | Sample 'a'<br>$P^H < 6.4$<br>(cut off value) | Time 'b' < 24 hr<br>Incubation |
|---------------|----------------------------------------------|--------------------------------|
| AND           | 4 & 6 / 6 & 7                                | YES                            |
| NOT           | 4 ^ 6                                        | YES                            |
| OR            | NO                                           | NO                             |
| NAND          | NO                                           | NO                             |

From the above table we can say that 4 is the critical value of  $P^H$  which increases the H concentration ion with Logarithmic exponential equation is formed as we can see in the Bacterial growth curve, thus we can correlate  $P^H$  of cancer to the growth of micro-organism in food, with the log to the power 10 – 1000 because each increase or decrease in each unit of  $P^H$  change Log10 also changes by 10-100 times . $P^H$  change the log to 10-1000 times . Each  $P^H$  corresponds to 59.16 mVolt / $P^H$ .



The CMOS Circuit design of NAND Logic, NOT Logic, NAND + NOT combined forms AND Logic with time delay the wave form changes. The circuits are designed with Cadence this are the virtual but works in the  $P^H$  meter in same logic and gives the output in mVolt Vs  $P^H$ . This is the bottom-up approach of Biosensor[9] for development of biochemical sensor from circuit to  $P^H$  meter.

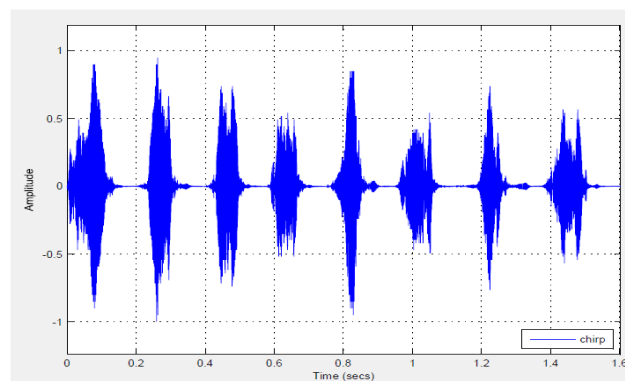
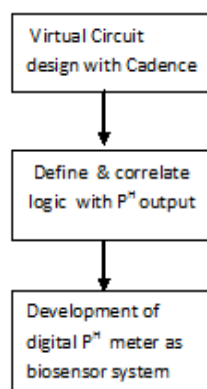
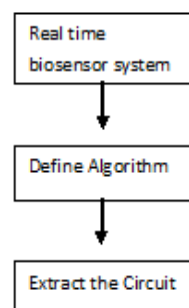


**Fig. 6. Simulation of Signalling output of the Biosensor with MATLAB simulation In VLSI design Hierarchy**

#### Bottom –up approach (Circuit – Sensor design)



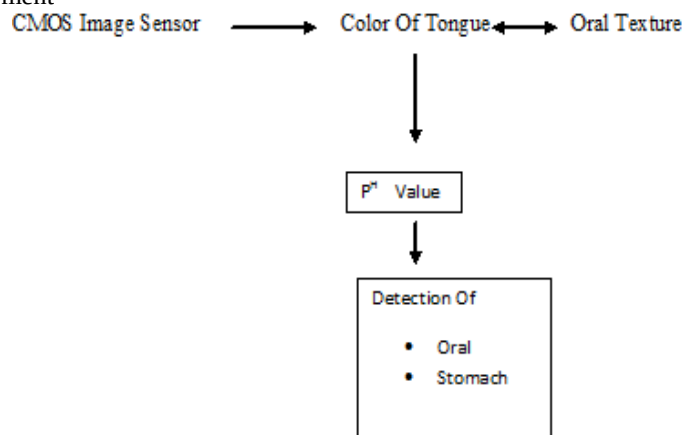
#### Top down approach (Sensor- circuit design)



$$n = \frac{\text{Log of Original } P^H - \text{Log of Changing } P^H}{\text{time } T}$$

More acidic  $P^H$  more anaerobic bacteria grows so with the help of Bacterial growth curve we can easily identify the microbes responsible for cancer, like the Bacteria the  $P^H$  also changes exponentially.

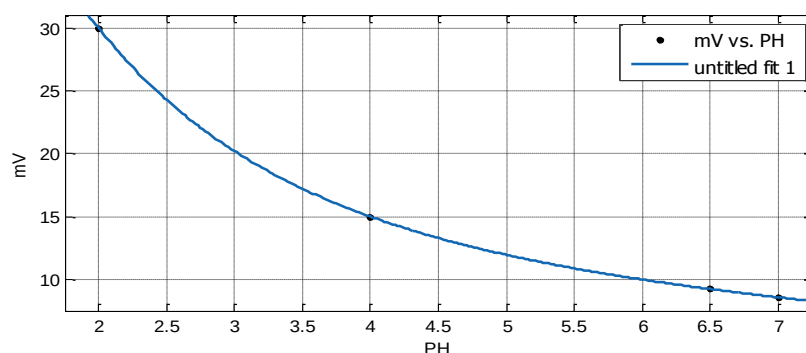
## Method development

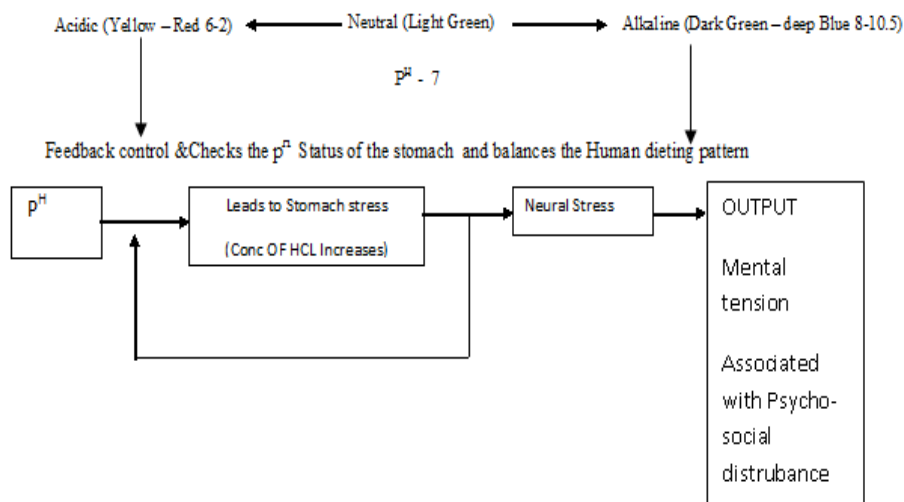


| P <sup>H</sup> | Time 1(Snacks)  | Lunch   | Dinner      | Column1          |
|----------------|-----------------|---------|-------------|------------------|
| 4 to 2         | No              | 2.00 pm | No          | Acidity observed |
| 6 to 7         | 11.00 am        | 1.00pm  | 9.00pm      | Balanced habit   |
| 7 to 9         | 6.00 am (Empty) | 1.00pm  | 7.00-9.00pm | Balanced habit   |

|                      |   |   |   |           |
|----------------------|---|---|---|-----------|
| P <sup>H</sup> 6.5-7 | 1 | 1 | 1 | Regular   |
| P <sup>H</sup> 2 - 4 | 0 | 1 | 0 | Irregular |
| P <sup>H</sup> 7-8   | 0 | 1 | 1 | Regular   |
| P <sup>H</sup> 2-4   | 1 | 0 | 0 | Irregular |

When the P<sup>H</sup> [10] goes acidic the demand for glucose is stronger, as the energy is less with acidic P<sup>H</sup> because the substrate is destroyed, so to stabilize the P<sup>H</sup> the standard buffer requirement of water – 7 P<sup>H</sup> is the standard, the affinity for the enzyme to bind with the substrate is stronger, K<sup>M</sup> is high, so the hexokinase is required at this stage to bind with glucose, as the reaction becomes anaerobic respiration. P<sup>H</sup> – 6.5 is the cut-off point below this P<sup>H</sup> the patient starts to get into the state of cancerous from benign in Oral cancer – patient, and the patient needs to get stabilized, with normal dieting, at this particular point of P<sup>H</sup>, the standard P<sup>H</sup> of Urine is 6.5. below which the patient is infected with Kidney cancer, when the P<sup>H</sup> reaches 5 – 4 thus constantly degrading, the cut-off value of P<sup>H</sup> depends on the type of cancer is suffering from. P<sup>H</sup> 2 is more critical and patient reaches metastatic Cancer. In case of lung cancer. Thus over all we can say that the low P<sup>H</sup> of 2 that is acidic P<sup>H</sup> is puts the patient in neural stress, high oxidative[14] stress. Case studies of P<sup>H</sup> monitoring at home = Morning 2 Roti + Tea at Early morning at 8.00 A.M – [10]P<sup>H</sup> – 7 with Afternoon at 1 P.m the P<sup>H</sup> drops down to 6 before lunch, and regains the stability of P<sup>H</sup> - 7 after Lunch, so there is a 5 hrs time interval between the 2 meals, to maintain the stability of P<sup>H</sup> again at evening the P<sup>H</sup> was detected to be 6.5 without any break fast or tea, at night dinner taken at 7.30 -8.00 pm – before eating the P<sup>H</sup> was monitored to be less then 6.5, feeling hungry to stabilize this P<sup>H</sup> to stabilize again to 7, but again when tea or Coffee was taken in the evening the P<sup>H</sup> was seen to be more then 7 -8 feeling alkalinity. Night become more alkaline so feeling like vomiting tendency due to over eating. so this study recommends and evidence to maintain the fooding habit to take light dinner only at night with 2 Rotis – 4 maximum with vegetable or Milk, and should not opt for tea or coffee at evening time, this makes the stomach more heat and gastic formation, we should avoid. 6.4 P<sup>H</sup> is the threshold P<sup>H</sup> below which the enzyme activity is deactivated, and the reaction cannot occur, Less energy, at this P<sup>H</sup> the threshold Voltage / P<sup>H</sup> approx 60 Mv / P<sup>H</sup> 60 / 6.4 = 9.375 Mv.





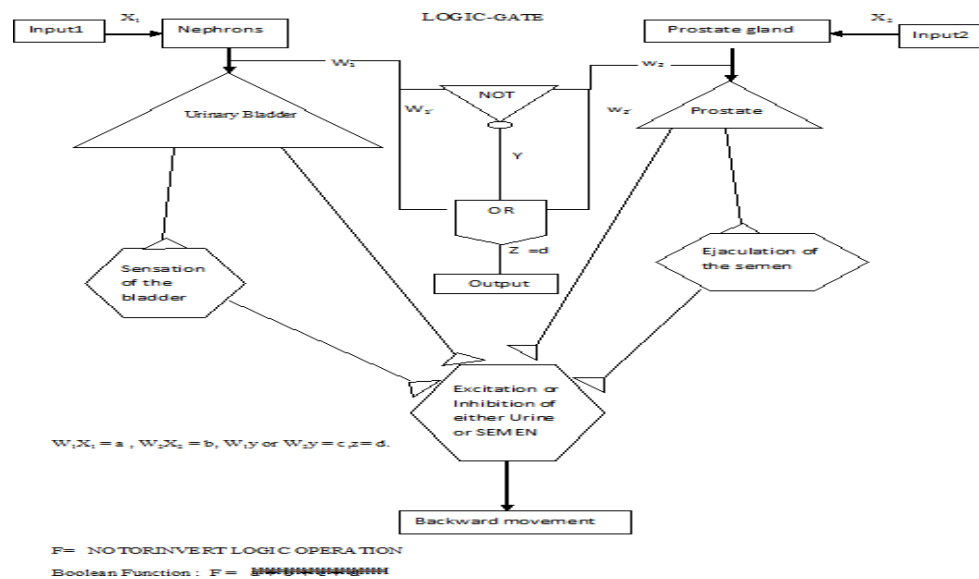
#### IV. The neural algorithm monitors the stress of $P^H$

The PH paper performs the action of a nanomechanical cantilever, as it bends when reacts with saliva,urine and changes its color, so it all happens due to Biochemical reaction of Hydrogen ion concentration of PH paper and acts as a electrochemical transducer to convert it into voltage.

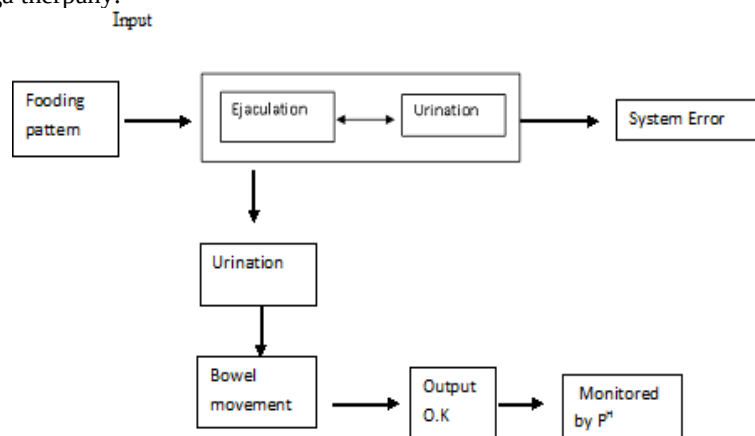
| Nutrition Assessment                                                     | Dieting pattern of Normal patient vs Cancerpatient                               |
|--------------------------------------------------------------------------|----------------------------------------------------------------------------------|
| Normal person –                                                          | Case study of a patient                                                          |
| BREAKFAST – 8.00 am                                                      | <b>Cancer patient</b>                                                            |
| ↓<br>Midmorning Break fast – 11.00am ( fruit/sprouted grain/ Tea/coffee) | a)Snack b/w meals – Yes                                                          |
| ↓<br>Lunch (Roti/ric e/dal/green vegetables/salad) – 2.00 pm/ Non veg    | Restaurants & food centres more than twice – No                                  |
| ↓<br>Mid Evening                                                         | Rush while eating /Eat hurriedly – Yes                                           |
| ↓<br>Chuda a fried /juice                                                | Eat meals at regular time interval –                                             |
| ↓<br>Dinner – 9.00 pm                                                    | Eat fresh fruits or raw uncooked vegetable daily – Yes                           |
|                                                                          | b) Red meats ( Porks, Mutton,beef) more than 3 days a week? Yes                  |
|                                                                          | Butter, Cheese or margarine daily? Yes/No                                        |
|                                                                          | Saturated Oil in preference to liquid Oils? Yes                                  |
|                                                                          | c) Candy, Chocolate, Cakes, Ice- cream other sweets more than 3 days a week? yes |
|                                                                          | Fluid – Six to eight glasses of water – No                                       |
|                                                                          | Salt – No                                                                        |
|                                                                          | Calories – Ht – 36 = 55 Kg ( patient wt was decreasing due to cancer)            |
|                                                                          | Life style behavior                                                              |
|                                                                          | Alcohol/ Smoking/ Paan/Tobacco                                                   |
|                                                                          | Tobacco smoking                                                                  |
|                                                                          | Drink alcohol                                                                    |
|                                                                          | Oral intoxicant – regular                                                        |
|                                                                          | Drink – irregular                                                                |
|                                                                          | <b>Heavy dinner- No</b>                                                          |
|                                                                          | Last 10 years 2 pegs of alcohol = Yes                                            |
|                                                                          | Physical activity( moderate exercise)                                            |

This Comparative algorithm describes the Normal dieting pattern vs Cancer patient, the red lines are the risk factor for the occurrence of Cancer. The most significant cancer causing food is the Red meats(Pork,Mutton,Beef). This fooding pattern compares the normal fooding habit vs cancerous dieting pattern, at various time interval, thus from this table we can sort out the  $P^H$  parameter at regular time interval at which the food is taken, because the color of the  $P^H$  changes according to the food we take acidic to alkaline[14], and we can decide which food to take for maintaining good health, and monitor that by what time the food needs to be taken to stabilize the  $P^H$ . At time interval, any type of stress,like neural stress of hunger for longer duration say more then the regular timing of fooding pattern which cause the symptoms of ulcer. Thus The  $P^H$  alerts us to detect the symptoms at the earliest possible. Morning  $P^H$  – 8 (due to improper digestion of food), stool immobility in stomach. Tea and water was eaten at 8.am lavatory and toilet, then the  $P^H$  is normal at neutral change to 7. This algorithm suggests that the  $P^H$  status of the saliva is linked with neural system leading to Hyper-tension and anger and hence Psychological disturbance in human behavior is monitored. So it does the multiple function for early detection of neural, Metabolic and Psychological monitoring, with shift in  $P^H$  [14] value from neutral – acidic & neutral – alkaline. When water +Sugar is taken – the  $P^H$  value of water – 7 and sugar is 4 if we make a insoluble sugar soluble into a water the  $P^H$  changes to 6.5 the nromal energy drink of

cancer patients, so  $6.5 P^H$  is the critical  $P^H$  of patients from here the revival the cancer cells begin to improve the state of the cell and normalized the cell, but again if no water and sugar is taken at appropriate time interval the acidity increases in stomach, the patient can go into metastatic state of cancer. This also causes the neural acidity.

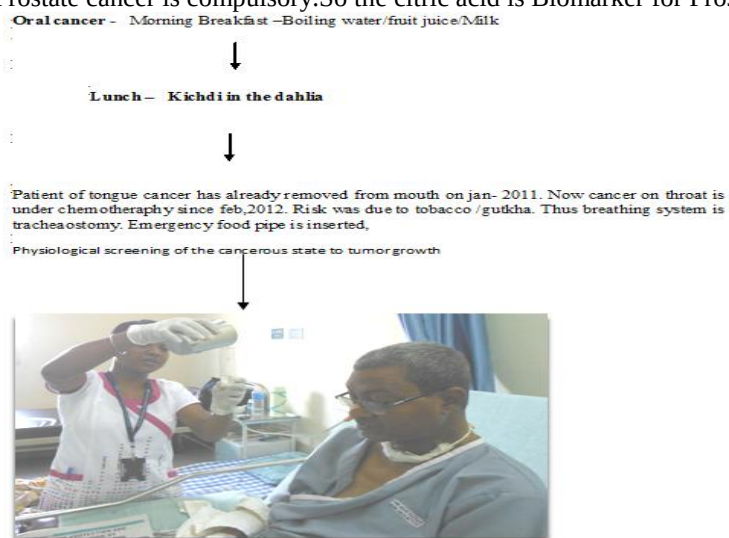


**Boolean expression :**  $F = \overline{a+b+c+d}$  Fig – 6 Triangles represent the sensory neuron, Hexagon represents the inter neurons, When sensory neurons of the urinary bladder, is stimulated by Nephrons, bladder gets sensitized, for function of urine excretion, or else inhibition of the function, If Prostate gland is stimulated to secrete semen, Therefore the operational logic behind the mechanism is the NOT OR Boolean expression. At one time only either of the two function take place Excretory or Prostatic function. Output 1 of excretory means 0 of prostatic, but if both function together  $W^1X^1$  acts as the switch A /  $W^2X^2$  acts as the switch B when switch A is on or switch B off or either switch states the function of the Prostate gland or the urinary bladder and the logic of the switch states controls the function of the  $W_1Y$  or the  $w_2y = c$  ( valve) to produce NOT urine or the semen = z product. The switches or the valve here detects the functionality of prostate OR Bladder. Our dieting pattern is related with Prostate, in the winter season, when the temperature is low the function of the Prostate gland is more activated, but the food we take effects a lot, can be monitored with  $P^H$ , Therefore balance food with temp, controls the Prostate function. Taking plenty of water also normalizes the temperature and  $P^H$ - 7 at high temp of our digestive system, melts the sperm, due to which volume of sperm is less. The important observation of the Prostate functions is that after the ejaculation of the sperm, the urine comes out the bladder function is activated after the prostate inhibits, so the contradictory activation of Prostate and bladder switches on/off state is observed. So During the ejaculation if the urination starts it is error in the function of prostate, also if the bowel movement occurs during this time of ejaculation of the sperm, error is observed in the quality /quantity of the Prostate gland, which happens as the age increases in human, but this can also be corrected by medicine and yoga therapy.



The prostate analysis of the semen is done with  $P^H$  paper and observed that normal  $P^H$  is more then 7- 7.5, that means the zinc is stable according to the literature suggests, and citricacid is less, but as the  $P^H$  is less then 6  $P^H$  it turns the color yellow orange, suggests the abnormality of  $P^H$  the semen viscosity is very less and thin,

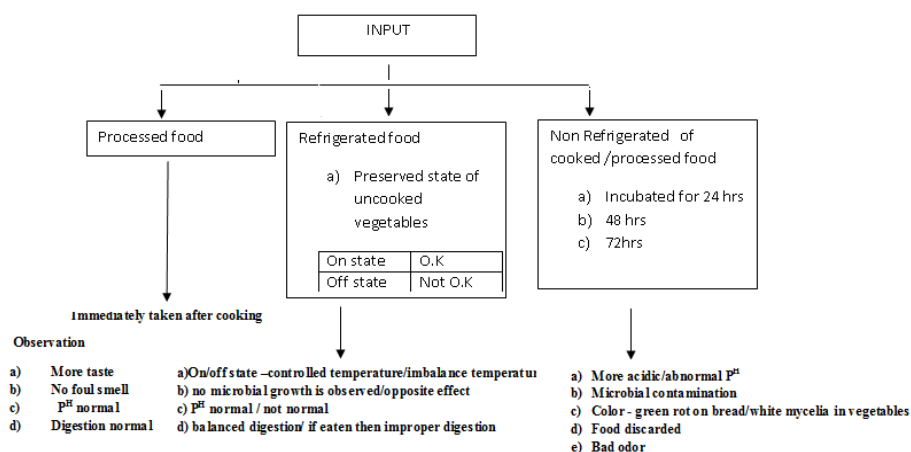
compared to high  $P^H$  condition. The urination soon after the Prostate ejaculation is normal as observed, so water intake is important, to stabilize after the ejaculation of sperm, again the dieting here also plays an important role to monitor the prostate status, as the age increases. Say the age limit is 40 years, for normal Prostate after this age regular screening of Prostate cancer is compulsory. So the citric acid is Biomarker for Prostate cancer detection.



This evidence shows that the patient condition and his method of feeding monitors that patient is suffering from Throat cancer.



This figure shows that the controlled temperature and humidity inside the refrigerator maintain the food at normal  $P^H$  [15] and control regulate the food, this occurs due to the Airflow system and Biosensor of refrigerator system feedback the temperature of the food, to prevent microorganisms to grow, is monitored when the refrigerator is in Off condition.



Shows the status of food and its state of contamination

## V. Summary & Conclusion

The main objective of this paper is towards early detection of cancer, with  $P^H$  as Biosensor, and to correlate with logic as how the  $P^H$  varies according to the logic, with time the circuits responsible to develop Biosensor[9] is described with diagram, Mathematical modelling is illustrated to show that how Benign cancer from normal shape can change into malignant tumor, and become metastatic in the course of time if not treated or alerted at early stage which is represented by the variable in the modelling. This study is very significant for patient monitoring, and purpose is to make the cost of detection and treatment very low and affordable, if monitoring is done at early stage and prevented from taking the shape of the cell to malignant size. The cell symptoms at each stage of cancer is alarming, to take precautionary measures like fooding pattern. Cancer screening and any type of disease monitoring starts from the general screening method, as body weight, Blood pressure, Glucometer is also used now-a-days for sugar check up, because sugar itself confirms the disease, but cancer is further progressive in nature, if not screened early at general checkup, it can take the shape of tumour, The human digestive system acts like fed batch bioreactor of the fermentation system, which requires the input of food, water at regular time interval to maintain the  $[14] P^H$ , temperature & the body wt, the fooding pattern is studied for digestive system and its relation with time and its varying  $P^H$  with the persons dieting pattern at cancer hospital and the findings was observed that there is difference between the normal fooding habit of person compared to the cancerous patient, which was studied with Cancer patient & normal mainly the gastric cancer patient. The algorithm of the fooding pattern is as follows. These changes in fooding habit also quantitatively changes the  $P^H$  [15] of the food in the stomach and the intestine. From this research overview we can conclude with the fact that, it is very important to maintain water balance in our body, to maintain the  $P^H$  our system 6.5-7 water is very important solvent, after checking the level of water in our system, we can know our dieting pattern of our digestive system.

**Literature review:** In 1964, only 1 person in 214 contracted Cancer. Today it is 1 in 3 females and 1 in 2 males. The determining factor between health and disease is  $P^H$ . It is not uncommon for the average American to test between 4 pH to 5 pH. Oxygen levels in the body are directly related to  $P^H$ . Increasing  $P^H$  from 4  $P^H$  to 5  $P^H$  increases oxygen to the cells by ten fold. From a 4 to a 6 increases oxygen by 100 times and raising pH from 4  $P^H$  to 7  $P^H$  increases oxygen levels by 1,000 times. Research shows that unless the body's  $P^H$  level is slightly alkaline, the body cannot heal itself. So, no matter what type of modality you use to take care of your health problem, it won't be effective until the  $P^H$  level is up. All drugs, medications and toxic chemicals have the effect of lowering the pH of the body. That is why there are side effects to every drug and none of them effect a cure. When body pH drops below 6.4 enzymes are deactivated, digestion does not work properly; vitamins, minerals and food supplements cannot effectively assimilate. Acid decreases energy production in the cells, the ability to repair damaged cells, the ability to detoxify heavy metals and makes the body more susceptible to fatigue and illness. Your body pH affects everything. Research has proven that disease cannot survive in an alkaline state, however, viruses, bacteria, yeast, mold, fungus, Candida and Cancer cells thrive in a low oxygen, / low  $P^H$  environment. An acid  $P^H$  can result from an acid forming diet, emotional stress, toxic overload, and/or immune reactions or any process that deprives the cells of oxygen and other nutrients. The body will try to compensate for acid by using alkaline minerals, like sodium from the stomach and calcium from the bones. This is the cause of Osteoporosis and a number of other diseases. If there are not enough minerals in the diet to compensate, a build up of acids in the cells will occur, resulting in symptoms like pain, Arthritis, Fibromyalgia, MS, Lupus, etc. There are two factors that are always present with Cancer no matter what else may be present. Those two factors are Acid  $P^H$  and Lack of Oxygen. Can we manipulate those two factors that always have to be present for Cancer to develop and by doing so will that help reverse the Cancer? If so, we need to learn how to manipulate  $P^H$  and Oxygen. Remember that the  $P^H$  number is an exponent number of 10; therefore, a small difference in  $P^H$  translates to a big difference in the number of oxygen or OH ions. In other words, blood with a  $P^H$  value of 7.45 contains 64.9% more oxygen than blood with a pH value of 7.3. Cancer needs an acid / low oxygen environment to survive and flourish. Terminal Cancer patients are about 1000 times more acidic than they should be. This equates to dangerously low amounts of oxygen at the cellular level. In the absence of oxygen, glucose undergoes fermentation to lactic acid. This causes the pH of the cell to drop even lower. Urine and saliva  $P^H$  of Terminal Cancer patients almost always runs between 4.0 and 5.5. When the cancer goes into metastases the pH drops even lower. Our bodies simply cannot fight disease if our body pH is not properly balanced. In other words, it's either alkalize or die.

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