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Design And Developement Of Temperature Controller In Box During Organ Transplantation

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Abstract:-- **The objective of this project is to improve the safety monitoring during organ preservation and transplantation. Cool-box system lead to reperfusion injury so cool box is replaced by warm preservation during transportation and design of temperature controller is needed to regulate the temperature. Peltier effect is majorly cooling of one junction and the heating of the other when electric current is maintained in a circuit of material consisting of two dissimilar conductors and thermostat is used for maintaining the setpoint. simulation is done with the help of Mat lab software and temperature is being regulated easily inside the organ transplantation box.**

***Keywords*—PELTIER SETRPOINT, REPREFUSION,MATLAB MICROCONTROLLER**

I. INTRODUCTION

The main objective of this project is to improve the system efficient. Organ transplantation is one of the crucial methodologies evolved in day to day life. some of the problems faced during organ transplantation is that Organ transplantation is done normally with the help of Ambu bag with the Silica gel filled around it for the preservation of organ within the particular time of travel .Ambu bag is coated with insulated cool box in order to avoid the room temperature enter into the box. Organ transplantation is the moving of an organ from one body to another or from a donor site to another location on the person's own body, to replace the recipient's damaged or absent organ Organs and tissues that are transplanted within the same person's body are called auto graft. The objective of project is to improve the safety monitoring during organ preservation and transplantation. A PDA controlled cool-box system lead to reperfusion injury so cool box is replaced by warm preservation during transportation and design of temperature controller is needed to regulate the Peltier effect is used for cooling of one junction and the heating of the other when electric current is maintained in a circuit of material consisting of two dissimilar conductors. Thermostat is a device that automatically regulates temperature and maintains set point. Organ transplantation is the moving

II. EXISTING SYSTEM

Organ transplantation is done normally with the help of ambu bag with the sol gel filled around it for the preservation of organ within the particular time of travel .During transportation organs are cooled to slow their metabolism. Organs are turned off, transported on ice, and then turned back on in the recipient's body and thus metabolism rate of the organ get Gradually decrease. The Box, filled with a saline solution and outfitted with
An Ambu bag during transplantation. Size of Ambu Bag is 55cm which stores the organ with ice.

III. PROPOSED SYSTEM

Organ stored in cool box lead to increase level of hydrogen sulphide which affects organ quality. So design of temperature controller with warm preservation of organ during transportation instead of ice bag is desired in order to avoid damage along with high safety precaution. Size of Ambu bag is 20 cm, as it does not contain any ice in the medium of storage during the transplantation. Peltier effect is normally used for regulating temperature .when temperature is below 37 degree Celsius ,hot body is regulated and when the temperature of box is above 37 degree Celsius temperature switch over to cold junction by Thermostat This switching is done with the help of microcontroller programming automatically .MATLAB is used for simulation and the hardware is done using a thermostat for monitoring temperature and controlling the inner temperature of organ box during transplantation.

IV. WORKING PRINCIPLE

Pettier effect, the cooling of one junction and the heating of the other when electric current is maintained in a

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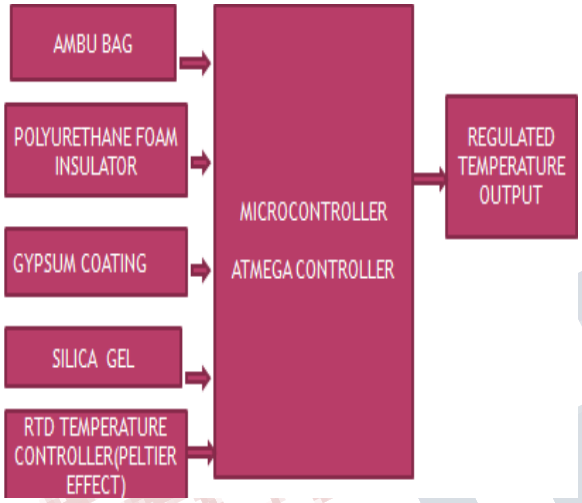
circuit of material consisting of two dissimilar conductors; the effect is even stronger in circuits containing dissimilar semiconductors. In a circuit consisting of a battery joined by two pieces of copper.Wire to a length of bismuth wire, a temperature rise occurs at the junction where the current passes from copper to bismuth, and a temperature drop occurs at the junction where the current passes from bismuth to copper .Inside the box of organ transplantation the entire body temperature is maintained.

V. BLOCK DIAGRAM



VI. HARDWARE REQUIREMENTS

- AMBU BAG
- POLYURETHANE FOAM
- GYPSUM COATING
- SILICA GEL
- RTD TEMPERATURE CONTROLLER
- PELTIER EFFECT
- MICROCONTROLLER(ATMEGA-MICROCONTROLLER PROGRAMMING)
- REGULATED TEMPERATURE

Table 1. Number of patients receiving organ transplantations in Sweden 1970±94, reported in the In-patient Registry

Organ	Men	Women	Total	% of total
Kidney	2862	1850	4712	87Š9
Liver	153	150	303	5Š7
Heart	152	42	194	3Š6
Heart and lung	27	43	70	1Š3
Pancreas	31	21	52	1Š0
Liver, lobules	11	10	21	0Š4
Pancreas, segment	3	1	4	0Š1
Total	3239	2117	5356	100Š

which the patients originated as a reference. The transplantations were performed in a homogeneous population with well-documented cancer incidence.

Subjects and methods

Patients

In 1964, the Swedish National Board of Health and Welfare began collecting information about people who were hospitalized. Since 1970 the In-patient Registry has been nation-wide and has included all hospitalized patients in Sweden. The information collected includes 5356 patients to identify those with cancer. Nation-wide information on the incidence of cancer in Sweden is available for all years since 1958, when compulsory registration began.34 The Cancer Registry collects information on diagnosed cancers from clinicians and pathologists. If a person has more than one cancer, each one is registered separately. Basal cell carcinomas are not registered. The completeness of registration is close to 100% for all cancers.35

The Cause of Death Registry includes information on all deceased persons listed in the parish registers, whether they died in Sweden or abroad.36 The underlying cause of death is generally determined from data on medical death certificates, which were designed in accordance with the internationally estab-lished norm.
Statistical analysis We estimated the expected number of cancers in our study group using incidence data from the Cancer Registry and a specially developed computer

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program, CANEST (CANcer ESTimates).37 The program calcu-lated the risk of cancer for each patient individually. The calculation was based on incidence data for the years between the first organ transplantation and 1994 (or death, if earlier). Information about deaths in the cohort was obtained from the Cause of Death Registry. Total risk was calculated as the sum of the individual risks. The relative risk (RR) of cancer, which is the ratio between the actual and the expected number of cancers, was used to assess the risk of cancer. The actual number of cancers in the cohort was obtained from the Cancer Registry. We calculated the confidence interval (CI) for the RR assuming a Poisson distribu-tion.38 This method has been described in detail elsewhere.37 Where the lower limit of the 95% CI exceeded 1´0, this was taken to indicate statistical significance. All tabulations and all statistical analyses.Following organ transplantation a total of 172 persons with 325 non-melanoma skin cancers (NMSCs) and six malignant melanomas was diagnosed in the 5356 patients. The RR of NMSC was 108´6 (95% CI 94´6±123´1) for men and 92´8 (95% CI 73´2± 116´0) for women. Lip cancer risk was also substan-tially increased after transplantation: RR was 37´8 (95% CI 22´4±59´7) and 126´4 (95% CI 57´8±240´0) for men and women, respectively. No significant increase in the risk of malignant melanoma was noted. For all cancer sites the RR was 7´6 in men (95% CI 6´9±8´3) and 4´8 in women (95% CI 4´2± 5´4). Although in some cases the risk was significantly elevated compared with that expected for the general population, the increase in risk for the other epithelial cancers that we studied was significantly less than for NMSC (Table 2). For all cancer sites that were not sun-exposed, i.e. excluding the skin and lip, the RR was 3´8 in men (95% CI 6´9±8´3) and 3´3 in women (95% CI 4´2±5´4).

Further analysis of the distribution of NMSC showed the highest risks to be on the upper limbs: RR was 157´0 (95% CI 114´9±209´4) and 165´1 (95% CI 99´4±257´8) for men and women, respectively. All NMSCs and lip cancers were squamous cell carcinomas except for two cases of Kaposi's sarcoma and one case of adenoid cystic carcinoma in the lip.

The 172 patients with NMSC developed an average of 1´9 NMSCs; 64 patients developed multiple NMSCs (Table 3). Based on life table analysis, 25% of patients with NMSC develop a second tumour within 13 months and 50% a second tumour within 3´5 years. In univariate analyses using the Cox survival models we identified three factors associated with a higher risk .

Table 3. Number of individuals with one or more skin cancers (excluding melanoma) following organ transplantation

Number of skin cancers	Men	Women	Total
1	76	32	108
2	27	7	34
3	5	3	8

Discussion developing a second NMSC: gender (relative hazard: male, 1´3; female, 0´6; P , 0´2), age at first trans-plantation (relative hazard: age , 50 years, 1´4; age $ 50 years, 0´8; P ˆ 0´2) and years from organ transplantation to first NMSC (relative hazard: , 10 years, 0´9; $ 10 years, 1´5; P , 0´05). In a multi-variate model incorporating these three predictor variables, only gender (hazard ratio male vs. female presents the number of NMSCs diagnosed before and after 1983, the year of introduction of cyclosporin in Sweden. The average follow-up for the recipients before 1983 (n ˆ 1658) was 17´6 years and after 1983 (n ˆ 3698) was 5´Thereafter, a large number of studies reported an increased incidence of NMSC.1±24,26±28However, reliable information from epidemiological studies with long follow-up is sparse,3,9,23,27 and these studies have shown a three- to fourfold increased risk of all cancers. In our study the risk was slightly higher, 7´6-fold increased for men and 4´8-fold increased for women. When cancers in sun-exposed sites are excluded, the risk of cancer post-transplanta-tion is increased about threefold. In contrast, the risk of NMSC was more than 100-fold elevated and that of lip cancer more than 50-fold elevated. The higher risks in our study are probably due to longer and more complete follow-up as well as the low baseline risks of NMSC in the Swedish population.

Apart from avoiding sun exposure in order to decrease the risk of skin cancer in organ transplant recipients, the type and dose of immunosuppression may be important. In our material the patients were immunosuppressed predominantly by azathioprine and prednisone in the beginning of the observation period,39 but since the introduction of cyclosporin in 1983, most patients have received this drug in com-bination with azathioprine and prednisone. The link between cancers and cyclosporin is thought to be dose-related,40 and it has been

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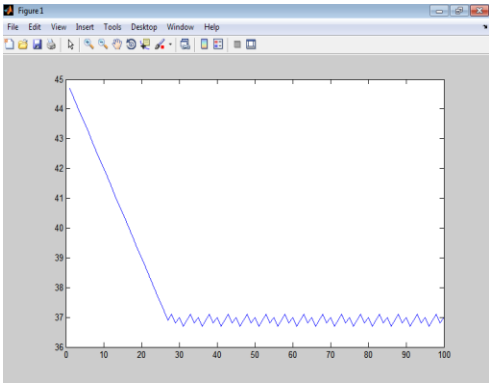
shown in a randomized study of renal transplant recipients that a low-dose regimen with cyclosporin was associated with fewer malignant disorders than a high-dose regimen.

VII SIMULATION RESULT



At any given temperature the regulated output is maintained throughout. Thus the product with higher rate of constant temperature is regulated throughout with the safe coating gypsum material. PID Control temperature has been regulated and the offset error attained during the process is eliminated because of the integral effect.

VII RESULT AND DISCUSSION

Organ transplantation with more advanced technology such as warm body preservation throughout the transplantation and also maintaining the exact constant temperature during the transplantation 37 0c is maintained. Thus metabolism change is easily avoided and the constant temperature in an ambu bag is regulated throughout.

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