

ELECTRONIC AUTOMATIC TEMPERATURE CONTROL OF
CRYOPRESERVATION FOR ARTIFICIAL INSEMINATION (PROTOTYPE)

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To my Father, Mother

&

Teachers

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ABSTRACT

The scientist and researchers are facing problems in genetically stabilizing living cells. The living cells can be stabilized by keeping them in cryogenic temperatures. Stabilizing cells at cryogenic temperatures is called cryopreservation, an applied aspect of cryobiology, or the study of life at low temperatures. Advances in cryopreservation technology have led to methods that allow low-temperature maintenance of a variety of cell types. Techniques are available for the preservation of microorganisms, isolated tissue cells, small multi cellular organisms, and even more complex organisms such as embryos. The freezing process involves complex phenomena which, even after decades of research, are not fully understood. The aim of this project to make prototype of a cryopreservation system, so, it can preserve the sperm or any other biological material. For the aim of cryopreservation, a circuit board with a microcontroller, thermocouple controller, and a voltage driver for valve are constructed. Two sensors are used, a K-types thermocouple and Water level detector-brick sensor, which send data to the microcontroller. After the microcontroller receives the data, the data of temperature and level are compared to control the valve. The cryopreservation system is modeled in AutoCAD and the temperature control circuit is programmed in MPLAB. An adjustable plastic box which is non-conductive and resistant to heat is used in the fabricated system. It has a metal box inside to reserve sperm tubes. An electrical solenoid valve is used for supplying necessary liquid. The total cryopreservation is activated by sensing physical value by the sensors which are converted by thermocouple amplifier in understandable form for microcontroller. The data are then processed, compared and the valve is then operated accordingly by the microcontroller. The fabricated system is tested at different temperature conditions and it is found that there is very less error. The system functions very effective and is able to control the temperature of the system to preserve the sperm.

ABSTRAK

Para saintis dan penyelidik menghadapi masalah dalam genetik menstabilkan sel-sel hidup. Sel-sel hidup boleh stabil dengan menyimpannya dalam suhu kriogenik. Penstabilan sel-sel pada suhu kriogenik dipanggil krioawetan, satu aspekgunaan cryobiology, atau kajian hidup pada suhu rendah. Kemajuan dalam teknologi krioawetan telah membawa kepada kaedah yang membolehkan penyelenggaraan rendah-suhu pelbagai jenis sel. Teknik yang disediakan untuk pemeliharaan mikroorganisma, sel-sel tisu terencil, organisma kecil yang berbilang sel, dan organisma yang lebih kompleks seperti embrio. Proses pembekuan melibatkan fenomena yang kompleks tidak difahami sepenuhnya, walaupun beberapa dekad penyelidikan. Tujuan projek ini untuk membuat prototaip sistem krioawetan, jadi, ia boleh memelihara sperma atau apa-apa bahan biologi lain. Bagi tujuan krioawetan, papan litar dengan pengawal mikro, pengawal suhu dan pemandu voltan untuk injap dibina. Dua sensor digunakan, suhu K-jenis dan paras air sensor pengesan-bata, yang menghantar data ke mikropengawal. Selepas mikropengawal menerima data, data suhu dan tahap dibandingkan untuk mengawal injap. Sistem krioawetan adalah model dalam AutoCAD dan litar kawalan suhu diprogramkan dalam MPLAB. Sebuah kotak plastik laras yang bukan konduktif dan tahan haba yang digunakan dalam sistem yang direka. Ia mempunyai kotak logam dalam untuk tiub sperma rizab. Injap solenoid elektrik digunakan untuk membekalkan cecair yang diperlukan. Jumlah krioawetan diaktifkan dengan mengesan nilai fizikal oleh sensor yang diubah oleh penguat suhu dalam bentuk mudah difahami bagi mikropengawal. Data-data ini kemudiannya diproses, dibandingkan serta injap itu dikendalikan sewajarnya oleh pengawal mikro. Sistem fabrikasi diuji pada keadaan suhu yang berbeza dan ia didapati bahawa terdapat ralat yang sangat minima. Fungsi sistem ini sangat efektif dan mampu untuk mengawal suhu sistem untuk memelihara sperma.