Bioinspired Device Improves the Cardiogenic Potential of Cardiovascular Progenitor Cells

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Box 1: Frequency generator board

Board circuit diagram of frequency generator board is presented in figure 4. The Adruino Uno board was used as an open source electronic platform to design this circuit. Main ATMEGA328 microcontroller has programming codes for the related frequency generation which is send to outputs 12 and 13 in engine drivers as follows:

```c
// the setup function runs once when you press reset or power the board
void setup() {
  // initialize digital pin LED_BUILTIN as an output.
  pinMode(8, OUTPUT);
}

// the loop function runs over and over again forever
void loop() {
  digitalWrite(8, HIGH);  // turn on (HIGH is the voltage level)
  delay(200);            // wait
  digitalWrite(8, LOW);   // turn off by making the voltage LOW
  delay(800);            // wait
}
```

Fig. 1 Circuit diagram of frequency generator board including: a) L9110 driver and b) ATMEGA328 microcontroller
Box 2: Temperature control system

The related board and the complete diagram of thermal control system are represented in figure 5. The used programming codes for controlling temperature are as follows:

```c
#include <Wire.h>
#include "Adafruit_MLX90614.h"
#include <LiquidCrystal.h>
define Relay 0
Adafruit_MLX90614 mlx Adafruit_MLX90614();
LiquidCrystal lcd(8, 9, 4, 5, 6, 7);
void setup() {
  mlx.begin();
  lcd.begin(16, 2);
  pinMode(Relay, OUTPUT); // sets the digital pin as output
  void loop() {
    double temp;
    char st=0;
    while(1) {
      temp = mlx.readObjectTempC();
      lcd.clear();
      lcd.print(“Temp: ”);
      lcd.setCursor(6, 0);
      lcd.print(temp);
      lcd.setCursor(12, 0);
      lcd.print((char)223);
      lcd.setCursor(3, 1);
      if(temp > 36.2) st =0;
      else if(temp < 36.0) st =1;
      if(st)
        digitalWrite(Relay, LOW);
        lcd.print(“Heater on”);
        delay(500);
        digitalWrite(Relay, HIGH);
        delay(1000);
      else
        digitalWrite(Relay, HIGH);
        lcd.print(“Heater off”);
        delay(250);
      // Serial.print("Ambient = "); Serial.print(mlx.readAmbientTempC());
      // Serial.print(" °C");
      // Serial.print(" °F");
      if(temp > 36.2) st =0;
      else if(temp < 36.0) st =1;
      if(st)
        digitalWrite(Relay, LOW);
        lcd.print(“Heater on”);
        delay(500);
        digitalWrite(Relay, HIGH);
        delay(1000);
      else
        digitalWrite(Relay, HIGH);
        lcd.print(“Heater off”);
        delay(250);
    }
    Serial.print("Ambient = "); Serial.print(mlx.readAmbientTempC());
    Serial.print(" °C");
    Serial.print(" °F");
}
```

Fig. 2 Circuit diagram of temperature control system including: a) LCD display, b) Relay to turn on and off the heater, c) Heater and d) Non-contact infrared temperature sensor
Fig. 3 Contact angle measurements of 1)PCL/gelatin 60:40, 2)PCL/gelatin 70/30 and 3)PCL/gelatin 80/20

Table 1. Primer sequences of TTN, MYH-6 and GJA1 genes

<table>
<thead>
<tr>
<th>Primer Name</th>
<th>Oligo Sequence 5’………3’</th>
<th>Length (bp)</th>
<th>Tm (°C)</th>
<th>Product length</th>
</tr>
</thead>
<tbody>
<tr>
<td>TTN-F</td>
<td>ATCATCAATGTAGCACCGAGT</td>
<td>21</td>
<td>59.1</td>
<td>108</td>
</tr>
<tr>
<td>TTN-R</td>
<td>AAAAGCCCAAGAAATCAACCAAC</td>
<td>23</td>
<td>59.2</td>
<td></td>
</tr>
<tr>
<td>MYH6-F</td>
<td>GCCCACTTTCCTCCCTGATCCAC</td>
<td>21</td>
<td>62.2</td>
<td>195</td>
</tr>
<tr>
<td>MYH6-R</td>
<td>CTTGCTCCTTTGCTTTTACCAC</td>
<td>23</td>
<td>61.2</td>
<td></td>
</tr>
<tr>
<td>CX43-F (GJA1)</td>
<td>CCAATCTCTCATGTGCGCTTC</td>
<td>21</td>
<td>59.0</td>
<td>105</td>
</tr>
<tr>
<td>CX43-R (GJA1)</td>
<td>CAGTTTCTCTCCCTTGGCATC</td>
<td>22</td>
<td>58.1</td>
<td>111</td>
</tr>
</tbody>
</table>