A Smart Medical Protection System That Ensures the Safe Storage of Insulin (INsulin) Syringes and Preserves Their Biological Effectiveness by Applying Stabilization (STAbility) Measures Against Temperature Fluctuations

Alizade, Goychak (School: Technical and Natural Sciences Lyceum Named After Nizami Ganjavi)
Nabiyeva, Shams (School: Secondary school No 1 Named After Ismat Gayibov)

The increasing number of people with diabetes has made safe insulin storage an important issue. Insulin is a temperature-sensitive protein and if it is stored outside the 2–8°C range, it can lose its effectiveness. This can lead to poor blood sugar control and unstable treatment results. In real-life situations such as hot weather, travel and daily activities, keeping insulin at the correct temperature is often difficult. The aim of this project is to develop a smart system called INSTA to keep insulin at a stable temperature. The project was carried out in three main steps. First, the effect of temperature on insulin stability was studied, showing that higher temperatures increase the risk of damage. Second, a prototype device was designed using thermal insulation, a cooling module, temperature sensors and a microcontroller with IoT connection. The system monitors temperature continuously and activates cooling when needed, while sending information to a mobile and web application. Third, the possible benefits for users were considered, including better treatment control and reduced stress during daily use. The results showed that the system can keep insulin within a safe temperature range and reduce the risk of effectiveness loss. This makes insulin storage safer and more reliable in everyday conditions.

Awards Won: