



## Micromachined, hydrogel-driven, glucose-sensitive valve for microfluidic control of insulin delivery

A device providing glucose-sensitive control of insulin delivery, fully implantable into the subcutaneous or intraperitoneal space and connected via a catheter to a pressurized insulin reservoir, has been developed.

An integral feature of the micromachined valve is a polymer microgel that binds glucose and, as a result, changes its degree of swelling. This microgel is embedded inside a silicon microchip into which microfluidic channels have been machined. The gel's glucose-sensitive swelling and shrinking is harnessed to open or close channels through which an insulin solution flows.

This technology, whose physical dimensions are measured in microns to millimeters, automatically adjusts the flow of insulin from the pressurized reservoir into the patient when it senses a change in blood glucose

level. It does so in a manner that does not require sophisticated glucose sensing, data processing and electromechanical pumping, all of which are features of the present state of the art in insulin delivery technologies.

The result of this project, which lies at the interface between drug delivery, polymer science, and microfluidics, will be an "artificial pancreas" which delivers insulin to counteract rises in blood glucose and will be used to treat Type I diabetes.

### Features & Benefits

- Fully implantable
- Wireless
- Insulin reservoir can be placed inside or outside the body
- Combined sensing and infusion integrated approach
- Extended device lifetime with less frequent replacement

### Technology Status

Technology reduced to practice using an insulin model. Now optimizing device time response in a rat model. Future research will focus on sensor function, response to glucose levels and insulin depot maintenance in vivo.

### IP Status

US Patent pending. Publication number 2004/0248326

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