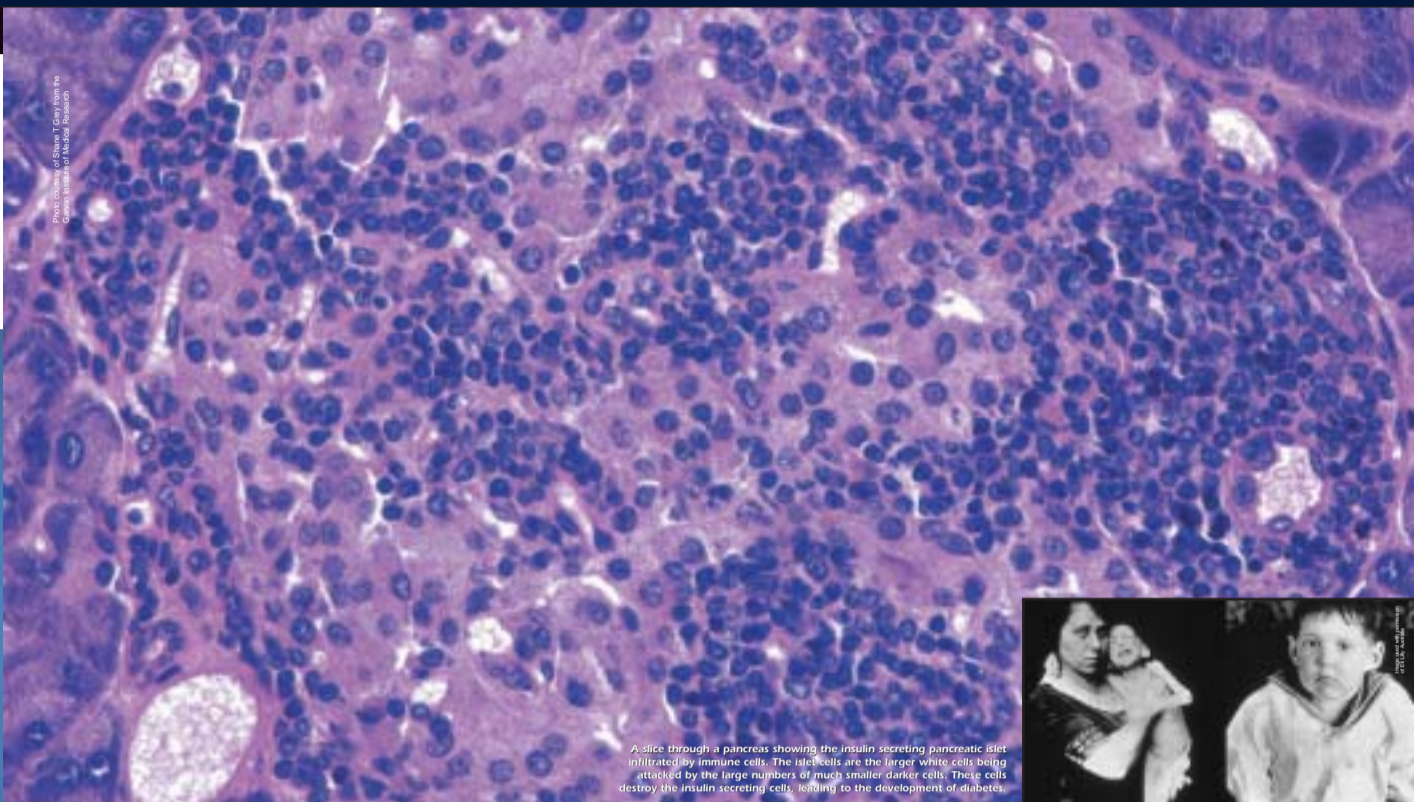


# Inspired by insulin

Injecting insulin is a daily routine for many



Without injecting insulin, people with diabetes are unable to convert the food they eat into energy. Their bodies **cannot produce insulin**, the hormone that transports glucose from the blood into body cells.<sup>1</sup>

To treat diabetes, insulin used to be sourced from the pancreas glands of pigs and cows. Some patients had an immune reaction to animal insulin so researchers looked to other methods.

## EUREKA!

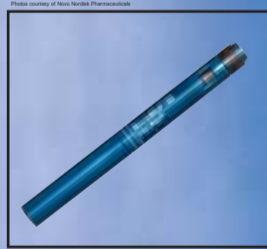


Biochemist John Shine provided the vital step in 1975 by **cloning** the first human hormone gene.<sup>2</sup> Since genes act as a blueprint, the **human gene** could be inserted into bacteria which act as living factories, producing unlimited amounts of the human protein in a biologically active form.

This technique was used to produce insulin, as well as many other human proteins such as human growth hormone, immune molecules for treating cancer and enzymes to dissolve blood clots after heart attacks.

### WHAT NEXT?

Stem cell research is one avenue for therapy. Stem cells can be programmed to turn into any cell in the body, including the islet cells that make insulin. One day these may be injected into the patient to replace the defective cells.<sup>3</sup>



Then and now. Injecting devices have certainly changed over time. From 1925, to the 1970s and the pen-like delivery system used today.

Photo courtesy of Novo Nordisk Pharmaceuticals

1. Diabetes Australia ([www.diabetesaustralia.com.au](http://www.diabetesaustralia.com.au)).  
 2. Shine, J et al. (1977). Construction and analysis of recombinant DNA for human chorionic somatomammotropin. *Nature*, 270, 494-499.  
 3. Juvenile Diabetes Research Foundation International ([www.jdrf.org](http://www.jdrf.org)).