



*Professor Pertti Törmälä believes biodegradable implants have market potential in the billions of euros.*

Photo Ari Ijäs

Biodegradable  
materials research  
generated a new  
branch of industry

**IN LATE 1984**, six years of research culminated in a biodegradable pin – a small cylinder-shaped rod – being used for the first time anywhere in the world to treat a broken bone. The invention was based on work ►

- conducted at Tampere University of Technology under the leadership of Professor **Pertti Törmälä**. The industrial manufacture of implants began in Tampere the following year. “As an idea, biodegradable material was a solution from a researcher with limited financial resources,” explains Professor Törmälä. The original aim had been to replace the metal nails used to surgically fix broken bones with other materials. The first object of research was a bone cement reinforced with carbon fibre. This would, however, have led to an expensive clinical follow-up of some 10 to 15 years. “The thinking was that if the product would dissolve in the body in

two or three years, there would be no need to worry about long-term follow-up.”

Another idea that accelerated development concerned the utilization of an established surgical suture that dissolves in the body as the raw material.

The first technical breakthrough was a sintering technique that yielded extremely strong and tough rods.

“By pressing threads together under high pressure while near melting point, we got them to adhere to each other and achieved a world strength record which to date hasn’t been beaten when a pure polymer is used,” Pertti Törmälä describes.

The aim of the development was to increase the well-being of patients. Initially this meant avoiding surgical removal of the metal implant. Very soon it was detected that the new materials also led to faster ossification. In addition, implants could be moulded into more purposeful shapes when removal was no longer an issue in their design.

### Only genuine novelties can enter the market

Tissue technology and the research and industrial manufacture of biodegradable implants are now firmly established in Tampere. In

Pertti Törmälä’s estimate, research activities by industry won’t grow in quantity in the near future, but industrial production and exports will grow due to a potential market worth billions.

Having the finished product isn’t enough; it also has to be sold to customers.

“I believe it isn’t possible to enter the world market in this field if you don’t offer something really new,” Pertti Törmälä says.

Current trends in the field relate to mechanically active implants, drug releasing implants and osteoactive implants. Memory materials are among the novelties now under development. Implants made of memory materials can be inserted in place through a small incision while ‘curled up’. They revert to their original form in the body, opening up and locking into place. Drug releasing implants shorten patient recovery times by releasing substances around them such as antibiotics. Osteoactive implants accelerate the growth of bone cells.

The next leading-edge product from Tampere might be the world’s first antibiotic-releasing biodegradable implant. Tampere-based company Bioretec hopes to gain a sales licence for this implant before the end of 2009.