TOP DUTCH

A good place to be great

MEDTECH TOOLKIT

From head to toe with TopDutch's MedTech toolkit

Prevention is always better than cure, but when an artery becomes blocked, the liver stops working, a jaw is broken or an eye no longer sees, we are increasingly able to 'repair' this with medical technologies and medical devices or smart materials. The strong and vital MedTech sector in the TopDutch region is in the global vanguard of ground-breaking medical technology.

FROM HEAD TO TOE WITH TOPDUTCH'S MEDTECH TOOLKIT

It is not surprising that the TopDutch region is so strong in developing highly innovative solutions for medical technology. First of all, there is a continuous demand for innovation. In the Netherlands, with one of the best healthcare systems in the world, doctors quickly look across the borders to explore the current options. This pioneering attitude is shared by the doctors of the University Medical Center in Groningen, which is one of the top medical centers in the world. They are working actively with companies and researchers in the region to explore new opportunities for medical technology.

The MedTech companies in the north of the Netherlands also have easy access to world-class knowledge. Besides medical and pharmaceutical knowledge, the region also has highly developed chemical knowledge and materials engineering. The research group of Nobel-prize winning chemist Ben Feringa has a long-standing tradition in developing innovative materials. The ground-breaking innovations tend to come from the interfaces between the disciplines.

The road from idea to introduction in the market is often long and complicated for medical-technology applications. The TopDutch region has all the prerequisites for completing this process as quickly and efficiently as possible. Access to state-of-the-art facilities, such as the laboratories of the Zernike Institute for Advances Materials (ZIAM) and Innolab Chemie. The mentality of cooperation, as reflected in the networks of LifeCooperative and Health Hub Roden. Support from regional governments and investors. Not to mention the constant flow of talent that comes from the educational institutes with a strong work ethos, suitable skills and an entrepreneurial attitude. That is why TopDutch is a region with a flourishing, ground-breaking MedTech sector with a global impact.


DONORASSIST
PUMP UNIT
ORGAN ASSIST
FLOW L/min
TEMPERATURE °C
POWER
ALARM
HEAT
ORGAN ASSIST
DONORASSIST
THERMO UNIT
POWER

1.

BLOOD VESSELS: BIGGEST INNOVATIONS REACHING THE SMALLEST ARTERIES

Health Hub Roden is one of the places in the north of the Netherlands where medical technology flourishes. Knowledge institutes and governments work closely together with businesses on world-class medical technology. IMDS, or Interventional Medical Device Solutions in full, is one of those companies with roots in the region and a global sales market.

'We develop the materials, the technology, and the processes and devices for making our products.'

Edwin Schulting, CEO of IMDS

‘With this catheter a doctor can remove blockages in the smallest blood vessels in and around the heart.’ Jan de Vries, Head of Research and Development at IMDS, points to a minuscule thin tube in a glass display cabinet. When an artery in or around the heart becomes blocked, part of the heart receives less oxygen and works less well. This is a common occurrence - cardiovascular diseases are the most common diseases in the Western world. Doctors can remove the accumulated fibrous and fatty material by inserting a balloon into the vessel with a catheter to push the dirt away. Or to insert a stent to keep the blood vessel open. The catheters that doctors have been using for decades are significantly bigger than those in the IMDS display cabinet.

Jan De Vries continued ‘We are always pushing the boundaries at IMDS. We want to solve the difficult cases that we cannot reach at the moment.’ That means the catheters need to go deeper into the vessel system, where the vessels become smaller and the walls thinner. ‘We are doing everything we can to make thinner catheters that are flexible, strong and easy to control’, said IMDS CEO Edwin Schulting. ‘And that is going well, we can work with an accuracy of one hundredth of a millimeter and that level of precision is unknown anywhere in the world.’

Global success from the Northern Netherlands

The showpiece in the IMDS display cabinet is the catheter with two exit ports. ‘Our ReCross is a surefire hit’, laughed Jan De Vries. ‘It seems simple, an extra exit port and another wire, but try that with those small dimensions. The doctors who are using it really like it. It’s as if they are working with two hands, when they could only use one hand for years.’

Keeping everything in house is the key to IMDS’ global success, according to Edwin Schulting, CEO of IMDS. ‘We develop the materials, the technology, and the processes and devices for making our products. We’re really a technology company, with mechanical engineers, electrical engineers, software developers and material engineers in service. Fortunately we have great courses in the region and it is easy to attract people from all over the world. They enjoy living here and the lively MedTech sector presents plenty of career opportunities.’

2.

ORGANS: MORE AND BETTER ORGANS FOR TRANSPLANTS

One of the great medical miracles of the 20th century was the development of organ transplants. The problem is, however, there is often a limited supply of organs available transplant. Public health campaigns will increase the number of people becoming donors, but often the organs we do have are not able to be used due to their rapidly diminishing condition outside of the body. That is where Organ Assist come in.

It's no wonder that OrganAssist was created in the TopDutch region. Since the first transplants half a century ago, the University Medical Center in Groningen has been at the forefront of transplant medicine and it still is. The UMCG performs every possible type of transplant, which is unique in the Netherlands and rare at a global level. Since a few years ago, that has been happening with the Organ Preservation Room developed by OrganAssist, 'a special operating theater where all the organ treatments take place, all equipped with our machines', explained Arjan Van der Plaats.

'A special operating theater where all the organ treatments take place, all equipped with our machines'

Arjan van der Plaats, Chief Technology Officer of Organ Assist

Arjan van der Plaats is at the cradle of developing those machines. In most places in the world, organs that have been removed are put on ice in a bag with a special storage fluid and then they are transported to the recipient as quickly as possible. OrganAssist developed a machine that pumps storage fluid through the organ during the transport. Damage to the organ is prevented by cooling the fluid and giving it extra oxygen. More to the point, the so-called 'cold perfusion' can actually improve the quality of the organs.

Arjan van der Plaats with an Organ Assist machine

OrganAssist also developed machines for warm perfusion. They mimic the body by pumping a warm blood-like fluid through a kidney, liver or lung. In that machine a doctor can test the operation of the donated organ. Does a lung put enough oxygen in the blood? Does the urine production in

Product: Donor Assist
Company: Organ Assist Products B.V.

a kidney work properly? 'With this technology we have managed to save a lot or organs that had been rejected on paper, for example because the donor smoked or was too old', continued Arjan van der Plaats. 'Half of the rejected lungs we tested, we were able to transplant.'

Cooperation is key

OrganAssist developed the perfusion machines in close cooperation with the physician-researchers of the UMCG. 'We just walk in and out. Those short lines of communication are essential when you want to develop products you can actually use. The same goes for good suppliers here in the region and support from the regional government.' By now the machines are all around the world and have perfused more than 1,200 organs.

'Short lines of communication are essential when you want to develop products you can actually use.'

Arjan van der Plaats, Chief Technology Officer of Organ Assist

Perfusion technology offers many more possibilities, commented Arjan van der Plaats. Together with doctors in Birmingham, UK, OrganAssist managed to remove fat from livers by adding medication during the warm perfusion. It made livers that were too fatty suitable for transplant. 'We are also thinking about ways in which a poorly performing organ could be improved within the body', said Arjan van der Plaats. 'You can look at it like we produced a car, as it were, and now we're looking where we can drive it to.'

3.

EYES: GLOBAL SUPPLIER OF INNOVATIVE LENSES

For 60 years, the TopDutch region has been a well-known destination for ophthalmologists from all over the world. Of all the lenses that are inserted in eyes all around the world, for example to deal with cataracts, around 60% comes from two companies in this region - Ophtec and Johnson& Johnson Vision. These companies are also the global center for innovations in so-called intraocular lenses.

The seed of both companies was planted by ophthalmologist Jan Worst from Stadskanaal, in the TopDutch region, who was one of the first in the world to implant artificial lenses in eyes. 'That was revolutionary back in those days. By replacing somebody's lens that has been clouded by cataracts with an artificial lens, this person could see better. My father became an example for ophthalmologists from the Netherlands and abroad. My mother structured the situation by starting up a business', remembered Ophtec Director Erik-Jan Worst. That first company generated Ophtec and, following a number of acquisitions, Johnson & Johnson Vision.

'We develop the materials and the lens, but also the operating technique and the production line.'

Eric-Jan Worst, Director of Ophtec

Interdisciplinary innovation

The urge to innovate remained. 'We used to make lenses of hard plastic that was also used for bus shelters. Now our lenses are made of much softer material. We roll them up and after inserting they unroll in the eye. It means you need a much smaller incision', explained Erik-Jan Worst. The multifocal lens is an even more recent development. With an artificial lens, accommodation- the ability to have focus at any distance- is no longer possible. Once you have been operated for cataracts, you can focus at one distance and you will need glasses for reading for example. In a multifocal lens, the optical part has been divided into parts to make sure you have clear focus close-up, at a distance and in between.

‘Soon we will be inserting multifocal lenses in people who don’t have cataracts. We leave their own lens and add a corrective multifocal lens as a substitute for glasses’, predicted Erik-Jan Worst. ‘Ophthalmologists are really interested in this technology as an addition to laser treatment. Laser treatment is not possible at higher strengths and it is irreversible, what you laser away from the cornea cannot come back. A lens you insert in an eye, can be removed too.’

The company works on such innovations in the Ophtec Innovation Center that was opened last year. ‘The innovation center is right next to our own clinic, so developers can hear what ophthalmologist need first hand’, said Erik-Jan Worst. ‘We develop the materials and the lens, but also the operating technique and the production line. We train ophthalmologists from all over the world.’

4.

TISSUE: REPAIR WITH SOLUBLE POLYMERS

Twenty years ago, Polyganics started, as a spin-off of the University of Groningen, with a stack of patents on advanced materials and technology. By intelligently combining these ingredients, they are able to develop products for repair in the body that then dissolve automatically.

The NasoPore for example, which keeps the nasal cavity open after a sinus operation and dissolves in two to three weeks. This is much more comfortable than the standard alternative, which are non-soluble dressings. Those grow into the wound, and it is extremely painful when they are removed from the nose. Rudy Mareel, Director of Polyganics, explains 'By now we have sold five million NasoPores in Europe, China and the United States. If you were to put them one behind the other, you would get from here to Paris.'

Rapid product development

The company uses the patented bioresorbable polymers - materials that are broken down in the body - to make advanced tubes for repairing damaged nerves. Then there are internal 'plasters' to prevent fluid leaking into the body, the Liquoseal. This Liquoseal produces watertight dural closure after brain surgery. 'Without a plaster there may be leakage of cerebrospinal fluid, which can produce infections', explained Rudy Mareel. 'We believe we will have a license for the European market shortly. The route from idea to market license took five years, which is extremely quick in the world of medical technology. You have to use a whole series of tests to prove that your product is safe and effective. We can achieve that so quickly, because we in the company and in the region really know the rules of the game.'

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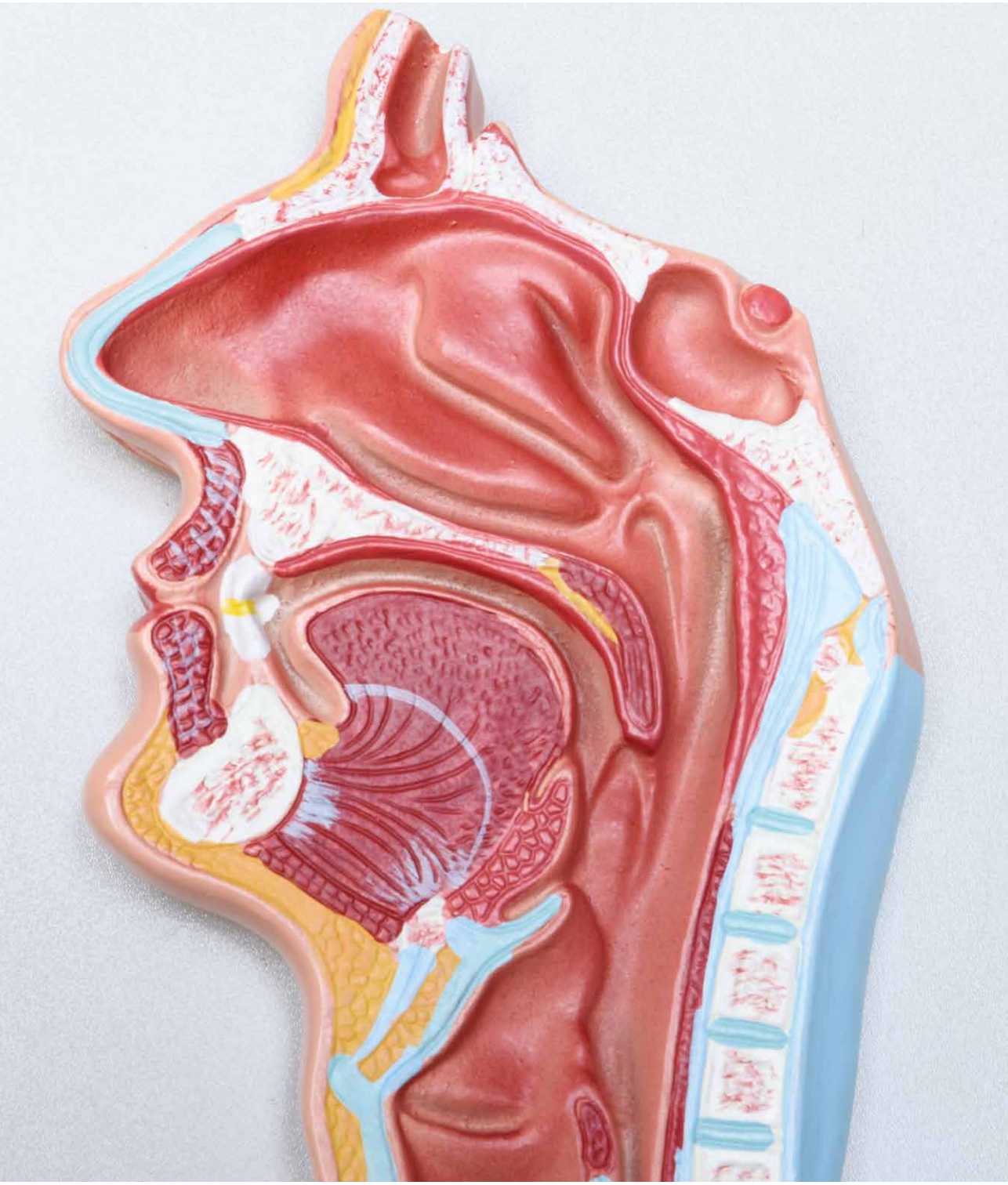
Rudy Mareel, Director of Polyganics

One-stop shop for innovation

After developing NasoPore, Polyganics sold the license to the multinational Stryker and continued producing the bioresorbable nose dressings on the instructions of Stryker. 'That is also how we aim to market our other products', said Rudy Mareel. In order to achieve that, Polyganics will have to expand significantly. 'As it is we don't have enough space to manufacture the NasoPore. So we're building a new premises at Campus Groningen, near the knowledge institutes and the other high-innovation companies. It means we have everything under one roof- the R&D lab, the offices and production. That synergy is essential to developing advanced products.'



5.

BONES: A NEW CUSTOMIZED JAW

Having a piece of jaw removed in order to reconstruct the jaw in situ with pieces of fibula. In most hospitals that is the standard way of repairing a jaw. However, the jaw surgeons of the University Medical Center Groningen (UMCG) rarely have to do it. In the 3D lab of the UMCG, nearly all jaw operations are now prepared meticulously with 3D technology.

Joep Kraeima, Coordinator 3D Lab, UMCG, explains their technique. ‘First we produce a virtual operation plan, where we determine extremely precisely how much bone needs to be removed. If there is a tumor, it needs to be removed completely, but you don’t want to remove too much bone’, In that lab, which is a room full of computers, the implants are designed. And the templates used by the surgeon during the operation to determine where he needs to saw and where the holes for the screws should be.

‘The patients recover quicker: The operation’s shorter and there’s less blood loss.’

With a 3D printer the templates and implants are printed exactly to size, either in the UMCG or by companies nearby. Witec, a company that also makes parts for fighter jets and computer chips, prints or grinds the titanium jaw implants. Accurate to a micrometer. As the operation is prepared with that level of detail and the implants are made precisely to measure, the surgeon has little DIY to do in situ, explained Joep Kraeima. 'The patients tend to recover more quickly, because the operation is shorter and there is less blood loss.' The results are better too. Sometimes, the patient is part of the decision-making process about a jaw reconstruction by showing the possible results with virtual reality glasses.'

'We are always able to innovate and to produce those products with a demand.'

Joep Kraeima, Coordinator 3D Lab, UMCG

Although jaw surgeons were the first to use the 3D technology and are still the main users, more and more other doctors are showing an interest. For trauma surgery, the 3D lab and Witec produce titanium plates for the precise reconstruction of a strong pelvis. Orthopedic surgeons have meanwhile given two patients a printed lower leg. 'We have printed a structure that resists forces properly, and where new bone can regrow. As we have a lot of contact with doctors and patients and with highly specialized companies in the region, we are always able to innovate and to produce those products with a demand.'

6.

DRUG DELIVERY: MEDICATION IN A SMART COAT

'We make smart coats for the medication from the future.' Jan Hendriks, Director of Innocore, is referring to **coatings for proteins and peptides** that are used increasingly often as medication.
'Those products have one disadvantage, and that is an advantage for us, they cannot be swallowed. Stomach acid would diminish their effectiveness. They need to be injected, but you don't want to do that too often either.
We **package the products in advanced polymers**, which means they are released slowly in the body.'

For synthetic medication, this 'polymer packaging' existed already. However, organic medication does not resist acid, heat or friction, so a new polymer needed to be developed and a new method for packaging the products. Innocore managed to do both. 'In the north of the Netherlands there is a lot of knowledge of polymers and pharmacy. There are various players who operate at this interface and we often work together. This has created an infrastructure, with labs and financing instruments, where we can test and market innovations quickly and with success.'

Treatment for macular degeneration is one of the innovations that Innocore and a large American pharmaceuticals company are working on. This eye disease, which affects a lot of older people, means that eyesight deteriorates slowly. This cannot be repaired yet, but there is a product that can stop the deterioration. That product needs to be injected in the eye every four weeks.

'Here there's an infrastructure, with labs and financing instruments, where we can test and market innovations quickly and with success.'

Jan Hendriks, Director of Innocore

Jan Hendriks continued ‘With our polymers and our technology, it is possible to make the exact right size balls for packaging the medication and then you only need an injection twice a year. That is much more comfortable for the patient and it reduces the chance of infection or hitting a vein.’

Based on the same technology, Innocore also works on a completely different range of medication. For psychiatric patients for example, for whom it may be an issue to take medication regularly every day. Or for the world’s poorest and most vulnerable women. With support from the Bill & Melinda Gates Foundation, Innocore made an contraceptive plaster. Innocore uses biodegradable polymers to develop microneedles that enter the skin painlessly and administer contraceptives slowly to ensure these women are protected for six months.

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Are you interested in exploring what your business possibilities could be? Connect with Gerard Lenstra, our Life Science & Health expert.

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