LIFE SCIENCES & HEALTH 010

Nr. 3 | 2018

Collaborate in the sector
'A healthy weight is not a simple matter'

Beating heart of thorax care
National and international forerunner

Invented010
Healthcare robot as dance partner

Rotterdam Undiscovered
Conquering Europe from Rotterdam

EDITORIAL

Life Sciences & Health is one of the most important sectors for Rotterdam. As one of the largest employers and economic drivers in the region, with a strong focus on innovation. Tens of thousands of Rotterdam residents work together for an increasingly healthy city. Their commitment is evident in all articles in this Life Sciences & Health 010 magazine. For example, Prof. Liesbeth van Rossum explains on page 28 how Rotterdam residents are successfully tackling their excess weight with the help of the Obesity Clinic. But they are primarily developing a healthy lifestyle and sticking to it. The medical students Wilma Oosthoek and Jan-Willem Kruijt emphasise the importance of prevention and a healthy lifestyle in this article about collaboration to make the city a healthier place. It's hardly a coincidence that their foundation, Student & Nutrition, was established in Rotterdam and has now expanded nationwide. Life Sciences & Health is booming in 010 and has an active start-up-community. With Invented010 we had already proved that Rotterdam is a fertile place for young researchers and entrepreneurs with a focus on healthcare. In this magazine we describe four Rotterdam inventions which have the potential to address global problems. These are innovations to be proud of, and we are equally delighted with the boost given to our sector by the Life Sciences & Health Hub in the Rotterdam Science Tower so soon after its opening.
Life Sciences & Health is developing rapidly in Rotterdam. Under the guidance of the Erasmus MC, Life Sciences & Health are developing rapidly in Rotterdam. And that is absolutely necessary and will remain so, as confirmed by the desperation Prof. Casper van Eijck encounters in his pancreatic cancer patients. But there is hope. The professor of surgery explains on page 36 together with Prof. Ron Fouchier, professor of molecular virology, how a revolutionary treatment with viruses will put a stop to the hopeless fate these patients face. The vast majority of people in our sector work outside the spotlights. We would like to introduce them to you. We trust that their drive and the other stories in the magazine will inspire you to continue contributing to improving healthcare.

INDEX

What's up in LS&H010?

1 LARGEST ONCOLOGICAL CENTRE IN THE NETHERLANDS

In recent years, the Erasmus MC Cancer Institute has grown into the largest oncological centre in the Netherlands. Firstly all the Erasmus MC's cancer-related activities were combined together under one name, then from May 18 this year, patient care, research and education in this area will also be found under the same roof in the new buildings of the university medical centre. 'We say goodbye to our treasured location Daniel den Hoed, but in this way, we can make results from scientific research more rapidly applicable in practice,' says prof. Pieter Sonneveld. 'This will allow our patients to have quicker access to new medicines and other innovations. This will help us hugely in our goal: better cancer care, now and in the future.' *Want to know more? Visit Erasmusmc.nl/kankerinstituut/*

2 BUILDING BRIDGES IN ROTTERDAM

In order to pilot the Erasmus MC into a new phase, prof. dr. Ernst Kuipers, Executive Chair of the University Medical Centre, has been proclaimed Care Manager of the Year 2017. Positive results, control of the ICT and the new building earned Kuipers this acclaim. 'Ernst Kuipers displays a particular blend of modesty, principles and resolve,' said jury chair André Rouvoet during the granting of the associated Care Vision Excellence Award. 'He has a calm yet direct management style, is approachable and gives people space. At the same time, he can involve people in his future vision, for example when it concerns the position and added value of the hospital in care networks. And he knows how to break through deadlocks. In this he can use the reputation he has built up as a scientist and doctor.'

3 #DURFTEZEGGEN

Anyone who wants to know the way in Dutch healthcare finds the route in the Dutch language. Many Rotterdam people can communicate with their doctor in writing, but 80,000 to 95,000 less literate adults in the city still leave the consulting room too often with answers from the doctor that, despite nodding in agreement, they can do little with. 'I always threw the package leaflets away, because I just couldn't read them,' says 59-year-old Ria, one of the faces of the #Durftezeggen (Dare to Speak) campaign that Rotterdam Municipality together with the Yes We Care foundation started at the end of last year. The purpose of the campaign is to break through the taboo on low literacy and increase the language skills of those with low literacy. Primary care providers are made aware of the negative impact of (hidden) language barriers on the health and lives of their patients. Also, they are encouraged to refer patients to practical, care-oriented language courses in the district. Luis (51), from Portugal, who dared to say he did not understand his doctor, is already reaping the reward from such a course. 'Now that I can read, speak and write better, it's easier to understand my doctor,' he says in one of the campaign videos. 'When she tells me something, I can just write it down at the time and read it over later.' *Want to know more? Visit Rotterdam.nl/taal.*

4 LS&H010 ON THE GLOBAL MAP

Rotterdam is an attractive city for companies with international ambitions in the life sciences & health sector. To promote the potential of its business climate globally, Life Sciences & Health 010 works together with Rotterdam Partners, a foundation partly funded by the municipality with a strong track record in city marketing and international acquisition of investors and company's. And collaboration is regularly sought with the regional investment company Innovation Quarter. One of the aims is to help realise the international ambitions of companies in the Rotterdam region and attract international companies and investment to the city and the region. A focus is also laid on attracting major scientific conferences and corporate events, like World of Health Care. This annual international conference on global health trends and challenges takes place on September 27 2018 in Rotterdam. *Want to know more? Visit Rotterdampartners.nl and Wohc.nl.*

5 COMMON SENSE FOR E-HEALTH
No fewer than one thousand Rotterdam people are combining their common sense to make e-health and home technology available to even more of their fellow city-dwellers. Better access to and use of e-health and home technology is essential to make Rotterdam people's life and work in the city more healthy and vital in the coming years. These thousand Rotterdam people's involvement and participation is part of the recently-launched Rotterdam eHealth Agenda. The Agenda is led by the Rotterdam entrepreneurs Jan Willem Faessen (co-founder eHealthCompany) and Jan Pons (Logoclicks.nl). Over a hundred events and campaigns are being organisedin 2018 and 2019 to put e-health in Rotterdam on the map. *Want to know more? Visit Lifesciencesandhealth010.nl*

6 GUIDE IN BURN INJURY CARE
The Maasstad Hospital takes the lead in Europe when it comes to burn injury care. Last year the Rotterdam Burn Injuries Centre bundled its strengths with the burn injuries centres in Beverwijk and Groningen into the new organisation Burn Injury Care Netherlands, so that acute care for adults and children with serious burn injuries is structured and thus guaranteed throughout the whole country. 'In this way we are able at any time to upscale and react to a major burn injuries incident, for example an attack,' said dr. Kees van der Vlies, Head of Rotterdam Burn Injuries Centre, at the start of the collaboration. 'Equally we're also ready 24 hours a day to give that one child with burn injuries the best treatment.' The burn injury care at the Maasstad Hospital meets the highest European quality requirements. For upscaling in case of emergency, agreements have been made with the Erasmus MC, with which there is also research collaboration. The three Dutch burn injuries centres' new approach has been described by the European Burns Association as an exemplary way of working. *Want to know more? Visit Maasstadziekenhuis.nl/english/the-burn-centre-at-maasstad-hospital/*

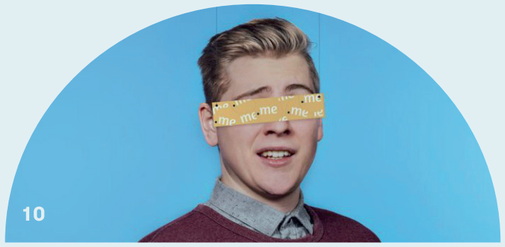
7 TITLE OF HONOUR AND SUPPORT
Not the striker who shot Feyenoord back into the championship after 18 years, nor the coach who assembled a winning side, but the national champions' club doctor was Rotterdam Person of the Year 2017. prof. dr. Casper van Eijck – who does weekend duty on Feyenoord's bench – received this title of honour from the Our Rotterdam foundation for his distinguished research into a new approach to pancreatic cancer. He considers it is time to move away from the known therapies that are still offering little solace after a good quarter of a century. 'I am convinced that, with viro-immunotherapy, we can allow the body itself to do battle against malignant cancer cells: increase resistance and let the body itself clear up the cancer cells.' Van Eijck lent his name to Support Casper, a foundation that raises funds to make research possible. Read an extensive interview with Van Eijck starting on page 36.

8 MORE COMPLETE, PURER, MORE OBJECTIVE
Rotterdam is aging, and among the elderly are ever more Rotterdam people from a non-Western background. 'It was long thought that labour migrants who came to the Netherlands in the sixties and seventies would go back to their countries of birth when they were older,' says dr. Janne Papma, Coordinator of the Erasmus MC Alzheimer's Centre. 'But these people want to grow old near to their children and grandchildren, here, in the city. Due to the aging of the first generation of non-Western migrants – and the associated increasing risk of dementia – we are now seeing them ever more often in our consulting room.' The Erasmus MC acted on this development two years ago with the opening of the Migrant Outpatients Clinic, with the Maasstad Hospital in the meantime as a second site. Papma: 'Because our test methods completely failed to tie up with the perception of these elderly people, who have often had no or little education, and from their cultural viewpoint see care and dementia differently.
Language – essential for diagnosis – was also often a problem. Word choice and sentence structure can betray dementia. But answers to doctors' questions were often reduced to 'yes' or 'no' by the children doing the interpreting. Developing new, adequate test methods is one of our challenges, but we have already removed the language barrier with the Migrant Outpatient Clinic. Trained medical students with a migrant background interpret, so that the translation is more complete, purer and more objective. This enables better dementia diagnosis.' *Want to know more? Visit Erasmusmc.nl/alzheimercentrum*

9 DONATED TO SCIENCE
At Hofwijk Cemetery, on the edge of Rotterdam-Overschie, there is a place of honour for people who donated their bodies to science. The relatives of the seventy to one hundred men and women who leave their bodies to the Erasmus MC for research and education annually, have, for the last eighteen months, been able to visit a monument in serpentine and glass designed by artist Wim ter Steege. With the unveiling by Mayor Ahmed Aboutaleb, a long-cherished wish was fulfilled. The memorial monument gives relatives the opportunity to keep the memory of their loved one alive in a physical place. The memorial monument exists alongside an annual gathering for relatives at the Erasmus MC, at which the names of people who have donated their bodies in the past year are read out and written down in a memorial book.

10 A QUICK TEST AND THEN GO ON
Catching an STD is often free, but having yourself tested for one by the GP or at the municipal health centre can tax the wallet. Questionnaires, waiting for weeks for the result and often a big bite out of your premium excess. This could be different, Hubert Mooren thought. He set up Testalize.me in Rotterdam, and since the end of 2015 he has been offering anonymous, inexpensive STD tests. 'People buy certainty from us,' says Mooren. 'An STD runs round in your head. You don't want to be walking around with the idea that something is wrong. Our test is delivered within one day and you already have the results after two days. Then it's a deep sigh of relief and on with your life, or get along to the GP.' Testalize.me works together in the Netherlands with a number of municipal health centres, dozens of pharmacists and with increasing numbers of GPs. They provide the test, and, in almost all medium to large towns and cities, customers of Testalize.me can also be treated anonymously. Mooren: 'Anyone who tests positive receives a list of doctors he or she can go to. Many people don't want an STD in their patient records. Meeting your neighbour in the waiting room can grate too. Anonymity proves to lower the barrier to treatment. So we make health gains.' *Want to know more? Visit Testalize.me*

11 A MILLION FOR BIG DATA
The Erasmus School of Health Policy & Management's has gained a powerful impulse from the European Horizon2020 subsidy of 1.1 million euros to research the use of big data in healthcare. In the BigMedilytics research project Rotterdam scientists compare big datasets from different medical institutes in several countries. They are working on making it possible to better forecast which patient will need which care at which time. This could yield substantial health gains, as it is emerging from research that tailoring treatment and medication to the individual patient benefits both patient and healthcare. *Visit Eur.nl/en/eshpm/research*



View on the sector

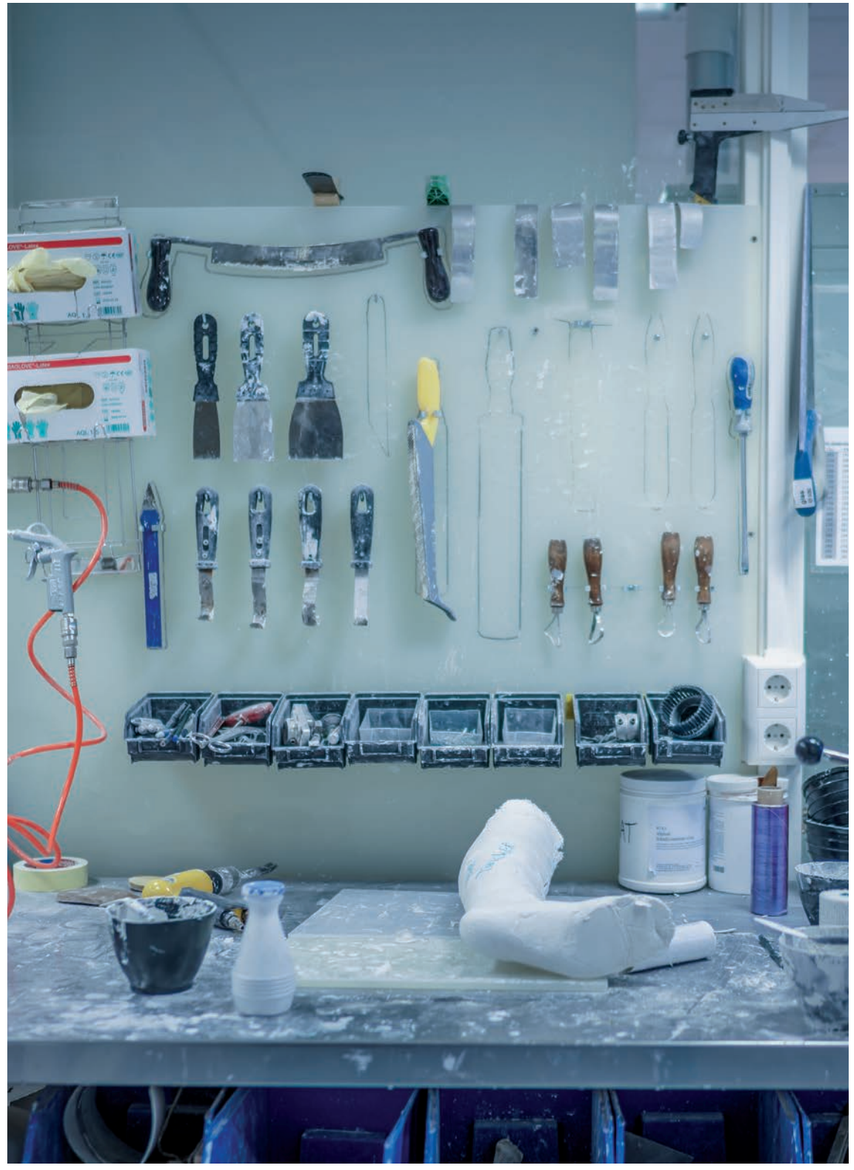
Take a look at three innovative LS&H010 organizations.

Beating heart of thorax care

Summer 2018 the Thorax Centre of the Erasmus MC will celebrate its fiftieth anniversary. This centre sees patients with conditions of the thorax, the chest (cavity). This includes the heart, lungs, the major blood vessels of the chest and the trachea. In 1984, the Dijkzigtziekenhuis – one of the predecessors of the Erasmus MC – was the first hospital in The Netherlands to perform heart transplants. The Erasmus MC Thorax Centre still leads the way and stands out nationally and internationally through its excellent patient care, scientific research and education.
Erasmusmc.nl/thoraxcentrum

Precision in proton treatment

The proton therapy of HollandPTC in Delft offers an entirely new means of radiation. The treatments, which are planned to start this year, are more precise than conventional radiotherapy and thus reduce the risk of serious adverse effects. This offers an opportunity to specific groups of cancer patients, for example those whose tumours are located close to vulnerable organs. With protons, a radiation dose can be precisely targeted in the tumour. The surrounding healthy tissue is spared to a greater extent. The quality of life for the patients can also be improved. HollandPTC is a MedicalData partnership between Erasmus MC, LUMC and TU Delft.
Hollandptc.nl



Frontrunner in prostheses

Rijndam Orthopedietechniek is the innovative medical equipment manufacturer within Rijndam Revalidatie, specialised in medical devices for the body such as prostheses and orthoses. The equipment makers develop made-to-measure solutions, from electronically controlled prosthetic knees and bionic prosthetic hands to sports devices with special blades. Rijndam Orthopedietechniek belongs to the international vanguard and helps put people into motion with its innovative techniques.
Rijndam.nl/orthopedietechniek

Rotterdam is known around the world for its unique, top scientific studies of long duration. The Rotterdam Study into the cause and effect of chronic diseases in ageing and Generation R (Next) into the development and health of growing children in Rotterdam are the most popular of these.

GENERATION R (NEXT)

duration of the study:
17+ years

in 2017 again
10.000 children

20 study leaders

study group max. age
18 years

127 scientific publications

82 PhD projects

The study started in 2001; almost 10,000 children were born and have been followed since then.

These children are currently around 15 years old and are invited to be examined once every four years. They are followed until they reach the age of 18.

Children from practically all ethnic groups in the Netherlands are participating. It has become increasingly clear that there are considerable differences in the growth, development and health of these groups.

Generation R is a scientific study that is unique in the world since considerable amounts of data about the children were already collected during pregnancy.

Generation R Next was started in mid-2017. This study starts even before pregnancy.

This study will ultimately facilitate the development of strategies for the promotion of the health and welfare of all children in the Netherlands.

ERGO/THE ROTTERDAM STUDY

duration of the study:
27+ years

13 study leaders

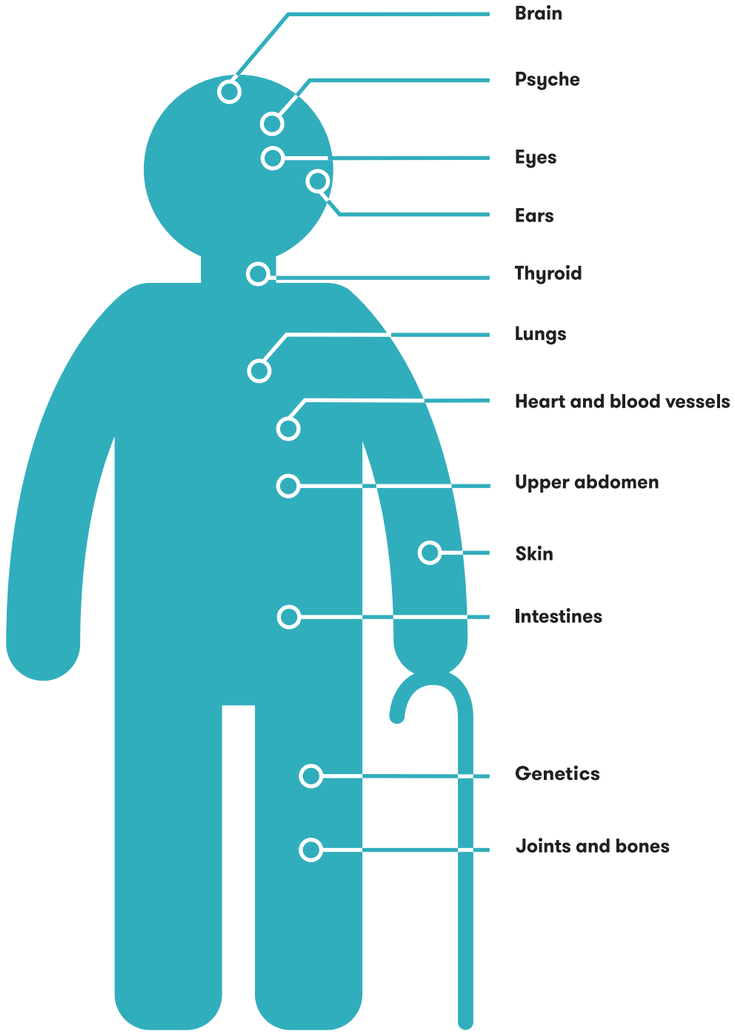
22.000 participants

From 2017: study group older than
40 years

Prof. Hofman Netherlands' most cited scientist

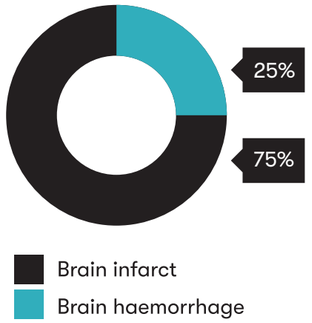
175 PhD projects

1,250 scientific publications



This study has taught us more about the relationship between health and habits and about genetics and their effect on health, development and growth.

STROKE



MICROBIOME

The intestinal microbiome (bacteria, fungi, unicellular organisms and viruses) accounts for 2 kg of an individual's body weight. This microbiome not only enables nutrition and resistance to disease, but appears to have a great effect on how our brains work, in the context of dementia, for example.

"Your intestines and your brain chatter away all day long"

New perspectives for treatment of head-neck cancer

To substantially increase both the chance of survival and the quality of life. The HyperCollar3D offers new perspectives to patients with head and neck cancer. This innovative equipment for thermal therapy, also called hyperthermia, has been developed at the Erasmus Medical Centre and is in service at the Daniel den Hoed site. Hard work is underway to prepare for batch production.

‘INTRODUCE MICROWAVE ENERGY, EXACTLY WHERE THE TUMOUR IS’

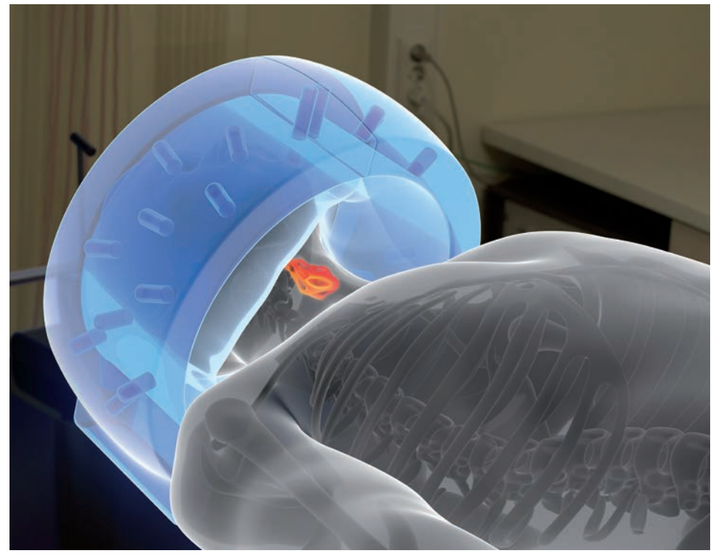
There is great international interest in the technique, developed by Prof. Gerard van Rhoon and Dr Maarten Paulides. Already, ten specialised cancer clinics all over the world want to start working with the HyperCollar3D. The marketing of the invention is being done by the Rotterdam bioscience company Sensius. As a spin-off from the Erasmus MC, the business possesses a licence on the knowledge.

CEO Paul van den Biggelaar: ‘Head and neck cancer is very complex. Using the traditional treatment methods, only four in ten patients survive to five years. With an early diagnosis, medication or a minor operation may be sufficient, but this type of tumour is often only discovered at a late stage. Unfortunately they then often display rapid proliferation, and in half the cases they also recur later. It has emerged in practice that if thermal therapy is added to the treatment, the cure percentage increases by fifty per cent. Also, there are no additional side effects such as the loss of teeth, or saliva glands no longer working, due to existing therapies with irradiation or chemo.’

Worldwide, head and neck cancer is detected in five hundred thousand people every year, with three thousand cases in the Netherlands. Van den Biggelaar: ‘We are talking here about the area from the eyes to the thyroid, so not the brain.’ He explains the operation of the HyperCollar3D based on a prototype that is in his lab. What the treating physician does is to introduce microwave energy, exactly where the tumour is. This heat kills malignant cancer cells, while leaving the surrounding healthy tissue undisturbed. This form of thermal therapy is unique. ‘This is why we are going full steam ahead with the development,’ reports Van den Biggelaar. ‘Our business plan is being refined and we are working on the proof of concept. We will use this to pitch our product to investors. We expect to have sufficient funding by mid-2018. It will be a form of seed funding. There’s no off-the-shelf product yet, through there is lots of potential. There’s also a lot of serious interest, though no solid customer orders as yet. This demands daring, and in our case certainly also a bit of idealism from the financiers.’

For the ‘proof of concept’ phase, Sensius received a loan of three hundred thousand euros from the UNIIQ Investment Fund, a consortium of the Erasmus MC, Delft University of Technology, Leiden University and the development association InnovationQuarter.

Once the funding process is complete, the HyperCollar3D’s actual development and production phase will follow. Van den Biggelaar expects that this will last another two years. ‘The existing equipment has come into existence by evolution in an academic environment, with a learning curve in its operation. For this reason, we’re doing the design process in close consultation with the future users: radio-oncologists, radio-technicians and nurses. We as a business learn from the practitioners, and they learn from each other.’



‘DESIGN PROCESS IN CLOSE COOPERATION WITH FUTURE USERS’

The production of the HyperCollar3D will take place in the Netherlands, at a company specialised in mechatronics. Before all this comes to pass, Sensius will grow from the current staff of five to ten people. Van den Biggelaar: ‘Rotterdam has an attractive entrepreneurial climate. The municipality supports us extensively in word and deed. We’re also happy to be based in the Rotterdam Science Tower, together with like-minded businesses.’

Sensius’s CEO is filled with confidence. ‘As a German doctor said to me: ‘This provides new perspectives for my patients. We’re just going to do it.’ She got a good feeling right away.’

Want to know more? Visit: Sensius.biz

Working on tests to treat melanoma

After the success introduction of the MMprofiler, a diagnostic test for bone marrow cancer, SkylineDx's new initiative is focusing on research into skin cancer. The Rotterdam biosciences company has started on the development of a test for better treatment of melanoma. Their partner in this is the prominent American Mayo Clinic in Rochester (Minnesota). 'Their scientists particularly wanted to collaborate with ours.'

'WE START WITH TWO HUNDRED IDEAS AND FINISH WITH ONE'

Skin cancer is the most prevalent type of cancer in white-skinned people. Melanoma is a malignant mole and an aggressive form of skin cancer. In the Netherlands, over seven thousand people develop this condition every year. Almost eight hundred patients die from it annually. CEO Dharminder Chahal of SkylineDx is happy with the collaboration with the Mayo Clinic. Extended preparation was needed to achieve this. He explains: 'We are researchers who really want to make a difference. For this reason, we follow a very thorough procedure so we can gauge whether ideas really have potential.'

First of all, the idea for a development must fit into SkylineDx's philosophy of personalised medicine. In other words, the right treatment at the right time for the right patient: completely bespoke work. Chahal: 'This is why we enter into discussion with respected universities and academic hospitals all over the world. Partly thanks to our connection with the Erasmus MC, from which our company is a spin-off, we can fairly easily gain access everywhere. In the last eighteen months, we have visited sixty such centres. In this, we checked whether they had access to patents and data that we could achieve something with. We do this with a large team of researchers, bioinformatics people and business developers. This grand tour yielded two hundred ideas for diagnostic tests.'

From these two hundred, one hundred and twenty ideas have so far been analysed and described in one-pagers by the SkylineDx team. Chahal: 'Then we gradually go deeper into them. This is a well-defined process. It concerns things like the technology needed, investments and particularly: what can a clinician do with it? Thereafter we invested more time and energy in a few dozen ideas. This process results in comprehensive reports in which we 'haul in' much expertise. One team member concentrates intensively on each idea.

Of the ten ideas that remained, three received a due diligence investigation. 'In this phase, we do extensive data analyses in house. Also, we talk to scientists who could influence opinions on the problems concerned, the key opinion leaders. You need them on board. In this, we don't only want to hear positive noises, we're glad to hear criticism.' Finally the net will be drawn so tight that only one idea survives for SkylineDx to take into the development phase. 'The Mayo Clinic scientists are impressed with our approach to the MMprofiler. They think it's an excellent product and want to collaborate with us in developing a diagnostic test for skin cancer, and in particular melanoma.'

For competitive reasons, Chahal cannot yet reveal details about the diagnostic test for melanoma that is under development. 'What the Mayo Clinic already has available itself looks good. But in collaboration with them, we can make it even better: we're going to optimise it.'

SkylineDx will soon have thirty staff and is based in the Rotterdam Science Tower. Blood tests at molecular level are done in their own laboratory. With the Rotterdam Van Herk Group, the business has a long-term investor in biosciences as a shareholder. Chahal: 'Our developments are a long-winded question. What we do demands major investment and much time and energy. Always with the universal objective: better information for the doctor in order to arrive at a treatment purely tailored to the individual patient.'

Want to know more? Visit: Skylinedx.com

'WHAT WE DO DEMANDS MAJOR INVESTMENT AND MUCH TIME AND ENERGY, A LONG-WINDED QUESTION'

Wall of fame


Gerwin Vis


Olga van Kleef


Dulcy Santos


Carola Immerzeel-Goosens

Life Sciences & Health 010 is supported by people. Meet four professionals who passionately work on a healthier city, often low key.

Gerwin Vis
DISTRICT NURSE, AAFJE
CO-HOST, ZORGINNOVISIE-PODCAST

‘Healthcare is the work of human beings, robots will not be able to do this job. Innovations could lighten our work and make it more fun. Innovative technology and the right tools will result in more accessible healthcare. This is what the society needs to handle the increasing demand for care, but more importantly: to be aware of people who need more attention.’

Olga van Kleef
EXECUTIVE BOARD SECRETARY, IJSSELLAND HOSPITAL

‘Secretaries anonymous? Definitely not, you have to show yourself. Because we deal with the questions, our managers can focus on the main tasks. It is great to contribute to the smooth functioning of the hospital from behind the scenes. Or to give directions to a patient in the corridor trying to find the way. We manage a lot s and a little friendliness will get the best results’

Dulcy Santos
NURSE, THE ROTTERDAM EYE HOSPITAL
CHAIR, LONGA MÔ FOUNDATION

‘People look for healing, safety or at least clarity in a hospital. The eye sees, but also communicates. I want to provide care, warmth. Cape Verde has never left my thoughts in Rotterdam. This year will be the sixth time we go on an eye-saving mission. Together with Dutch ophthalmologists, we shall give people on our islands their view of the world back. I just have to help out with that’

Carola Immerzeel-Goosens
MANAGER OF INCUBATOR & LSH HUB, ERASMUS MC

‘Our scientists have brilliant ideas for better care. To get these ideas to our patients’ beds, entrepreneurship is needed. So we link our researchers to parties that can bring their innovations forward, or we set up a startup ourselves. Whatever’s needed to achieve an advance in health’

INVENTED 010

**INNOVATION TAKES LIFE SCIENCES & HEALTH 010 TO THE NEXT LEVEL.
FOUR LOCAL ROTTERDAM SOLUTIONS FOR GLOBAL PROBLEMS.**

REPULSIVE

Costly possessions need protection. Invi Bracelet provides a nonviolent form of self defence, inspired by one of the most effective techniques nature has given us. Skunks keep enemies away by releasing a repulsive scent in case of threat. Invi translated this method into a stylish bracelet, including an ampoule made of stainless steel containing a complex scent with notes of rot and sweaty feet. The scent is released by a pull on the bracelet – after simply deactivating the safety mechanism – and arouses deep disgust, working in conflict with sexual arousal. The repulsive yet harmless gas smell can literally make (sexual) attackers keep their distance, while conversely alerting bystanders. Wearers of the bracelet perceive a greater feeling of security. For men and women.
Invi.world

BREAKTHROUGH

The SaveBreak makes a break with a long history of cuts into the fingers of nurses, doctors, GPs and pharmacy assistants. In collaboration with the Erasmus MC, students of Rotterdam University of Applied Sciences invented a safe way of opening glass ampoules of 2 to 20 millilitres, without the risk of being cut. The banana-shaped ampoule breaker is made of a single piece of plastic, and is user-friendly and simple to clean. The SaveBreak meets hygiene standards.
Expected in 2018

DANCE PARTNER

Lea is the new best friend of the elderly. The care robot provides daily rhythm, warns when it is time to take medicines, and makes contact with family and care providers, and if things unexpectedly go wrong, with the emergency centre. Lea – Lean Empowering Assistant – monitors the elderly person's walking posture and warns of obstacles. She helps the elderly to remain fit, active and independent. The robot rollator – also usable for rehabilitation – provides autonomous support thanks to its algorithms. The newest techniques are integrated, and tailored in design and function to the wishes of the elderly and handicapped. Lea can also dance. A waltz, the samba, and if her partner wishes, the tango.
Sparkdesign.nl, Robotcaresystems.com

LISTENING EAR

The Erasmus MC is giving trainee ENT doctors the chance to practise drilling on 3D-printed inner ears. The plastic petrosal bones – with the same properties as human bone – are custom-made based on a CT scan, so that the degree of difficulty of milling a fixing slot a few millimetres long for a hearing aid can be increased during every practice period, and no longer depend on the supply of people who make their bodies available to science. The 3D-printed inner ears, volume around 4 cm3, are clicked into a workbench designed to resemble a human head. The red clown's nose is a joke by designer András Füzy. Human inner ears remain necessary to practise the entire operation on the skull.

Caring for a vital city 1/3

More than ten per cent of Rotterdam people work in the life sciences and health sector. Six professionals who met up tell about cooperating for a healthier city.

PROF. DR. LIESBETH VAN ROSSUM
Internist, Professor of Obesity and Stress, Head of Centre for Healthy Weight

MARIJE POOT-REYNDERS
Policy Officer Public Health, Gemeente Rotterdam

Liesbeth van Rossum and Marije Poot-Reynders do not want to leave people with obesity to just drift in the district. Luckily, the cooperation between the Centre for Healthy Weight and Rotterdam Municipality gained momentum in the year just past. 'Together, we are setting up a structure to allow our care to link up with the many good initiatives in the districts,' says Van Rossum. 'The Municipality's network is very valuable in this. As a hospital, we aren't so deeply rooted in the districts.'

The centre provides an eighteen-month intensive lifestyle programme on a small scale to Rotterdam people with severe obesity. For each person, the underlying factors that cause weight increase are looked at first, after which treatment by a psychologist, dietician and physiotherapist follows, and successfully.

Van Rossum: 'Within the foreseeable future, lifestyle interventions will be included in the basic package of the health insurance, and will thus become accessible to many more people. We, other doctors and GPs will soon be responsible for diagnosis and treatment advice, after which patients will preferably start to work on a healthy weight and a lifestyle to maintain it in their own district.'

Partly through Poot-Reynders' efforts, this connection with the district is developing ever further. The municipality gets back a health gain for its residents and knowledge in return. 'Municipal interventions in the field of obesity are usually targeted at healthy nutrition and more exercise. It's logical, this is the basis. But Liesbeth and her colleagues teach us to look further. Stress, lack of sleep and medicines for example can also act to increase weight. With the centre's knowledge, we improve our policy.'

'A HEALTHY WEIGHT IS NOT A SIMPLE MATTER FOR EVERYONE'

Poot-Reynders calls the cooperation with Van Rossum 'inspiring'. The municipal policy officer is happy that the doors to the Erasmus MC are open. 'Around half of all Rotterdam residents are overweight. I am impressed by the enthusiasm behind Liesbeth's efforts to combat this. She has such enormous drive, while at the same time you can hear compassion in her words when she is speaking about patients and explaining the bigger picture.'

Van Rossum was appointed last year as Professor of Obesity and Stress at the Erasmus MC. The title of her inaugural lecture was 'You're not fat for the fun of it'. 'Through research, we're bringing ever more hidden weight-increasing factors to light. With the municipality as partner, we can take better advantage of this in the city. This is necessary to reverse the increase in obesity. But to look in the mirror as a society is no bad thing either. A healthy weight is not a simple matter for everyone. Some people need help to develop and maintain a good lifestyle. We need to support people with obesity, not judge them.'

Want to know more?
Visit Centrumgezondgewicht.nl/en

2/3

WILMA OOSTHOEK
Founder and Chair of Dutch Student & Nutrition Foundation

JAN-WILLEM KRUIJT
Committee member of Dutch Student & Nutrition Foundation

Two years ago, at the fifth Doctor & Nutrition Congress, Wilma Oosthoek developed a yearning. The student of medicine inherently wanted to contribute to the mission outlined that day to get lifestyle as medicine into the doctor's consulting room. 'Before I knew it I had set up the Student & Nutrition Foundation,' says Oosthoek. 'Our medical studies are good, but we learn very little about nutrition and lifestyle.' Student & Nutrition argues for the inclusion of the subjects nutrition, lifestyle and productivity management into the six-year basic physician course. Until this is achieved, the foundation is itself organising an extra-curricular education programme on these themes. Oosthoek: 'We don't want to just tell a story, but also do something. So far, we are working with six of the eight medical faculties and are getting them into action. We're already in discussion with the Erasmus MC to expand the number of lectures on these subjects.'

Oosthoek does not conduct these discussions alone. Spread over the six local departments, there are now thirty medical students active for the foundation, including Jan-Willem Kruijt in Rotterdam. 'We clearly have a voice in the student world,' says the Bachelor of Medicine student in Rotterdam. 'It is a major help that Rotterdam Municipality is also making efforts towards learning a healthy lifestyle. Alteration of the medicine course is our main objective, while with the municipality we're already looking at secondary schools. Students who follow our extra education programme will possibly start as soon as this year on guest lessons for secondary schoolchildren.'

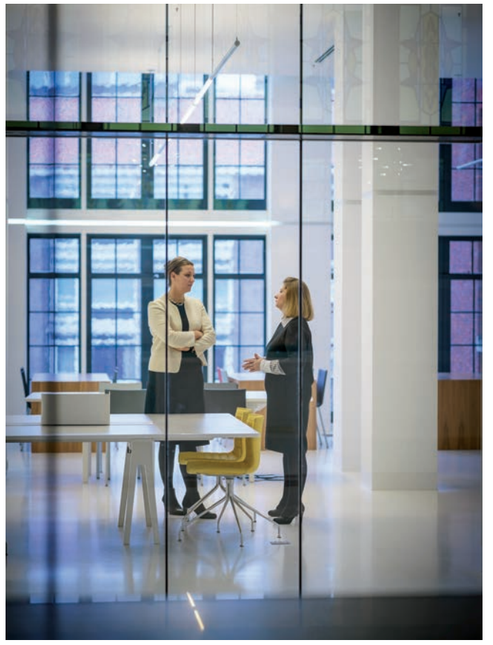
'OUR MEDICINE STUDIES ARE GOOD, BUT WE HARDLY LEARN ABOUT NUTRITION AND LIFESTYLE'

Oosthoek is happy that Student & Nutrition with its local committees is now rooted in almost all the cities with faculties of medicine. She herself is combining chairing the national committee with doing internships. 'Hard work, but what we're achieving together makes me grateful,' she says. 'In the Netherlands, illness is a revenue model. Almost everything is about treatment; there are few financial stimuli for prevention. We want to change this – and with the new generation of doctors we'll succeed.'

Lessons about productivity management must teach medical students what realistic goals are and how these can be achieved in a healthy way – during their study, and also afterwards. 'I don't want to become a doctor who, after working sixty or eighty hours in a week, is still standing next to a patient's bed,' says Kruijt. 'This is still often the culture now, but patients deserve a fit doctor. People see doctors as the no. 1 authority when it comes down to what is or isn't good for you. This is well and good, but it means we should also set a good example ourselves.'

Want to know more or take part? Visit Studentenvoeding.nl.

Wilma blogs: FoodFirst Coassistent (Facebook) and @foodfirstcoassistent (Instagram)



PROF. DR. SEMIHA DENKTAŞ,
professor of Health Psychology, academic director of Healthy'R

IR. CAROLINE GIEZEMAN,
manager Healthy'R, projectmanager LS&H Gemeente Rotterdam

Semiha Denktaş wants to adjust the automatic pilot of Rotterdam residents. That is necessary to make the city healthier. 'Much of human behaviour is automatic,' says the initiator of Healthy'R. 'We thought for a long time: If people only knew what was healthy for them, they would change their behaviour appropriately themselves. But that is not how it works. We especially have to make it easier for people to make healthier choices. And easier means that it must fit into our daily routine.'

With Healthy'R the municipality and Erasmus University are joining forces for a healthier Rotterdam. The new Rotterdam centre for behavioural research and development will help the city's residents to choose healthier behaviour. Denktaş: 'Creating a city where healthy choices are more widely available, without forbidding unhealthy choices, is the essence.'

Caroline Giezeman leads Healthy'R on behalf of the municipality. She feels that a healthy city begins at street level. 'What do people encounter? What does their life look like? We combine the knowledge of the street with scientific knowledge in this field of behaviour and health. On this basis, we develop and research measures, often small incentives (nudges), that will lead to healthy behaviour.'

Denktaş and Giezeman believe that small changes in the living environment of Rotterdam residents can help them make healthier choices. No smoking? Enough exercise and a healthy diet? Safe sex? 'Lifestyles can be adjusted,'

'HEALTHY'R IS WORKING ON A CITY WHERE HEALTHY CHOICES ARE EASILY AVAILABLE'

says Giezeman. 'As soon as healthier behavior becomes easier than unhealthy behavior. The positive effect of healthy food being offered in canteens and making smaller portions more attractive, has already been proven. We want to show that other adjustments can contribute to a healthier city. And gain more insight into what does not work, so we can stop doing things that have no impact.'

Healthy'R tests at least three measures each year via short, experimental studies. Denktaş, who scientifically supervises the studies, adds: 'This is a good way of examining what works well in behaviour modification. But this is not all. Because we also need to explore how we can make the effect of the measures sustainable. The last step is translating the knowledge gained into practice. We shall do that, too, by providing training in successful adjustments.'
Which measures to test and develop further – if proven successful – Healthy'R will determine in cooperation with the municipality, caregivers, companies and people on the street. Giezeman: 'So we can ultimately implement the best adjustments for the city and all its residents.'

From startup to global player in laboratory research

In only four years from 45 to 125 staff and 25% more floor area in the Rotterdam Science Tower. Viroclinics Biosciences already has access to over 4.500 square metres of laboratory space. This young company is a fast grower, and CEO Bob van Gemen expects this growth to continue.

Viroclinics Biosciences is what is called a specialised Contract Research Organization that conducts independent laboratory research. Clients include the world's top ten biopharmaceutical companies. This company tests antiviral medication and vaccines against flu, polio, hepatitis, MERS, RSV, SARS and Dengue fever. 'We are good at everything that has to do with respiratory tract infections,' states Van Gemen. Viroclinics conducts clinical tests on samples. These could be samples from the nose or throat of volunteers participating in clinical studies. In the last two years, Viroclinics has investigated no less than eighty thousand of these.

Van Gemen: 'We are also expanding our range of services to include more than laboratory investigation. We also look after part of the logistical concerns for our clients. Samples are vulnerable and the viruses in them are fragile. These are brought from all over the world to Rotterdam and it's always possible that something goes wrong. For this reason, we have 24/7 contact with specialised couriers and are ready to support them however may be needed to stabilise the samples, in case of any setback.'

According to Van Gemen, Viroclinics is in many ways unique. But at the same time, it has rapidly become a business just like many others. With a pressing need naturally for professionals and researchers for the lab, and also specialists in the fields of logistics, ICT, marketing and human resources. 'Then being based in a major city is a great advantage,' says Viroclinics' leading man. 'With the Erasmus University and Medical Centre, the port and the international business community, Rotterdam is ideal for us. You need an inspiring and dynamic work environment like this in order to find the right staff.'

The Rotterdam life sciences company has put together a highly international group of staff, with a good mix of youth and experience. This diversity makes Viroclinics attractive to many professionals. Van Gemen: 'It's also true that we make the work here challenging for all our staff. Not only for research, but also for example for our colleagues in general services, like the specialised cleaners. And further we are happy to participate in the education of young people. We have many placements available. It's often possible to offer people a job after their placement here.' To sum up, it's full steam ahead at Viroclinics, with no change expected. CEO Bob van Gemen: 'Viruses have the perpetual tendency to change, to pop up unexpectedly, to show up in other places due to climate change, and thus to form new threats, so we have enough on our hands. At the same time, we're seriously considering expanding into bacteriology. This would be a logical extension to our current laboratory activities.'

Want to know more? Viroclinics.com

'WE ALSO LOOK AFTER PART OF THE LOGISTICS FOR OUR CLIENTS'

Above: Ron Fouchier, down: Casper van Eijck

‘It is possible to treat pancreatic cancer effectively’

Professor Ron Fouchier is researching a ground-breaking treatment for pancreatic cancer using viruses. Professor Casper van Eijck’s patients cannot wait.

Casper van Eijck displays a rankings summary. The Professor of Surgery indicates with his finger how pancreatic cancer, his specialism, climbs higher every year in the tables of numbers of deceased cancer patients arranged by type. ‘Around three thousand people a year now die of this type in the Netherlands. If we don’t do anything, it’ll soon be the deadliest type after lung cancer,’ he says. Ninety per cent of his patients can hardly be treated at all and die within three to six months of the diagnosis. ‘Despite this, there’s been too little research into this in the Netherlands in the last 25 years. A fruitless mission, was the thinking. Untreatable – that makes patients desperate.’

Seven years ago, Van Eijck chanced upon a vet and a pig farmer who survived despite the diagnosis. They had started to treat themselves out of desperation, by injecting themselves with a living vaccine against Newcastle disease. ‘And that proved to have a surprisingly good effect,’ says Van Eijck, who immediately paid a visit to the virology department at the Erasmus MC. ‘To see whether I had that virus in stock, for the other patients,’ says Ron Fouchier, Professor of Molecular Virology. ‘I’d already been looking at the use of viruses for genetic and oncotherapy for a while, and thought that there was a development period of ten or twenty years still needed in order to treat cancer patients with it. But the vet and the pig farmer showed it was already possible, that it’s low-hanging fruit.’

‘MY PATIENTS WOULD PREFER TO EXPERIMENT ALREADY’

This low-hanging fruit is there through natural development. ‘Viruses have evolved over millions of years to multiply themselves rapidly,’ says Fouchier. ‘And humans have evolved over millions of years to produce an immune response against them. Cancer cells hide away from your immune system. These viruses in principle make the cancer cells visible to the immune system again. What we actually want to do is make use of this process. Activate healthy immune cells with viruses and use them against the malignant tumour cells.’

In fact, according to Van Eijck and Fouchier, all they still have to do is make the treatment applicable. Fouchier: ‘We need to ensure these patients don’t get ill from the treatment, and also the people and animals around them shouldn’t suffer any problems from it. If we’re capable of this, we’re in principle ready for treatment.’

In the meantime, teams at the Erasmus MC, AMC and LUMC are working on research that is necessary for the oncolytic viro-immunotherapy. Van Eijck: ‘Separately from the pharmaceutical industry, so we keep the research in our own hands. And the treatment won’t need to be terrifyingly expensive. By the way, the pharmacists were not standing waiting.’ Too progressive, this research. ‘Pharmacy is conservative,’ says Fouchier. ‘They thought they’d never get permission to use this kind of virus.’

In order to be able to start the research nonetheless, Support Casper was set up in 2015, by the relatives of a number of former patients. In the meantime, over three million euros has been raised, and the target is ten million via benefit campaigns. Van Eijck, also known as Feyenoord’s club doctor: ‘Society’s support is heart-warming. We have to get on; my patients have no time to wait. They’d prefer to experiment with the treatment already – what do they have to lose? But the regulations don’t provide this space.’

Nonetheless Van Eijck and Fouchier are hopeful from the first study results. ‘These confirm what that vet and pig farmer have already shown,’ says Fouchier. ‘It’s possible to treat pancreatic and other types of cancer effectively. As long as the tumours have not propagated to places where you would retain permanent damage from them, we ought finally to be able to cure patients with the right virus. But we do need to get a move on.’

Contribute to the research? Donate via Supportcasper.nl.
Want to know more about Virology? Visit: Erasmusmc.nl/viroscience

Rotterdam Undiscovered

TEMPORARY LABS SATISFY GROWING DEMAND

Ever more businesses and research centres need temporary laboratory space. For example due to capacity problems, or for specific pharmaceutical, biopharmaceutical, nutritional, technical or R&D investigations. The Rotterdam entrepreneur is meeting this demand with his LabHotel on Marconiplein. In the Rotterdam Science Tower, he leases out completely equipped, certified labs, including required facilities such as ventilation, fire and other safety facilities, an environmental licence and internet. If wanted, office space, equipment, management, technicians, office management and expert advice can also be arranged. The smallest lab measures 26 m^2. All leasing arrangements are possible, even a 'season ticket'. This is clearly a growth area. Schellekens: 'From the start of 2018, there will be another 4,500 m^2 of lab space available, on top of the current 800 m^2. So whoever phones today can start work tomorrow as it were.' *www.laboratoryforrent.com*

NEOBIOTECH: CONQUERING EUROPE FROM ROTTERDAM

NeoBiotech set up camp in Rotterdam in 2017. From Maasstad, this Korean manufacturer intends to conquer Western Europe with its innovative products and solutions for dental implants and restorations and digital dentistry. The customer circle mainly comprises dentists and implantologists. The new West-European headquarters are led by the Korean James Park. He has very high expectations. 'The existing suppliers in Western Europe are doing little in the way of innovation and have been supplying more or less the same products for decades. With our innovations, we make working more comfortable for the dentist and surgeon and the treatment is more pleasant and safer for the patient. In this way we provide clear added value in contrast to the competition. A market share of ten per cent in a few years is certainly feasible.' *Neobiotecheu.com*

10.000 PREGNANT WOMEN

Wanted: 10.000 pregnant Rotterdam women and women who want to have children for 'Generation R Next'. With this research project, the Erasmus MC, Erasmus University, Rotterdam-Rijnmond Municipal Health Centre and Rotterdam Municipality want to map out the differences in growth and development of a new generation of Rotterdam children. By following children and their mothers from pregnancy or pre-pregnancy, insight is gained into the development of illnesses, and behavioural and other problems. Generation R Next is the successor to the Generation R study into the development and health of 10,000 growing children. The new study targets the differences in the course of pregnancy and development of children and the question of why one woman becomes pregnant more easily than the other. Around 120 specialists, researchers and staff are involved in the study. Read more about this interview on page 16, *Generationr.nl*

ONLINE SPEECH THERAPY

NiniSpeech is a virtual 'speech clinic', using which customers with speech problems can do speech exercises themselves, guided by a speech therapist. The business has branches in Israel and the US. The European market has been served since 2017 from a new Rotterdam branch, led by business developer Dennis van der Molen. The Ninispeech app supports patients with on-line speech exercises and video consultations with a certified speech therapist. Progress is automatically recorded in the app. Van der Molen: 'With the Ninispeech speech therapy, customers no longer need to leave home to visit the speech therapist, while the therapist in turn can follow the customer's progress closely, providing guidance where needed. This encourages therapy compliance and the customer makes much faster progress than with traditional speech therapy.' *Ninispeech.com*

DIAGNOSIS WITH PIANO MUSIC

The Japanese pianist and music teacher Yayoi Sakaki has developed a unique method for the very early diagnosis and treatment of cognitive problems such as ADHD, dementia and Parkinson's. She explains: 'Using biofeedback techniques such as brain waves (EEG) and eye tracking, we can measure reactions to specially-written piano music. In this way, any cognitive problems can be identified earlier and more accurately than with existing methods. This allows treating physicians to prescribe the right treatment and medication, and human assessment errors are prevented.' At present, tests are under way on a prototype, consisting of a digital piano and the biofeedback instruments already mentioned. For the testing and marketing, a startup has been founded in Rotterdam under the name Project Ipsilon. 'Why Rotterdam? Simple: because most of the pilot partners are based in the Netherlands.' *Projectipsilon.com*

SCOLIOCASE PREVENTS (TOO) LATE DIAGNOSIS

By screening children early for scoliosis ('hunched back'), serious deformities at a later age can be prevented. Parents will soon be able to detect a tendency to scoliosis using the Scoliocase. With the help of the associated smartphone app, they will fold this piece of cardboard into a measuring instrument with which they can measure the curvature of the back. The Scoliocase is an invention from student startup Orthas and orthopaedic surgeon Hanneke van West of the Erasmus MC. She comments: 'There is no longer any national screening for scoliosis. This is why we often see children too late and surgery is the only option. By distributing the Scoliocase nationally to parents via the Paediatric Care Bureau we can anticipate these problems.' The Scoliocase will be available from mid-2018. *Orthas.org*

INTERNATIONAL SUCCESS WITH BRAILLE CONTROLLER

The Dutch Optelec is causing an international furore with its Alva BC640, the smallest and most user-friendly Braille controller in the world. The device coverts the text on a computer or phone screen into Braille characters, so the blind and partially-sighted can also read them. The Alva BC640 is a design and development from the Rotterdam bureau Spark Design & Innovation (with 30 staff). More than a decade after its introduction, the design of the Alva BC640 still stands as firm as a rock, according to Spark partner Robert Barnhoorn: 'The design was at that time such a huge step forwards that it still has added value in the market. Apple displayed our device for years as an example of internet accessibility on its website. And that's saying something, because if there's one company that understands innovation...' *sparkdesign.nl/en*

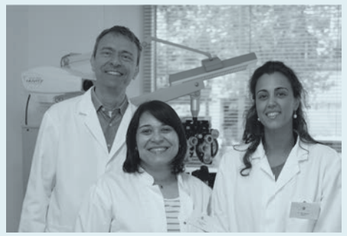
GE HEALTHCARE IN ROTTERDAM

With 54.000 staff and customers in over 100 countries, GE Healthcare is a leading manufacturer of high-tech medical equipment in the areas of imaging and information technology, medical diagnosis, patient monitoring, pharmaceutical research and biopharmaceutical production technology. With its new innovations and solutions, the concern helps care providers give patients ever better care for ever lower prices. GE Healthcare was already active in the Netherlands from its branches in Eindhoven and Hoevelaken. To give it a presence closer to the large market in the country's north-western cities, it opened a branch in the Cambridge Innovation Center in the Groothandelsgebouw in Rotterdam last year. Recently, the technology company delivered three giant latest-generation MRI systems for the Erasmus MC's new buildings. *Gehealthcare.nl*

INEXPENSIVE ALTERNATIVE FOR COSTLY DA VINCI ROBOT

'It's the very thing.' This is how Alphatron Medical's Director Harald Verloop describes the Flexdex. This ingenious manual instrument, costing under 1000 euros, can be used to conduct the same complex endoscopic operations as the 2 million euro Da Vinci surgical robot. Just as precise, but quicker and much cheaper. Alphatron Surgical (with ex-surgeon Hubert Prins, healthcare entrepreneur Maarten Triebels and others) has recently introduced the instrument into Benelux and Germany. Verloop: 'With the Flexdex, surgeons can make turning and tipping motions much more easily, comfortably and stably than with other endoscopic surgery instruments. This lets them work precisely every time and they suffer less from shoulder and wrist complaints.' The Rotterdam firm Alphatron also arranges instruction courses for the Flexdex. *Alphatronmedical.com*, *alphatronsurgical.com*

MELLES CORNEA CLINIC: INTERNATIONAL LEADER



The Melles Cornea Clinic in Rotterdam is leading the way internationally with its 'lamellar' cornea transplants. In operations for conditions such as keratoconus and Fuchs endothelial dystrophy, the surgeon only replaces the damaged layer (lamella) and not the whole cornea, as is usual. By application of highly advanced treatment techniques, the operations are more minor and the patients recover more quickly. Distinguishing too are the personal attention and involvement of the staff, the continuing contact with patients and the much shorter waiting times than are average in the Netherlands. At zorgkaartnederland.nl, patients award the three permanent cornea specialists a 9+/10. The Melles Cornea Clinic is part of the Netherlands Institute for Innovative Ocular Surgery (NIIOS), which is also home to a tissue bank and a research institute. *Niios.com*

SAFE HYPERTHERMIA

Since 1 January, Eight Medical's Dutch and international customers have been served from the new Rotterdam branch near Zestienhoven. The company is mainly known for the Recirculator 8.0, an advanced administration device for the safe, efficient and comfortable introduction of sterile heated solutions into the abdomen or chest. Hyperthermia is frequently used as a post-treatment after radio- or chemotherapy. By heating the tumour to between 40 and 43°C for some time, cancer cells are made more sensitive to other treatments, so these have a greater effect. According to the manufacturer, the Recirculator 8.0 is the safest and most advanced and user-friendly device for intraperitoneal and intrathoracic hyperthermia on the market. Soon, a smaller version for bladder treatment will be available. The American market is supplied from Bloomington in Indiana. *Eightmedical.com*

SURGICAL ROBOT FOR THE ROTTERDAM EYE HOSPITAL

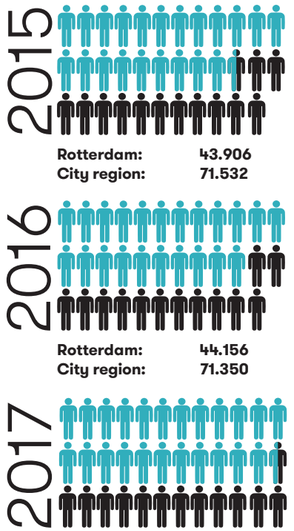
This year, The Rotterdam Eye Hospital and Preceyes will be testing a surgical robot for retina surgery. In the future, this will enable us to help patients more accurately and safely. At the moment, a small group of highly specialised eye surgeons still performs all retina surgery manually. In cooperation with Koorosh Faridpooya, Preceyes has developed a robot that assists the surgeon with these operations. The eye is a small and complex organ, making eye surgery very challenging. With the aid of the surgical robot the hospital will be able to perform operations that are currently still very difficult or even impossible. In this way, the robot may help prevent people from losing their eye sight or may help slow down this process. *Oogziekenhuis.nl*, *Preceyes.nl*

THE ECONOMY OF LS&H010

The scale of cluster Life Sciences & Health in the region.

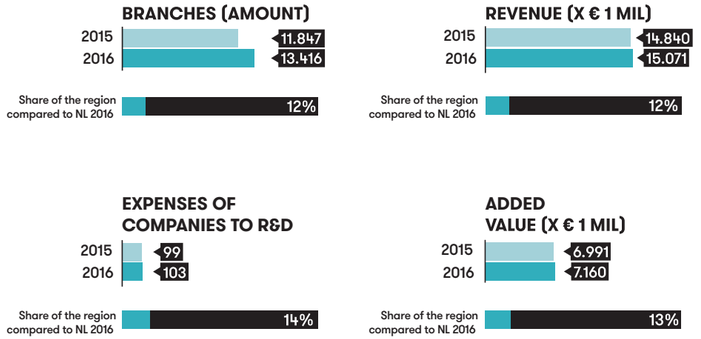
EMPLOYMENT IN PERSONS LS&H

= Rotterdam = City region Rotterdam



Rotterdam total employment 2017: 365.531

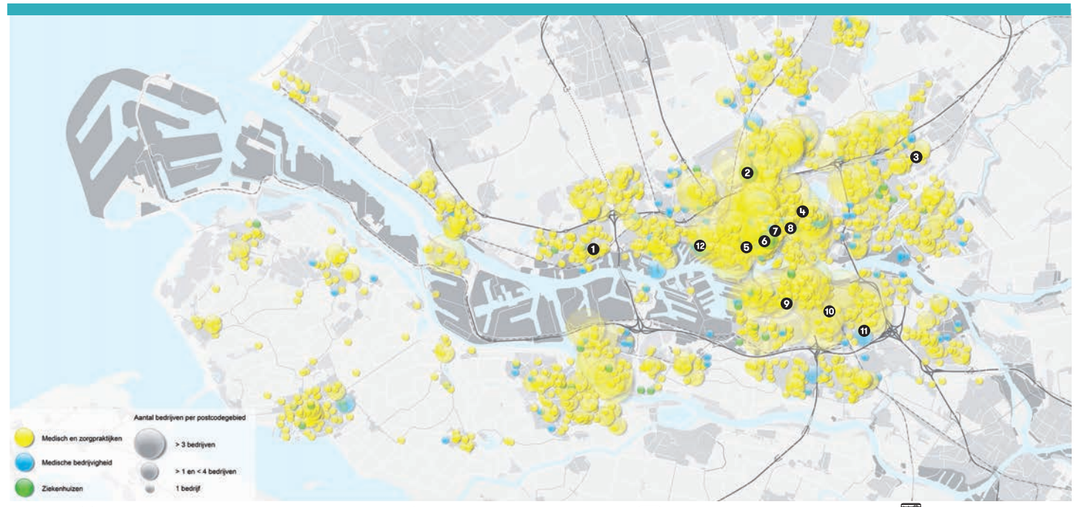
CITY REGION ROTTERDAM, HAAGLANDEN AND LEIDEN



12 ROTTERDAM SCIENCE TOWER:

Development of Life Science & Health hub 2017

- 14 LS&H companies located in the hub
- 80+ events/meetings/delegations
- 500+ students connected with the Rotterdam LS&H hub
- 50+ Erasmus MC researchers involved
- 200+ matches with care institutions and companies
- 60+ jobs created
- 70+ seniors involved
- 12 million available for funding
- 26 connections hub partners



1 2 FRANCISCUS GASTHUIS & VLIETLAND
3 IJSELLAND ZIEKENHUIS
4 HAVENPOLIKLINIEK
5 6 10 ERASMUS MC
7 RIJNDAM REVALIDATIE
8 HET OOGZIEKENHUIS ROTTERDAM
9 IKAZIA ZIEKENHUIS
11 MAASSTAD ZIEKENHUIS

COLOPHON

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LIFE SCIENCES & HEALTH 010=

ROTTERDAM.
MAKE IT HAPPEN

Gemeente Rotterdam