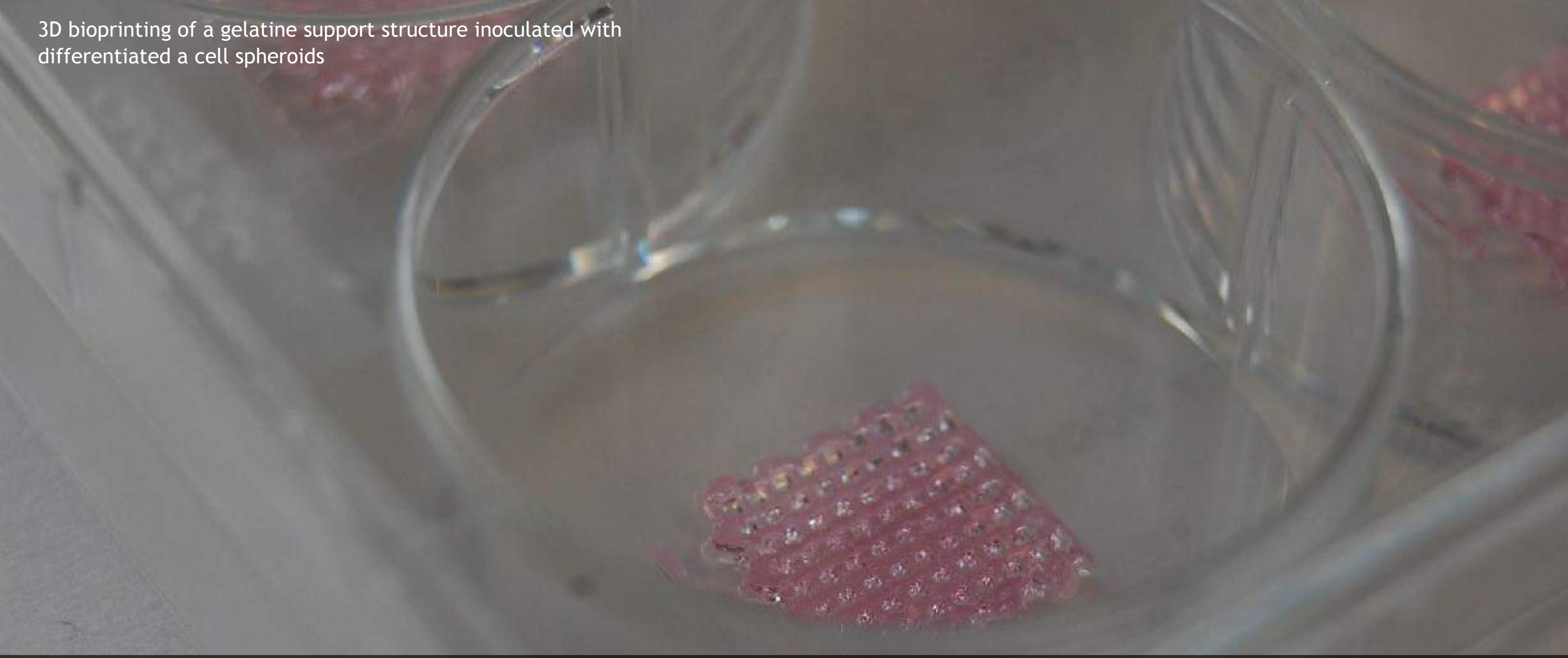
3D bioprinting of a gelatine support structure inoculated with differentiated a cell spheroids

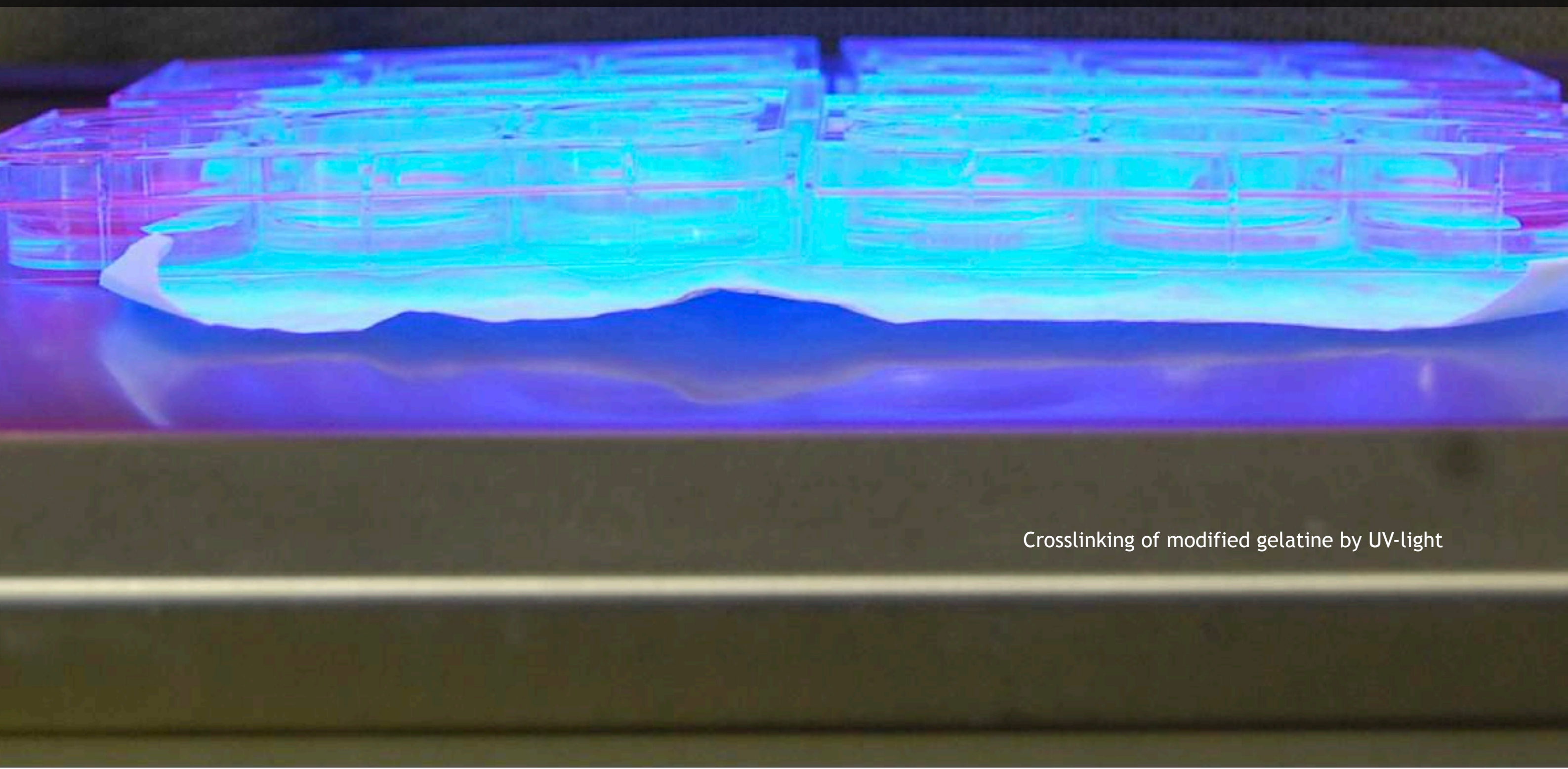


RESEARCH REPORT 2019-2020

DEPARTMENT OF PLASTIC SURGERY

UZ GENT

UGENT



Crosslinking of modified gelatine by UV-light

2019-2020 Research Report

Department of Plastic and Reconstructive Surgery
Ghent University Hospital

Tissue engineering and Biomaterials Lab
Ghent University

Prof. Dr. Phillip Blondeel
Dr. Bernard Depypere

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B-9000 Gent, Belgium

Tissue engineering and Biomaterials Lab
Department of Human structure and repair
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Supervisors

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Prof. Ruslan Dmitriev - Tissue engineering and Biomaterials Lab, Gent University
Prof. Sandra Van Vlierberghe - Department of Organic and Macromolecular chemistry
Research group Polymer Chemistry and Biomaterial group, Gent University
Prof. Dr. Olivier De Wever - Laboratory of Experimental Cancer Research, UGent
Prof. Dr. Esther Hoste - Unit for Cellular and Molecular Pathophysiology, VIB-UGent
Center for Inflammation Research
Dr. Bernard Depypere - Plastic Surgery, Gent University Hospital
Dr. Filip Stillaert - Plastic Surgery, Gent University Hospital
Dr. Alexis Verpaele- Esthetisch Medisch Centrum 2, Gent
Dr. Patrick Tonnard - Esthetisch Medisch Centrum 2, Gent

PhD Students

Dr. Karel Claes	Burns and bio-dressings
Dr. Nicolas Dhooghe	Facial Surgery
Dr. Bernard Depypere	Tissue engineering in breast reconstruction
Dr. Arne Peirsman	Tissue engineering and oncology
Dr. Mohammad Ghiasloo	Intercellular messaging
Dr. Lana Van Damme	Polymer bio-engineering
Dr. Ignace De Decker	Tissue Engineering of the skin
Dr. Dries Opsomer	Breast reconstruction with Lumbar Flaps

Medical Students

De Maere	Elisabeth	Bert	Emma
Van Waeyenberghe	Michiel	Poelaert	Jeroen
Vanlauwe	Florian	Schelfaut	Laura
Madelyn	Ann-Sophie	Ruyssinck	Laure
Van Elewijck	Karen	Verdeyen	Naomi
Knops	Oliver	Vermeir	Ruben
Vandeweege	Sander		
Huyck	Thijs		

Welcome by Prof. Phillip Blondeel

Earlier this week in my consultation room: a woman in her early forties lifts up her shirt and takes off her bra. Across her abdomen a large scar, approximately 32 centimeters, running from hip to hip. Her left breast, that was first removed and then reconstructed, looks like what you may expect four months after surgery. The abdomen fat transplant was successful, but the upper part seems a bit empty. Less filled. This needs to be rectified. As well the other healthy breast needs to be lifted, because there is an imbalance between the two breasts now. We want symmetry as a result.

Prof. Dr. Phillip N. Blondeel

What if… What if this same woman could have walked out of my consultation room this week with a new perfect breast, looking the exact same as her other breast, and no scars at all?

In Darkman and The fifth element, two sci-fi movies of the nineties, there were already scenes where skin and body parts were 3D-printed. This will be possible outside movie theatres, in laboratories like ours. Not tomorrow, not in a foreseeable future. But in a nearly foreseeable one. And this is what our mission is about.

Reconstructive surgery today provides many benefits for patients who have suffered a traumatic or onco-surgical removal of parts of their body. But none of the techniques we use today are without disadvantages. Very often our patients accept the surgical inconveniences in order to reach reconstitution of the damaged area of the body. Breast reconstruction after breast cancer is often a good example. The scar on the abdomen is accepted to allow autologous (with tissue obtained by the same person) reconstruction of the breast after mastectomy with the Deep Inferior Epigastric Artery Perforator (DIEAP) flap.

We came to understand that the future of tissue reconstruction will no longer be the transplantation of tissues within the same body but rather the construction of autologous body parts in a laboratory environment, outside of the body. This is called tissue engineering. Tissue Engineering will avoid most of the disadvantages of the present reconstructive techniques and will guarantee the use of body-own tissue. We will be able to re-build an exact copy of the part that was removed, in size, in shape and in composition. But then without diseased or damaged cells.

But we are far from our target. Many research centers in the world are working on the dream to be a contractor in human tissues. The road is still long. There is a lot that needs to be discovered, developed, checked, double-checked and tested in humans.

The department of plastic and reconstructive surgery of the Ghent University Hospital and the Tissue engineering and Biomaterials Lab of the Gent University want to be the frontrunners in this exciting research. We have been performing intensive clinical research over the last 30 years in our department. The last five years we have added the layer of basic research in reconstructive surgery. What you are reading now is our first Research report. And we are very proud to present it to you.

The strongest asset of our group is its multidisciplinary approach. From the beginning we have decided to work together with many other researchers in other faculties of the UGent, other institutions like the VIB (Vlaams Instituut voor Biotechnologie), IMEC and even other universities. Secondly, our group has – and this is unique- nearly unlimited access to human tissues. We harvest and isolate human stem cells for research purposes.

Every day, thousands of people undergo liposuction. In the extracted fat lies a hidden treasure of large quantities of untouched stem cells and precursor cells. From that fat, that is otherwise just discarded, we have developed unique isolation techniques. We can start working and experimenting on the ultimate omni-potent building block in tissue regeneration and reconstruction, the mesenchymal stem cell.

We now also provide these precious types of human cells to our partner researchers, so that they also can make advances in their own work. Our partners, on their end, give us the opportunity to work together with their researchers, use their facilities…

The most crucial part is that we don't work in our separate silos. We have created a collaborative organ where we can think, reflect, brainstorm, together, and move ahead as one team. Medicine, chemistry, engineering, biotechnology and basic sciences are now all united. Together we mine this exciting field of Tissue Engineering. To further facilitate this collaboration, a new platform was created in the womb of our university, called GATE (Ghent Advanced Therapies and Tissue Engineering).

The team is always stronger than the individual. I want to finish by thanking my fabulous team, my collaborators and partner researchers for their efforts, but also for their confidence. Moreover, I wish to express my highest gratitude to our patients who have been willing to donate (literally) a part of themselves to support research. Without their living contributions our research would be much less meaningful.

The pillars of our research

In our quest for large volume and functional tissue engineering we are active in different sub-domains. We believe that tissue-cells can structure themselves by self-assembly. This is called the ‘bottom-up’ or ‘histio-induction principle of tissue engineering’: just like an embryo develops out of two cells that join and afterwards, by some yet poorly understood mechanism, are able to proliferate and differentiate into a human body. Human cells are seen as building blocks held together with a biological liquid environment (also called bio-ink), in which hormones, antibodies and messenger proteins move around as inter-cellular communicators. Cells stimulate or inhibit each other by this sophisticated type of communication that still is a great mystery.

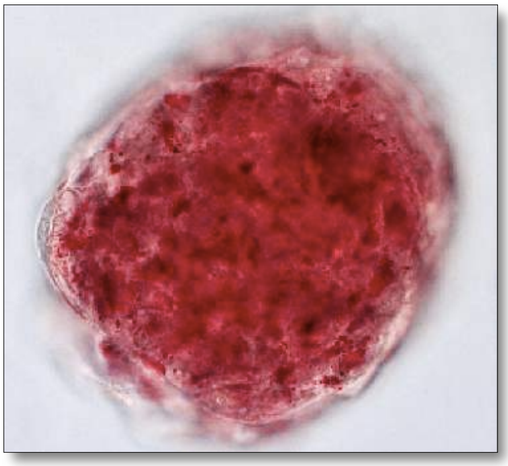
Below you can find out about the five most important pillars of our basic research program and the concomitant scientific output of the last two years. All research projects are performed with the consent of the Ghent University and Ghent University Hospital Ethical Committee. Additionally, all research on human tissues is performed following the rules of General Data Protection Regulation (2019) and with respect of personal privacy.

1. Cell engineering

This is the field in which we isolate human stem cells donated by patients, let them grow and have them differentiate into different types of cells. Very often these cells are brought together in clusters or spheroids (photo to the right). We are now experimenting on bringing different types of cells together in specific spheroids in order to serve as building blocks.

This last paper won the prize of the best scientific paper at the 2019 meeting of the European Association for Plastic Surgeons (the leading scientific society in plastic surgery) in Helsinki, Finland.

Members of the research team with the winner, Dr. Lara Benmeridja (fltr: Dr. Nicolas Dhooghe, Prof. Phillip Blondeel, Dr. Lara Benmeridja, Dr. Bernard Depypere)

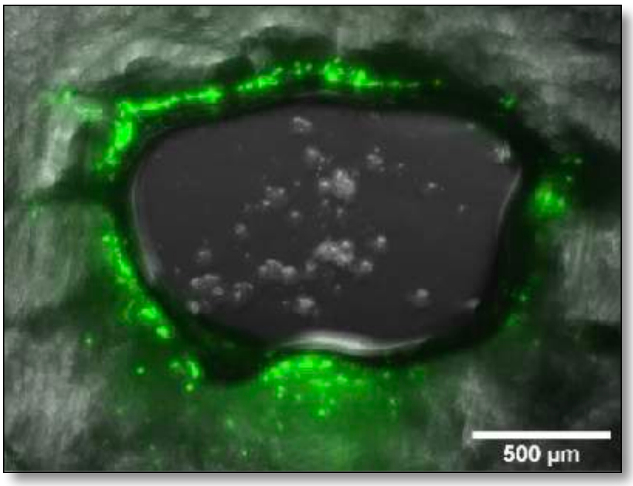


A spheroid of about 150 micron, consisting out of fat cells and endothelial cells (basis of blood vessels) developed out of mesenchymal stem cells.

Scientific output:

- Xenogen-free isolation and culture of human adipose mesenchymal stem cells. Doornaert M, De Maere E, Colle J, Declercq H, Taminau J, Lemeire K, Berx G, Blondeel P. Stem Cell Res. 2019
- Expanding Clinical Indications of Mechanically Isolated Stromal Vascular Fraction: A Systematic Review. Ghiasloo, M; Lobato, RC; Diaz, JM; Singh, K; Verpaele, A; Tonnard, P. Aesth Surg J 2020, vol 40, 9.
- High-throughput fabrication of vascularized adipose microtissues for 3D bioprinting. Lara Benmeridja , Lise De Moor , Elisabeth De Maere, Florian Vanlauwe, Michelle Ryx, Liesbeth Tytgat , Chris Vercruysse, Peter Dubruel, Sandra Van Vlierberghe, Phillip Blondeel, Heidi Declercq. J Tissue Eng Regen Med. 2020 Jun;14(6):840-854.
- Human decellularized dermal matrix seeded with adipose-derived stem cells enhances wound healing in a murine model: Experimental study. Doornaert M, Depypere B, Creytens D, Declercq H, Taminau J, Lemeire K, Monstrey S, Berx G, Blondeel P. Ann Med Surg (Lond). 2019

2. Angiogenesis



Green immunofluorescent endothelial cells line the wall of a tubular structure as a basis to form cylindric vessel-like tubes.

In this field we look at the creation and development of blood vessels both at a microscopic level (capillaries) as at a macroscopic level, or larger vessels that can be sutured to recipient vessels in the human body. This domain is often called the key to tissue engineering as we know that tissue growth and development always follow the sprouting of blood vessels. A lot of the work we are doing in this field is still ongoing.

Scientific output:

- Initial experience with a novel hybrid vascular graft for peripheral artery disease. Willaert, W; Claes, K; Flamme, A; Jacobs, B. Journal of cardiovascular disease; 2020, vol 61, 3.

3. Bio-ink

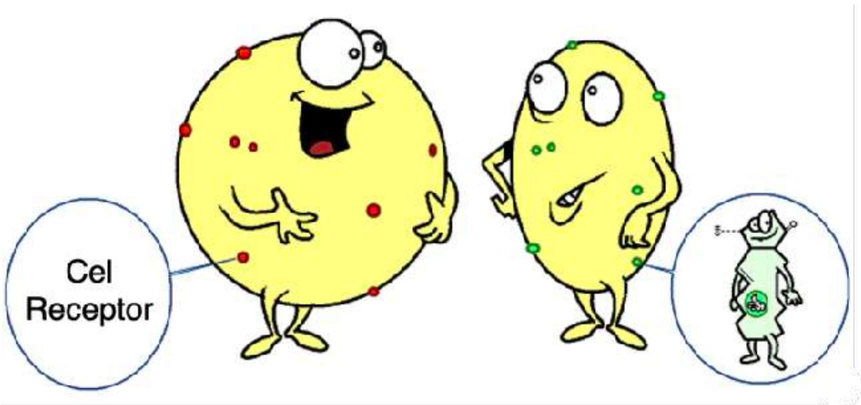
Human cells are embedded in an environment called the Stromal Vascular Fraction. It is a gelatinous environment filled with mostly collagen, to maintain support, and blood vessels that bring along oxygen, nutrients and fluids. To be able to duplicate this environment we have been working to develop the ideal 'gel'. The research performed at the Faculty of Science, department of Organic and Macromolecular Chemistry of the UGent has been crucial on this matter. This gel has different purposes. It will not only serve as a support for the survival of fat cells in the daily clinical practice of lipofilling but also as the recipient medium for human cells in the process of 3D bioprinting.

Scientific output:

- **Patent Application of *Gelgraft*:** Gelgraft is a sterile, biodegradable, fine powder that can be mixed with a liquid (f.e. physiological buffer, autologous fat) obtaining an injectable (hydro)gel implant. It consists of crosslinked modified gelatin.
- Bioprinting predifferentiated adipose-derived mesenchymal stem cell spheroids with methacrylated gelatin ink for adipose tissue engineering. Julien Colle, Phillip Blondeel, Axelle De Bruyne, Silke Bochar, Liesbeth Tytgat, Chris Vercruysse, Sandra Van Vlierberghe, Peter Dubruel and Heidi Declercq. Journal of Materials Science: Materials in Medicine. 2020, vol 31, 4.
- Extrusion-based 3D printing of photo-crosslinkable gelatin and carrageenan hydrogel blends for adipose tissue regeneration. Tytgat L, Van Damme L, Ortega Arevalo MDP, Declercq H, Thienpont H, Otteveare H, Blondeel P, Dubruel P, Van Vlierberghe S. Int J Biol Macromol. 2019
- Additive manufacturing of photo-crosslinked gelatin scaffolds for adipose tissue engineering. Tytgat L, Van Damme L, Van Hoorick J, Declercq H, Thienpont H, Ottevaere H, Blondeel P, Dubruel P, Van Vlierberghe S. Acta Biomater. 2019

4. Inter-cellular communication

Cells talk to each other all the time. This can happen through direct contact, proteins, hormones or other messenger molecules and finally through extracellular vesicles and exosomes. This inter-cellular 'language' is complex and there are still a lot of things to be learned specially in the field of tissue engineering. Close collaboration with the VIB (Vlaams Instituut voor Biotechnologie) and the Laboratory of Experimental Cancer Research will help us unravel some of these mysteries.

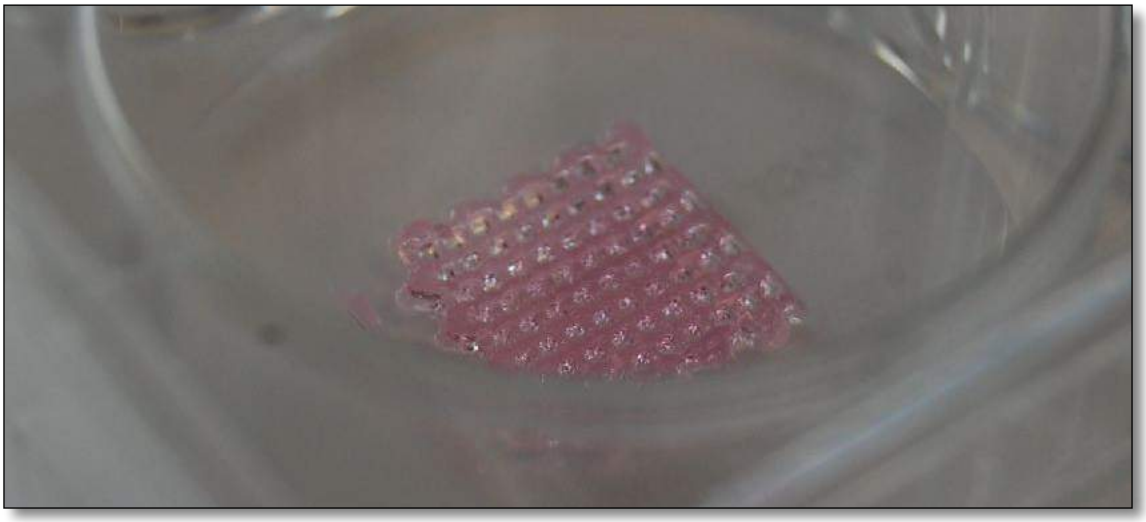


Scientific output:

- A Systematic Review on Extracellular Vesicles-Enriched Fat Grafting: A Shifting Paradigm. Ghiasloo M, De Wilde L, Singh K, Tonnard P, Verpaele A, De Wever O, Blondeel P. Aesthet Surg J. 2020 Dec 15:sjaa362.

5. 3D-Bioprinting

Obviously, all these building blocks need to be put together as one living, functional organoid element. For this we use our brand new state-of-the-art 3D bioprinter (see below). Cells, collagen, bio-ink, blood vessels and so much more need to be assembled in the right place, the right concentration and the right composition. The effects of gravity need to be surmounted, survival of the cells need be guaranteed and overgrowth of cells (cancer) needs to be avoided. A very challenging final step where everything comes together. We are now able to create constructions of up to 2 cm^3. Not much at this time, but a very good beginning.



Waffle-like structure printed with the RegenHu 3D Bioprinter containing a biodegradable gel and spheroids of human fat cells and endothelial cells (basis of blood vessels).

Scientific output:

- Indirect versus direct 3D printing of hydrogel scaffolds for adipose tissue regeneration. MRS Advances. Van Damme, L; Briant, E; Blondeel, P; Van Vlierberghe, S. 2020, vol 5, 17
- High-Resolution 3D Bioprinting of Photo-Cross-linkable Recombinant Collagen to Serve Tissue Engineering Applications. Tytgat, L; Dobos, A; Markovic, M; Van Damme, L; Van Hoorick, J; Bray, F; Thienpont, H; Ottevaere, H; Dubruel, P; Ovsianikov, A; Van Vlierberghe, S. Biomacromolecules. 2020, vol 21, 10
- Evaluation of 3D Printed Gelatin-Based Scaffolds with Varying Pore Size for MSC-Based Adipose Tissue Engineering. Tytgat, L; Kollert, MR; Van Damme, L; Thienpont, H; Ottevaere, H; Duda, GN; Geissler, S; Dubruel, P; Van Vlierberghe, S; Qazi, TH. Macromolecular bioscience. 2020, vol 20, 4.
- Indirect versus direct 3D printing of hydrogel scaffolds for adipose tissue regeneration. Van Damme, L; Briant, E; Blondeel, P; Van Vlierberghe, S. MRS Advances, 2020, Vol 5, 17

6. Clinical research

Besides basic research, our department of Plastic Surgery is also known for its high-standard clinical research. Clinical research is the driver for basic research because it shows us exactly where we should be heading with our basic research. Below you will find a list of some of our publications over the last two years.

Scientific output:

- International Expert Panel Consensus on Fat Grafting of the Breast. Nava MB, Blondeel P, Botti G, Casabona F, Catanuto G, Clemens MW, De Fazio D, De Vita R, Grotting J, Hammond DC, Harris P, Montemurro P, Mendonça Munhoz A, Nahabedian M, Pompei S, Rancati A, Rigotti G, Salgarello M, Scaperrotta G, Spano A, Stan C, Rocco N.Plast Reconstr Surg Glob Open. 2019 Oct 28;7(10):e2426.
- International multidisciplinary expert panel consensus on breast reconstruction and radiotherapy. Nava MB, Benson JR, Audretsch W, Blondeel P, Catanuto G, Clemens MW, Cordeiro PG, De Vita R, Hammond DC, Jassem J, Lozza L, Orecchia R, Pusic AL, Rancati A, Rezai M, Scaperrotta G, Spano A, Winters ZE, Rocco N. Br J Surg. 2019 Sep;106(10):1327-1340.
- Breast levonorgestrel concentrations in women using a levonorgestrel-releasing intrauterine system. Depypere HT, Stanczyk FZ, Croubels S, Blondeel PN, Roche NA, Depypere BP, Vanhaecke L.Contraception. 2019 Oct;100(4):299-301.
- 20 Years of DIEAP Flap Breast Reconstruction: A Big Data Analysis. Depypere B, Herregods S, Denolf J, Kerkhove LP, Mainil L, Vyncke T, Blondeel P, Depypere H.Sci Rep. 2019 Sep 9;9(1):12899.
- The Thin bilateral and bipedicled DIEAP flap for axillary reconstruction in hidradenitis suppurativa. D'Arpa S, Pignatti M, Vieni S, Muradov M, Blondeel P, Cordova A.Handchir Mikrochir Plast Chir. 2019 Dec;51(6):469-476.
- Nipple reconstruction in autologous breast reconstruction after areola-sparing mastectomy. Opsomer D, Vyncke T, Depypere B, Stillaert F, Van Landuyt K, Blondeel P.J Plast Reconstr Aesthet Surg. 2020 Nov 9:S1748-6815(20)30579-9.
- Comparing the Lumbar and SGAP Flaps to the DIEP Flap Using the BREAST-Q. Opsomer D, Vyncke T, Ryx M, Stillaert F, Van Landuyt K, Blondeel P.Plast Reconstr Surg. 2020 Sep;146(3):276e-282e.
- The Prepectoral, Hybrid Breast Reconstruction: The Synergy of Lipofilling and Breast Implants. Stillaert FBJL, Lannau B, Van Landuyt K, Blondeel PN.Plast Reconstr Surg Glob Open. 2020 Jul 23;8(7):e2966.
- Intraoperative Laser Speckle Contrast Imaging in DIEP Breast Reconstruction: A Prospective Case Series Study. Zötterman J, Opsomer D, Farnebo S, Blondeel P, Monstrey S, Tesselaar E.Plast Reconstr Surg Glob Open. 2020 Jan 20;8(1):e2529.
- Lumbar Flap versus the Gold Standard: Comparison to the DIEP Flap. Opsomer D, Vyncke T, Depypere B, Stillaert F, Blondeel P, Van Landuyt K.Plast Reconstr Surg. 2020 Apr;145(4):706e-714e.
- A Prospective Comparative Study of Color Doppler Ultrasound and Infrared Thermography in the Detection of Perforators for Anterolateral Thigh Flaps. Xiao W, Li K, Kiu-Huen Ng S, Feng S, Zhou H, Nicoli F, Blondeel P, Zhang Y.Ann Plast Surg. 2020 May;84(5S Suppl 3):S190-S195.
- Aging of the Upper Lip: Part I: A Retrospective Analysis of Metric Changes in Soft Tissue on Magnetic Resonance Imaging. Ramaut L, Tonnard P, Verpaele A, Verstraete K, Blondeel P.Plast Reconstr Surg. 2019 Feb;143(2):440-446.
- Aging of the Upper Lip: Part II. Evidence-Based Rejuvenation of the Upper Lip-A Review of 500 Consecutive Cases. Tonnard PL, Verpaele AM, Ramaut LE, Blondeel PN.Plast Reconstr Surg. 2019 May;143(5):1333-1342.
- Bilateral DIEP Flap Breast Reconstruction to a Single Set of Internal Mammary Vessels: Technique, Safety, and Outcomes after 250 Flaps. Opsomer D, D'Arpa S, Benmeridja L, Stillaert F, Noel W, Van Landuyt K. Plast Reconstr Surg. 2019 Oct.

Recent major investments

In the summer of 2020 our new 3D bioprinter arrived at our lab. This is our second 3D-bioprinter joining our older RegenHu printer. This new printer is a fully customised printer specially made by Regemat3D for our research team with 2 metal syringes and a coaxial syringe. This will not only give us more capacity but also more quality in 3D bioprinting. This project was a co-investment with Prof. Sandra Van Vlierberghe (Polymer Chemistry and Biomaterial group, Gent University). Total cost about 80.000€.

Prof. Blondeel (right) with Dr. Depypere at the new Regemat 3D bioprinter.

We are also investing in new incubators and Laminar Air Flow cabinets in the beginning of 2021. Total budget about 25.000€.

Creation of GATE: Ghent Advanced Therapies and Tissue Engineering

The last years it became very clear that we needed to unify research groups that were working in very similar research areas within the Ghent University. Very often these groups work with the same material: DNA, stem cells (and inter-cellular communication). Many of these groups were also using the same research tools. And we were all looking for ways to heal or regenerate diseased or damaged human cells in a wide variety of medical pathologies.
We therefor decided to create a new research platform, where different researchers within the field of gene therapy, cellular therapies and tissue engineering decided to work together. We felt that this collaboration would boost our work in the entire field of regenerative medicine.

It has been a great honor for Bernard Depypere and myself to co-found GATE. GATE was first initiated 2 years ago as the “Ghent Alliance for Tissue Engineering”.

The goals of GATE include the following:

- GATE creates a step-up for researchers in the area around Gent to contact and communicate with each other
- GATE stimulates a modern multidisciplinary approach of research for example by encouraging the use of core facilities
- By gathering and centralizing background information on research groups, GATE helps collaboration and helps to excel in new, ground-breaking research
- GATE stimulates learning AND teaching environments
- GATE valorizes research efforts into business opportunities
- GATE helps to increase the visibility of joint research efforts (f.e. to our business partners)

The ultimate goal of GATE is to have an important impact on daily health care and the cure of different types of diseases.

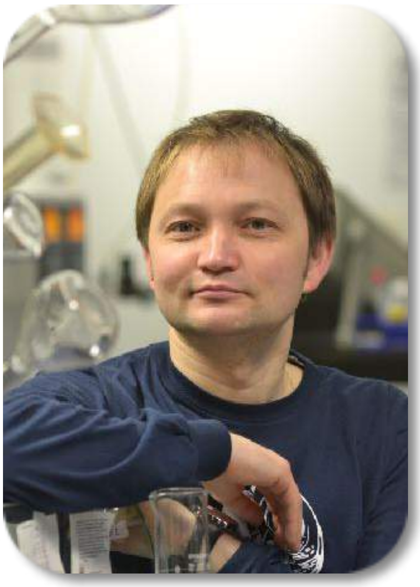
As president of the ad-hoc steering committee it is my goal to get consensus and approval by all parties on the consortium agreement and to get the key-players of the most important research institutions around Gent on board. We are still in the start-up fase: logo, website and administrative support are being developed as you read this report.

The list of individual research groups and principal investigators is too long to mention here. Researchers originate from the Ghent University, Ghent University Hospital and the Flemish Institute for Biotechnology. A list of research groups will be available through our website soon.

Spotlight: Prof. Ruslan Dmitriev

Prof. Dmitriev is a well established and well-known researcher and fortunately he responded positively to our search for a new head of the Tissue Engineering and Biomaterials Lab. He has joined our university since September 1st, 2020. It is a pleasure to present him to you.

Prof. Dmitriev is a biochemist, microscopist, developer and tester of bioconjugate, nanoparticle- and scaffold-based biosensors for live cell imaging of stem cell-derived organoid constructs.



Prof. Ruslan Dmitriev

His primary research interest is in advanced quantitative, live and multi-parameter fluorescence (FLIM) and phosphorescence (PLIM) lifetime imaging microscopies. These methodologies are highly useful for metabolic and O_2 imaging of 3D tissue models including ex vivo tissues, tumour spheroids and adult stem cell-derived intestinal organoids.

Over the course of his PhD and postdoctoral training he gained strong interdisciplinary experience in protein chemistry and molecular biology, studies of metabolism, hypoxia and development of phosphorescent high-performance biosensors. In 2014 he has been awarded the Starting Investigator Research Grant and started his research group (‘Metabolic Imaging Group, Cork), followed up by a 1 year-long industry placement at Agilent technologies (2019-2020) and the starting tenure-track position at the Ghent University (current position).

His current ambitions are in developing new FLIM approaches to visualize the stem cell metabolism in organoids and in developing hybrid biosensor scaffold materials, sourced from natural sources for advanced imaging-assisted tissue engineering and other areas of applied science.

To date, he has gained research leadership in the areas of quenched phosphorescence-based detection of molecular oxygen and multi-parameter FLIM of spheroid and intestinal organoids. Evident when we look at his track record: number of reviews, editorship of 2 books (2017, 2018), organizer of research meetings (TERMIS-WC 2018, Sechenov Biomedical Summit 2019) and his society memberships (ISSCR, TERMIS, ASCB). His industrial experience has led to generating 3 invention disclosures, 1 patent application and collaborations with SME and MNE such as Luxcel Biosciences (now part of Agilent Technologies), Becker & Hickl GmbH and Leica Microsystems. So far, he has secured ~1.2M euro of funding (total), published 50 research papers and 7 reviews (h index = 26, Google Scholar).
https://scholar.google.com/citations?user=fAYmtSUAAAAJ&hl=en

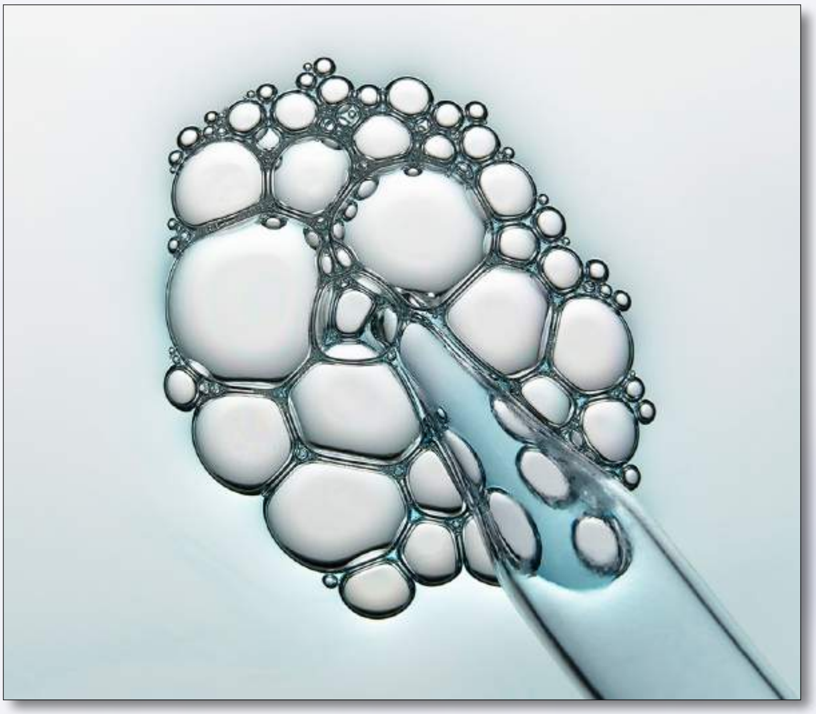
Prof. Dmitriev is a great added value not only to our research group but also to all other research groups of the Ghent University

Recent major funding projects

Project	Year	Amount
IOF Fructosamine 3-kinase (F2018/IOF-advanced/FN3K)	2018-19	250.000 €
IOF GEL GRAFT - Development of a proprietary gel for Fat Grafting targeting Breast reconstruction (F2018/IOF-advanced/422)	2019-20	250.000 €
FWO-TBM Optimizing the skin grafting procedure: micrografts versus meshed skin grafts (T000319N)	2019-23	774.500 €
FWO PhD fellowship strategic basic research, Dr. Lana Van Damme: Smart Biomaterials towards minimal invasive breast reconstruction (FWO 1S85120N)	2019-22	244.000 €
IOF-Platform valorisation coordinator	> 2019	
Advanced cell and Tissue Therapy Act-T IOF consortium	> 2020	
IOF StepStone 'GELGRAFT MEdical' (F2020/IOF-StepStone/118)	2021-22	650.000 €
Beautiful After Breast Cancer Foundation	Yearly	20.000 €
Private donors	Yearly	+/- 70.000€

The Industrial Research Fund (IOF - Industrieel Onderzoeksfonds) of the Ghent University has been our most important financial supporter in these last two years. The IOF provides a supporting framework for collaboration between the Ghent University Association and industry, through IOF-Business Development Centers that group complementary research departments by application area or domain of expertise. They support the crucial stages of the development track of valorisation-oriented projects.

In 2019-2020 the IOF council has approved a large series of project fundings. Moreover they have invested in an additional business developer and an IOF-platform valorisation coordinator. All with focus on Regenerative Medicine and Tissue Engineering.



How to contribute to our research?

(the girlfriend): "You'll perfect the skin. You'll make it work. It doesn't matter."
(the scientist): "... don't you think I told myself that? Night after skinless night!"

In 1990, Darkman was the first movie to feature 3D bioprinting. Liam Neeson, a.k.a. Darkman, used a 3D printer to print skin and disguise himself.

30 years later, the road is still very long…

As you know, research is very costly. We depend on our private donors and regional, national and sometimes European funding for financial support to be able to continue our research program. We explicitly wish to thank all our donors for their support during the last few years. They have made it possible for us to take off. Well, the egg has turned into a chick meanwhile and we are in an everlasting quest for financial support.

All donations pass exclusively through the Ghent University Donation Fund. For Belgian donors this means that for every donation over 40€, the Ghent University will provide a tax exemption form that allows you to deduct your donation from your annual income (60% in this year of COVID crisis!). This academic process of donating guarantees that every euro that is donated goes entirely and exclusively to our research projects. Further explanations can be found on the following website:
https://www.ugent.be/nl/univgent/universiteitsfonds

If you are thinking about donating money to our research program, here is what you can do:

- Direct donation to the bank account of the Ghent University:
  - Ghent University, Sint-Pietersnieuwstraat 25, 9000 Ghent, BELGIUM
  - IBAN: BE26 3900 9658 0329
  - BIC: BBRUBEBB
  - Please mention: "Fonds Breast Engineering" or just "GE_495"
- Please do not hesitate to contact me personally. My team will do all the necessary for you as an individual or as a company to provide you with all necessary administrative support.

  Phillip.Blondeel@ugent.be
  Bernard.Depypere@ugent.be

The road is still long…