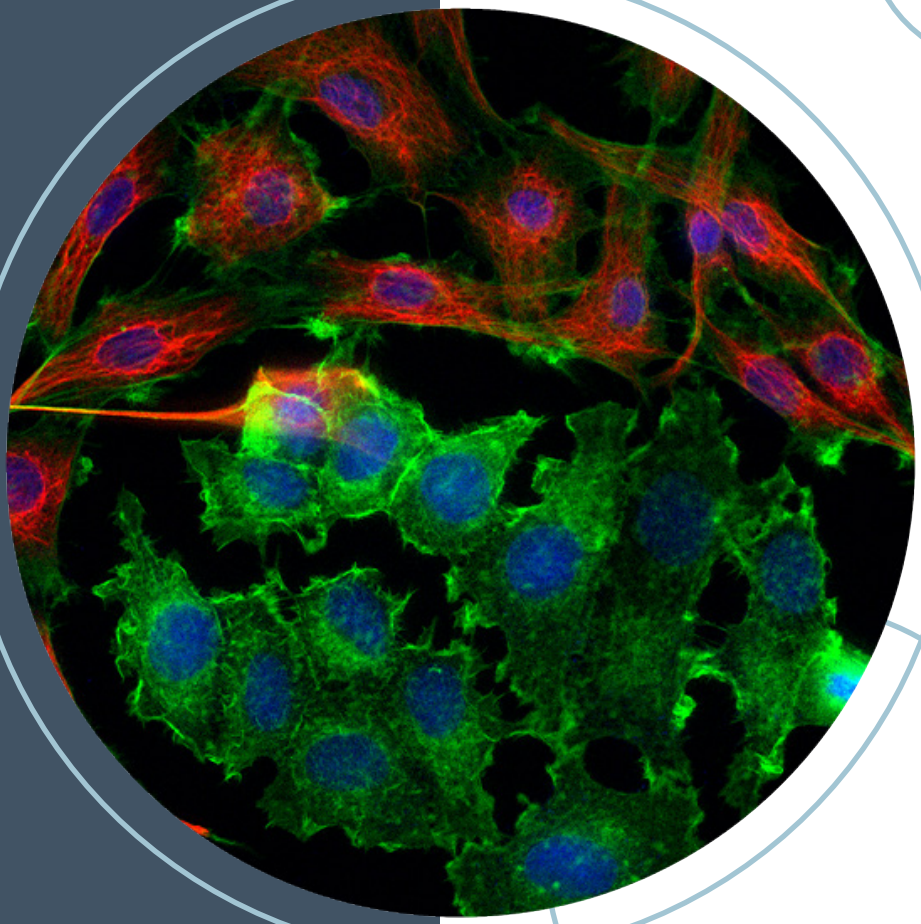
CTET Newsletter



AUGUST 2022

DIRECTOR'S MESSAGE

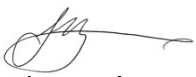
CTET is now through the middle of our second year and whilst operations have been challenging during the pandemic, I believe we can say that we have really come together as a Centre.

This year we were fortunate enough to be able to gather in person for the first time since the Centre commenced. We had a great turnout and a very successful Centre workshop at Peppers, Noosa in June, where it was fantastic to all be together for a few days, and I would like to thank everyone who attended. There was great engagement from the CTET CIs, PIs, Postdocs and students. We even had international representation from the University of Newcastle Upon Tyne via Zoom.

We still have a little bit of work to do to follow up on the main action items emerging from the workshop so thanks for your patience as we work through these. We are hoping to have even greater participation in 2023, particularly from industry partners who will hopefully have more leway to travel, and our esteemed Scientific Advisory Committee.

We also have a bit of work to do finalising some agreements and potentially engaging with new Partner Organisations in the near future. Once that is done, we can really focus on delivering great outcomes and impact from the collaborative work we are doing together.

Our training program is in full swing with more offerings to come this year, so I am looking forward to participating in some of the future sessions. Read on for more information on that, and also some highlights from our research.



Professor Laurence Meagher
CTET Director

IN THIS ISSUE

CHANGES TO CTET: Industry Partners

Over the course of the proposal, the grant being awarded and CTET officially starting, there were a number of changes to industry partners, and members involved. This is to be expected, and was unfortuantely exacerbated due to COVID and additional strains on resources.

CTET has introduced several new partners to fill gaps that were left when changes were made. These now include ReNerve, TissueGUARD and Peter Mac and TissueGnostics. Negotiations are also occuring with an additional two companies for the remaining planned projects.

AESCULAP, BELLASENO, bluechiip Tracking Solutions, CCRM Commercializing Living Therapies, CATAPULT Cell and Gene Therapy, cell therapies, CERI, CSIRO, cytiva, gelomics, Invetech, ipf Leibniz-Institut für Polymerforschung Dresden, MOGRIFY Transforming Cell Therapy, Newcastle University, Opyl, PolVax, SPRUSON & FERGUSON Intellectual Property, stryker, ULVAC, World Courier AmerisourceBergen

New Industry Partners

Miltenyi Biotec, ReNerve, TissueGUARD, Peter Mac Peter MacCallum Cancer Centre Victoria Australia, TISSUEGNOSTICS PRECISION THAT INSPIRES

Changes to Chief Investigators

CIs changed to PIs

Dr. Roey Elnathan

A/Prof. Rebecca Lim

Prof. Martin Obschonka

Prof. Jose Polo

In addition to Industry Parnter changes, there were some changes to Chief Investigators, with some researchers changing universities or companies, and therefore not being able to stay on as Chief Investigators. These former Chief Investigators are now Partners Investigators, remaining involved in the projects and affiliated with Monash and QUT. Additional CIs have been brought on to fill the gaps.

New CIs

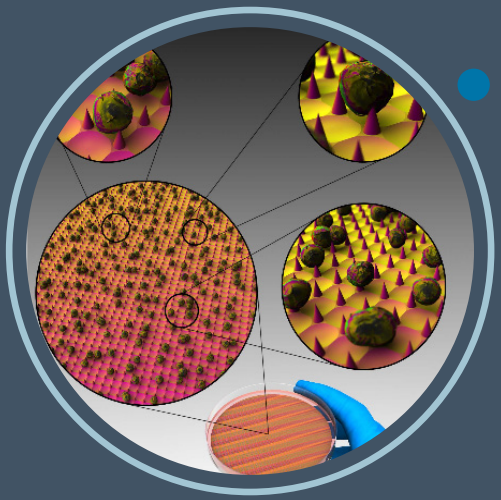
Dr. Bo Sun

A/Prof. Daniela Loessner

Dr. Victor Cardarso

Prof. Peter Currie

RESEARCH HIGHLIGHT:
Development of vertically aligned nanoneedle arrays for intracellular delivery
Industry Partner: ULVAC



Relatively low-cost and high throughput polymeric nanoneedle arrays can be fabricated from cell culture polystyrene. The nanoneedles with precise geometry are directly imprinted on polystyrene from the cell culture petri dish via nanoimprint lithography. The nanoneedles can mediate intracellular delivery and manipulate complex cellular processes.

The CTET Nanoneedle Team

Prof. Nicolas Voelcker

Dr. Koukou Suu

Dr. Roey Elnathan

Dr. Yaping (Crystal) Chen

Re-engineering patients' immune cells to treat their cancers is a rapidly growing field in cancer treatment. One of the world's newest forms of cancer immunotherapies, chimeric antigen receptor (CAR) T cell therapy, has generated enormous global excitement due to promising results in treating some blood cancers. In the project 'Nanomaterials for T-cell cancer immunotherapy', a partnership between Monash University, the Melbourne Centre for Nanofabrication and ULVAC, we are developing a new cellular nanotechnology that is urgently needed as an alternative the current technology of viral-based CAR-T manufacturing and therapy.

Programmable nanoneedle arrays provide the potential for major improvements in complex cellular manipulation, including intracellular delivery of various biomolecules. With their unprecedented nanoscale resolution, nanoneedles can negotiate localised biological barriers, such as cell membranes, with minimal invasiveness. This allows nanoneedles access to the cells' interior for intracellular delivery—a physical delivery process termed 'nanoinjection'.

Using silicon nanoneedles, we achieved the introduction of CAR constructs into primary mouse T cells to produce effective CAR-T cells. When these CAR-T cells were co-cultured with target lymphoma cells, the lymphoma cells' growth was significantly inhibited. The nanoneedle-engineered CAR-T cells showed greater efficiency than CAR-T cells produced by a conventional method (i.e. bulk electroporation), providing evidence that this cost-effective non-viral method is a promising tool to make CAR-T therapy a widely affordable living drug.

Despite the success of the semiconducting silicon nanoneedles, there are advantages of using nanoneedles made from different materials. One of the aims of this project is to advance nanomanufacturing to enable the integration of nanoneedles into a wide range of materials by using commercially scalable methods for mass production. For this, we investigated nanoneedles with identical topologies, but differing stiffness using three polymeric materials.

We designed and fabricated nanoneedles with different compositions, with precisely controllable nanoscale resolution; such nanoneedles enabled efficient delivery of a range of biomolecules, such as plasmids and mRNAs, into mouse cells. In addition, polymeric nanoneedles were able to facilitate mRNA delivery into mammalian cells with up to 49% efficiency. State-of-the-art electron microscopy and confocal microscopy revealed the intricacy of cell–nanoneedle interfacing, facilitating the probing and understanding of cellular/molecular mechanisms behind nanoneedle-mediated intracellular delivery; this in turn can provide strategic insights into nanoneedle programming.

These early successes of introducing biomolecules into cells with minimal perturbations have demonstrated the great potential of nanoneedle-enhanced tools for universal and effective intracellular delivery, providing opportunities for transforming next-generation cellular manufacturing in biomedical research.

Nicolas Voelcker and Roey Elnathan recently published in Nature Nanotechnology on the use of nano-needles in start-ups

EDUCATION:
Pitch Training
Practice makes a perfect pitch!

Sofia Hilmi is a Master students at QUT and writes here about her experience doing pitch training at the CTET Annual Retreat

Ms. Sofia Hilmi

On the very first day of the ARC CTET Retreat 2022, our Melbourne and Brisbane students ventured outside of comfort zones to build their perfect elevator pitch. With a focus on the verbal articulation of thoughts, as well as, communicating in an adaptive manner to suit audiences; students were immersed in an engaging workshop filled with participative activities to improve their presentation skills.

CTET students had the pleasure of working with Dr. Susan Chapman, a brilliant lecturer in the School of Early Childhood and Inclusive Education at QUT, who is incredibly passionate about developing engaging academic communicators. Covering the foundations of effective presentation skills, we expanded on our gesture vocabulary, vocal techniques, and frameworks to help deliver informative speech succinctly whilst maintaining audience engagement.

Students found this workshop to be an invaluable experience in learning and practicing on how to be purposeful and influential in the way they speak, so that their message is amplified, and that the audience understand the importance of what we do.

Above and beyond, CTET students had an absolute fun time in bonding with one another, through learning about each other's projects, raising their levels of confidence, and exercising their creativity. This calls for a great success in elevating their elevator pitches.

One major benefit of being part of an ARC Training Centre, is the access to addition training that the Centre provides its students and postdocs.

So far in 2022, students and postdocs have also done training on being an ethical researcher.

In partnership with CTET Training Partners, we are intending to run training in the following areas in 2022 and beyond:

- communication strategies
- entrepreneurship
- intellectual property
- research development and technology transfer
- regulatory considerations in research and manufacturing

ANNUAL RETREAT 2022:
Peppers Resort, Noosa

At the end of May and the beginning of June, CIs, PIs, postdocs and students were able to come together in Noosa for two days to hear about the Centre structure, research and plans for the future. It certainly didn't hurt those from Melbourne who would have otherwise been experiencing weather at top temperatures of 10 and 11°C that Noosa experienced lows of 12 and 13°C and very pleasant highs of 22 and 23°C.

Students and postdocs participated in pitch training, but it was also an opportunity to be together in person and to discover research areas of people we might not have met before. There were several informal discussions from which ideas for projects and additional collaborations grew.

We heard from industry partners, both in person and virtually, and also had the opportunity to discuss Centre key performance indicators, and plan for how we see success in strategic planning sessions and theme meetings.

We are certainly hoping to experience a similar meeting, with even more partners involved, in 2023.

FOCUS ON INDUSTRY PARTNER:
Invetech

Robert Neil

Ken Galbraith

Invetech's award-winning automated bag filling system can be configured to accurately dispense therapeutic products or processing material from formulated bulk into individual aliquot bags.

The new Korus™ system's elutriation application gently prepares your starting material to optimize downstream performance in unit processes such as cell selection and expansion. It enriches the cells you need while removing the cells and contaminants you don't for a cleaner cell population.

Invetech has been involved, in one way or another, in Cell Therapy for 15 years at this point. We have watched this sector grow from its infancy to where it is today. Over that time, we have matured our approach and now have a range of product and service offerings that allow our clients to repeatedly manufacture cell therapies in a closed automated manner.

Despite the geographic challenges of being based in Mount Waverly, Invetech has carved itself a niche in Cell Therapies on the world stage, with our client base predominantly offshore in North America, Europe and Asia. With this international focus, we sometimes forget that there is a growing CT industry here in Australia. As such we are excited to bring our focus closer to home and get involved in CTET and all it has to offer in growing our collective capabilities.

We enjoyed a very warm welcome at the recent CTET retreat and were overwhelmed by the interest shown by participants in our company and what we do. We were never short of a conversation the whole two days, and we thank Dianne for her invitation to attend.

Going into the retreat we had our sights set on being involved with Nico and his team on their theme regarding reducing the cost of therapies. Given the open nature of the conversations during the retreat many more opportunities opened up with the other themes, many of which we might like to get involved in.

Aside from the PhD projects, we see CTET as a catalyst for industry and university collaboration, as well as education. We look forward to having the opportunity to share some of our learnings with the CTET group (i.e. How to produce your therapy in a closed consumable when your usual tool set are not available) and potentially hosting industry collaboration events.

If you are interested in more about our company, feel free to check out our website and reach out for a discussion. https://www.invetechgroup.com/services/manufacturing-automation-for-cell-therapies/

For those of you interested in new autologous technologies, you may be interested in our most recent product release, KorusTM, an elutriation and washing system that prepares cleaner cell populations for your autologous manufacturing process.

https://www.invetechgroup.com/cell-therapy-products/korus/

Ken Galbraith
Cell Therapy Engineering Manager

NEWS

CTET CI Dr. Jacqui McGovern awarded a grant worth $299,171 over three years from the Kids' Cancer project

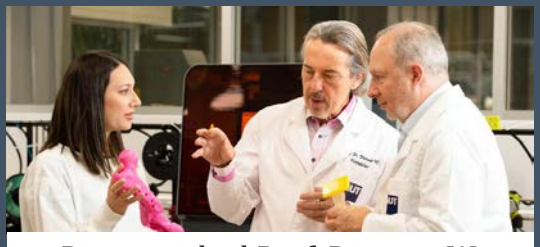
CTET students and postdocs join with four other Training Centres for ethical researcher training

Visiting academic Prof. Millicent O. Sullivan gives CTET presentation at Monash University

CTET members present posters, talks and keynote at ASBTE Conference 2022

Distinguished Prof. Dietmar W. Hutmacher presents keynote talk at the Allianced for Advanced Therapies in Orthopaedics conference

CTET holds first Scientific Advisory Committee meeting



Distinguished Prof. Dietmar W. Hutmacher named as co-director in newly formed Max Planck Centre in Australia

See CTET.org.au/news for more information

POSITIONS AVAILABLE

CTET is recruiting for the remaining research projects in various areas. Postdocs, PhD students and Masters students are being sought to begin projects before the end of 2022.

Candidatures are being recruited for:

PhD in Improving Efficacy of CAR T Cell Therapies for Solid Tumors
Faculty of Medicine, Nursing & Health Sciences
Monash University, Peter Mac
Supervisor: Gail Risbridger

PhDs in Supply Chain Optimisation & Business Model Innovations
Faculty of Business & Economics
Monash University, Bluechiip, Cell Therapies, World Courier
Supervisor: Amrik Sohal, Dietmar W. Hutmacher

Masters in In Vivo Assessment of BoneFlo® System in an Ovine Model of Tibial Critical-Sized Defect
Faculty of Engineering
QUT, Aesculap
Supervisor: Laura Bray

FOR MORE, SEE: WWW.CTET.ORG.AU

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