2019 Community Dissemination Report

BioCanRx-Cancer Stakeholder Alliance Learning Institute

Cancer Immunotherapy Research - An Outline of Current Work as Discussed at the 2019 BioCanRx Summit4CI written by participating Patients and Caregivers, in Collaboration with Early Career Researchers Working in the Field

BioCanRx
Canada's Immunotherapy Network
Le réseau canadien d'immunothérapie

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December 2019

Welcome Messages

From BioCanRx

We are very proud to share this publicly available **Community Dissemination Report** written by the participants of the 2019 BioCanRx-Cancer Stakeholder Alliance Learning Institute. The Learning Institute was held at the 2019 Summit for Cancer Immunotherapy (Summit4CI) from October 20 to October 23, in Victoria, British Columbia.

The Learning Institute piloted at the 2017 Summit for Cancer Immunotherapy and has since become a permanent component of the annual Summit. This initiative was developed in partnership with the Cancer Stakeholder Alliance through the members of its working group. We are deeply grateful for this partnership and for the invaluable time and focus that participants have committed to developing this important patient engagement initiative.

This Dissemination Report serves to highlight and share the key research take-away messages presented at the Summit4CI as well as group reflections of the Learning Institute. The report is targeted toward the boarder oncology patient and researcher community, BioCanRx network, the Cancer Stakeholder Alliance, and the general public.

We look forward to hosting another successful event at the next Summit in November 2020. You can learn more about the Summit4CI at cancersummit.ca.

We hope you will find this informative report as enlightening as we do.

John C. Bell, Ph.D.
Scientific Director
BioCanRx

Stéphanie Michaud, Ph.D.
President and CEO
BioCanRx

From the Cancer Stakeholder Alliance

In 2017, on the advice of the Cancer Stakeholder Alliance and with inspiration from the Community AIDS Treatment Information Exchange (CATIE) – Canadians Association for HIV Research (CAHR) Learning Institute, BioCanRx created the Learning Institute. The Learning Institute was built with the following objectives in mind:

- To create a model of learning that encourages, supports and creates the integration of patient leaders into the scientific conference,
- Integrate the patient/caregiver perspective to ensure that cancer research is well informed by the patient voice and lived experience and,
- Ensure that scientific research presented at the conference is accessible so that patients can be advocates to their communities.

As part of the Learning Institute, trainees working in cancer immunotherapy research are paired with patient advocates. Together, they attend the annual BioCanRx Summit for Cancer Immunotherapy and learn from each other through a bi-directional exchange of information during the conference.

Trainees are able to guide patient advocates through the conference and help them to better understand the scientific knowledge and general scientific process, as well as to practice their knowledge-translation skills. Patient advocates are able to help trainees understand the real-world implications and importance of their work while passing on their own lived experience both within and outside of the cancer landscape.

I believe we have created the start of something very valuable for patients and researchers alike. It is important to remember that patients have a lot to teach others about the cancer landscape and this initiative helps the patient voice be heard.

I want to thank and commend BioCanRx for being so committed to patient engagement in cancer research.

Louise Binder
Chair of the Cancer Stakeholder Alliance Working Group
Health Policy Consultant, Save Your Skin Foundation

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The Learning Institute

What is the Learning Institute?

The BioCanRx-Cancer Stakeholder Alliance Learning Institute **brings together** leaders from oncology patient communities (**patient scholars**) and BioCanRx Trainees (**academic scholars**) from the immunotherapy research community to engage in **interactive, collaborative, and bidirectional knowledge exchange** activities at the annual Summit for Cancer Immunotherapy. The overall aim of the Learning Institute is to ensure that novel cancer immunotherapy research is **accessible** to the cancer patient community.

Goals

- **Create a model of learning that encourages, supports and creates the integration of patient leaders into the scientific conference,**
- **Integrate the patient/caregiver perspective to ensure cancer research is well informed by the patient voice and lived experience,**
- **Ensure that cancer immunotherapy research is accessible so that patients can be advocates to their community, and**
- **Bridge the knowledge gap between patients and researchers through bi-directional learning**

The Four Main Components of the Learning Institute:

PRE-SUMMIT TRAINING

Familiarization of basic cancer biology and immunotherapy concepts in advance of the Summit for Cancer Immunotherapy.

KNOWLEDGE EXCHANGE SYSTEM

Buddy groups get together and discuss the research they have heard. After discussion, buddy groups present to the group and explain the key take-aways of the research.

BUDDY SYSTEM

The buddy system consists of pairing a technical expert (academic scholar) with people with lived cancer experience (patient scholars) for information sharing of their expertise with each other.

DISSEMINATION REPORT

Co-authorship of a community dissemination report outlining key take-aways from the Summit.This report is available to the general public and is written in lay language to make it accessible.

Interested in Participating?

For more information please visit the BioCanRx website at https://biocanrx.com or email us at info@biocanrx.com

Development

The Learning Institute was inspired by the Community AIDS Treatment Information Exchange (CATIE) – Canadians Association for HIV Research (CAHR) Learning Institute. In 2016, the Cancer Stakeholder Alliance (CSA) and BioCanRx identified the Learning Institute as a joint priority and made it part of their Joint Action Plan. Members of the 2017 CSA Working Group partnered with BioCanRx staff and Highly Qualified Personnel to develop the inaugural Learning Institute, which was piloted at the 2017 Summit4CI. This year's Learning Institute was designed by the BioCanRx-CSA Learning Institute Working Group and BioCanRx staff using the feedback obtained from last year's initiative. Changes made by the Working Group this year included: a new knowledge exchange session framework for efficient and meaningful discussion as well as an extra pre-summit training module explaining some basic cancer biology.

Table 1 Members of the 2019 BioCanRx-CSA Learning Institute Working Group.

Members:
Roberta Casabon Prostate Cancer Canada **Kevin Hay** Director, Clinical Cellular Therapy Laboratory, BC Cancer Medical Director, Conconi Family Immunotherapy Laboratory, BC Cancer **Patrick Sullivan** President, Team Finn and a Founder & Chairman of Ac2orn
BioCanRx Trainees:
Joshua Del Papa Medical Student, Queens University **Alyssa Vito** PhD Candidate, Karen Mossman's Lab, McMaster University
BioCanRx Staff:
Stéphanie Michaud President and CEO, BioCanRx **Megan Mahoney** Manager, Highly Qualified Personnel Training Program, BioCanRx **Sarah Ivanco** Knowledge Mobilization Intern, BioCanRx

Thank You

BioCanRx and the members of the BioCanRx-CSA Learning Institute Working Group wish to thank the CATIE-CAHR Learning Institute for the inspiration and for setting the bar of excellence.

BioCanRx wishes to give a special thank you to the Learning Institute Working Group and mentors for their dedication of their time, energy, focus and work in making the Learning Institute a great success.

We would also like to extend a big thank you to Canadian Institutes of Health Research, Institute of Cancer Research for being a proud supporter of this initiative.

2019 Learning Institute

This year's initiative brought together eight members from the cancer patient/caregiver community, in the role of patient scholars, eight members of the BioCanRx trainee community, in the role of academic scholars, three members from the Learning Institute Working Group as mentors, and a BioCanRx staff as a facilitator (Figure 1). Trainees are defined as all individuals responsible for the translation of promising cancer biotherapeutics. They include undergraduate and graduate students, post-doctoral fellows, and research and clinical staff.

Figure 1: 2019 BioCanRx-CSA Learning Institute participants.

Together, they participated in a series of interactive and collaborative “Knowledge Exchange sessions” that served to guide the process of knowledge synthesis, dissemination, and exchange. (Figure 2).

Figure 2: Early morning Knowledge Exchange sessions in action. Participants discussed the plenary sessions from the previous day each morning over breakfast. These high-energy sessions included small group discussions followed by a brief presentation to the group highlighting key take-aways, scientific content, personal thoughts and overall accessibility of the talks.

Table 2 Full List of the participants in the 2019 Learning Institute.

Patient Leaders/Caregivers who participated as "patient scholars":	
Julie Chessell **Adrienne Co-Dyre** **Joan Mackay** **Patricia Pitts**	**Denis Raymond** **Marilyn Sapsford** Ovarian Cancer Canada **Eva Villalba** Quebec Cancer Coalition **Taylor Wheatley**
BioCanRx Trainees who participated as "academic scholars":	
Douglas Chung PhD Candidate, Dr. Pamela Ohashi's Lab, Princess Margaret Cancer Center **Indrani Dutta** PhD Candidate, Dr. Lynne-Marie Postovit's Lab, University of Alberta **Brian Keller** Resident Physician and Post-Doctoral Fellow, Dr. Carolina Ilkow and Dr. John Bell's Lab, Ottawa Hospital Research Institute **Stacey Lee** Master's Student, Dr. Jeanette Boudreau's Lab, Dalhousie University	**Dave Mealiea** Resident Physician and Master's Student, Dr. Andrea McCart's Lab, University of Toronto **Etienne Melese** PhD Candidate, Dr. Ninan Abraham's Lab, University of British Columbia **Jessica Silva** PhD Candidate, Dr. Kenneth Harder's Lab, University of British Columbia **Ashley Stegelmeier** PhD Candidate, Dr. Byram Bridle's Lab, University of Guelph
CSA Working Group members who participated as "mentors":	
Roberta Casabon Prostate Cancer Canada **Patrick Sullivan (Co-Chair)** President, Team Finn and a Founder & Chairman of Ac2orn **Alyssa Vito (Co-Chair)** PhD Candidate, McMaster University	
BioCanRx Staff who participated as a "facilitator":	
Sarah Ivanco Knowledge Mobilization Intern	

Dissemination Report Details

The Learning Institute key take-away messages and group reflections from select plenary session at the 2019 Summit4CI can be found below.

This conference was held from October 20th to October 23rd, 2019, in Victoria, British Columbia. A general overview of the program agenda is provided below.

Monday, October 21 (Day 2)	• Plenary Session 1: Immunotherapy 101 • Plenary Session 2: Gene Editing and Cancer Immunotherapy
Tuesday, October 22 (Day 3)	• Plenary Session 4: Highlighting BioCanRx Clinical Trials • Plenary Session 6: Patient Plenary – Innovation, Access, and Affordability
Wednesday, October 23 (Day 4)	• Plenary Session 7: Brain Cancer Immunotherapy

To learn more about the Summit and to view the full program, please visit http://www.cancersummit.ca/. You can also learn more about the Learning Institute experience from a patient and academic scholar in our November newsletter here: https://biocanrx.com/sides-learning-institute-2019-experience

MONDAY, OCTOBER 21, 2019 (DAY 2)

Plenary Session 1: Immunotherapy 101

Lay Abstract of Plenary Session 1

Immunotherapy - therapies that harness the immune system to fight cancer - has the potential to change how cancer is treated and for some forms of the disease, immunotherapy has already radically improved therapeutic outcomes. Immunotherapy has the potential to support durable long-term cures with fewer side effects to the patient, but to achieve this vision we need to better understand how the immune system interacts with cancer treatments. In this plenary session, we had speakers that are researching the interaction between the immune system and other cancer treatments, including surgery, radiation and viruses that can infect tumours. Our speakers discussed how the immune system might be studied, activated and supported so that it can support cancer control and destruction. Dr. Rebecca Auer discussed how the immune system is negatively impacted following surgery, and how surgical stress may actually help tumours to regrow and metastasize. Dr. Julian Lum showed us how immune function and radiation therapy might work hand-in-hand, if radiation treatments are targeted to support immune function. An array of viruses that infect and kill cancer cells, called oncolytic viruses, can work with the immune system to support cancer control, or the immune system could limit the spread, growth and effectiveness of oncolytic viruses; Dr. John Bell demonstrated how this happens with a vast array of examples. Finally, our trainee speaker, Natalie Firimino, showed us how tumours can interfere with training of anticancer immune cells. These researchers work on a variety of cancers and mechanisms, but their work collectively shows us that supporting a strong anti-cancer immune response, even when the tumour works against it, will be necessary for effective cancer treatment.

Talk title: Targeted radiation therapy and immune checkpoint blockade by Julian Lum, BC Cancer Agency

Notes by Taylor Wheatley and Brian Keller

- Dr. Lum gave a great talk on one of the longstanding research interests of his laboratory, which has to do with combination radiotherapy and immunotherapy and how best to translate these data to clinical utility.
- There are several important take-home messages from Dr. Lum's talk:
    - The abscopal effect: this is a phenomenon that has been known clinically for many years, but only in the last 15 years have we appreciated that this is an immune-mediated observation. Essentially, the abscopal effect is the observation that even though a tumour may be treated locally with radiation therapy, distant tumours that have not undergone irradiation can be seen to demonstrate a therapeutic response.
        - Now, there are studies demonstrating that the use of immunotherapy in combination with radiation therapy (especially in models in which the abscopal effect is prevalent) is a favourable therapeutic approach.

    - Dr. Lum showed some results of early negative clinical trials from this field that were designed to boost the abscopal effect and speculated on the reasons for why some of these earlier studies may have failed.
    - He then introduced the concept of prostate-specific membrane antigen (PSMA)-targeted radionuclide therapy in the context of metastatic prostate cancer, which has advantages both from the perspective of therapeutic delivery, but also from the perspective of functional imaging and treatment efficacy monitoring, which is an ongoing clinical challenge for all clinicians who administer biologic therapies.
    - Dr. Lum then discussed the blockade of the immune checkpoint OX40 in combination with PSMA-targeted radiotherapy and demonstrated promising results on control of tumour burden in murine models of prostate cancer.
- This is a more targeted way to apply radiation therapy that will hopefully allow us to take advantage of the immune-mediated abscopal effect, while at the same time utilizing combination immune checkpoint (OX40) blockade. 50% or more of patients need radiation therapy and the intent is often curative, therefore this highly translational research can change the trajectory of disease. This is promising for the treatment of prostate cancer and in the field of radiation oncology in general.
- Two unaddressed questions remain:
    - How can we best improve radiation therapy in the setting of combination immunotherapy given that we are in this era of highly focused immunotherapy research?
    - Is it better to combine currently used external beam radiation therapy with immunotherapy treatments, or targeted radiotherapy approaches, such as those targeting PSMA with therapeutic radionuclides?

Talk title: Germinal center hypoxia during exposure to tumour antigens and modulated antitumour immune response by Natalie Firmino, BC Cancer Research Centre

Notes by Adrienne Co-Dyre and Jessica Silva

- When the immune system is exposed to tumour antigens, either directly via the tumour cells, or through the tumour-associated antigens, the tumour-draining lymph node (lymph node directly downstream of a tumour) becomes activated.
- This activation of the tumour-draining lymph node results in B cell growth and maturation.
- Due to the expansion in the germinal centre of the lymph node, the germinal centre becomes hypoxic, with low levels of oxygen available.
- The lymph node hypoxia then promotes tumour-specific antibody-producing B cell development, and in turn, the production of tumour-specific antibodies.
- *Caveat/Nuance: Eventually, increased hypoxia in the germinal centre also promotes increased hypoxic signalling, which in turn negatively regulates germinal centre hypoxia (negative feedback loop).
    - This results in decreased development of tumour specific antibody-producing B cells and decreased production of tumour specific antibodies.

- Final observation: In a mouse breast cancer model, the increased hypoxic signalling that reduced production of B cells producing tumour specific antibodies, resulted in slowed tumour growth. Therefore, the antibody-producing B cells were being co-opted by the tumour to be pro-tumoural.

- Speaking to the presenter to request clarification and more information was very beneficial to our understanding of the presentation.

Plenary Session 2: Gene Editing in Cancer Immunotherapy

Lay Abstract of Plenary Session

One of the most promising new developments in cancer immunotherapy involves the genetic modification of immune cells to enhance their ability to recognize and destroy cancer cells. The most notable example of this technology is the use of Chimeric Antigen Receptor (CAR) T cells. With this approach, a patient's T cells are cultured *in vitro*, and a viral vector is used to insert a gene (called a CAR) that confers recognition of tumour cells (most widely used for recognition of leukemia and lymphoma cells). The resulting CAR-T cells are then infused back into the patient's bloodstream so they can circulate throughout the body and destroy cancer cells wherever they are found. CAR-T cells have proven to be highly efficacious, particularly against certain blood cancers, with complete response rates as high as 90%. These high rates of success have further fueled interest in applying this approach to other forms of cancer as well. This session featured several of the top researchers and clinicians in the CAR-T cell field. They shared their latest research findings and visions for the future of this exciting, rapidly advancing field.

Talk Title: Functional genomic landscape of cancer intrinsic immune evasion by Jason Moffat, University of Toronto

Notes by Denis Raymond and Douglas Chung

- Genomic-wide CRISPR nuclease screening approaches are used to identify essential genes (‘fitness genes’). In this approach, they took tumour cell lines and looked for genetic similarities between the different lines.
- Next, they compiled a list of core genes to target in the tumours using CRISPR to further identify genes that make tumours more sensitive to T cell-mediated killing.
- Finally, they showed that ATG12-deficient tumour cells, which play a role in autophagy, make tumour cells more sensitive to TNF-α secreted by the T cells. Therefore, the researchers inferred that in tumours ATG12 provides resistance against TNF-α signalling by T cells.

Talk title: Metabolic engineering of chimeric antigen receptor T cells for cancer immunotherapy by Gillian Carleton, Deeley Research Centre

Notes by Joan Mackay and Indrani Dutta

- This study addresses the challenges of using CAR T cells in solid tumours; in this case, ovarian cancer.
- Generally, solid tumours present with extremely harsh tumour microenvironments including various immunosuppressive cells and hypoxic conditions. CAR T cells require oxygen and glucose to expand and proliferate *in vivo* to better target the tumour cells, but in the tumour microenvironment, both oxygen and glucose are limited as they are continually consumed at rapid rates by the tumour cells to grow and survive.
- The tumour cells are constantly dividing, and in the process, they also release waste such as lactic acids that ultimately stimulates autophagy (self-destruction) in the CAR T cells.
- They have developed autophagy-resistant CAR T cells which they believe will have increased persistence in the tumour microenvironment and in turn, a better antitumour response.
- Key take-aways:
    - There is metabolic competition between tumour cells and T cells in the tumour microenvironment.
    - T cells undergo autophagy as a result of this metabolic competition.
    - Blocking autophagy is a valid strategy for improving CAR T cell responses in solid tumour phenotypes.

TUESDAY, OCTOBER 22, 2019 (DAY 3)

Plenary Session 4: Highlighting BioCanRx Clinical Trials

Lay Abstract of Plenary Session

New and innovative cancer immunotherapies go through extensive research and testing before they are ever brought into the clinic and given to patients. Clinical trials are the first step in testing these new promising therapies in people. Many immunotherapies continue to be developed in the hopes of curing and improving the lives of patients with cancer. In this plenary session, BioCanRx-funded clinical trials were highlighted. Kevin Hay talked about CAR T cells and how they could be used as a powerful new tool for treating patients with various forms of blood cancer that do not respond to standard treatments. Marcus Butler then discussed his ACTIVATE trial, which investigates how a combination of immune checkpoint inhibitors, a novel class of anti-cancer drugs, and adoptive T cell transfer may improve melanoma and ovarian tumour control. Sandy Pelletier then presented pre-clinical data on tumour infiltrating T lymphocytes (TILs) and how these data will be critical for getting clinical trial approval in the near future. Finally, Jonathan Bramson discussed how the combination of a vaccine and immune checkpoint inhibitor may benefit those living with cancer.

Talk title: Optimizing Cell Therapies for Solid Tumours by Marcus Butler, University Health Network

Notes by Patricia Pitts and Etienne Melese

There are several examples of cell therapies that were addressed in the conference, detailed below:

- **CAR T Cell Therapy**: The process by which T cells isolated from patients' blood and engineered to express a CAR (or chimeric antigen receptor), which can then be used to direct T cells to target and kill tumour cells bearing a specific cancer antigen.
- **T cell receptor (TCR) T cell therapy**: T cells are isolated from patients' blood and engineered to express a TCR that responds to the patient's specific tumour antigens, as determined by screening tests on the patient's TCR. The T-cell receptor molecule recognizes these specific cancer antigens and binds to them. This is different from CAR T cell therapy because it is using a receptor more akin to a patient's normal endogenous TCR structure.
- **Tumour infiltrating lymphocyte (TIL) Therapy:** TILs are immune cells that enter tumours from the patient's bloodstream. These TILs are then isolated from a patient's tumour and expanded *in vitro* for re-infusion. Many of these T cells will already be targeting specific cancer cells from initial exposure in the tumour microenvironment.
- Dr. Butler addressed these cell therapies and advances in their use for solid tumours, as well as the draw backs currently present in translating these therapies into the clinic.
- Identifying and selecting the tumour antigen to be targeted is a major challenge to overcome. Additionally, there is evidence that local infusion of cell therapies (as opposed to intravenous administration) produced a better response and there are clinical trials showing that giving cell therapies after treatment with checkpoint inhibitor antibodies (such as anti-PD1 antibody) has improved efficacy.
- To conceptualize these results, we developed a metaphor of thinking of solid tumours like a forest. In this forest there are different types of trees, and cell therapies are targeting one specific type of tree, but the forest continues to grow different species, which now need to be targeted by new therapeutic approaches.
- Key take-away: Cell therapies are frequently used in hematological malignancies and show strong clinical benefit. More recently, they are also being evaluated for efficacy in targeting the vast range of antigens present in solid tumours malignancies.
- Final thoughts: Dr. Butler's talk addressed the increasing use of cell therapies for targeting solid tumours, recent advances in the field of TCR-T cell therapy and several clinical trials with success in using TCR-T cells in solid tumours (see clinical trial TBI-1301). All of this suggests that there is good reason to believe cell therapies can be effective on solid tumours, including lung and ovarian.

Talk title: Demonstrating the boosting capacity of Maraba virus in humans by Jonathan Bramson, McMaster University

Notes by Eva Villalba and Stacey Lee

- This talk focused on the potential role of cancer vaccines and oncolytic viruses as a driver of an immune response against cancer.
- Dr. Bramson discussed using two different viral coatings as one therapeutic treatment: the first virus (adenovirus) would "prime" the immune system, and the second virus (maraba virus) would "boost" (activate) the immune response.
- His research team has noticed that when oncolytic viruses were used to try and activate an immune response against cancer, the immune cells were more preoccupied with attacking the virus coating than the gene that had been inserted.
- They used the two different viruses simultaneously with the same target - to attack cancer cells that expressed a dangerous protein called MAGE-A3 (Melanoma-associated Antigen 3).
- The cold virus (adenovirus) trained the patient's immune system to recognize (but not destroy) the cancer cells, and the Maraba virus went a step further by replicating inside the cancer cells once found and killing them from within.
- The immune system had never seen this virus before and thus did not have a response to the Maraba virus itself. But as it had the same target as the previous virus, the immune system recognized it and was able to respond to the cancer cells. As a result, the cancer was more effectively targeted.
- We used a **comic book analogy to explain this process** simply:
    - The **cancer cells** were the **villain** hiding in plain sight (e.g., Penguin)
    - The **adenovirus** was the **infiltrating transport vehicle** to find the cancer cells (ex. Batmobile, tracking device)
    - The immune system functioned as the Gotham city police; really good at finding Batman, not always so good at finding the real villain.
    - The **Maraba virus** was the **hero** (e.g., Batman) who located the villain (cancer cells) thanks to his targeted transport vehicle (ex. Batmobile, tracking device) and was able to eliminate the "bad guy" by unmasking him/it and carrying out a targeted attack to destroy him/it
- We understood that researchers must be creative and use combinations of delivery systems to more effectively target and destroy cancer cells, which are "smart" and adapt to and escape from most traditional treatments.
- This presentation could have been made more accessible through analogies or simpler diagrams and lay language.

Plenary Session 6: Patient Plenary – Innovation, Access, and Affordability

Lay Abstract
There are many new and exciting therapies being developed to treat many diseases, including cancer. While there is tremendous hope and promise with many of these innovative therapies, they can also be challengingly complex to implement within the current healthcare system due to the added resources, training, and infrastructure that may be required. The purpose of this session was to understand the opportunities and challenges of innovative therapies from a variety of stakeholder perspectives. The speakers for this session included a cancer survivor who founded a patient advocacy group, an ethicist who spoke to the ethical considerations from a societal perspective when jurisdictions adopt new therapies, a clinician who has also been responsible for the care of patients as well as a cancer drug budget, a PhD candidate who has conducted research on the importance of engaging patients in research, and finally, an academic researcher who has conducted research on the financial burden of cancer diagnosis on patients and their families.

Talk title: Is there room for innovation in the Canadian cancer drug review and approval process by Marianne Taylor, BC Cancer

Notes by Julie Chessel and Ashley Stegelmeier

- This seminar focused on explaining the current drug approval process in Canada. Marianne provided a very useful and accessible talk on the intricacies of government bureaucracy.
- In general, the average drug approval timeline in Canada is 12 years. A drug must be approved by Health Canada, CADTH, pCPA, and the provincial agencies before it is available on the market. Health Canada is concerned with the safety and efficacy of the product, while the subsequent groups concern themselves with cost effectiveness, patient values, drug pricing and implementation.
- However, this process could be improved via numerous different facets. There should be better patient involvement, more transparency, improved timelines, better prioritization and equitable access. A national drug plan with clear thresholds and nationwide contracts could improve both drug access and pricing for patients.
- The patient and advocate voice is a powerful and effective tool that should be used to further research and clinical trials. With patient engagements, meaningful partnerships can be created between government, doctors and patients.
- This allows knowledge transfer to be set as a priority and all parties mutually benefit from the information shared.

Talks: Barriers/Successes in Patient access talks by Christopher Longo (McMaster University), Blair Henry (Sunnybrook Health Sciences Centre) and Kathy Barnard (Save Your Skin Foundation)

Notes by Marilyn Sapsford and Dave Mealiea

- The final three speakers here focused on some of the barriers to patient access to cancer research and treatment and examples of successful ways to address this.
- Christopher Longo's data on financial barriers to receiving cancer treatment demonstrated that costs to patients have actually worsened over the past 2 decades. Some important takeaways from his discussion included the need to include underrepresented patient groups in future research of this type (such as rural and lower income patients), the gaps that exist in drug coverage and how this varies amongst provinces and the issue of some patients forgoing care altogether as a result of these burdens.
- Blair Henry's presentation on the ethical issues of cancer research and treatment reinforced the fact that these barriers exist across the spectrum of care, in areas including screening, diagnosis and enrollment in clinical trials.
- Kathy Barnard, a melanoma survivor, left the group with a very positive message surrounding examples of successes in the face of these barriers. She discussed both the importance of personal perseverance and strength and family support, but also strategies such as compassionate trials and the creation of patient advocacy groups to help ensure patients may access all available options. She reinforced the message of patient inclusion in cancer research with the quote "Don't do anything for me without me.""
- It was impressive to see that a full plenary session was devoted to patient engagement, highlighting the level of commitment BioCanRx has instilled in this initiative. Although there were fewer people in the audience at this session, it shows a growing interest on the part of researchers in this topic with the hope that this audience will continue to grow.
- Both Drs. Longo and Henry's presentations highlighted the hidden cost of cancer that is often unknown and unstated. Henry's term "financial toxicity" clearly captured the financial devastation that can occur when people find themselves having to pay for drugs, supplies, home care, travel and parking, at the same time as experiencing a loss of income. His data indicated that 1 in 6 people said that the cost of cancer was unmanageable.
- This reminded me of my own experience filling a prescription for anti-nausea medication at the cancer centre pharmacy after my first chemotherapy treatment. It was $300 for 7 pills and they wanted full payment upfront. I was shocked and upset as I was on long term disability and did not have the extra funds to pay for it. If I couldn't pay for the medication, I guess it meant I was going to experience nausea and vomiting. I had mistakenly assumed that it would be covered by my provincial drug plan. Fortunately, I did have group insurance that ultimately paid for this medication, but many people do not. Longo's data showed that 30% of the people surveyed from 2017-19 had no private insurance.
- I also hear about this on a regular basis from the women that I work with who have cancer. Some women have lost their homes and just recently, a young, single

mother was looking for financial help to cover the cost of childcare. It is sad to hear that at a time when physical health is such a concern, that financial issues can add to the burden. It is the first time I have seen hard data outlining the financial hardship that cancer patients can face as a result of their diagnosis. It was hard to hear but also very encouraging. With hard evidence, perhaps there is hope that some solutions will be more forthcoming.

WEDNESDAY, OCTOBER 23, 2019 (DAY 3)

Plenary Session 7: Brain Cancer Immunotherapy

Lay Abstract

Brain cancer is a leading cause of cancer-related mortality in both adult and pediatric populations and is recognized as a difficult-to-treat cancer due not only to its aggressive and treatment-refractory nature, but also to the challenge of delivering therapies across the blood-brain barrier into the brain, traditionally thought to be an "immune-protected" environment. If immune cells are not able to routinely traffic into and perform surveillance on the brain for invading cell populations, this may afford cancer cells the opportunity to evade therapies only to grow and find a sanctuary in the brain instead. This plenary session focused on the new scientific discoveries that have begun to surmount the huge challenges of aggressive brain cancers such as glioblastoma (GBM), DIPG(diffuse intrinsic pontine glioma) and medulloblastoma, through the development of multiple new immunotherapies that promise hope for patients with these deadly brain cancers. The session reviewed the latest discoveries and challenges in the development of oncolytic viruses, T cell receptor therapies and CAR T cells for adult and pediatric brain tumours alike, in a series of lectures given by leading scientists across North America.

Talk title: Oncolytic Virus Immunotherapy for Glioblastoma: Challenges and Rewards by Frank Tufaro, DNAtrix

Notes by Denis Raymond and Douglas Chung

- This session primarily focused on an aggressive and deadly form of brain cancer called Glioblastoma, which currently has no standard of care, yet only approximately only 10% of affected patients have accessed clinical trials. Dr. Tufaro presented work in modifying an Adenovirus, a common cold virus, for the purpose of developing an immunotherapy to treat this deadly cancer type.
- Dr. Tufaro's lab made two genomic manipulations to the Adenovirus: to target cancer cells specifically, they modified the virus to only replicate in tumour-specific retinoblastoma(Rb)-deficient pathways and to only infect cells that express retinoblastoma-binding integrins (proteins that act as glue to stick to other cells).
- This modified common cold virus, named DNX-2401 or Tasadenoturev, therefore has two separate mechanisms of action: (1) direct killing of tumour, and (2) triggering anti-tumour immune response.

- A successful Phase I Dose Escalation study was undertaken at MD Anderson in the United States, whereby the chosen method of delivery was 1 ml/hour dose-dense intratumoural injection via cannula.
- Impressively, the complete responders of this initial study lived up to 3.5 years without additional recurrences.
- A promising Phase II clinical trial is underway using this same modified DNX-2401 virus in combination with Pembrozilumab, a monoclonal antibody, to target both recurrent Glioblastoma and Gliosarcoma, which will see results in the near future.
- General reflections: Are oncolytic viruses truly an immunotherapy? I think it is important to be testing whether oncolytic virus (OVs) in humans actually trigger an immune response, something this work has focused heavily on.

Helpful Websites

BioCanRx Cancer Stakeholder Alliance: https://biocanrx.com/about/governance/cancer-stakeholder-alliance

BioCanRx-Cancer Stakeholder Alliance Learning Institute https://biocanrx.com/about/governance/cancer-stakeholder-alliance/biocanrx-cancer-stakeholder-alliance-learning-institute

BioCanRx's Patient Section https://biocanrx.com/patients/about-biotherapeutics

Canadian Cancer Society http://www.cancer.ca/en/research-horizons/e/c/9/immunotherapy-promising-new-field-treatment/

Clinical Trials http://www.canadiancancertrials.ca/
and https://www.cancer.gov/aboutcancer/treatment/clinical-trials/advanced-search

Leukemia and Lymphoma Society of Canada http://www.llscanada.org/treatment/types-of-treatment/immunotherapy

NCRI Consumer Forum https://www.ncri.org.uk/

Society for Immunotherapy of Cancer patient glossary: http://www.sitcancer.org/patient/glossary

Society for Immunotherapy of Cancer patient resource:
http://www.sitcancer.org/patient/resources

US American Cancer Society https://www.cancer.org/treatment/treatments-and-side-effects/treatment-types/immunotherapy/what-is-immunotherapy.html

US Cancer Research Institute https://www.cancerresearch.org/immunotherapy/what-is immunotherapy

US Cancer Support Community https://www.cancersupportcommunity.org/immunotherapy-cancer-it-right-you