

# Letter from the Scientific & Executive Directors

July 2024

# **Mission Accomplished!**

## NMIN concludes on a high note

In its final report to the NCE, submitted mid-June 2024, NMIN rightfully affirmed: "mission accomplished."

Launched in 2019 with its legacy firmly in mind, NMIN mobilized in record time, with half of its total research funds in the hands of project teams before the year was out. Despite obstacles—like a global pandemic (that nanomedicines helped arrest)—in its brief but productive five years of activity, which are coming to an end on 30 September 2024, NMIN nurtured a wealth of scientifically excellent knowledge and innovation, and contributed significantly to the professional growth of a new generation of exceptional researchers.

Through 70 projects involving 123 researchers and 202 partner organizations, NMIN research has already resulted in 20 patent filings, 8 IP disclosures, and 146 peer -reviewed publications in journals with an average impact factor (IF) of 10; 17 of which were in journals with an IF of >20. NMIN capacity-building programming benefited 406 students and young professionals, providing learning opportunities through 77 webinars and 17 in-person events, issuing 79 Advanced Training Certificates, and launching 143 into employment (seven being co-founders and co-leaders of new companies spun out of NMIN).

But beyond what has already been achieved, NMIN spawned or joined forces with numerous new initiatives that will extend the Network's vision and reach well into the future, as detailed in its final report. Highlights of these legacy initiatives include:

10+ spin-off companies, with four new companies launched in 2023-24: Nanogenix from the lab of Dr. G. Zheng, University Health Network (UHN); Sinedore Bioscience and GeneStar Bioscience, both from NMIN's 2021-22 spin-off NanoStar Pharmaceuticals Ltd. in the lab of Dr. S. Li in Vancouver; and CereCura Nanotherapeutics, a Vancouver spin-off from NMIN's 2021 spin-off NanoVation Therapeutics, which commercialized NMIN's NanoCore facility for use by industry. There are also at least two additional spin-out companies emerging from NMIN research at BC Cancer/UBC (M. Bally lab) and the University of Toronto (G. Walker lab), which will be formalized in 2024-25. NMIN's spin-off companies have generated 107 jobs to date.

NMIN projects and teams will be supported by new sources of funding totaling over \$153M, including CIHR, NSERC, New Frontiers in Research Fund (NFRF), the McGill CFREF-funded DNA 2 RNA (D2R) research

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# MESSAGE FROM THE SCIENTIFIC & EXECUTIVE DIRECTOR

NMIN officially concludes as a Network at the end of September 2024.

We, as Directors of NMIN, are grateful to have had the opportunity over these past five years to contribute to the advancement of the dynamic field of nanomedicines in Canada, and to have been associated with such an illustrious community of outstanding researchers, trainees and partners.

The efficient and professional functioning of a Network like NMIN relies on the commitment and integrity of many individuals and organizations. An enormous debt of thanks is owed to them all:

The volunteer members of NMIN's Board of Directors, Research Management Committee (RMC), and RMC Advisory Committees, who applied their formidable talents and expertise toward ensuring NMIN's research and training expenditures, adhered to the highest standards of excellence. Special thanks are owed to Dr. Inès Holzbaur, NMIN Board Chair; Dr. Lesley Esford, NMIN Board Vice-Chair and Chair, NMIN Finance & Audit Committee; Dr. Terry Allen, Chair, NMIN RMC; Brenna Rau, Chair, NMIN Commercialization Advisory Board (CAB) and Dr. Nicolas Bertrand, Chair, NMIN Highly Qualified Personnel Advisory Committee (HPAC).

Previous Scientific Directors, Drs Pieter Cullis and Christine Allen, provided tremendous leadership and vision, the foundation for everything the Network has achieved. The leaders of NMIN's research themes and Core Facilities provided invaluable guidance to the teams working within their areas of focus, and all NMIN PIs demonstrated great commitment to maximizing the impact of the NMIN funding with which they were entrusted.

NMIN's 202 partner organizations significantly enhanced the Network's research efforts through their generous contributions of resources, expertise and funding.

The energy, enthusiasm and raw talent of NMIN HQP was a vital force underpinning all of the Network's research endeavors. NMIN trainees' deep engagement with NMIN

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### Mission Accomplished—continued

program, and the Stage 2 Canada Biomedical Research Fund (CBRF) and Biosciences Research Infrastructure Fund (BRIF) program proposals at UBC and UofT. These initiatives are led by or centrally involve NMIN researchers and leverage NMIN research and/or the expertise of NMIN's Core Facilities. Among the programs providing legacy support to NMIN initiatives are:

At UBC: Advanced Therapeutics Manufacturing Facility (ATMF), a state-of-the-art good manufacturing practice (GMP) facility enabling the production of therapies with high potential to solve current and future health challenges, specifically mRNA vaccines, viral vectors and cell and gene therapies.

AVENGER: Advanced LNP RNA Vaccines Engineered with Next-Generation designs to Enhance pandemic Readiness, which aims to be Canada's LNP/RNA vaccine platform by developing a library of optimized LNP formulations designed to generate long-lasting immunity to viruses or antimicrobial resistant bacteria.

PROGENITER: Pathogen Response Optimization by GENeratIng ThErapeutics Rationally, which will provide a suite of capabilities and state-of-the-art infrastructure to enable the rapid design, engineering, and production of antibody leads against present and future viral diseases.

RNA & Formulation Core, a self-sustaining RNA provider that aims to accelerate research and industrial use of RNA in an IP-free context by making RNA research as affordable as possible.

At the University of Toronto: Biomanufacturing Hub Network (BioHubNet), an immersive talent development program that will address the severe shortage of industry-ready highly qualified personnel (HQP) in the biomanufacturing sector.

**Networking legacies:** Beyond funded initiatives, NMIN's legacy will also be perpetuated by the strong relationships forged within the Network over the last five years.

NMIN's HQP Network (NHN) Executive Members are implementing a legacy strategy that involves establishment of social media platforms and a podcast series to continue networking, knowledge sharing and mutual support among emerging professionals within the field.

More fundamentally, NMIN's network of expertise will continue to provide coordination at the national level, allowing the ready assembly of future teams from across disciplines and sectors to help address emerging research and health challenges nationally and globally.

NMIN's leaders submitted the Network's final NCE report with enormous pride in what has been accomplished over the past five years, and in what further advances—catalyzed by NMIN—lie ahead.

As the Network's NCE chapter comes to a close, may all those who participated in NMIN share this sense of achievement and pride in a mission well accomplished.

At NMIN our work may be nanoscale, but our impact—past and future—is huge!

 $Message\ from\ the\ Scientific\ \&\ Executive\ Directors—continued$ 

capacity-building programs ensured that maximum impact was generated from every training opportunity.

Administrative staff provided a solid backbone for all the Network's core operations, keeping the wheels turning in terms of policy and procedure adherence, financial management, research and HQP programming, event organization, reporting, and knowledge mobilization.

And, of course, the NCE Program provided NMIN with the opportunity to do all of this: to advance Canada's global leadership in the nanomedicines space; to further develop new technologies, treatments and diagnostics to address the urgent unmet medical and health needs of Canadians and other individuals worldwide; and to provide the next generation of innovative Canadian nanomedicines science professionals with a foundation for rewarding and productive careers.

To all these crucial contributors to NMIN's success, we extend our most sincere thanks.

You can take away funding from the network, but that does not end the interactions and relationships that have developed among its participants.

It is difficult to accept that such a productive,

vital and always-evolving network like NMIN, active in such a promising, revolutionary field, should have to close shop. But the work continues, under different umbrellas and forms of support; the science continues to advance; the collaborations endure.

Thank you for sharing the journey with us. We look forward to the fruits that our shared efforts will continue to bear in future.

Dr. Gilbert Walker Scientific Director & CEO, NMIN

**Dr. Diana Royce** Executive Director, NMIN

### **RESEARCHER NEWS**

NMIN Researcher Dr. Ellen Wasan received NSERC Discovery Grant funding for her project "Exploring soft material nanoparticles for engaging mucosal immunity."

NMIN Researcher Dr. Bob Hancock was rated by ScholarGPS as one of the top scientists in the world in a number of areas, including peptides and antimicrobial peptides.

NMIN Research Leader Dr.
Pieter Cullis was inducted into
the <u>Canadian Medical Hall of</u>
<u>Fame</u> and was co-awardee, with
Nobel laureate Dr. Drew
Weissman, of the <u>2024 Harvey</u>
<u>Prize</u> from Technion University.



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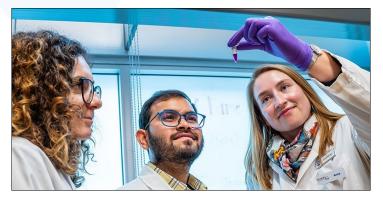
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## News from across the Network

Recent developments & accomplishments



## Funding released to national biomanufacturing hubs involving NMIN researchers & infrastructure

In May 2024, the Government of Canada announced Stage 2 of its integrated Canada Biomedical Research Fund (CBRF) and Biosciences Research Infrastructure Fund (BRIF) investments in the amount of \$574 million for 19 projects at 14 research institutions across Canada. These investments, channeled through five national research hubs, aim to prepare Canada for future health emergencies by building capacity.

NMIN is a partner organization, and NMIN researchers and NMIN Core Facilities play significant roles in two of these hubs: Canada's Immuno-Engineering and Biomanufacturing Hub (CIEBH) at The University of British Columbia and the Canadian Hub for Health Intelligence and Innovation in Infectious Diseases (HI3) at the University of Toronto. Read more



## Dr. Gang Zheng co-founds NMIN's 7th spin-off company

In July 2023, NMIN researcher Dr. Gang Zheng cofounded the new biotechnology company Nanogenix, NMIN's seventh spin-off company.

The company's novel photo-immune therapy platform, based on the porphysome technology discovered by Dr. Zheng and developed in his lab, aims to change treatment prospects for cancer patients, with an initial focus on skin and pancreatic cancers.

NanoGenix's proprietary platform encompasses direct therapeutic, diagnostic imaging and drug delivery agents. <u>Read more</u>

## NMIN researchers to help train a new generation of immunoengineers

An interdisciplinary UBC team led by Dr. Peter Zandstra has received \$1.65 million in federal funding to train a new generation of immunoengineers to innovate, develop and deliver new immunoengineering technologies.

NMIN researchers Drs Pieter Cullis and Anna Blakney will colead, with their colleague Dr. Nozomu Yachie, the Nucleic Acid Engineering and Immune Targeting component of this training program, dubbed ImmunoE. Read more.



NMIN Spin-off SeraGene Therapeutics a "company to watch," joins adMare National Tx Accelerator

Founded by NMIN research Dr. Christian Kastrup, SeraGene Therapeutics is a biotech company focused on developing low treatment burden RNA-based therapies for a broad range of blood coagulation disorders.

In June 2024, SeraGene was given honourable mention as a "company to watch" by Life Sciences BC as part of that organization's 2024 Annual Awards celebration. Read more

In May 2024, SeraGene was accepted into the adMare National Therapeutics (Tx) Accelerator program. The program is designed to help early-stage ventures achieve essential milestones for the successful development and commercialization of therapeutics in Canada. Read more

In 2023, NMIN spin-off NorthMiRs, co-founded by Dr. Gilbert Walker, was one of the inaugural ventures accepted into this program. Read more

### Thanks and farewell

NMIN's Manager of Events & HQP Programs, Divya Rao, completes her role

With the successful execution of NMIN's 2024 Research Conference and the conclusion of NMIN's HQP Program following a final round of Graduate Awards, NMIN staff member Divya Rao fulfilled her role as Events and HQP Program Manager and finished her last day of work with the NMIN Administrative Centre on 31 June 2024.

Divya joined the NMIN Admin team in late 2022 and hit the ground running to carry forward the slate of activities envisioned in NMIN's strategic plan.

Divya oversaw the delivery of capacity-training webinars, NMIN lectures series, and HQP research presentations during the Network's final two years; ran various HQP awards programs as well as the Advanced Trainee Certification program; led the organization of the 2024 Research Conference and a final HQP Networking Workshop; and was staff lead on NMIN's final NCE statistical reporting process.

"We are very grateful to Divya for her oversight of these key elements of NMIN's programing and operations," comments NMIN Executive Director Dr. Diana Royce.

"She adeptly maintained the momentum of the activities within her portfolio and saw them through to their successful completion."

"As a core member of the NMIN staff, Divya played a significant role in NMIN's success over the last two years," adds NMIN Scientific Director Dr. Gilbert Walker.

"On the Network's behalf, I offer my thanks and my congratulations to her on



## Supporting Spin-offs

NMIN's final funding round offers its legacy companies an added boost

In June 2024, NMIN announced a final round of funding through its Research Spin-off Support Program.

This round allocated a small envelope of non-NCE funding to NMIN spin-off companies through an adjudicated application process. The support aims to help the companies commercializing NMIN research results to achieve viability, thereby accelerating the generation of social and economic benefits to Canadians.

"We are delighted to be able to offer this parting boost to NMIN's legacy companies," notes Executive Director Dr. Diana Royce.

"Each of them holds incredible promise and deserves every chance to succeed. This is a very apt finale for this Network that has been so emphatically committed to research translation and commercialization."



### NMIN HQP-Entrepreneur wins pitch competition

On 27 March 2024, NMIN HQP Michael Valic won first place in Medicine by Design's 2024 Building a Biotech Venture Pitch Competition on behalf of the prospective venture Twenty-nine Therapeutics.

Emerging from the University Health Network (UHN), in collaboration with the lab of NMIN researcher Dr. Gang Zheng and his NMIN spin-off company, NanoGenix, Twentynine Therapeutics is developing the use of Copper-67 (Cu-67) in radiation therapy to treat peritoneal cancers, leveraging a targeted nanoparticle delivery system platform technology.

The \$25,000 in prize funding from the pitch competition will support research to increase the technology readiness level of the platform."

The '29' in the venture name refers the atomic number of copper," explains Dr. Zheng. "Michael's first-place pitch really conveyed well the potential of our idea."

Peritoneal carcinomatosis is a rare, difficult-to-treat form of cancer that affects the thin membrane surrounding abdominal organs. Current approaches to treatment involve lengthy surgeries and systemic treatments, with high recurrence and poor survival rates. Read more

## NMIN's Highly Qualified Personnel (HQP) Program



A selection of workshop participants (L to R): Miguel Tsai (NanoVation Therapeutics [NTx] co-op trainee/UBC undergraduate student), Dr. Rachel Hernandez (AVP, Research & Innovation, UBC), Dr. Diana Royce (NMIN Executive Director), Dr. Anthony Tam (NTx preclinical scientist), Mark Zhang (NTx co-op trainee/UBC undergraduate student)

# NMIN 2024 Trainee Networking Workshop a success

On April 25-26, 2024, 32 NMIN trainees gathered, together with two NMIN staff members and 11 invited guests, for a final two-day trainee capacity-building event: the NMIN 2024 Trainee Networking Workshop.

The event aimed to remind participants of ways to stay connected with the people in their networks, the value of those networks, and how to build strong, diverse and strategic networks as they go forward in work and life.

On Thursday afternoon, Michael Valic, Vice-President of the NMIN HQP Network (NHN), offered opening remarks, following which NMIN Executive Director Diana Royce delivered an opening keynote on "Strategies for Success in Work and Life." Friday's full-day workshop was run by Gayle Hallgren, a networking expert.

The event featured a networking reception, as well as a networking dinner to which 11 life sciences professionals from NMIN were invited, including senior and emerging academics, entrepreneurs, and industry-based NMIN advisory committee members. Guests were distributed among tables of trainees over dinner to facilitate the forging of new connections and sharing of experiences.

As part of the all-day workshop, NMIN trainees brainstormed ways in which to preserve and reinforce connections among NMIN trainees and researchers after the Network's conclusion, generating a wealth of ideas and potential plans for action.

In a post-event feedback survey, participants rated the event an average of 4.4 out of 5 for "value of workshop content," where 5 = extremely valuable. In terms of level of "satisfaction with networking opportunities," they rated the event 4.6 out of 5, where 5 = very satisfied.

#### Read more

# New Research SNIPS describes research to improve cancer therapy

The second NMIN Research SNIPS, <u>Spicing up cancer</u> treatment: adding curcumin to tiny chemotherapy beads, was recently completed by Dr. Liza Silverman.

It describes research findings reported in the article "Improvements in Drug-Delivery Properties by Co-Encapsulating Curcumin in SN-38-Loaded Anticancer Polymeric Nanoparticles" by L. Silverman et al, published June 2022 in *Molecular Pharmaceutics*.

Dr. Silverman recently joined the laboratory of Prof. Lindsey Ingerman James of the University of North Carolina Eshelman School of Pharmacy as a post doctoral fellow. She is developing a platform for high throughput testing of small molecule drugs targeting multiple myeloma by means of protein degradation.

Research SNIPS are an output of NMIN's science communication program, NanoMedicines Translated, which made NMIN-supported research findings more accessible to a broad audience and honed the plain-language writing skills of NMIN HQP.



NMIN's NanoMedicines Translated

Spicing up cancer treatment: adding curcumin to tiny chemotherapy beads SN-38 is a strong cancer-fighting drug, but it is difficult to safely administer to patients

#### WHAT IS THIS RESEARCH ABOUT?

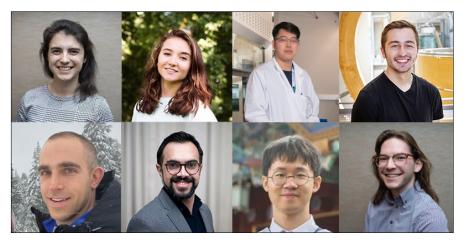
SN-38 is good at fighting cancer, but if released directly into a patient's body it damages too much healthy tissue and is too toxic for human use. However, you can often make a drug safer by packaging it in a lipid or plastic container called a nanoparticle, so instead of travelling through the entire body it can travel directly to the cancer before being released. Also, you can sometimes make a drug work better by mixing it with other ingredients that affect how it acts and how well it interacts with the nanoparticles in which it is wrapped.

We pursued both these approaches by designing an integrated drug delivery strategy to find a "cocktail recipe" that would make SN-38 safe for injection.

#### WHAT DID THE RESEARCHERS DO

We first tried wrapping SN-38 by itself in plastic nanoparticles but that didn't work well. We then tried mixing SN-38 with different amounts of curcumin, and using slightly different approaches to making the nanoparticles to see if we could find better wavs of getting SN-38 into them. With each new recipe, we

### Meet the 2024 Graduate NMIN Award Winners



NMIN is pleased to announce the 8 recipients of the its 2024 Doctoral-level Graduate Awards. Recipients hail from five universities and research centres in three provinces.

The goal of NMIN Graduate Awards is to enable exceptional students to pursue nanomedicine academic research training with Canadian experts.

These doctoral awards provide a stipend of \$35,000 for one year. Read more about the awardees and their projects <u>here</u>.

### Top left to right in photo above

- Amélie Baron (PhD award), Polytechnique Montreal, supervisor: Dr. Michel Muenier
- Alexandra Birkenshaw (PhD award), University of British Columbia, supervisor: Dr. Colin Ross
- Jingan Chen (PhD award), University of Toronto, supervisor: Dr. Bowen Li
- Joshua Joseph Friesen (PhD award), University of British Columbia, supervisor: Dr. Anna Blakney

### Bottom left to right in photo above

- Devon Heroux (PhD award), BC Cancer, supervisor: Dr. Marcel Bally
- Rasim Masimov (PhD award), University of Saskatchewan, supervisor: Dr. Ellen Wasan
- Yulin Mo (PhD award), University of Toronto, supervisor: Dr. Gang Zheng
- Logan Zettle (PhD award), University of Toronto, supervisor: Dr. Gilbert Walker

### Thirty-six new recipients of NMIN's Advanced Training Certification (ATC) announced



NMIN is pleased to announce 36 new recipients of NMIN Advanced Training Certification (ATC), who were celebrated in an online ceremony on 18 June 2024.

All have qualified for certification as a result of their high level of engagement in NMIN HQP Program activities.

Seven qualified for Platinum (minimum 50 credits): Ariadne Tuckmantel Bido, Miffy Chen, Nancy Dos Santos, Yulin Mo, Liza Silverman, Jennyfer Zapata-Farfan and Nashmia Zia.

Ten qualified for Gold (minimum 40 credits): Noorjahan Aibani, Amélie Baron, Po-Han Chao, Sarthak Garg, Tavonga Mandava, Fariba Saadati, Sarah Thomson, Michael Valic, Abishek Wadhwa, and Kelsy Yuan.

The other 19 qualified for Silver (minimum 20 credits): Morgan Alford, Abdulaziz Alhussan, Nuthan Vikas Bathula, Alexandra Birkenshaw, Alberto Cevallos, Norman Chow, Nick Dragojlovic, Devon Heroux, Pardis Kazemian, Scott MacKay, Parnian Mehinrad, Hadeel Mohammad, Masoud Norouzi, Madelaine Robertson, Nasim Sarrami, Kevin Sun, Anthony Tam, Ethan Watt, and Jiamin Wu. Read more

## Stay Connected: NMIN HQP Legacy Networking Platforms are on the way!

Members of the NMIN HQP Network's (NHN's) Executive Committee plan to keep the NMIN HQP network alive and active in evolving new forms after the conclusion of NMIN. They are establishing new communication platforms to enable ongoing networking, collaboration, and knowledge and resource sharing among early-career professionals, students, trainees and research staff working in the field of nanomedicines in Canada. The platforms under development and their key contacts are:

Podcast: NanoTalks | Contact: Ariadne Tuckmantel Bido ariadne.tuckmantel-bido@msl.ubc.ca

WhatsApp group | Contact: Sarthak Garg sgarg@bccrc.ca

LinkedIn group | Contact: Jennyfer Zapata Farfan jennyfer.zapata-farfan@polymtl.ca

NMIN will issue an eblast and post on its website how to connect to these platforms, once established.

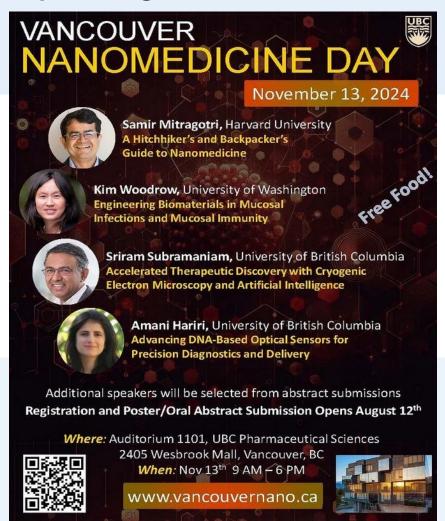


## **NMIN HQP on the Move**

NMIN Travel Awards support HQP in their efforts to attend and contribute to important events in the nanomedicines field, within Canada and internationally. Final award recipients and their events of interest are listed below.

HQP	Institution	Event	Location	Date
Victoria Palmgren	UBC	ARVO Annual Meeting 2024	Seattle, USA	May 2024
Sara Abd El-Hafeez	UAlberta	CSPS-CRS-CC Annual Symposium	Edmonton, AB	Jun 2024
Zoha Hajikhani	UAlberta	CSPS-CRS-CC Annual Symposium	Edmonton, AB	Jun 2024
Jiamin Wu	UBC	CSPS-CRS-CC Annual Symposium	Edmonton, AB	Jun 2024
Pardis Kazemian	UBC	GNAO1 Conference 2024	Boston, USA	Jun 2024
Miffy Cheng	UBC	LRD 2024	Glasgow, Scotland	Jun 2024
Kevin Fox	UBC	LRD 2024	Glasgow, Scotland	Jun 2024
Sarah Thomson	UBC	LRD 2024	Glasgow, Scotland	Jun 2024
Abishek Wadhwa	UBC	LRD 2024	Glasgow, Scotland	Jun 2024
Yao Zhang	UBC	LRD 2024	Glasgow, Scotland	Jun 2024
Nashmia Zia	UofT	LRD 2024	Glasgow, Scotland	Jun 2024
Jerry Leung	UBC	ISTH Annual Congress	Bangkok, Thailand	Jun 2024
Colton Strong	UBC	ISTH Annual Congress	Bangkok, Thailand	Jun 2024
Ahmed Ahmed	UAlberta	CRS 2024	Bologna, Italy	Jul 2024
Kevin Fox	UBC	CRS 2024	Bologna, Italy	Jul 2024
Madelaine Robertson	UBC	CRS 2024	Bologna, Italy	Jul 2024
Rasim Masimov	USaskatchewan	CRS 2024	Bologna, Italy	Jul 2024
Michael Valic	UofT	Radionuclide Theranostics for the Management of Cancer	Newry, USA	Jul 2024
Petya Popova	UBC	mRNA Health Conference	Boston, USA	Nov 2024
XuXin Sun	BC Cancer	US-Japan Symposium on Drug Delivery Systems	Lahaina, USA	Dec 2024

## **Upcoming event**





### Videos available of recent NMIN events









Videos of most past NMIN events will remain available on its YouTube channel

