BC CHILDREN'S HOSPITAL BioBank

Annual Report

BC Children's Hospital BioBank

APRIL 1, 2022 – MARCH 31, 2023

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1.0 Overview

This is the eighth annual report of the BC Children's Hospital BioBank (BCCHB), which has been operational since January 1, 2015 and made possible by a generous contribution from Mining for Miracles - the BC mining community's longstanding fundraising campaign for BC Children's Hospital. This report will cover operations and finance from April 2022 – March 2023.

The mission of the BCCH BioBank is to provide a comprehensive service for the collection, processing, storage, rapid access and retrieval of biospecimens and clinical information for research projects using a professional and compassionate approach to patient consenting that adheres to the highest standards of research ethics and patient privacy.

The BCCHB has a two-pronged approach to supporting research, "general biobanking" and "PI-driven research". In the general biobank, specimens are collected under the mandate of the BCCHB for future research. For PI driven research the BCCHB provide researchers with specified services to enable their own research.

Pages 12 – 14 of this report refer to projects that have utilized specimens from the general biobank. The BCCHB has released specimens to a range of projects from antibody research, immunity and responses to infections, cancer and rheumatic diseases.

Pages 15 – 17 describe the extensive list of PI driven studies that the BCCHB has been able to support over the years.

Dr. Vercauteren and Dr. Bush has continued to participate in a Pediatric Special Interest Group that she formed at the International Society of Biological and Environmental Repositories (ISBER). This is an international group, which is leading discussions specifically about pediatric biobanking.

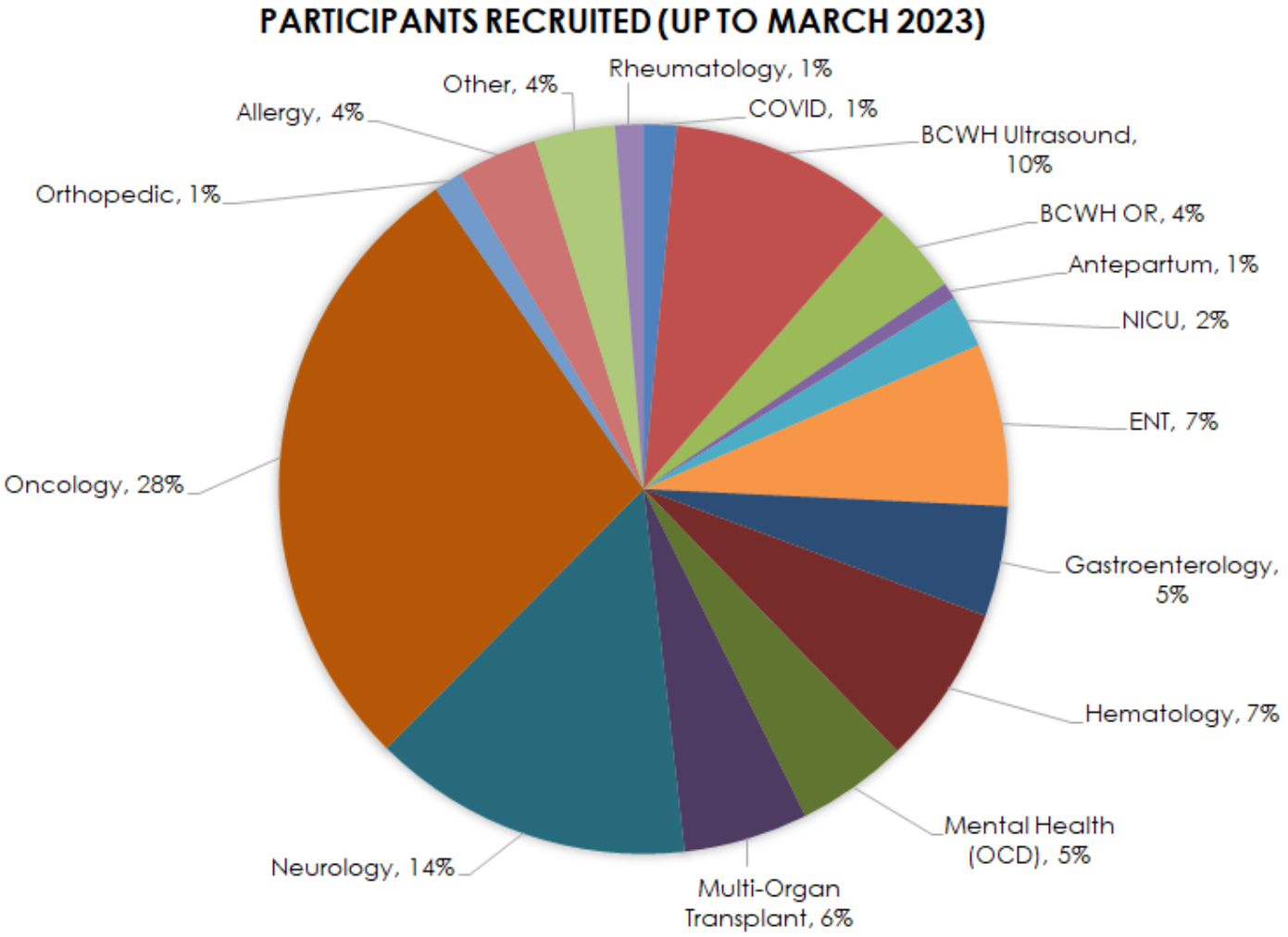
Below are data and other achievements from April 2022 – March 2023.

2.0 Participation Rate – General BioBank

	BCCH+		BCWH*		COVID-19		Total (BCCH + BCWH)	
	This Year	Total	This Year	Total	This Year	Total	This Year	Total
Consent Obtained	234	2189	45 (8 NICU)	490 (63 NICU)	0	40	279	2719
Capacity to Consent	24	146	--		0	3	24	146
Declined	4	82	0	1	0	1	4	83
Withdrawn/Revoked	1	34	0	0	0	0	1	34
Consent rate	98.0%	95.0%	--		--		--	

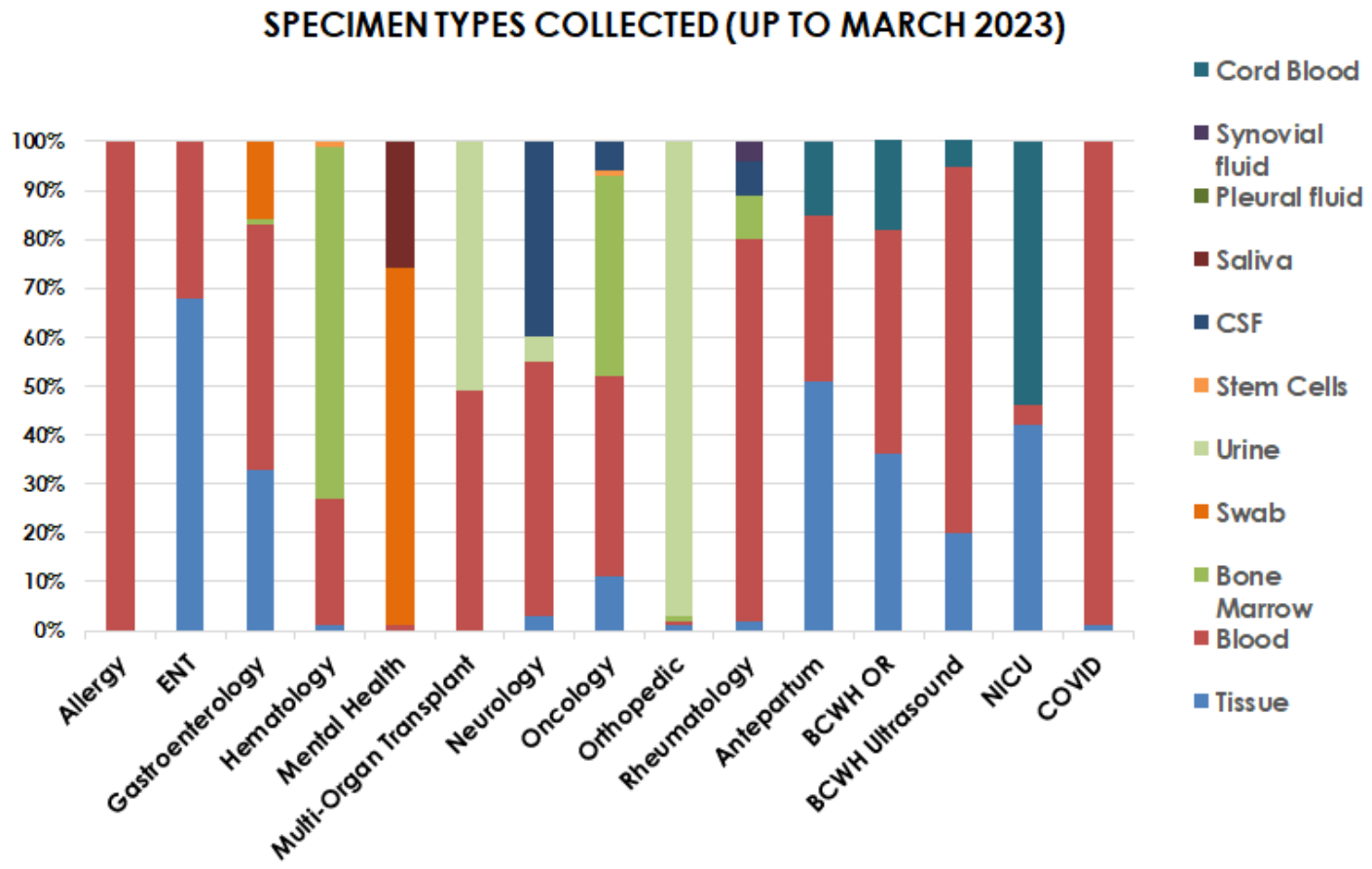
As per PHSA Privacy Guidelines, the BCCHB has moved to obtain full informed consent from all participants who are 14 and over as opposed to obtaining assent where applicable.

3.0 Clinic Representation – General BioBank

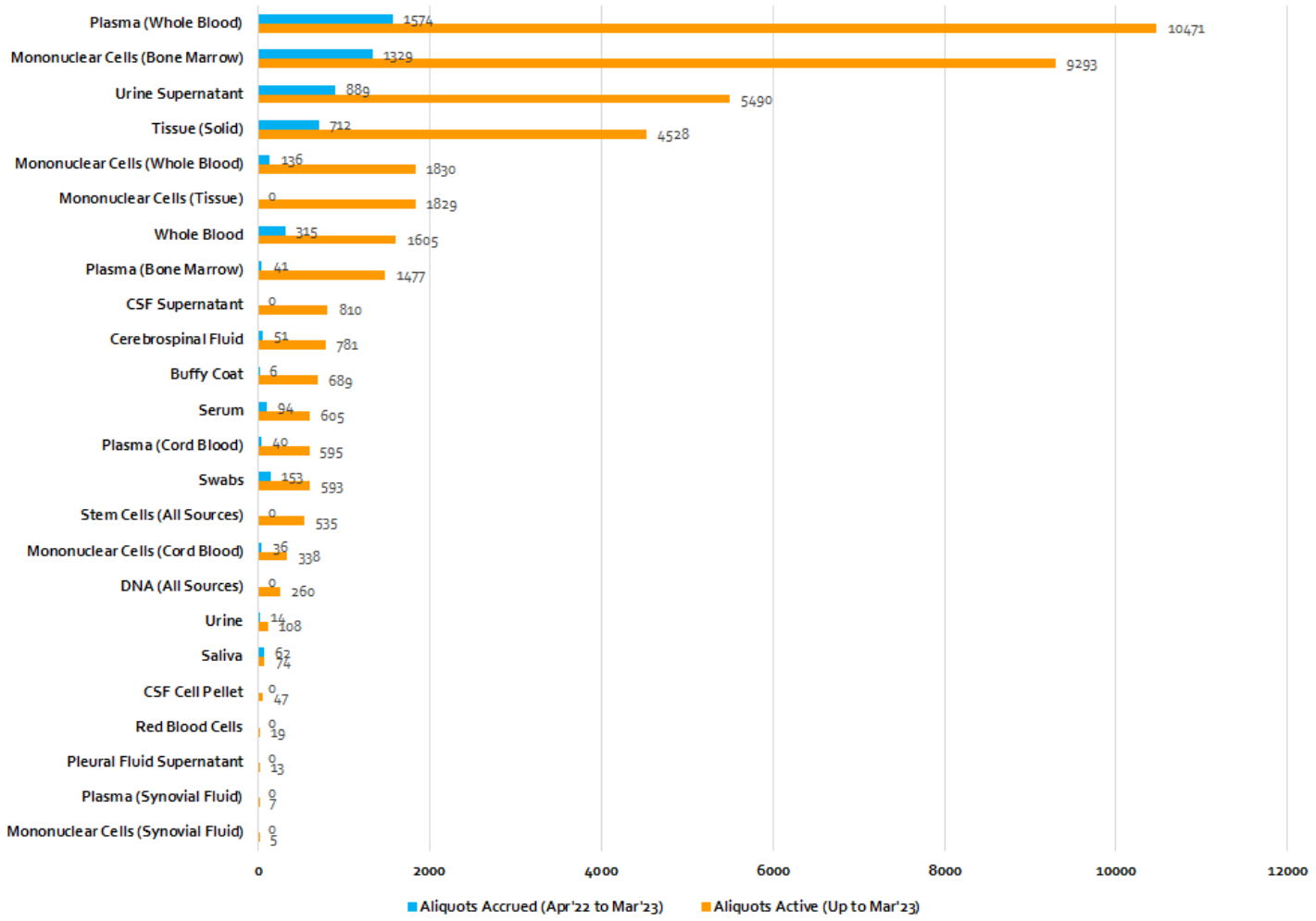


**Other clinics include BCCH ER, BCCH Clinic, Cardiology, Endocrinology, General Pediatrics, Medical Genetics, Recurrent Pregnancy Loss, Internal Referral, External Referral, and Urgent Care Centre which have lower clinic representation compared to the above listed.

4.0 Specimen Collections – General BioBank



5.0 Aliquots Accrued and Aliquot Availability – General BioBank



6.0 BioBank Oversight Committee (BOC)

Suzanne Vercauteren Chair of BOC	**Co-Director, BCCH BioBank**
Jonathan Bush	Co-Director, BCCH BioBank
Cheryl Wellington	Vice Chair of Research, Department of Pathology and Laboratory Medicine, UBC - *beginning Mar 1 2022*
Kathryn Dewar	Senior Research Manager, WHRI
Ellen Giesbrecht	Department of Obstetrics and Gynecology, UBC (BCWH Site Head) – *end October 2022*
Janet Lyons	Senior Medical Director, Maternal Newborn Program, Department of Obstetrics and Gynecology , BCWH – *Replaced Ellen Giesbrecht October 2022*
Michelle Demos	Representative for the Head of Pediatrics, UBC
Peter Watson	External Biobank Expert
Erik Skarsgard	Head of Department of Surgery at BCCH
Quynh Doan	BCCHR Director of Clinical Research
Mike Burgess	External Ethics Expert
David Goldfarb	Associate Head of Pathology and Laboratory Medicine at C&W (starting July 1, 2020)
Anthony Bailey	Professor and Chair of Child and Adolescent Psychiatry, UBC – *retired May 2022*
Brenda Jackson	Representative for the Provincial Laboratory Medicine Services
Alice Virani	Director of the Clinical Ethics Service, PHSA
Ashton Ellis	Research Coordinator, BCCH BioBank (ex-officio)

7.0 BioBank Executive Committee (BEC)

Jonathan Bush **Chair of BEC**	Co-Director, BCCH BioBank
Suzanne Vercauteren	Co-Director, BCCH BioBank
Caron Strahlendorf	Member of Research Ethics Board
Wendy Robinson	Member of BCCHR
Sheila O'Donoghue	Representative from Biobanking and Biospecimen Research Services (BBRS)
Anna Lee	Pediatric and Perinatal Pathologist, Anatomical Pathology, BCCH
Tanya Nelson	Member of Pathology and Laboratory Medicine at C&W
Luis Nacul	Member of WHRI, Medical Director CCDP at BCWH
Gregor Reid	Member of BCCHR
Jennifer Claydon	Manager, Clinical Research Support Unit, BCCHR
Ashton Ellis	Research Coordinator, BCCH BioBank (ex-officio)

8.0 BioBank Biospecimen Advisory Committee (BAC)

William Gibson **Chair of BAC**	Member of BCCHR
Suzanne Vercauteren	Co-Director, BCCH BioBank
Jonathan Bush	Co-Director, BCCH BioBank
David Cabral	Member of BCCH
Helene Cote	Member of UBC
Jacob Rozmus	Member of BCCH
Anthony Cooper	Member of BCCH
Wee-Shian Chan	Member of BCWH
Clare Beasley	BC Mental Health and Addiction Services
Isabel Jordan	Founder of Rare Disease Foundation parent advocacy group
Jefferson Terry	Member of the Department of Pathology and Laboratory Medicine
Veronica Chow	Laboratory Manager, BCCH BioBank

9.0 Staff

Suzanne Vercauteren	Co-director
Jonathan Bush	Co-director
Veronica Chow	Laboratory Manager
Ashton Ellis	Research Coordinator
Vi Nguyen	Research Technician
Kendall Plant	Research Technician – *end September 2022*
Sadaf Sediqi	Research Technician (CITF Project) – *end September 2022*
Qudrat Aujla	Research Assistant
Marissa Song	Research Assistant – *begin January 2023*
Sebastian Kondratowski	Co-op Student/Undergraduate Research Assistant
Mackenzie Sturn	Co-op Student – *begin September 2022*
Jasleen Grewal	Summer Student (May – August 2022)

10.0 Applications & Biospecimen Release

Between April 2022 and March 2023, the BCCH BioBank received twelve new applications for biospecimens. Applicants and their research project titles are displayed below.

1. Prohormone processing studies in PCSK1 heterozygotes versus controls. Drs. William Gibson and Bruce Verchere – specimens granted. ***14 control plasma samples.***

   Lay Summary: Patients with homozygosity or compound heterozygosity for PCSK1 mutations have severe obesity and polyendocrinopathy. Literature also suggests that these mutations may cause obesity in heterozygous individuals. Dr. Verchere's study seeks to obtain plasma samples from control patients to analyze various measures of prohormone processing. These control plasma samples will be compared to a patient who has a PCSK1 mutation.

2. Functional workup of a pediatric patient with a novel *ZBTB7B* variant. Dr. Stuart Turvey – specimens granted. ***6 control mononuclear cell samples.***

   Lay Summary: Primary immunodeficiency diseases (PIDs) are genetic disorders that harm the function and/or development of the immune system. Patients with PIDs are more susceptible to infections, inflammation, allergic disease, and malignancy. Dr. Turvey's study hypothesizes that a variant in the gene *ZBTB7B* may be related to the negative effects seen in patients with PIDs. The *ZBTB7B* gene encodes the protein ThPOK which helps in the development of T cells. This study will use mononuclear cell samples to test whether the *ZBTB7B* variant affects the development and function of T cells.

3. Development of a human multi-cellular engineered living culture system. Amgen – specimens granted. ***14 fresh tonsil and 10 crude mononuclear cell samples.***

   Lay Summary: Representative multi-cellular living culture systems are important in antibody discovery and immunology research. In vitro, human tonsil tissue can form culture systems that model features of human immune responses, including immune cell maturation and antibody secretion. Amgen's study seeks to use tonsil tissue samples to create and evaluate tonsil cell-based multicellular living culture systems for immunology research purposes.

4. Developing human tonsil organoids for the study of CAR-Treg function and efficacy. Megan Levings – specimens granted. ***20 tonsil mononuclear cells and 5 Formalin-Fixed Paraffin-Embedded (FFPE) tonsil samples.***

   Lay Summary: Regulatory T cells (Tregs) are often dysfunctional in autoimmune diseases or in transplantation. Research into improving Treg therapies is limited due to the poor results seen in in vivo mouse experiments. Dr. Levings hypothesizes that an in-vitro lymphoid organoid system will improve the prediction of Treg therapy function. By using human tonsil samples, Dr. Levings will develop a lymphoid organoid model for Treg therapy.

5. Creation of a humanized mouse model of a SETTLE tumor patient-derived xenograft (PDX) model with an autologous human immune system as part of the PROFYLE initiative (case study). Dr. Elie Haddad – specimens granted. ***1 stem cell sample.***

   Lay Summary: PDX is useful in predicting drug efficacy and for understanding tumor characteristics; however, the traditional PDX model is limited in its ability to test immune-tumor interactions. Therefore, Dr. Haddad's team has created a new model of a humanized PDX that mimics the patient's tumor and its surrounding immune system. By using the humanized PDX model, Dr. Haddad will study the anti-tumoral immune response from the patient's T cells against the patient's tumor cells. These patient-tailored PDX models will be used to study the interaction between immune cells and tumors, as well as study treatments for human cancer.

6. Overcoming the barriers to successful immune therapy for acute leukemia. Gregor Reid – specimens granted. ***14 cord blood/ mononuclear cell samples.***

   Lay Summary: B cell precursor (BCP) acute lymphoblastic leukemia (ALL) is the most common childhood malignancy. Although cure rates have improved in recent decades, relapsed ALL is still one of the primary causes of death from childhood cancer. Based on recent findings, research suggests that targeting precursor leukemia cells, before they become cancerous, may decrease ALL risk and the incidence of relapse. Dr. Reid's goal is to study the mechanisms that control ALL progression and to use these findings for therapeutic benefit.

7. Potential role of Platelet-factor 4 (PF4) as a biomarker of disease activity in Juvenile Idiopathic Arthritis (JIA). Dr. Kelly Brown – specimens granted. ***10 plasma samples from allergy patients and 18 control plasma samples.***

   Lay Summary: Juvenile idiopathic arthritis (JIA), which causes chronic joint inflammation and bone degradation, is the most common cause of youth disability in Canada. There are also no current reliable means to identify children with JIA at risk of a more serve elapsing disease. In adults, increased circulating concentrations of platelet factor 4 (PF4) have been associated with inflammation in rheumatoid joints; however, the role of these proteins has not been studied in juvenile arthritis. Dr. Brown's study seeks to discover the role of PF4 as a potential marker of disease in children with JIA. To study PF4, Dr. Brown will measure the amount of PF4 in plasma from children with JIA, compared to the PF4 in plasma from healthy controls.

8. Single cell profiling of hematopoietic stem and progenitor cells in pediatric aplastic anemia. Dr. Derek Chan – specimens granted. ***5 additional mononuclear cell samples from Aplastic Anemia patients and 8 additional control mononuclear cell samples.***

   Lay Summary: Aplastic Anemia (AA) in children predisposes the affected individuals to a heightened risk of mortality, relapse, and infections due to a lack of blood cells produced by the bone marrow. Current research believes AA is caused by the T-cell mediated destruction of blood stem cells. Using mononuclear cells from AA patients, this study will map the pathways involved in blood cell production compared to healthy participants. Results from this study have the potential to address the sources of stem cell failure and how to provide longer term survival for affected children.

9. Discovery and development of optimal immunotherapeutic strategies for childhood cancers. Dr. Poul Sorensen – specimens granted. ***16 control tissue samples.***

   Lay Summary: In recent research, the IL1RAP cancer cell surface marker was found to be associated with cell metabolism and immunotherapies targeting IL1RAP and other targets. Dr. Sorensen's study seeks to assess the immunotherapeutic targets of pediatric cancer cells using a cell model that mimics the in vivo immune response and cell environment. Using a 3D model of sarcoma tissues, Dr. Sorensen's study hypothesizes that cure rates can be improved if cell surface molecules that are expressed in pediatric cancers can be identified and used in immunotherapies.

10. SARS-COV2 seroconversion in asymptomatic individuals: pediatric vaccine sub-study. Dr. Kevan Jacobson – specimens granted. ***17 control mononuclear cell samples and 1 serum sample.***

    Lay Summary: The SARS-CoV-2 pandemic has negatively impacted medical care, school attendance, and social interactions. To return to normal life activities, safe and effective vaccines against SARS-CoV-2 must be given to children and adults. Patients that have Pediatric Inflammatory Bowel Disease (PIBD) rely on immunosuppressant therapies which can affect their immune responses to infection; therefore, these patients have been given priority for the SARS-CoV-2 vaccine. Dr. Jacobson's study aims to analyze the effectiveness of the SARS-CoV-2 vaccine in patients with PIBD. By obtaining samples from PIBD patients that have received a SARS-CoV-2 vaccine, Dr. Jacobson will assess the antibody levels and the ability of T cells from patients with PIBD to recognize SARS-CoV-2, as compared to those in healthy controls.

11. Iron status of young children. Dr. Crystal Karakochuk – specimens granted. ***23 full-term pregnancy cord blood plasma samples, 23 pre-term pregnancy cord blood plasma samples, and 16 control plasma samples.***

Lay Summary: In Dr. Karakochuk's previous research, it was found that out of the 60 pregnant women participating in the study, 80% were likely to be iron deficient in late stage pregnancy. Iron deficiency during pregnancy has been associated with impacted neonatal growth and neurocognitive development. To assess the impacts of iron deficiency in newborns, Dr. Karakochuk's study hopes to measure the iron levels in plasma samples of young children (<1 years of age). In addition to children, this study will also use plasma samples collected from the umbilical cord blood of women, as a proxy of newborn iron blood status.

12. Age-related differences in metabolome composition in a pediatric cohort. Dr. Tom Blydt-Hansen – specimens granted. ***44 control plasma samples.***

    Lay Summary: In recent studies by the Blydt-Hansen team, they discovered metabolites that varied by age in children with end-stage kidney failure. Dr. Blydt-Hansen hypothesizes that these metabolites in children change during development and puberty. This study aims to analyze the differences in the metabolome across different ages and stages of sexual maturation by studying the blood metabolome of healthy pediatric patients. In addition, the blood metabolome of children with kidney failure will be compared to the blood metabolome of healthy children, using control plasma samples.

Over the period of April 2022 and March 2023, the following two projects requested additional specimens for their studies which had previously been approved.

1. Personalize Molecular Characterization. BRAvE. Dr. Gregor Reid, Dr. Chris Maxwell, Dr. James Lim, Dr. Kirk Schultz and Dr. Philipp Lange - specimens granted. ***9 cerebrospinal fluid samples and 26 mononuclear cell samples from B-ALL patients.***

   Lay summary: The aims for this study are to procure viable tumor tissues, B- and T- acute lymphoblastic leukemia (ALL) and acute myeloid leukemia (AML) bone marrow, and PDX samples available through BCCH BioBank. The requested samples will include those obtained at diagnosis and, if available in the BioBank, later points during therapy. This will enable assessment of the diagnostic material and identification of new targets arising during treatment. The study team will extract DNA and RNA and perform targeted sequencing for selected genomic alterations (e.g., single-nucleotide variant, INDELS, fusion mutations) and gene expression changes known to be associated with pediatric cancers.

2. Enhanced immune monitoring in pediatric kidney transplant recipients (EnMo I). Dr. Tom-Blydt-Hansen - specimens granted. ***8 mononuclear cell samples and 86 urine samples from solid organ transplant patients.***

   Lay summary: Urinary biomarkers such as CXCL10 have been validated for their ability to predict acute organ rejection, but not tested yet for clinical utility. To address the efficacy of urinary biomarkers as an indicator of acute organ rejection, an adapted clinical trial design is required. Prior to conducting a clinical trial, preliminary data is needed to guide trial design. The study team proposes a pilot feasibility study to establish the groundwork for a definitive clinical trial in children with kidney transplantation to test the hypothesis that real-time, enhanced monitoring with urine biomarkers is superior to standard monitoring for identifying risk of rejection.

11.0 PI Driven Studies

Closed Studies:

#	Study Name	PI	Services Provided	Sample Processing	Storage
1.	CAN-TBI (recruitment closed)	Dr. William Panenka	Long-term storage	Plasma PBMC	- 80°C Liquid Nitrogen
2.	CROPS (recruitment closed)	Dr. Jan Dutz and Dr. Kevan Jacobson	Long-term storage	Serum Plasma PAX gene PBMC	- 80°C Liquid Nitrogen
3.	iPSC (recruitment closed)	Dr. Francis Lynn	Long-term storage	PBMC	Liquid Nitrogen
4.	P2RISM (recruitment closed)	Dr. Kate Chipperfield	Long-term storage	Plasma	- 80°C
5.	DBS (recruitment closed)	Dr. David Goldfarb	Long-term storage	Serum Plasma Blood spot cards	- 80°C
6.	SLED (recruitment paused)	Dr. Dina Panagiotopolous & Dr. Megan Levings	Long-term storage	Serum Plasma Buffy Coat PBMC	- 80°C Liquid Nitrogen
7.	CAUSES (recruitment closed)	Dr. Jan Friedman	Long-term storage	Whole Blood DNA	- 80°C
8.	CPVT (recruitment closed)	Dr. Shubhayan Sanatani	Long-term storage	Blood spot card	Room Temp - 80°C
9.	Epilepsy & Genomics (EpGen) (recruitment closed)	Dr. Michelle Demos & Dr. Mary Connolly	Long-term storage	DNA Extraction	- 80°C
10	Schizophrenia BI (study closed)	Dr. Diane Fredrikson	Processing	Serum	Same-day Shipping
11	FASCD (study closed)	Dr. Crystal Karakochuk	Labeling, recording, storage & processing	Whole Blood Plasma Serum Buffy Coat	- 80°C
12	VitDalize (study closed)	Dr. Srinivas Murthy	Labeling, recording, storage & processing	Serum Urine	- 80°C

13	Kovaltry (study closed)	Dr. Mark Belletrutti	Labeling, recording, storage & processing	Plasma	- 80°C

Ongoing Studies:

#	Study Name	PI	Services Provided	Sample Processing	Storage
1.	PedVas	Dr, Kelly Brown	Aliquoting, labeling, recording, Long-term storage	None	- 80°C Liquid Nitrogen Room Temp.
2.	BC-SICR	Dr. Srinivas Murthy	Labeling, recording, storage & processing	Whole blood aliquoting PBMC Plasma DNA	- 80°C Liquid Nitrogen
3.	VIRTUUS	Dr. Tom Blydt-Hansen	Labeling, recording, storage & processing	Urine (supernatant, cell pellet)	- 80°C
4.	PROFYLE	Dr. Rebecca Deyell	Labeling, recording, storage & processing	Urine Tissue Plasma Buffy coat PBMC	- 80°C
5.	Biobank for Skin and Adipose Tissue	Dr. Sarah Hedtrich	Consenting and coordinating	None	4°C
6.	AFII	Dr. Jefferson Terry	Labeling, recording, storage & processing	Plasma	- 80°C
7.	UST1D Phase 2	Dr. Jan Dutz	Labeling, recording, storage & processing	Plasma PBMC Whole Blood Tempus Feces	- 80°C Liquid nitrogen
8.	CAR-CF	Dr. Mark Chilvers	Labeling, recording, storage & processing	Serum	- 80°C
9.	HiRO + ARVC-B	Dr. Shu Sanatani	Labeling, recording, storage & processing	Serum Whole Blood	- 80°C
10	CITF	Dr. Brian Grunau Dr. Pascal Lavoie	Accessioning	Serum	- 80°C
11	Abcellera Adult	Dr. David Goldfarb	Labeling, recording, storage & processing	Serum Plasma PBMC	- 80°C Liquid nitrogen
12	PREVent	Dr. Megan Levings	Labeling, recording, storage & processing	Serum Plasma PBMC	- 80°C Liquid nitrogen
13	PREVent-Peds	Dr. Hana Mitchell	Labeling, recording, storage & processing	Serum Plasma PBMC	- 80°C Liquid nitrogen

14	UCAN CAN DU	Dr. Lori Tucker	Processing	Whole Blood	4°C
15	CKD/BCCBN	Dr. Darryl Knight	Labeling, recording & storage	Serum	- 80°C
16	Merck	Dr. Mark Chilvers	Processing	Serum	- 80°C
17	DIVA	Dr. Connie Yang	Processing	Serum Whole blood	- 80°C
18	CAN-Impact	Dr. Jonathan Rayment	Processing	Serum, Plasma, Buffy Coat, PaxGene Stool	- 80°C
19	CPEX	Dr. Jonathan Rayment	Processing	Serum, Plasma, PaxGene	- 80°C
20	DINOSAUR	Dr. Ann-Marie Schoos & Dr. Edmond Chan	Labeling, recording, storage & processing	Swabs, saliva, hair, urine, plasma, serum, PBMCs, whole blood	- 80°C
21	FAO-T Cell	Dr. Bojana Rakic	Processing	Plasma PBMCs	- 80°C Liquid Nitrogen
22	T1DI	Dr. Megan Levings	Processing	Serum Plasma PBMCs	- 80°C
23	VMAP	Dr. Edmond Chan	Processing	Plasma	- 80°C
24	ACCENT	Dr. Tom Blydt-Hansen	Processing	Serum Urine	- 80°C
25	Fit4Kid	Dr. Tom Blydt-Hansen	Processing	Serum Plasma	- 80°C
26	EPIC 3	Dr. Wendy Robinson	Consenting	None	**None**
27	Impact-BREATH	Dr. Jonathan Rayment	Processing	Sputum	- 80°C
28	GECKO	Dr. Michael Kobor	Storage		- 80°C
29	SLC6A8	Dr. Sylvia Stockler	Storage	PBMCs	- 80°C

12.0 Key Performance Indicators (KPI)

	Key Performance Indicators	April 1, 2018 – March 31, 2019	April 1, 2019 – March 31, 2020	April 1, 2020 – March 31, 2021	April 1, 2021 – March 31, 2022	April 1, 2022 – March 31, 2023
1	# of participants recruited	334 per year 28 per month	240 per year 20 per month	163 per year 14 per month	172 per year 14 per month	233 per year 19 per month
2	# of requests for specimens from general biobank	14	14	14	13	15
3	# of PI driven research projects supported (cumulative, some studies continue to store samples despite being closed)	29	36	44	51	64
4	# of aliquots released from General BioBank (per year)	624	467	659	449	384
5	Sample QC (two methods) i) Mononuclear cells *Recovery* *Viability* ii) DNA *A260/280* *A280/230*	 59.3%* 73.4%* 1.84 1.90	 N/A* N/A* 1.84 1.64	 N/A* N/A* N/A+ N/A+	 73% 92% N/A+ N/A+	 74% 90% N/A+ N/A+
6	# of successful grants for BCCHB specific projects (per year)	4	1	0	0	1
7	# of successful grants/awards that proposed using BCCHB (per year)	3	4	0	2	0
8	# of publications with BCCHB specimens/data (per year)	4	3	3	3	4
9	# of conference presentations/posters (per year)	3	4	1	2	2

*Recovery and viability were self-reported by researchers on fewer released mononuclear cells than in previous years, and could not be accurately measured from a significantly smaller sample size.
+Studies during this fiscal year did not require Nanodrop QC readings from DNA extractions.

13.0 BioBank Lifetime Utilization

Clinic	# of Participants Consented	Sample Type	Aliquots Accrued	Aliquots Available	Aliquots Released	% Utilization
AllergyΔ	96	Frozen Tissue Block	1	1	0	
		Mononuclear Cells	60	47	13	
		Plasma	176	130	46	
		Whole Blood	169	169	0	
		Total Aliquots	**406**	**347**	**59**	**15%**
Post-COVID Recovery	40	Frozen Tissue Block	12	12	0	
		Mononuclear Cells	48	48	0	
		Plasma	131	131	0	
		Serum	88	84	4	
		Whole Blood	3	3	0	
		Total Aliquots	**282**	**278**	**4**	**1%**
ENTΔ	196	Buffy Coat	1	1	0	
		Cell Culture	13	11	2	
		DNA	115	0	0	
		Fluid from Swab	1	1	0	
		Frozen Tissue Block	790	691	99	
		Mononuclear Cells	2190	1551	639	
		Plasma	375	39	336	
		RNA	168	168	0	
		Serum	64	35	29	
		Whole Blood	32	16	16	
		Total Aliquots	**3749**	**2513**	**1121**	**30%**
Gastroenterology Δ	133	Buffy Coat	5	4	1	
		Fluid from Swab	47	45	2	
		Frozen Tissue Block	193	156	37	
		Mononuclear Cells	17	17	0	
		Plasma	191	144	47	
		Whole Blood	131	95	36	
		Total Aliquots	**584**	**461**	**123**	**21%**
HematologyΔ	193	Buffy Coat	22	22	0	
		Frozen Tissue Block	2	2	0	
		Mononuclear Cells	953	931	22	
		Plasma	257	223	34	
		Red Blood Cells	9	9	0	
		Serum	54	23	31	
		Stem Cells	29	20	9	

		Urine	3	3	0	
		Whole Blood	40	40	0	
		Total Aliquots	**1369**	**1273**	**96**	**7%**
Mental Health (OCD)	134	Fluid from Swab	463	339	124	
		Plasma	8	7	1	
		Buffy Coat	1	1	0	
		Saliva	81	37	44	
		Total Aliquots	**553**	**384**	**169**	**31%**
Multi-Organ Transplant	150	Buffy Coat	144	118	26	
		Frozen Cell Pellet	1	1	0	
		Frozen Tissue Block	12	10	2	
		Mononuclear Cells	479	463	16	
		Plasma	2796	2582	214	
		Serum	48	48	0	
		Urine	113	80	33	
		Urine, Supernatant	4669	3870	799	
		Whole Blood	3	3	0	
		Total Aliquots	**8265**	**7175**	**1090**	**13%**
NeurologyΔ	387	Buffy Coat	9	9	0	
		Cerebrospinal Fluid	504	500	4	
		Cerebrospinal Fluid, Supernatant	5	5	0	
		DNA	70	70	0	
		Frozen Cell Pellet	1	1	0	
		Frozen Tissue Block	23	22	1	
		Mononuclear Cells	84	57	27	
		Plasma	337	175	162	
		Serum	18	8	10	
		Urine, Supernatant	54	54	0	
		Whole Blood	439	428	11	
		Total Aliquots	**1544**	**1329**	**215**	**14%**
OncologyΔ	759	Buffy Coat	184	181	3	
		Cerebrospinal Fluid	20	17	3	
		Cerebrospinal Fluid, Cells	15	14	1	
		Cerebrospinal Fluid, Supernatant	588	552	36	
		Mononuclear Cells	7483	6734	749	
		Fixed Tissue Block	14	14	0	
		Frozen Cell Pellet	41	38	3	
		Frozen Tissue Block	940	876	64	
		Plasma	4429	4162	267	

		Pleural Fluid	5	5	0	
		Pleural Fluid, Cells	4	4	0	
		Pleural Fluid, Supernatant	9	9	0	
		RNA	1	1	0	
		Serum	16	14	2	
		Stem Cells	496	448	48	
		Whole Blood	202	198	4	
		Total Aliquots	**14447**	**13267**	**1180**	**8%**
Orthopedic∆	35	Frozen Tissue Block	4	0	4	
		Mononuclear Cells	2	2	0	
		Plasma	8	6	2	
		Whole Bone Marrow	1	1	0	
		Urine, Supernatant	253	253	0	
		Total Aliquots	**268**	**262**	**6**	**2%**
Rheumatology∆	34	Buffy Coat	10	10	0	
		Cerebrospinal Fluid	20	20	0	
		Cerebrospinal Fluid, Cells	4	4	0	
		Cerebrospinal Fluid, Supernatant	15	15	0	
		Frozen Tissue Block	2	2	0	
		Mononuclear Cells	43	43	0	
		Plasma	88	82	6	
		Whole Blood	14	14	0	
		Total Aliquots	**196**	**190**	**6**	**3%**
Other	97	Buffy Coat	4	4	0	
		DNA	3	3	0	
		Frozen Tissue Block	95	85	10	
		Mononuclear Cells	191	161	30	
		Plasma	219	209	10	
		Serum	15	15	0	
		Stem Cells	7	5	2	
		Whole Blood	66	18	48	
		Total Aliquots	**600**	**500**	**100**	**17%**
Antepartum	20	Cord Blood	5	5	0	
		Frozen Tissue Block	33	33	0	
		Mononuclear Cells	8	8	0	
		Plasma	30	30	0	
		Total Aliquots	**76**	**76**	**0**	**0.%**
		Buffy Coat	1	1	0	
		Frozen Tissue Block	840	840	0	

BCWH ORΔ	110	Mononuclear Cells	154	153	1	
		Plasma	327	297	30	
		Whole Blood	47	47	0	
		Total Aliquots	**1369**	**1338**	**31**	**2%**
BCWH UltrasoundΔ	271	Buffy Coat	5	5	0	
		Frozen Tissue Block	540	540	0	
		Mononuclear Cells	130	121	9	
		Plasma	245	237	8	
		Serum	146	127	19	
		Whole Blood	6	6	0	
		Total Aliquots	**1072**	**1036**	**36**	**3%**
NICUΔ	63	Frozen Tissue Block	193	193	0	
		Mononuclear Cells	66	66	0	
		Plasma	291	273	18	
		Total Aliquots	**550**	**532**	**18**	**3%**

Δ Samples from these clinics were re-aliquoted in-house and returned to BCCHB inventory.

14.0 BCCHB Publications

A paper about the patient survey at BCWH that gathered opinions about consenting, biobanking, and research is currently being written and expected to be completed soon.

A paper about the creation and implementation of the BCCHB e-consent platform is currently being written, and expected to be completed soon.

A paper about British Columbia high school students' opinions about research, biobanking, and COVID-19 is in the early stages of being written.

Publications Acknowledging the BCCHB

The following peer-reviewed publications have acknowledged the BCCHB for services, the utilization of general biobank specimens, and/or clinical data in their research:

Barnabas GD, Goebeler V, Tsui J, Bush JW, Lange PF. ASAP—Automated Sonication-Free Acid-Assisted Proteomes—from Cells and FFPE Tissues. Anal Chem. 2023 Feb 14;95(6):3291-3299. doi: 10.1021/acs.analchem.2c04264. Epub 2023 Feb 1. PMID: 36724070; PMCID: PMC9933881.

Nierves, L., Guo, J., Chen, S. et al. Multi-omic profiling of the leukemic microenvironment shows bone marrow interstitial fluid is distinct from peripheral blood plasma. Exp Hematol Oncol 11, 56 (2022). https://doi.org/10.1186/s40164-022-00310-0

Williams B, McCartney H, Devlin A, Amid A, Vercauteren S, Wu J, Karakochuk C. P-082: Vitamin B-6 status and dietary intake among Canadian children with sickle cell disease. HemaSphere. 2022;6:55. 4th Global Congress on Sickle Cell Disease, Paris, France

Yuan, V., Hui, D., Yin, Y., Penaherrera, M.S., Beristain, A.G., Robinson, W.P. Cell-specific characterization of placental methylome. BMC Genomics **22**, 6 (2021). https://doi.org/10.1186/s12864-020-07186-6

The following peer-reviewed publications have acknowledged the BCCHB for the utilization of our services:

Asamoah-Boaheng M, Goldfarb DM, Barakauskas V, Kirkham TL, Demers PA, Karim ME, Lavoie PM, Marquez AC, Jassem AN, Jenneson S, MacDonald C, Grunau B. Evaluation of the Performance of a Multiplexed Serological Assay in the Detection of SARS-CoV-2 Infections in a Predominantly Vaccinated Population. Microbiol Spectr. 2022 Feb 23;10(1):e0145421. doi: 10.1128/spectrum.01454-21. Epub 2022 Feb 23. PMID: 35196794 Free PMC article.

Deeba F, Hu R, Lessoway V, Terry J, Pugash D, Hutcheon J, Mayer C, Salcudean S, Rohling R. SWAVE 2.0 Imaging of Placental Elasticity and Viscosity: Potential Biomarkers for Placenta-Mediated Disease Detection. Ultrasound in Medicine & Biology. 2022 Dec 1;48(12):2486-501.

Grunau B, O'Brien SF, Kirkham TL, Helmer J, Demers PA, Asamoah-Boaheng M, Drews SJ, Karim ME, Srigley JA, Sediqi S, O'Neill D, Drennan IR, Goldfarb DM. A Prospective Observational Cohort Comparison of SARS-CoV-2 Seroprevalence Between Paramedics and Matched Blood Donors in Canada During the COVID-19 Pandemic. Ann Emerg Med. 2022 Jul;80(1):38-45. doi: 10.1016/j.annemergmed.2022.03.009. Epub 2022 Apr 21. PMID: 35461719 Free PMC article.

Grunau B, Golding L, Prusinkiewicz MA, Asamoah-Boaheng M, Armour R, Marquez AC, Jassem AN, Barakauskas V, O'Brien SF, Drews SJ, Haig S, Lavoie PM, Goldfarb DM. Comparative 6-Month Wild-Type and Delta-Variant Antibody Levels and Surrogate Neutralization for Adults Vaccinated with BNT162b2 versus mRNA-1273. Microbiol Spectr. 2022 Apr 27;10(2):e0270221. doi: 10.1128/spectrum.02702-21. Epub 2022 Mar 7. PMID: 35254166 Free PMC article.

Grunau B, Prusinkiewicz M, Asamoah-Boaheng M, Golding L, Lavoie PM, Petric M, Levett PN, Haig S, Barakauskas V, Karim ME, Jassem AN, Drews SJ, Sediqi S, Goldfarb DM. Correlation of SARS-CoV-2 Viral Neutralizing Antibody Titers with Anti-Spike Antibodies and ACE-2 Inhibition among Vaccinated Individuals. Microbiol Spectr. 2022 Oct 26;10(5):e0131522. doi: 10.1128/spectrum.01315-22. Epub 2022 Sep 19. PMID: 36121252 Free PMC article.

Grunau B, Tom J, Asamoah-Boaheng M, O'Brien SF, Drews SJ, Sediqi S, Lavoie PM, Barakauskas V, Goldfarb DM. Sensitivity of the Elecsys Nucleocapsid Assay for the Detection of Preceding SARS-CoV-2 Infections. Open Forum Infect Dis. 2022 Jul 26;9(8):ofac349. doi: 10.1093/ofid/ofac349. eCollection 2022 Aug. PMID: 35937649 Free PMC article.

The following peer-reviewed publications have utilized the BCCHB for our services:

Asamoah-Boaheng M, Grunau B, Karim ME, Jassem AN, Bolster J, Marquez AC, Scheuermeyer FX, Goldfarb DM. Are higher antibody levels against seasonal human coronaviruses associated with a more robust humoral immune response after SARS-CoV-2 vaccination? Front Immunol. 2022 Sep 8;13:954093. doi: 10.3389/fimmu.2022.954093. eCollection 2022. PMID: 36159791 Free PMC article.

Asamoah-Boaheng M, Goldfarb DM, Karim ME, OBrien SF, Wall N, Drews SJ, Barakauskas V, Jassem AN, Grunau B. The Relationship Between Anti-Spike SARS-CoV-2 Antibody Levels and Risk of Breakthrough COVID-19 Among Fully Vaccinated Adults. J Infect Dis. 2023 Feb 1;227(3):339-343. doi: 10.1093/infdis/jiac403. PMID: 36197948 Free PMC article.

Asamoah-Boaheng M, Goldfarb D, Prusinkiewicz MA, Golding L, Karim ME, Barakauskas V, Wall N, Jassem AN, Marquez AC, MacDonald C, O'Brien SF, Lavoie P, Grunau B. Determining the Optimal SARS-CoV-2 mRNA Vaccine Dosing Interval for Maximum Immunogenicity. Cureus. 2023 Jan 31;15(1):e34465. doi: 10.7759/cureus.34465. eCollection 2023 Jan. PMID: 36874687 Free PMC article.

Grunau B, Goldfarb DM, Asamoah-Boaheng M, Golding L, Kirkham TL, Demers PA, Lavoie PM. Immunogenicity of Extended mRNA SARS-CoV-2 Vaccine Dosing Intervals. JAMA. 2022 Jan 18;327(3):279-281. doi: 10.1001/jama.2021.21921. PMID: 34860253 Free PMC article.

Deeba F, Hu R, Lessoway V, Terry J, Pugash D, Mayer C, Hutcheon J, Salcudean S, Rohling R. Project SWAVE 2.0: An overview of the study design for multimodal placental image acquisition and alignment. MethodsX. 2022 May 23:101738.

Presentations Acknowledging the BCCHB

The following posters, presentations, and abstracts have acknowledged the BCCHB for the utilization of biobank services in their research:

Longjohn ML; Hudson, JB; Moorehead PC; Peña-Castillo L; Chacko S; Lewis S; Christian SL (2023) A small RNA signature in plasma extracellular vesicles that identifies B-acute lymphoblastic leukemia. Terry Fox Research Institute 9th Annual Meeting. Vancouver, BC. Poster Presentation

Longjohn ML; Hudson, JB; Moorehead PC; Peña-Castillo L; Chacko S; Lewis S; Christian SL (2022) miRNA approaches to monitoring paediatric B cell acute lymphoblastic leukaemia. TFRI pan-Canadian seminar November 22, 2022. Invited talk

Cielle Wachnian, Caron Strahlendorf, Patrice Eydoux, Ann Van Eyssen, Amanda Lorentzian, Steven Jones. Childhood Leukemia Long-read Transcriptomics Based Point of Care Diagnosis. ASPHO virtual conference . April 2021. Poster presentation. International, C.

Cielle Wachnian, Caron Strahlendorf, Patrice Eydoux, Ann Van Eyssen, Amanda Lorentzian, Steven Jones. Childhood Leukemia Long-read Transcriptomics Based Point of Care Diagnosis. ASPHO virtual conferences. April 2021. Poster presentation. International, C. BC Children's Research Day. Vancouver BC. April 2021. Provincial, C.

Research Activities

The BCCHB is planning to conduct a survey aiming to gather patient opinions on the consent experience and compare the paper vs. electronic consent methods for in-person recruitment. Data collection will begin summer 2023 and continue until sufficient data has been collected

15.0 Relationships and Networks

The BCCHB aims to be a collaborative resource both locally and abroad. Over the years, we have established professional relationships with various research groups. We look forward to continued partnerships.

- **BC COVID Biobank Network (BCCBN):** a province-wide network of partner biospecimen collection sites. Biospecimens with annotated data related to COVID-19 are formally coordinated together as one unified resource. (https://crci.med.ubc.ca/bc-covid-19-biobank-network/)

- **BCCHR Clinical Research Support Unit:** an institutional initiative that provides consultative and practical support for researchers conducting sponsor-initiated or investigator-initiated clinical trials (https://www.bcchr.ca/about-us/how-we-support-research/clinical-research-support)

- **Maternal Infant Child and Youth Research Network (MICYRN):** a federal not-for-profit, charitable organization founded in 2006 to build capacity for high-quality applied health research. It now links 21 maternal and child health research organizations based at academic health centres in Canada; is affiliated with more than 20 practice-based research networks; provides support to new and emerging teams; and has established strong national and international partnerships. (https://www.micyrn.ca/)

- **Pediatric Outcome imProvement through Coordination of Research Networks (POPCORN):** a large collaboration of pediatric researchers across Canada using serology testing combined with contemporaneous rates of transmission, hospitalization, vaccination and use of public health measures, to inform public health policy.

- **PRecision Oncology For Young PeopLE (PROFYLE):** a pan-Canadian project that gives eligible patient access to tumour molecular profiling that improves and expands their treatment options and may change the outcome of their cancer. (https://www.tfri.ca/profyle)

- **UBC Women's Health Research Cluster**: an international network of multidisciplinary professionals that collectively strive to create a future where women can live equitably healthy lives from birth to old age. We promote, expand and catalyze women's health research because we believe it holds the key to better lives—not just for women, but for all people. (https://womenshealthresearch.ubc.ca/)

- **Neuromuscular Disease Network for Canada (NMD4C):** the pan-Canadian network that brings together the country's leading clinical, scientific, technical, and patient expertise to improve care, research, and collaboration in neuromuscular disease. (https://neuromuscularnetwork.ca/)

16.0 Grants & Funding (awarded in 2022/2023)

BCCHR Summer Studentship Award – Jasleen Grewal, awarded: $5,198.

BioTalent Student Work Placement Program – co-op funding: $12,240.83

BC Children's Hospital Research Institute contribution to support biobanking operations on campus, $200,000.

17.0 Presentations (2022/2023)

International Presentations:

- Kondratowski, S. Society for Pediatric Pathology Fall 2022 Meeting, University of Rochester Medical Center, Rochester, NY. *Immunohistochemical Assessment of Methylation in Primary Bone Tumours* (October 7-9, 2022). Platform Presentation

Local Presentations:

- Vercauteren, S. & Ellis, A. BC Children's Hospital Research Institute Healthy Starts Seminar Series: *A survey of pregnant women and new moms regarding their opinion of research, biobanking, and the consent process (May 4, 2022).*
- Kayda, I. Digital Health Week: *Development of a multimedia electronic consent platform for biobanking and research utilizing opinions from children, teens, and adults* (November 17, 2022). Poster Runner Up.
- Kondratowski, S. 2022 Connective Tissue Oncology Society Annual Meeting, Vancouver Convention Centre, Vancouver, BC. *Reduced H3k27me3 Immunoexpression In Pediatric Osteosarcoma Is Associated With Poor Response To Neoadjuvent Therapy*; (November 17, 2022) **Abstract ID:** 2206941 Poster Presentation/Conference.
- Ellis, A. & Aujla, Q. WHRI Symposium: *A Survey of Pregnant Women and New Moms Regarding Their Opinion of Research, Biobanking, and the Consent Process* (March 8th, 2023). Poster Presentation.
- Vercauteren, S. & Ellis, A. BC Women's Virtual Rounds: *BioBanking in the Prenatal and Neonatal Period* (March 17, 2023*)*

Local Information Sessions:

- Ellis, A. & Claydon, J. Summer Student Research Program: *Fundamentals of Free and Informed Consent in Clinical Research* (June 6 & 8, 2022).
- Nguyen, V. & Aujla, Q. DOHaD Conference: *Successful Interventions for a Healthy Future* (August 30 & 31, 2022).
- Chow, V. & Nguyen, V. & Aujla, Q. BCCHR Resource Fair (September 28, 2022).
- Ellis, A. BC Children's Hospital Research Institute: *Consenting Workshop* (October 19, 2022).
- Ellis, A. BC Children's Hospital Research Institute Lunch & Learn: *e-Consent: Making Consent More Informed and Accessible* (October 26, 2022).
- Ellis, A. Women+ and Children's Health (WACH) Program: *How the BCCHB can help support your research* (March 14, 2023).

18.0 Communication

Website: www.bcchbiobank.ca

YouTube

- BC Children's Hospital BioBank – Superhero Video https://www.youtube.com/channel/UCS1LxeGRJTRiejLRXw9heMw
- Learn About the BC Children's Hospital BioBank https://www.youtube.com/watch?v=YaT-8dQshuQ

Our BCCHB Superhero YouTube video about the BCCHB has been viewed 3390 times since it was published on December 4, 2015. Closed captioning in Simplified Chinese and Punjabi were added in March 2022, and Arabic captions were added in September 2022.

The Learn About the BC Children's Hospital BioBank YouTube video has been viewed 356 times since it was published on December 11, 2020.

Our Placenta Processing and Storage video was published on May 18, 2021, intended for internal use and educational purposes only. We continue to refer back to this video when onboarding and training new staff.

BCCHB Newsletters: Winter 2023

External Newsletters:

- Maternal Infant Child and Youth Research Network (MICYRN) Spring 2022 Newsletter (April 8, 2022)
- UBC Women's Health Research Cluster April 2022 Newsletter (April 19, 2022)

19.0 Financials

Full financial details for financial year ending March 2023:

	Q1	Q2	Q3	Q4	Grand total
	Consolidated	*Consolidated*	*Consolidated*	*Consolidated*	*Consolidated*
Opening Balance ($)	$ 173,351	$ 143,557	$ 97,958	$ 45,869	$ 173,351
Total Revenue ($)	$ 47,652	$ 35,431	$ 33,281	$ 113,264	$ 229,627
BCCHR grant ($)	$ -	$ -	$ -	$ 205,000	$ 205,000
Total Salaries ($)	$ 68,661	$ 76,425	$ 77,249	$ 93,159	$ 315,494
Total Operating Expenses ($)	$ 8,785	$ 4,604	$ 8,121	$ 48,159*	$ 69,670
Total Expenses ($)	$ 77,446	$ 81,029	$ 85,370	$ 141,318	$ 385,164
Unexpended Balance ($)	$ 143,557	$ 97,958	$ 45,869	$ 222,814	$ 222,814

*Increased operating expense in this quarter due to payment for licensing for OpenSpecimen database for years 2021 and 2022, paid for in this fiscal year

Comment on Financial status:

All operating expenses and salaries are now paid for from the UBC income account.

A comparison of predicted and actual expenditure and income is shown below:

Expenditure

	FY 2015/16	FY 2016/17	FY 2017/18	FY 2018/19	FY 2019/20	FY 2020/21	FY 2021/22
Actual	474,664	680,428	291,442	365,338	315,328	232,205	335,189
Predicted	313,000	592,500	433,200	415,000	311,897	358,197	324,619

	FY 2022/23
Actual	385,264
Predicted	377,535

Income

	FY 2015/16	FY 2016/17	FY 2017/18	FY 2018/19	FY 2019/20	FY 2020/21	FY 2021/22
Actual	48,536	79,476	117,966	97,371	177,910	232,205	201,290
Predicted	35,000	70,000	100,000	140,000	135,000	130,00	141,103

	FY 2022/23
Actual	229,627
Predicted	200,000

20.0 Quality Management Activities

BCCHB conducts a series of audits throughout the year to ensure quality and accurate biobanking practices.

1. **Pending Formal Consent:** Query for consents with Formal Consent Status 'Pending'
2. **Empty Formal Consent Fields (BCCH):** Query for BCCH consents where Formal Consent Status is 'Obtained' OR 'Interrupted' OR 'Denied' OR 'Withdrawn' OR 'Not Obtained' and export as CSV file. Filter for only blank Person Consenting OR Date of Formal Consent.
3. **Empty Formal Consent Fields (BCWH):** Query for BCWH consents where Formal Consent Status is 'Obtained' OR 'Interrupted' OR 'Denied' OR 'Withdrawn' OR 'Not Obtained' and export as CSV file. Filter for only blank Person Consenting OR Date of Formal Consent.
4. **Denied Consent with Samples:** Perform checks on specific cases that should not occur**.** Query for all aliquots then browse consents with filter of Formal Consent Status 'Denied'
5. **Aliquot Storage Location:** Query for aliquots with In Stock as 'Yes & Available' OR 'Yes & Not Available' AND created in previous year. Export as CSV file and filter for only aliquots without storage location.
6. **Review Affected Existing Records by ATiM Updates:** With the creation of new fields or new mandatory fields, a good practice is to go back and update existing records to keep the data clean and organized.

   **Note: This process is not required monthly. Perform this audit with every ATiM update.*

		January	February	March	April	May	June	July	August	September	October	November	December
1	**Pending Formal Consent**												
2	**Empty Formal Consent Fields (BCCH)**												
3	**Empty Formal Consent Fields (BCWH)**												
4	**Denied Consent with Samples**												
5	**Aliquot Storage Location**												
6	**Review Existing Records Affected by Open Specimen Updates***												

21.0 Abbreviations

BCCHB – BC Children's Hospital BioBank
BCCH – BC Children's Hospital
BCWH – BC Women's Hospital
PHSA – Provincial Health Services Authority
UBC – University of British Columbia
BCCHR – BC Children's Hospital Research Institute
WHRI – Women's Health Research Institute
REB – Research Ethics Board
CITF – COVID-19 Immunity Task Force

22.0 Sign Off

Report compiled for the BCCH BioBank by:

Veronica Chow, Vi Nguyen, Mackenzie Sturn, Ashton Ellis

Report reviewed by:

Suzanne Vercauteren & Jon Bush, BCCH BioBank Co-Directors

Approved by:

BCCH BioBank Oversight Committee

Report signed off on behalf of the BCCH BioBank Oversight Committee by:

Suzanne Vercauteren & Jon Bush, BCCH BioBank Co-Directors

_____ July 20th, 2023_____

Suzanne Vercauteren Date

_____ July 20th, 2023_____

Jonathan Bush Date