BC CHILDREN'S HOSPITAL BioBank

Annual Report

BC Children's Hospital BioBank

APRIL 1, 2020 – MARCH 31, 2021

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1.0 Overview

This is the sixth 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 2020 – March 2021.

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.

2021 has undoubtedly been a challenge for many due to the COVID-19 pandemic; however, this year has also opened many new opportunities for the research community and the BCCH BioBank. Despite these unprecedented times, the BCCH BioBank has found novel ways of consenting, has provided researchers with support in COVID-19 research and biobanking, and has continued to be a valuable resource for sample and projects requests.

Pages 13 – 17 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 18 – 21 describe the extensive list of PI driven studies that the BCCHB has been able to support over the last three years.

Dr. Vercauteren 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 2020 – March 2021.

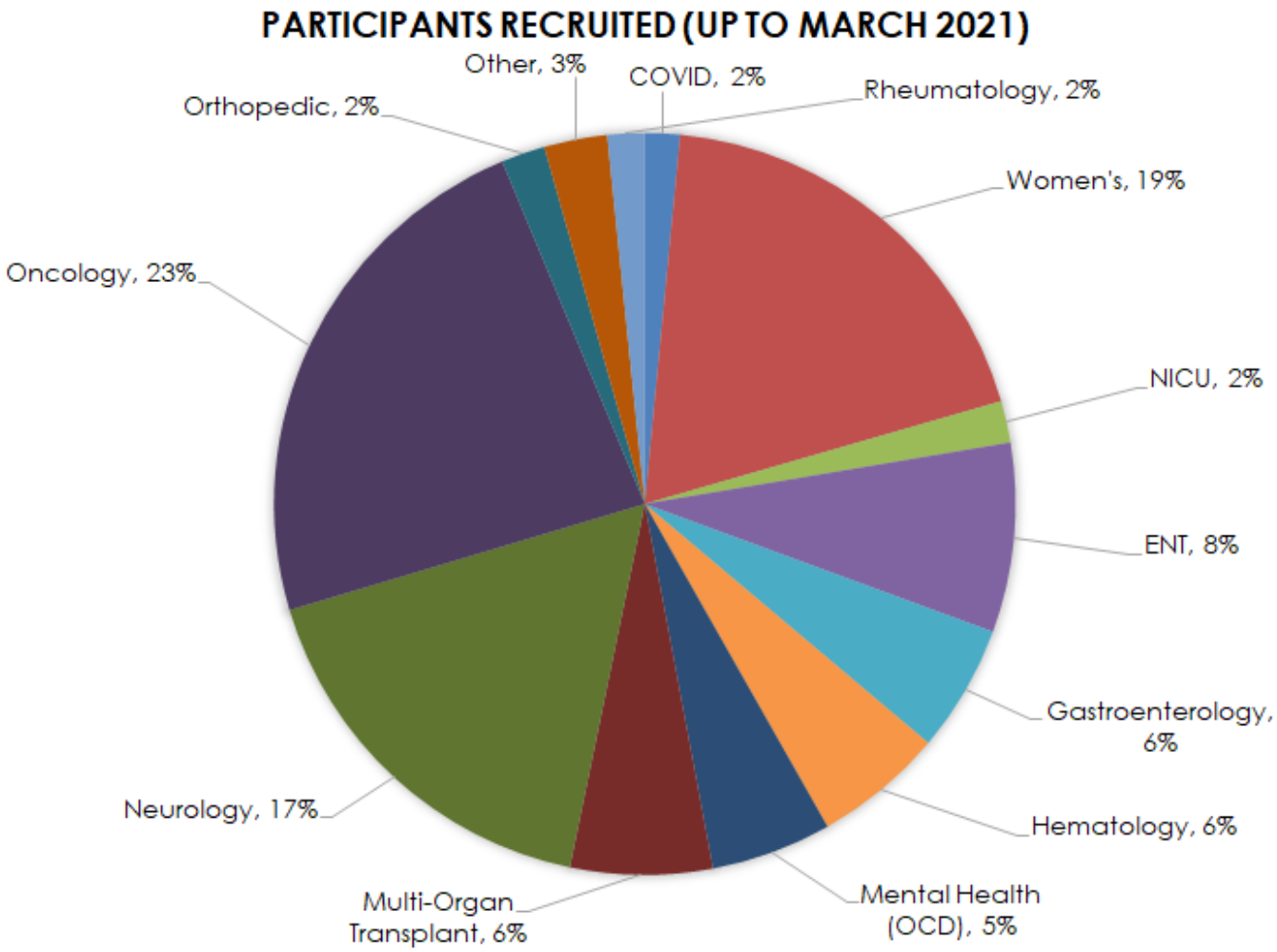
2.0 Participation Rate – General BioBank

	BCCH+		BCWH*		COVID-19	Total (BCCH + BCWH)	
	This Year	Total	This Year	Total	This Year	This Year	Total
Consent Obtained	146	1638	17 (12 NICU)	424 (37 NICU)	31	163	2062
Capacity to Consent	22	104	--		--	22	104
Declined	3	61	0	1	1	6	55
Withdrawn	0	21	0	0	0	1	19
Consent rate	98.0%	95.2%	--		--	--	

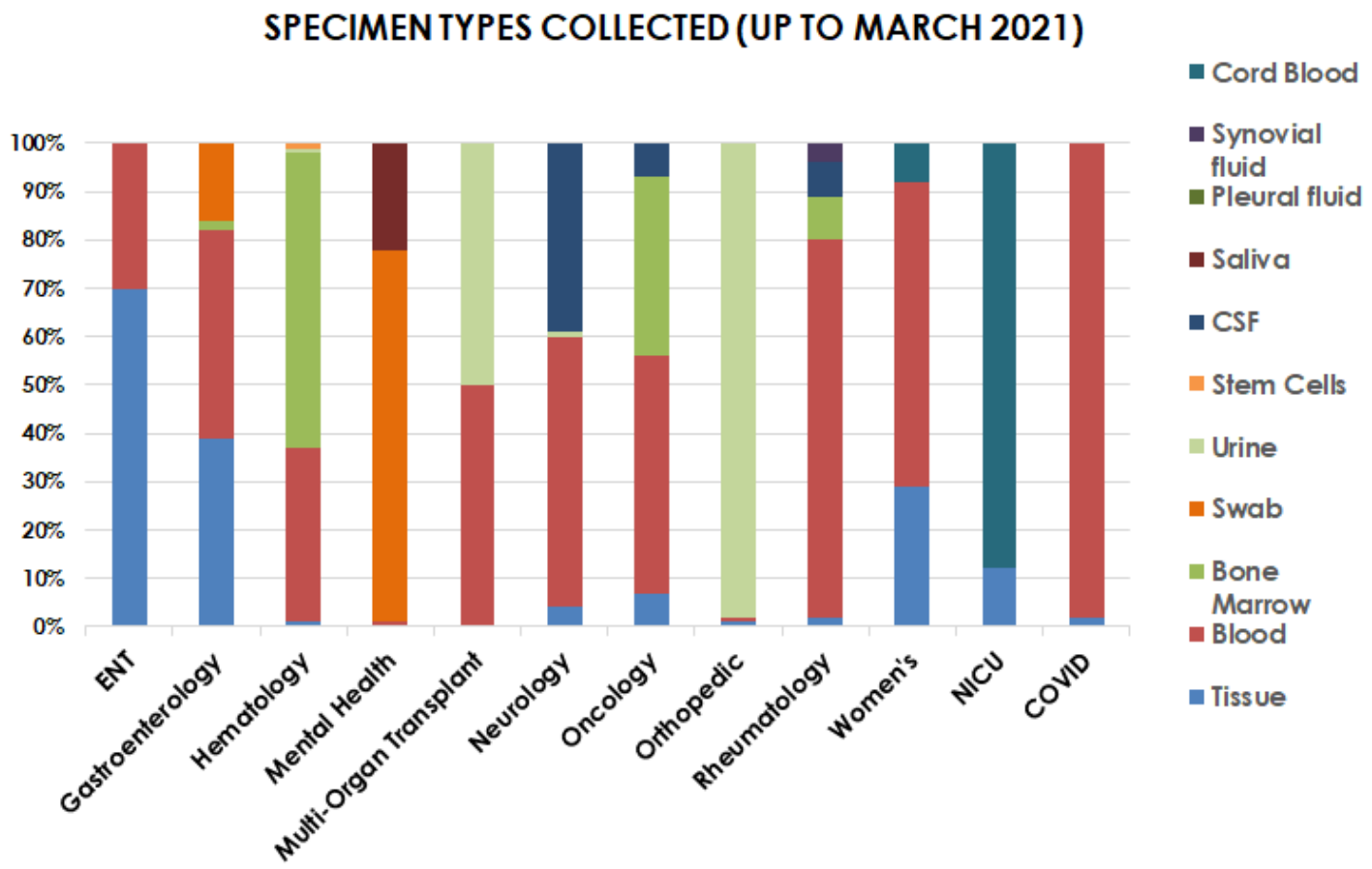
*BCWH recruitment has been minimized until a demand in maternal samples is observed.
+BCCH and BCWH recruitment volume was lower than previous years due to COVID-19 patient interaction restrictions.

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.

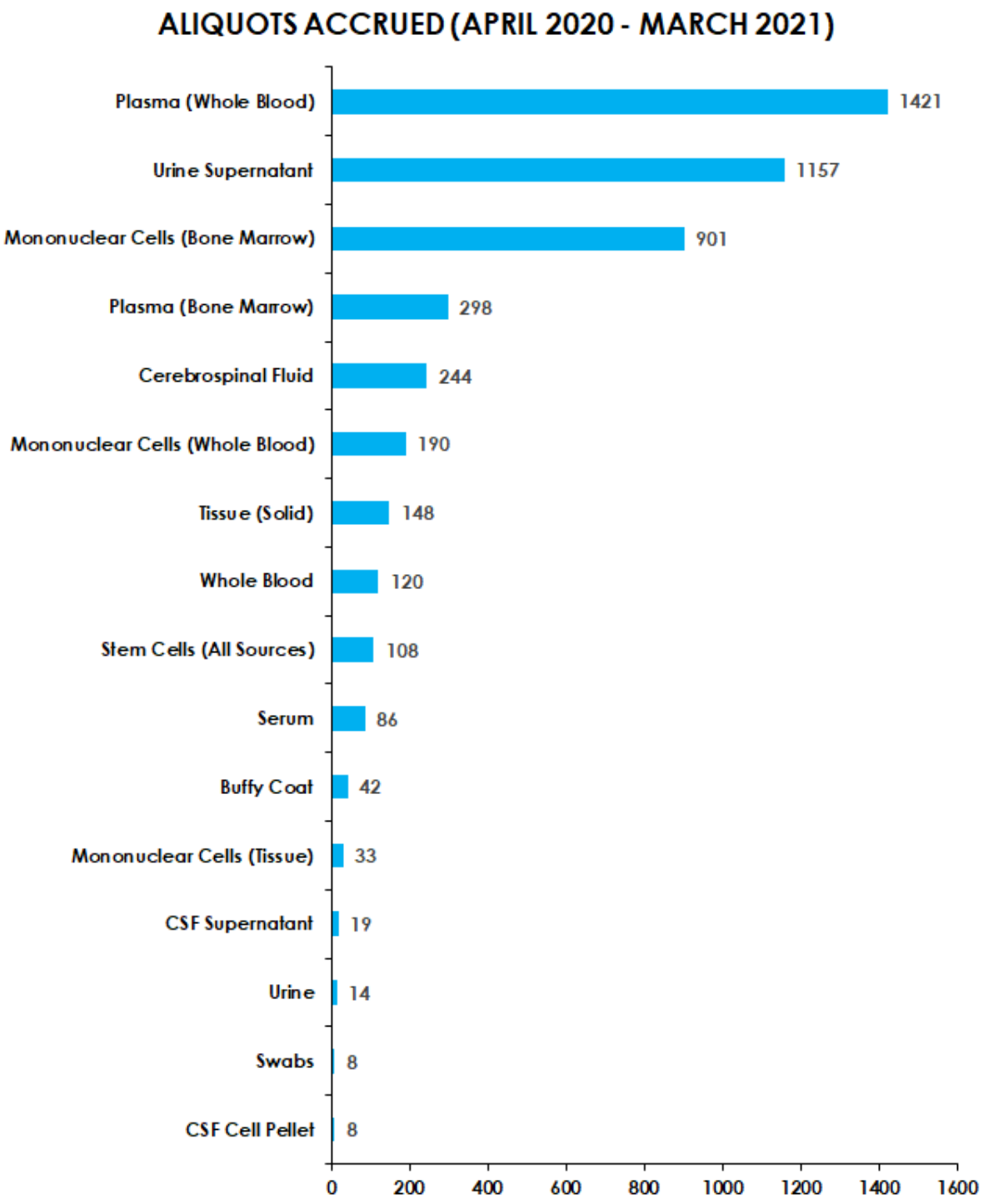
3.0 Clinic Representation – General BioBank



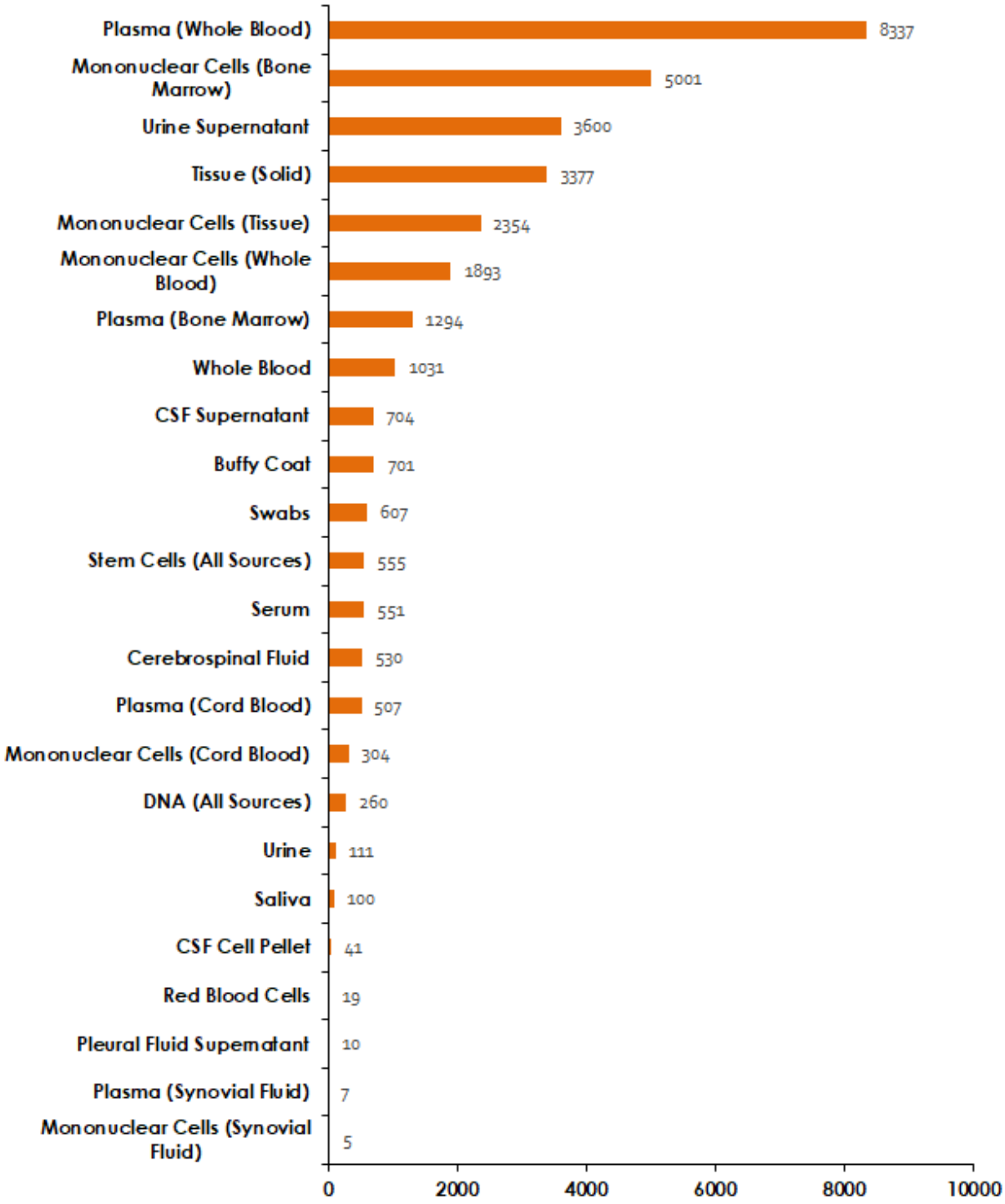
4.0 Specimen Collections – General BioBank



5.0 Aliquots Accrued and Aliquot Availability – General BioBank



TOTAL ALIQUOTS AVAILABLE AS OF MARCH 2021



6.0 BioBank Oversight Committee (BOC)

Suzanne Vercauteren Chair of BOC	**Co-Director, BCCH BioBank**
Jonathan Bush	Co-Director, BCCH BioBank
Don Brooks	Interim Head of Pathology and Laboratory Medicine, UBC
Kathryn Dewar	Senior Research Manager, WHRI
Ellen Giesbrecht	Department of Obstetrics and Gynecology, UBC (BCWH Site Head)
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
Pam Ramsay	Representative for the Provincial Laboratory Medicine Services (October 6, 2020 – March 31, 2021) *Retired*
Ashton Ellis	Research Coordinator, BCCH BioBank (ex-officio)

7.0 BioBank Executive Committee (BEC)

Suzanne Vercauteren Chair of BEC	Co-Director, BCCH BioBank
Jonathan Bush	Co-Director, BCCH BioBank
Caron Strahlendorf	Member of Research Ethics Board
Wendy Robinson	Member of BCCHR
Sheila O'Donoghue	Representative from OBER
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
Alice Virani	Director of the Clinical Ethics Service, PHSA
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 (starting April 2021)
Veronica Chow	Laboratory Manager
Ashton Ellis	Research Coordinator
Iryna Kayda	Research Technician
Vi Nguyen	Research Technician
Sadaf Sediqi	Research Technician (CITF Project)
Qudrat Aujla	Undergraduate Research Assistant
Lise Rutherford	Summer Student (May – August 2020)
Jaeden Moerike	Volunteer Student

10.0 Applications & Biospecimen Release

Between April 2020 and March 2021, the BCCH BioBank has received twelve new applications for biospecimens. Applicants and their research project titles are displayed below.

1. ImmuSkin. Dr. Sarah Hedtrich – specimens granted. ***5 plasma samples from atopic dermatitis and eosinophilic esophagitis patients, and 5 control plasma samples.***

   Lay Summary: This project aims to investigate inflammatory markers in children diagnosed with atopic dermatitis and eosinophilic esophagitis compared to controls. It is hypothesized that atopic skin releases multiple pro-inflammatory mediators, which have the potential to trigger the manifestation of allergic asthma in primary lung tissue. This project aims to detect and quantify five of these skin-derived mediators at elevated levels in blood samples from children with high-risk atopic dermatitis, that have also developed a second atopic disease (ie. eosinophilic esophagitis).

2. Enhanced Monitoring Implementation in Pediatric Kidney Transplant Recipients (EnMo II). Dr. Tom Blydt-Hansen – specimens granted***. 62 urine samples from pediatric kidney transplant patients.***

   Lay summary: Kidney transplantation is widely regarded as the best option to treat end-stage kidney disease. Currently, children experience higher risk of acute rejection and allograft injury than adults, and blood testing for creatinine and routine surveillance kidney biopsies are used to monitor rejection risk. This group and others have identified urinary CXCL10 as the most promising new biomarker to enhance clinical surveillance for rejection risk in post-transplant patients. This project is a pilot feasibility study to test the hypothesis that serial, real-time monitoring with urinary CXCL10 is a safe, non-invasive alternative to surveillance biopsy. This project also aims to evaluate clinical diagnostic accuracy and potential clinical implementation of this novel urinary CXCL10 test.

3. Validation of Biomarker Profiles using a Novel Microfluidic-Based Platform That Enables Automated, Operator-Independent Monitoring in the Clinic. Dr. Tom Blydt-Hansen and Dr. David Briscoe – specimens granted. ***119 urine samples from pediatric kidney transplant patients.***

   Lay summary: This project aims to examine stability and variability of biomarker levels in urine samples from patients in the first year after transplant. Several molecules have been found to be predictive of, or associated with, acute and chronic allograft rejection in kidney transplant patients including CXCL9, CXCL10, CCL2 and VEGF-A. However, integration of biomarker profiling into clinical practice has been hindered and requires validation. This project has developed a novel transplant urine 'cart' for use with the SimplePlex platform for the rapid, automated analysis of these four biomarkers. This project also aims to confirm the interoperability of the platform across different testing sites, enhance understanding of test level variability over time, and validate and refine biomarker cut off values prior to clinical use.

4. SARS-CoV-2 Seroconversion in Asymptomatic Individuals. Dr. Pascal Lavoie – specimens granted. ***20 control prenatal serum samples.***

   Lay summary: Determining the prevalence of SARS-CoV-2 exposure in asymptomatic individuals and understanding how this may lead to protection in the general population is critical to understanding viral transmission and immunity. It is hypothesized that a substantial proportion of the population will show evidence of prior exposure to SARS-CoV-2 by antibody testing. This project aims to determine the proportion of individuals who have evidence of prior exposure to SARS-CoV-2, and to explore how these antibodies protect against future COVID-19. By studying serum samples both prior to the onset of the COVID-19 pandemic, and prospectively, this project aims to understand what proportion of individuals may have acquired the virus without being sick, and may have already developed protective immunity for COVID-19.

5. Metabolic Conditioning of Expanded Primary Human T Cells for Adoptive Cellular Therapy. Dr. Ramon Klein Geltink – specimens granted. ***12 tonsil tissue mononuclear cell samples.***

   Lay summary: The cells in our immune system are specialized in traveling through the body to find and eliminate infections, and even cancer causing cells. In some cases, our immune system is weakened and infections or cancerous cells can no longer be eliminated. This project is investigating the best way to generate large numbers of anti-viral and anti-cancer immune cells in the laboratory using adoptive cellular therapy (ACT) strategies that depend on antigen-specific T cells. In order for T cell therapies to be effective against solid tumors or viral infections, in vitro or in vivo expansion of the therapeutic cells is required. This project aims to optimize and validate protocols to apply glucose restriction in the expansion of human antigen-specific CD8+ T cells to enhance treatment strategies for children at risk of viral infections or suffering from malignancies.

6. The role of IgA1, IgA2 and their glycosylation in COVID-19 severity. Dr. Josef Penninger – specimens granted***. 2 plasma samples from MIS-C patients, and 3 control plasma samples.***

   Lay summary: This project aims to investigate IgA-based immune responses in patients with COVID-19, comparing mild and severe illness in adults and children. This group has demonstrated that higher levels of total IgA and IgA-antiphospholipid antibodies (IgA-aPL) are significantly associated with more severe COVID-19, suggesting that COVID-19 can be a potent trigger of IgA-mediated autoimmunity. It is hypothesized that this could explain the development of systemic complications such as multisystem inflammatory syndrome in children (MIS-C). This project aims to analyze blood samples to assess whether shifts in IgA and their glycosylation result in a "proinflammatory signature" that can be used as an early biomarker for disease progression and severity of COVID-19.

7. Characterization and Regulation of Normal and Leukemic Stem Cells. Dr. Connie Eaves – specimens granted. ***5 stem cell samples and 4 mobilized peripheral blood stem cell bags.***

   Lay summary: By investigating human hematopoietic stem cells (HSCs) isolated from fetal liver, cord blood, and bone marrow from younger and older donors, this group seeks to characterize the changes that occur during the development and aging of normal human HSCs. It is hypothesized that the spectrum of HSC types released into the blood under physiologic conditions is not fully representative of that present in the bone marrow. This project aims to compare existing knowledge on HSCs with samples of bone marrow and mobilized peripheral blood, to determine if there are revealed characteristic changes associated with donor source or age. This will allow for a greater understanding of how human HSCs change throughout life, and how this may relate to the different types and frequencies of acute leukemia seen in children and adults.

8. Mechanistic understanding of the profound B cell defects in complete human CARD11 deficiency. Dr. Stuart Turvey – specimens granted. ***14 control mononuclear cell samples***.

   Lay summary: Primary immunodeficiency diseases or inborn errors of immunity are a group of rare genetic disorders in which key elements of the immune system are absent or dysfunctional. Children with a mutation in the CARD11 gene leading to CARD11 deficiency have been found to have a significant block in B cell development and absent antibody production. It is hypothesized that B cell development is halted, and that the T follicular helper cells are not getting activated or are developmentally abnormal. Children with complete CARD11 deficiency may present with profound combined immunodeficiency, severe respiratory disease, and inflammatory gastrointestinal disease. This project aims to compare the immune cell populations of children with CARD11 deficiency to controls of the same age to better understand where the B cell block is and how antibody production is affected.

9. Analysis of Antibody Neutralization Efficiency and Cellular Immunity in SARS-CoV-2-Positive Individuals Identified in At-Risk Individuals. Dr. Marc-Andre Langlois – specimens granted. ***144 control plasma and 33 control serum samples.***

   Lay summary: This project is a large serological survey for COVID-19 antibodies in convalescent and at-risk individuals in the Ottawa region. Children are at high-risk for contracting seasonal coronavirus infections, and some antibodies against coronaviruses such as 229E, NL63, HKU1, and OC43 are known to bind to antigens of SARS-CoV-2. This project aims to establish the sensitivity and specificity of an ELISA-based assay to detect COVID-19 antibodies by analyzing blood samples collected prior to the COVID-19 pandemic from various demographic populations, such as children, elderly, individuals with co-morbities, and the population at large. This project will determine if there are antibodies that can bind to SARS-CoV-2 antigens, and also establish the prevalence of antibodies against seasonal coronaviruses.

10. Childhood Leukemia: transcriptomics-based point of care rapid diagnosis. Dr. Cielle Wachnian – specimens granted. ***13 mononuclear cell samples from B-ALL patients.***

    Lay summary: Leukemia genomics are used for diagnosis, and are required for risk stratification and may provide evidence to support targeted therapy that may improve survival. A fast, low-cost, and accurate point of care method of detecting RNA/DNA rearrangements would allow for risk stratification, and the potential of added targeted therapy in patients with high-risk disease in low-income countries. This project aims to create a low-cost, accurate, and efficient point of care test, using Nanopore sequencing, to diagnose and provide genomic information on acute leukemia. By extracting RNA from leukemia samples, this project will demonstrate that Nanopore sequencing can be used to recognize B-cell, T-cell, or myeloid leukemia, and will identify common driver genomic events.

11. Mechanistic understanding of the profound T cell defects in IRF4 deficiency. Dr. Stuart Turvey – specimens granted. ***6 control mononuclear cell samples.***

    Lay summary: This project aims to better understand the immune mechanisms associated with IRF4 deficiency. IRF4 is a transcription factor that plays a critical role in the maturation of the adaptive immune system, including the generation of B and T cells, and patients with a mutation in IRF4 have been identified as having combined immunodeficiency. It is hypothesized that these patients will have increased B and T cells, as well as decreased cytokine production and antibody class switching, when compared to healthy controls. This project seeks to investigate the consequences of disturbances in IRF4 on cellular function by analyzing immune cell populations in blood samples.

12. CODEX deep imaging training, validation and optimization. Dr. Fabio Rossi – specimens granted. ***1 tonsil tissue sample.***

    Lay summary: The CODEX microfluidics controller allows for the detection of up to 50 antibodies within a single tissue section. The setup and optimization of this method requires the staining of human immune tissue, such as tonsils or spleen, with a specific set of antibodies provided by the manufacturer. This project aims to validate the performance of this novel instrument using a tonsil tissue sample for quality control purposes.

Over the period of April 2020 and March 2021, 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. ***52 mononuclear cell samples.***

   Lay summary: The aims for this study are to procure viable HR 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 robustness of original targetable lesions and identification of new targets arising during treatment. We will extract DNA and RNA as per standard protocols 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. ***156 urine samples from pediatric kidney transplant patients.***

   Lay summary: Urinary biomarkers such as CXCL10 have been validated for their ability to predict acute rejection, but not tested yet for clinical utility. These markers must improve on the existing framework for clinical decision-making to be useful as clinical tools. For the diagnosis of rejection, they must be superior to existing surveillance at indicating a need for biopsy, such that they may reduce the requirement for biopsy surveillance. To address the efficacy of urinary biomarkers, an adapted clinical trial design is required. The interpretation of a biomarker level will be made in the context of existing clinical information. The biopsy result will be used to determine the accuracy with which rejection is predicted. Prior to conducting a clinical trial, preliminary data is needed to guide trial design. We propose 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

#	Study Name	PI	Services Provided	Sample Processing	Storage
1	SLED	Dr. Dina Panagiotopolous & Dr. Megan Levings	Receiving, labeling, recording, & processing the specimen Long-term storage	Serum Plasma Buffy Coat PBMC	- 80°C Liquid Nitrogen
2	Adult SLED	Dr. Jan Dutz	Receiving, labeling, recording, and processing the specimen Long-term storage	Serum Plasma Buffy Coat PBMC	- 80°C Liquid Nitrogen
3	Epilepsy & Genomics (EpGen)	Dr. Michelle Demos & Dr. Mary Connolly	Receiving, labeling, recording, and aliquoting the specimen Long-term storage	DNA Extraction	- 80°C
4	CAUSES	Dr. Jan Friedman	Receiving, labeling, recording, and aliquoting the specimen Long-term storage	Storage of whole Blood	- 80°C
5	SWAVE-U (study closed)	Dr. Jefferson Terry	Consenting patients and delivering the placenta to Anatomical Pathology	None	Store in the BioBank box in AP
6	mTOR (study closed)	Dr. Rebecca Deyell	Receiving, labeling, recording, and processing the specimen	Protein Lysate (PBMC)	Temporary storage only (-80°C)
7	UST1D (study closed)	Dr. Jan Dutz	Receiving, labeling, recording, and processing the specimens Long-term storage	Serum Plasma PBMC Whole blood	- 80°C Liquid Nitrogen
8	Genome wide assessment of genetic alterations in pediatric acute leukemia (LBRWN)	Dr. Lindsay Brown	Consenting and data collection	None	None

#	Study Name	PI	Services Provided	Sample Processing	Storage
9	Understanding the risk of sudden death in families: cascade screening in CPVT (CARDIO)	Dr. Shubhayan Sanatani	Coordinating the collection of patient blood samples to FTA blood spot cards Long-term storage	Blood spot card DNA extractions	Room Temp - 80°C
10	TREASuRE (study closed)	Dr. Suzanne Vercauteren	Consenting	None	None
11	Vitamin B12 status in South-Asian and European pregnant women and their newborns (study closed)	Dr. Hilary Vallance	Labeling, recording, storage	None	- 80°C
12	Broady Lab	Dr. Raewyn Broady	Labeling, recording, storage	None	Liquid Nitrogen
13	Levings Lab (study closed)	Dr. Megan Levings	Labeling, recording, storage	None	Liquid Nitrogen
14	A randomized controlled pilot study to examine the effects of goal-directed fluid therapy on post-operative outcomes in children undergoing scoliosis repair (study closed)	Dr. Zoe Brown	Labeling, recording, storage	None	- 80°C
15	Kingella Kingae (study closed)	Dr. Ghada Al-Rawahi	Identifying eligible patients, deliver kits, consent patients	None	None
16	Overcoming the barriers to successful immune therapy for acute leukemia	Dr. Gregor Reid (Dr. Nina Rolf)	Consenting	None	None
17	PedVas	Dr Kelly Brown	Aliquoting, labeling, recording, Long-term storage	None	- 80°C Liquid Nitrogen Room Temp.

#	Study Name	PI	Services Provided	Sample Processing	Storage
18	AKI (study closed)	Dr. Cherry Mammen	Processing, aliquoting, labeling, recording, storage	Urine (aliquoting)	- 80°C
19	EoE	Dr. Edmond Chan	Labeling, recording, storage	Freezing Tissue Whole Blood Plasma PAX gene	- 80°C
20	TED (study closed)	Dr. Linda Casey	Consenting and coordinating	None	None
21	POG cf DNA	Dr. Ryan Morin	Processing	Plasma Buffy Coat	- 80°C
22	BC-SICR	Dr. Srinivas Murthy	Labeling, recording, storage & processing	Whole blood aliquoting PBMC Plasma DNA	- 80°C Liquid Nitrogen
23	CAN-TBI Sub study	Dr. William Panenka	Labeling, recording & processing Long-term storage	Plasma PBMC	- 80°C Liquid Nitrogen
24	CROPS	Dr. Jan Dutz and Dr. Kevan Jacobson	Labeling, recording, storage & processing	Serum Plasma PAX gene PBMC	- 80°C Liquid Nitrogen
25	iPSC	Dr. Francis Lynn	Labeling, recording, storage & processing	PBMC	Liquid Nitrogen
26	Rheumatology	Dr. David Cabral and Dr. Kelly Brown	Labeling, recording, storage & processing	Whole blood aliquot Plasma PBMC	- 80°C Liquid Nitrogen
27	ABLE-Glyconet (study closed)	Dr. Kirk Schultz	Consenting and coordinating	None	None
28	SPACEY (study closed)	Dr. Sian Spacey	Labeling, recording, storage & processing	Whole Blood DNA extractions	- 80°C
29	VIRTUUS	Dr. Tom Blydt-Hansen	Labeling, recording, storage & processing	Urine (supernatant, cell pellet)	- 80°C
30	PROFYLE	Dr. Rebecca Deyell	Labeling, recording, storage & processing	Urine (supernatant, cell pellet) Freezing Tissue Plasma Buffy coat PBMC	- 80°C

31	PRISM	Dr. Vilte Barakauskas	Storage, coordinating	None	- 80°C
32	P²RISM	Dr. Kate Chipperfield	Consenting, coordinating, labeling, recording & storage	Plasma	- 80°C
33	PRIMED	Dr. Vikram Sabhaney	Labeling, recording, storage & processing	Tempus Plasma Serum Urine (supernatant)	- 80°C
34	OncNut (study closed)	Dr. Paul Rogers	Labeling, recording & storage	Whole Blood	- 80°C
35	Biobank for Skin and Adipose Tissue	Dr. Sarah Hedtrich	Consenting and coordinating	None	4°C
36	CUDDLE	Dr. Wee-Shian Chan	Consenting and Coordinating	None	None
37	FASCD	Dr. Crystal Karakochuk	Labeling, recording, storage & processing	Whole Blood Plasma Seru, Buffy Coat	- 80°C
38	AbCellera (pediatric)	Dr. Dewi Schrader	Consenting, coordinating, labeling, recording, storage & processing	Serum Plasma PBMC	- 80°C Liquid nitrogen
39	UST1D2 Phase 2	Dr. Jan Dutz	Labeling, recording, storage & processing	Plasma PBMC Whole Blood Tempus Feces	- 80°C Liquid nitrogen
40	CAR-CF	Dr. Mark Chilvers	Labeling, recording, storage & processing	Serum	- 80°C
41	DBS	Dr. David Goldfarb	Labeling, recording, storage & processing	Serum Plasma Bloodspotting	- 80°C
42	HiRO + ARVC-B	Dr. Shu Sanatani	Labeling, recording, storage & processing	Serum Whole Blood	- 80°C
44	CITF	Dr. Pascal Lavoie	Labeling, recording, storage & processing	Serum	- 80°C

12.0 Key Performance Indicators (KPI)

	Key Performance Indicators	January 1, 2015 – March 31, 2016	April 1, 2016 – March 31, 2017	April 1, 2017 – March 31, 2018	April 1, 2018 – March 31, 2019	April 1, 2019 – March 31, 2020	April 1, 2020 – March 31, 2021
1	# of participants recruited	402 per year (+ carry-over from CCBR) 27 per month	310 per year 26 per month	417 per year 35 per month	334 per year 28 per month	240 per year 20 per month	163 per year 14 per month
2	# of requests for specimens from general biobank	4 per year 0.2 per month	7 per year 0.6 per month	12 per year 1.2 per month	14 per year 1.2 per month	14 per year 1.2 per month	14 per year 1.2 per month
3	# of PI driven research projects supported (cumulative, some studies continue to store samples despite being closed)	17	23	29	29	36	44
4	# of aliquots released from General BioBank (per year)	51	485	305	624	467	659
5	Sample QC (two methods) i) Mononuclear cells *Recovery* *Viability* ii) DNA *A260/280* *A280/230*	 62% 75% 1.84 1.93	 90% 85% 1.86 2.20	 83.3% 96.3% 1.84 1.73	 59.3%* 73.4%* 1.84 1.90	 N/A* N/A* 1.84 1.64	 N/A* N/A* N/A+ N/A+
6	# of successful grants for BCCHB specific projects (per year)	1	4	1	4	1	1
7	# of successful grants/awards that proposed using BCCHB (per year)	2	1	3	3	4	7
8	# of publications with BCCHB specimens/data (per year)	1	1	2	4	3	3
9	# of conference presentations/posters (per year)	7	4	1	3	4	3

*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
COVID	31	Frozen Tissue Block	12	12	0	
		Mononuclear Cells	37	37	0	
		Plasma	106	106	0	
		Serum	62	62	0	
		Whole Blood	3	3	0	
		Total Aliquots	**220**	**220**	**0**	**0.00%**
ENT◊	168	Buffy Coat	1	1	0	
		Cell Culture	13	11	2	
		DNA	115	0	0	
		Fluid from Swab	1	1	0	
		Frozen Tissue Block	770	674	96	
		Mononuclear Cells	2107	1589	518	
		Plasma	356	77	279	
		RNA	168	168	0	
		Serum	47	19	28	
		Whole Blood	32	16	16	
		Total Aliquots	**3610**	**2556**	**939**	**26.01%**
Gastroenterology ◊	113	Buffy Coat	5	4	1	
		Fluid from Swab	33	31	2	
		Frozen Tissue Block	143	106	37	
		Mononuclear Cells	16	16	0	
		Plasma	134	99	35	
		Whole Blood	74	38	36	
		Total Aliquots	**405**	**294**	**111**	**27.41%**
Hematology◊	115	Buffy Coat	22	22	0	
		Frozen Tissue Block	1	1	0	
		Mononuclear Cells	423	420	3	
		Plasma	206	173	33	
		Serum	54	23	31	

		Stem Cells	31	31	0	
		Urine	3	3	0	
		Whole Blood	29	29	0	
		Whole Bone Marrow	15	15	0	
		Total Aliquots	**784**	**717**	**67**	**8.55%**
Mental Health (OCD)	107	Fluid from Swab	346	346	0	
		Plasma	5	4	1	
		Saliva	49	6	43	
		Total Aliquots	**400**	**356**	**44**	**11.00%**
Multi-Organ Transplant	126	Buffy Coat	129	103	26	
		Frozen Cell Pellet	1	1	0	
		Frozen Tissue Block	11	9	2	
		Mononuclear Cells	448	440	8	
		Plasma	1756	1751	5	
		Urine	85	52	33	
		Urine, Supernatant	2564	1961	603	
		Whole Blood	3	3	0	
		Total Aliquots	**4997**	**4320**	**677**	**13.55%**
Neurology◊	349	Buffy Coat	9	9	0	
		Cerebrospinal Fluid	297	297	0	
		DNA	65	65	0	
		Frozen Tissue Block	17	17	0	
		Mononuclear Cells	64	47	17	
		Plasma	221	90	131	
		Serum	17	7	10	
		Urine, Supernatant	8	8	0	
		Whole Blood	296	286	10	
		Total Aliquots	**994**	**826**	**168**	**16.90%**
		Buffy Coat	160	160	0	
		Cerebrospinal Fluid	14	13	1	
		Cerebrospinal Fluid, Cells	14	13	1	

Oncology	475	Cerebrospinal Fluid, Supernatant	491	180	11	
		Mononuclear Cells	4178	3880	298	
		Fixed Tissue Block	14	14	0	
		Frozen Cell Pellet	29	27	2	
		Frozen Tissue Block	320	281	39	
		Plasma	3615	3371	244	
		Pleural Fluid, Cells	3	3	0	
		Pleural Fluid, Supernatant	7	7	0	
		RNA	1	1	0	
		Serum	16	14	2	
		Stem Cells	452	405	47	
		Whole Blood	51	47	4	
		Total Aliquots	**9365**	**8416**	**649**	**6.93%**
Orthopedic◊	39	Frozen Tissue Block	4	0	4	
		Mononuclear Cells	2	2	0	
		Plasma	8	6	2	
		Urine, Supernatant	299	299	0	
		Total Aliquots	**313**	**307**	**6**	**1.92%**
Rheumatology◊	33	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	87	83	4	
		Whole Blood	14	14	0	
		Total Aliquots	**195**	**191**	**4**	**2.05%**
		Buffy Coat	16	16	0	

Other	56	Cerebrospinal Fluid	31	31	0	
		DNA	8	8	0	
		Fluid from Swab	12	12	0	
		Frozen Tissue Block	69	59	10	
		Mononuclear Cells	288	278	10	
		Plasma	175	170	5	
		Saliva	1	0	1	
		Serum	5	5	0	
		Stem Cells	27	27	0	
		Whole Blood	76	28	48	
		Total Aliquots	**708**	**634**	**74**	**10.45%**
Women's‡	387	Buffy Coat	5	5		
		Frozen Tissue Block	1237	1237		
		Mononuclear Cells	256	256		
		Plasma	490	480	10	
		Serum	148	129	19	
		Whole Blood	53	53		
		Total Aliquots	**2189**	**2160**	**29**	**1.32%**
NICU	37	Frozen Tissue Block	20	20	0	
		Mononuclear Cells	43	43	0	
		Plasma	210	210	0	
		Total Aliquots	**273**	**273**	**0**	**0.00%**

‡ Samples from this clinic were released, freeze/thawed, and returned back into BCCHB inventory.

◊ Collectively 64 samples from these clinics were released, freeze/thawed, and returned back into BCCHB inventory.

14.0 BCCHB Publications

Dr. Vercauteren is co-editor on a special pediatric edition of Biopreservation and Biobanking, which is due to be published in the spring of 2021. The BCCHB will have a number of papers in this.

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 by summer 2021.

Publications Acknowledging the BCCHB

The following peer-reviewed publications have acknowledged the BCCHB for the utilization of general biobank specimens and clinical data in their research.

Bowers SM, Gibson KM, Cabral DA, Brown KL (2020). Adenosine Deaminase 2 activity negatively correlates with age during childhood. Pediatric Rheumatology. 18: 54.

Gibson KM, Kain R, Luqmani RA, Ross CJ, Cabral DA and Brown KL (2021) Autoantibodies Against Lysosome Associated Membrane Protein-2 (LAMP-2) in Pediatric Chronic Primary Systemic Vasculitis. Front. Immunol. 11:624758. doi: 10.3389/fimmu.2020.624758 .

Anuli C. Uzozie, Enes K. Ergin, Nina Rolf, Janice Tsui, Amanda Lorentzian, Samuel S. H. Weng, Lorenz Nierves, Theodore G. Smith, C. James Lim, Christopher A. Maxwell, Gregor S. D. Reid, Philipp F. Lange PDX models reflect the proteome landscape of pediatric acute lymphoblastic leukemia but divert in select pathways. Journal of Experimental & Clinical Cancer Research 40, 96 (2021). https://doi.org/10.1186/s13046-021-01835-8

The following peer-reviewed publications have acknowledged the BCCHB for the utilization of BioBank services in consenting, collection, processing of samples and data for their research.

Gill EE, Smith ML, Gibson KM, Morishita KA, Lee AHY, Falsafi R, Graham J, Foell D, Benseler SM, Ross CJ, Luqmani RA, Cabral DA, Hancock REW, Brown KL and the PedVas Initiative Investigators (2021) Different Disease Endotypes in Phenotypically Similar Vasculitides Affecting Small-to-Medium Sized Blood Vessels. Front. Immunol. 12:638571. doi: 10.3389/fimmu.2021.638571 .

Mackley MP, Fernandez NR, Fletcher B, Woolcott CG, Fernandez CV. Revisiting Risk and Benefit in Early Oncology Trials in the Era of Precision Medicine: A Systematic Review and Meta-Analysis of Phase I Trials of Targeted Single-Agent Anticancer Therapies. JCO Precision Oncology. 2021 Jan;5:17-26.

Roston A, Evans D, Gill H, McKinnon M, Isidor B, Cogné B, Mwenifumbo J, van Karnebeek C, An J, Jones SJM, Farrer M, Demos M, Connolly M, Gibson WT; CAUSES Study; EPGEN Study. SETD1B-associated neurodevelopmental disorder. J Med Genet. 2021 Mar;58(3):196-204. doi: 10.1136/jmedgenet-2019-106756. Epub 2020 Jun 16. PMID: 32546566.

Trivisano M, Ferretti A, Bebin E, Huh L, Lesca G, Siekierska A, Takeguchi R, Carneiro M, De Palma L, Guella I, Haginoya K, Shi RM, Kikuchi A, Kobayashi T, Jung J, Lagae L, Milh M, Mathieu ML, Minassian BA, Novelli A, Pietrafusa N, Takeshita E, Tartaglia M, Terracciano A, Thompson ML, Cooper GM, Vigevano F, Villard L, Villeneuve N, Buyse GM, Demos M, Scheffer IE, Specchio N. Defining the phenotype of FHF1 developmental and epileptic encephalopathy. Epilepsia. 2020 Jul;61(7):e71-e78. doi: 10.1111/epi.16582. Epub 2020 Jul 9. PMID: 32645220.

Pelletier F, Perrier S, Cayami FK, Mirchi A, Saikali S, Tran LT, Ulrick N, Guerrero K, Rampakakis E, Van Spaendonk RM, Naidu S. Endocrine and growth abnormalities in 4H leukodystrophy caused by variants in POLR3A, POLR3B, and POLR1C. The Journal of Clinical Endocrinology & Metabolism. 2021 Feb;106(2):e660-74.

Research Activities

The BCCHB has conducted a large number of focus groups and workshops in the past as part Dr. Vercauteren's public engagement interest. While these focus groups were put on hold for this fiscal year due to COVID-19 pandemic, we hope to continue these activities in the future as restrictions return to normal.

15.0 Grants (awarded in 2020/2021)

BC Canadian Research Continuity Research Fund (CRCEF) 2020

Stage 1 and 2 - $24,593.88
Stage 3 - $11,712.15
Stage 4 - $16,444.40

Total Rewarded: $52,750.43

UBC Research Facilities Support Grant (RFSG) 2020: $75,000.00

BC Children's Hospital Research Institute Salary Aid: $1,768.14

16.0 Presentations (2020/2021)

International Presentations:

- Ellis, A. (April 2020). *A survey of pregnant women and new moms regarding their opinion of research, biobanking, and the consent process.* International Society of Biological and Environmental Repositories (ISBER) Annual General Meeting, online due to COVID-19.

Local Presentations:

- Ellis, A. (June 2020). BC Children's Hospital Research Institute Summer Studentship: BCCHR Resources
- Ellis, A. (December 2020). *REDCap Days.* BCCHR

Presentations acknowledging BioBank; done by collaborators and other groups:

- **OCD-Mental Health Group: Salivary biomarkers in childhood-onset obsessive compulsive disorder: Preliminary analyses of pro-inflammatory cytokines.** Westwell-Roper C, Naqqash Z, Au A, Lin B, Lu C Shao L, Beasley CL, Stewart SES. BB&D Research Day, BCCHR, Vancouver, Canada Jan 2021
- **OCD-Mental Helath Group: Salivary biomarkers in childhood-onset obsessive compulsive disorder: Preliminary analyses of pro-inflammatory cytokines.** Westwell-Roper C, Naqqash Z, Au A, Lin B, Lu C Shao L, Beasley CL, Stewart SES. UBC Psychiatry Research Day Oct 2020.

17.0 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 3011 times.
Our new Learn About the BC Children's Hospital BioBank video has been viewed 248 times.

BCCHB Newsletter: Spring 2020
UBC Pathology Newsletter: February 2021

18.0 Financials

Full financial details for financial year ending March 2021:

	Q1	Q2	Q3	Q4	Grand total
Opening Balance ($)	$107,249	$94,004	$44,135	$63,636	**$107,249**
Total Revenue ($)	$40,974	$14,264	$88,955	$88,013	**$232,205**
Total Salaries ($)	$53,054	$59,637	$65,081	$27,915	**$205,686**
Total Operating Expenses ($)	$1,165	$4,496	$4,372	$16,485	**$26,519**
Total Expenses ($)	$54,219	$64,133	$69,453	$44,400	**$232,205**
Unexpended Balance ($)	$94,004	$44,135	$63,636	$107,249	**$107,249**

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

	FY2013/14	FY 2014/15	FY 2015/16	FY 2016/17	FY 2017/18	FY 2018/19	FY 2019/20	FY 2020/21
Actual	142,172	818,846	474,664	680,428	291,442	365,338	315,328	232,205
Predicted	978,500	290,000	313,000	592,500	433,200	415,000	311,897	358,197

Income

	FY2013/14	FY 2014/15	FY 2015/16	FY 2016/17	FY 2017/18	FY 2018/19	FY 2019/20	FY 2020/21
Actual	565	10,395	48,536	79,476	117,966	97,371	177,910	232,205
Predicted	0	16,000	35,000	70,000	100,000	140,000	135,000	130,00

19.0 Abbreviations

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

20.0 Sign Off

Report compiled for the BCCH BioBank by:

Veronica Chow, Ashton Ellis, Vi Nguyen, Iryna Kayda

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

_____ _____ _June 11 2021_____

Suzanne Vercauteren Date

_____ _____ __June 11 2021_____

Jonathan Bush Date