cryobio

Additional Agreement to Use Donor CB 952-B

I, (_____ (Recipient), and _____ (Partner, if applicable)), specifically request and accept frozen semen from Cryobio donor CB 952-B. I understand that this Additional Agreement is an additional part of the Sperm Use Agreement specific to donor CB 952-B. CB 952-B had expanded carrier screening to determine their carrier status for 283 recessive genetic conditions. Please note that Cryobio thoroughly evaluates each donor's results and assesses potential risks of any identified results before allowing donors to remain in our donor program.

I have reviewed genetic test results on this sperm donor, and I understand that donor CB 952-B has been found to be a carrier of the following recessive genetic conditions:

Autosomal recessive spastic ataxia of Charlevoix-Saguenay; and

Increased risk of being silent carrier of spinal muscular atrophy.

Purpose of genetic carrier screening: Carriers of genetic conditions have changes, called pathogenic variants or mutations, in a specific (or multiple) gene(s). Most of the genetic conditions that the Cryobio donors are tested for are inherited in an autosomal recessive pattern (see Figure 1). Typically, we all have two copies of every gene---one from the egg source and one from the sperm source. Autosomal recessive conditions require a mutation in both copies of the same gene in order for it to cause the condition. Therefore, individuals who carry just one mutation in a gene that causes recessive genetic conditions are 'carriers' of that specific condition. Carriers of most of the genetic conditions Cryobio donors are tested for do not typically show symptoms of the condition, i.e., they are asymptomatic, although there are rare exceptions. Most individuals are carriers for at least one if not multiple recessive genetic conditions.

Carrier status is helpful to know because if both the egg source and the sperm source are carriers for pathogenic variants or mutations in the same gene, then there is a 1 in 4 chance of the resulting child having that specific condition; a 2 in 4 chance of the resulting child being a carrier for that specific condition; and a 1 in 4 chance of the resulting child being neither a carrier or having that specific condition. Some of the conditions Cryobio donors are tested for have genotype-phenotype correlation, meaning that specific genetic pathogenic variations (the genotype) in a specific gene can be predictive of the type/specific features of a condition that may present in the individual (the phenotype), but not all do. Additionally, some of the genes can be linked to dominant conditions, meaning having a mutation in just one gene may increase the risk of a specific condition. If a specific change in a gene is linked to a dominant condition, it will be noted in this consent form.

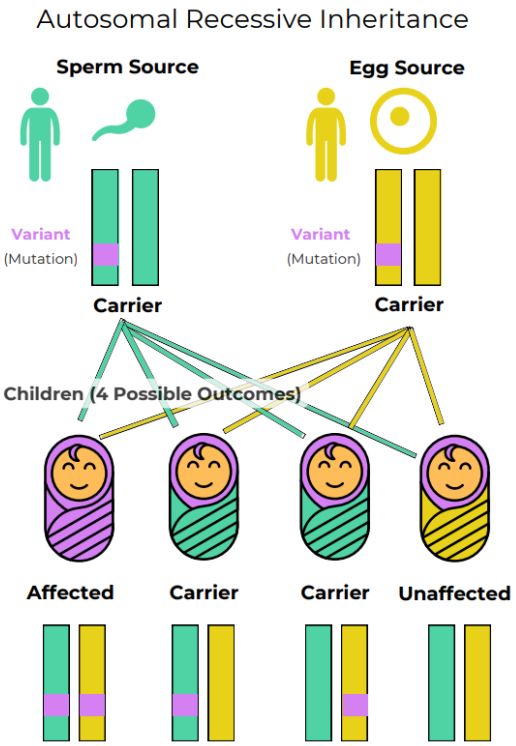

Figure 1. Graphic representing autosomal recessive inheritance of two carrier gametes.

Autosomal recessive spastic ataxia of Charlevoix-Saguenay (*SACS* gene): Autosomal recessive spastic ataxia of Charlevoix-Saguenay (ARSACS) is an autosomal recessive disorder that is caused by pathogenic variants in the gene *SACS* and has the highest prevalence among the French Canadian population. The clinical presentation includes progressive muscle damage and lack of muscle coordination, peripheral weakness and numbness caused by nerve damage (neuropathy), and muscle spasms (spasticity) in the lower limbs. For individuals of Quebec ancestry, the onset of symptoms usually begins between age 12-18 months with difficulty and unsteadiness while walking. Non-Quebec individuals with ARSACS often do not experience symptoms until later in childhood or adulthood. Other symptoms include involuntary eye movements, loss of sensation due to the progressive nerve damage, deformities of the fingers and feet, difficulties with speech, and yellow streaks in the retina. The cognitive skills of those affected with ARSACS tend to be in the lower range of normal, and while the condition is progressive, most individuals are capable of coping with daily living tasks. No genotype-phenotype correlation is currently known, which means the symptoms and severity of the condition cannot be predicted by the particular gene mutations a person carries.

Increased risk of being a silent carrier for spinal muscular atrophy (*SMN1* gene): Spinal muscular atrophy (SMA) is a pan-ethnic, autosomal recessive disease caused by loss of function of the *SMN1* gene. In over 95% of cases, patients are missing both copies of the *SMN1* gene. The disease is characterized by the degeneration of alpha motor neurons of the spinal cord anterior horn cells, leading to progressive symmetric weakness, atrophy of the proximal voluntary muscles and early death. Age of onset can be anywhere on a continuum from the prenatal period to adulthood. Life expectancy varies from death before 6 months of age up to normal lifespan. Most patients, regardless of the severity of disease, have a deletion of both *SMN1* copies. Patients with later-onset disease usually have three or more copies of *SMN2*, which encodes a small amount of residual protein and lessens the severity of the symptoms. However, other factors besides *SMN2* copy number may affect the phenotype, and therefore the severity of the disease may not be able to be accurately predicted in all patients based on genotype.

Of Note: CB 952-B's variant of *SMN1* gene: CB 952-B has a variant of the *SMN1* gene that roughly doubles the chance that he is a silent carrier for SMA. He is not a carrier based on the testing performed, but he has an increased risk of being a carrier. Cryobio's genetic counselor still recommends that the recipient or the egg source, if different, be tested to determine their SMA carrier status.

Carrier status frequency: Carrier status frequency is the chance of an individual being a carrier for a genetic condition, based on general population risks or based on ethnicity, prior to any genetic screening. If an individual tests negative as a carrier for a condition or conditions, then the chance of being a carrier is significantly decreased. There is still remaining risk called residual risk. Residual risk means the risk of being a carrier even after negative genetic testing for a condition. Residual risk data on the conditions the donor tested negative for can be requested from Cryobio. The carrier frequency provided is from the test provider. As with all genetic information, these carrier frequency numbers may change over time, and may slightly vary from lab to lab depending on the data used to curate them. Therefore, the carrier frequencies from this additional agreement are based on the numbers available from the performing laboratory on the date the donor's test results were reviewed by the lab.

Autosomal recessive spastic ataxia of Charlevoix-Saguenay (ARSACS) (*SACS* gene) carrier status frequency in different ethnicities, from SEMA4:

African	1 in 201
Ashkenazi Jewish	1 in 483
East Asian	1 in 338
Finnish	1 in 341
Caucasian	1 in 100

Latino	1 in 309
South Asian	1 in 383
Worldwide	1 in 148
French Canadian Charlevoix-Saguenay	1 in 21

Spinal muscular atrophy (*SMN1* gene) carrier status frequency in different ethnicities, from SEMA4:

African American	1 in 85
Ashkenazi Jewish	1 in 76
East Asian	1 in 53
Caucasian	1 in 48
Latino	1 in 63
South Asian	1 in 103
Sephardic Jewish	1 in 34

Recommendation: Cryobio recommends that the recipient, or egg source if different than recipient, be tested for autosomal recessive spastic ataxia of Charlevoix-Saguenay (*SACS* gene) and SMA (*SMN1* gene) carrier status and consider genetic counseling. Please contact Cryobio with any questions or to arrange genetic counseling. Genetic counseling services can also be found through the National Society of Genetic Counselors. We also strongly recommend that you discuss the donor's genetic carrier status results with your health care provider. Finally, we recommend that any future child be notified of this donor's carrier status once they are of reproductive age, as even if they do not have a recessive disease, they could be a carrier and their carrier status could help them identify risks related to their own reproductive future.

Cryobio has advised me of the following:	Please initial to show your understanding and agreement:
The donor I have chosen has positive results from genetic testing looking at carrier status for 283 genes. These results indicate that the donor is a carrier for autosomal recessive spastic ataxia of Charlevoix-Saguenay and is at an increased risk of being a silent carrier of SMA.	Initials: _____ Initials: _____
The genetic conditions tested for are inherited as recessive patterns. This means that if both the egg source and the sperm source are carriers for the same condition, there is a significantly higher chance of the resulting child having that genetic condition.	Initials: _____ Initials: _____
By the donor testing positive for autosomal recessive spastic ataxia of Charlevoix-Saguenay and being at an increased risk of being a silent carrier of SMA, the risk to a resulting child would now be higher than that of the general population.	Initials: _____ Initials: _____
When an individual tests negative for carrier status, it does not completely eliminate their chance of being a carrier for that condition, however their remaining risk is greatly reduced. This remaining risk is called residual risk, and the residual risk can vary significantly from person to person. For more detailed information regarding the sensitivity of testing and remaining risk after negative screening, please contact Cryobio.	Initials: _____ Initials: _____

As genetic testing evolves and more data becomes available, I understand that there is the possibility of updated genetic information that may be uncovered for this donor for a variety of reasons. It is my responsibility to check back with Cryobio to see if any new genetic information is available for this donor.	Initials: _____ Initials: _____
Genetic testing for me (or the egg source, if different) can also be done to better understand and further reduce the risk to offspring.	Initials: _____ Initials: _____
Genetic testing is *strongly recommended* for me (or the egg source, if different) to see if I am a carrier for autosomal recessive spastic ataxia of Charlevoix-Saguenay (*SACS* gene), and SMA (*SMN1* gene).	Initials: _____ Initials: _____
Expanded genetic carrier screening is continuing to evolve, and at the time this donor entered the program this was the screening available. This donor had genetic testing with SEMA4 in 2019. My health care provider may recommend an expanded carrier screen that includes/included more than the 283 genes screened for in this donor. It is my responsibility to share this information with my health care provider and review the risks and benefits of being screened for more (or fewer) genetic conditions.	Initials: _____ Initials: _____
The genetic testing done on the donor does *not* screen for all known genetic conditions.	Initials: _____ Initials: _____
While genetic testing can lower the likelihood for certain genetic conditions, no amount of genetic testing can guarantee that a child will be free of all genetic conditions.	Initials: _____ Initials: _____
Genetic counseling is available to me if I have additional questions regarding these test results and potential risks.	Initials: _____ Initials: _____
Both the donor's carrier status and whether the donor is acceptable for my use should be discussed with my health care provider.	Initials: _____ Initials: _____

I have read the above material and assume the risk of using donor sperm from a donor who has been found to be a carrier of genetic conditions. I am making the choice to use donor sperm from donor CB 952-B willingly and agree to release any legal claims, including negligence, that may arise from or are related to insemination or assisted reproduction using donor sperm from donor CB 952-B.

I have read and had the chance to ask questions, and I understand and agree to the terms of this Additional Agreement to use donor CB 952-B.

_____ _____ _____

Recipient Date Email

Partner, if applicable	Date	Email

William C. Baird, PhD, HCLD	10-18-2020
Cryobio	Date