

# Fetal Blood Group Genotyping for Alloimmunized Pregnancies

## A Guide for Health-Care Providers

Clinical Pathway  
on page 4



**Alloimmunized Fetal Blood Group Genotyping (Allo-FBGG) is a non-invasive blood test for pregnant individuals with select red blood cell antibodies. Allo-FBGG determines the Rh D, C, c, E and Kell (K) blood group status of a fetus using cell-free DNA from a pregnant woman/individual's plasma. This test enables targeted monitoring of pregnancies at risk of hemolytic disease of the fetus and newborn (HDFN).**

**Note:** For information on Fetal RHD screening to guide RhIG administration, please refer to the document [Fetal RHD Screening for RhD Negative Pregnancies: A Guide for Health-Care Providers](#).

### Who Is Eligible for This Test?

Alloimmunized Fetal Blood Group Genotyping is publicly funded for pregnant women/individuals living in Ontario who are alloimmunized towards one or more of the following antigens:

-  RhD (anti-D)
-  RhC (anti-C)
-  Rhc (anti-c)
-  RhE (anti-E)
-  Kell (anti-K)

*Pregnant individuals eligible for this test may be RhD negative or RhD positive.*

### Ordering Allo-FBGG

**1 Confirm Presence of Antibodies in Pregnant Woman/Individual:** Confirm presence of anti-D, anti-C, anti-c, anti-E, and/or anti-K (Kell).

**2 Order Test:** The test can be ordered as of

- **≥ 16 weeks' gestation for anti-D, C, c, E**
- **≥ 20 weeks' gestation for anti-K (Kell)**

Requisitions can be downloaded from the PSO website: [prenatalscreeningontario.ca/tools-and-resources/alloimmunized-screening-requisition](https://prenatalscreeningontario.ca/tools-and-resources/alloimmunized-screening-requisition)



**3 Sample Collection:** Blood samples can be drawn at community or hospital labs across the province.

**4 Analysis & Results:** Blood samples are sent to Sinai Health: Diagnostic Medical Genetics Laboratory in Toronto for analysis. Results are typically available within 10 business days and are sent to the ordering provider by mail or fax and posted in the Ontario Laboratory Information System (OLIS).

### How Does Allo-FBGG Testing Work?

Between 8-11 weeks' gestation

 Routine ABO/RhD/antibody screen and identification performed

 Pregnant individual is positive for anti-D, C, c, E or K (Kell)

≥16 weeks' gestation/ ≥20 weeks' gestation for Kell



 **Allo-FBGG test**



**Fetal antigen positive**



**Fetal antigen negative**

Remainder of pregnancy



**At risk of HDFN.** Requires close monitoring for the duration of the pregnancy.



**Not at risk of HDFN.** Continue with routine prenatal care.

# Fetal Blood Group Genotyping for Alloimmunized Pregnancies

## A Guide for Health-Care Providers

### How to Interpret Allo-FBGG Test Results

| Test Result                                                                               | Interpretation                                                                                                            | Action: Rh D, C, c, E                                                                                                                                                                                                                                                             | Action: Kell (K)                                                                                                                                                                                                                                                                                                                    |
|-------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  Positive | The result predicts that the fetus has the antigen.<br><b><i>The fetus/newborn is at risk for HDFN.</i></b>               | Monitor pregnancy with serial antibody titres every 4 weeks until 28 weeks' gestation, then every 2 weeks thereafter, or if titre increases two-fold.<br>If a critical titre is reached, refer to a maternal-fetal medicine (MFM) specialist or follow local clinical guidelines. | Kell (K) antibody titres may not reliably predict HDFN risks. Any positive Kell (K) result, regardless of titre, should prompt referral to a maternal-fetal medicine (MFM) specialist or be managed according to local clinical guidelines. Pregnancies affected by Kell (K) antibodies require close monitoring for signs of HDFN. |
|  Negative | The result predicts that the fetus does not have the antigen.<br><b><i>The fetus/newborn is not at risk for HDFN.</i></b> | Continue with routine prenatal care.                                                                                                                                                                                                                                              | Repeat Allo-FBGG at 28 weeks' gestation. If repeat Allo-FBGG is negative, continue with routine prenatal care.                                                                                                                                                                                                                      |

\* For an **inconclusive or no result**, treat the fetus as antigen-positive and at risk of HDFN. Antigen-positive monitoring recommendations apply. Repeating the test may be advised by Sinai Health: Diagnostic Medical Genetics Laboratory.

### Why Is Allo-FBGG Testing Important?

#### ✓ Targeted Monitoring

This test identifies pregnancies carrying an antigen-positive fetus that may be at risk of HDFN and require additional monitoring, while allowing pregnancies with an antigen-negative fetus to continue with routine prenatal care.

#### ✓ Accurate

This test has a >99% negative predictive value. Fewer than 1 in 100 fetuses are incorrectly reported as antigen-negative (after 16 weeks for Rh D, C, c, E; after 20 weeks for Kell (K)). Approximately 2% of cases may yield a false-positive RhD result, which may prompt additional monitoring as a precaution.

#### ✓ Non-Invasive

This cell-free DNA test analyzes the pregnant woman/individual's plasma to determine the Rh D, C, c, E and Kell (K) antigen status. Rh D, C, c, E status can be detected from 16 weeks' gestation, and Kell (K) from 20 weeks.

### Discussing Allo-FBGG Testing with Alloimmunized Pregnant Women/Individuals

Refer to the handout: ***Fetal Blood Group Genotyping for Alloimmunized Pregnancies: A Guide for Pregnant Women/Individuals with Red Blood Cell Antibodies*** to guide your discussion.



# Fetal Blood Group Genotyping for Alloimmunized Pregnancies

## A Guide for Health-Care Providers

### Frequently Asked Questions

**? Can this test be performed for multiple gestations?**

Yes. Allo-FBGG can be performed in pregnancies involving multiple fetuses. A positive result indicates that at least one fetus has the antigen, whereas a negative result indicates that all fetuses do not have the antigen.

**? Can this test be performed for patients with passive anti-D?**

No. This test is not intended for patients with passive anti-D (e.g., following RhIG administration). It is intended for alloimmune anti-D or when passive and alloimmune anti-D cannot be reliably distinguished. For patients with passive anti-D, Fetal *RHD* screening is recommended to determine whether additional RhIG prophylaxis is indicated.

**? Can this test be performed when there has been a vanishing twin or a fetal demise in a twin pregnancy?**

No. Allo-FBGG cannot be performed in these situations because cell-free DNA from the demised twin can lead to false-positive results.

**? Is it necessary to do partner antigen testing (phenotyping)?**

No. Partner antigen testing is not required for pregnancies with anti-D, C, c, E, or K (Kell) that are having Allo-FBGG testing. Consider paternal testing for other clinically significant alloantibodies.

**? Can samples from pregnancies with alloantibodies other than anti-D, C, c, E, or K (Kell) be tested?**

No. The Allo-FBGG test is limited to anti-D, C, c, E, and K (Kell).

**? What should be done while waiting for the results?**

HDFN can develop as early as 16 weeks' gestation. Antibody titres should be checked promptly after detecting an alloantibody in pregnancy. Serial antibody titres should be monitored every 4 weeks until 28 weeks' gestation, then every 2 weeks thereafter, or if titre increases two-fold. Routine pregnancy care can resume if Allo-FBGG results are negative for Rh D, C, c, E or after two negative Kell (K) results.

**? When should the pregnant woman/individual be referred to a maternal-fetal medicine specialist?**

Referral to a maternal-fetal medicine specialist is recommended for any positive Kell antibodies (regardless of titre) or when a critical titre (1:16 or higher) is reached for all other alloantibodies.

**? Is Allo-FBGG testing available to those without a valid OHIP card?**

Yes. The Allo-FBGG test is publicly funded for all pregnant women/individuals living in Ontario, regardless of OHIP status.

### References:

1. Fung-Kee-Fung, K., et al. (2024). Guideline No. 448: Prevention of RhD alloimmunization. *Journal of Obstetrics and Gynaecology Canada*, 46 (4), 1–10. <https://doi.org/10.1016/j.jogc.2024.102449>
2. Lieberman, L., et al. (2025). Guidance for prenatal, postnatal and neonatal immunohematology testing in Canada: Consensus recommendations from a modified Delphi process. *Journal of Obstetrics and Gynaecology Canada*, 47 (9), 1–10. <https://doi.org/10.1016/j.jogc.2025.103088>
3. Robitaille, N., et al. (2025). National consensus statements for the prevention of maternal Rhesus D alloimmunization and management of alloimmunized pregnancies: A modified Delphi process. *Journal of Obstetrics and Gynaecology Canada*. Advance online publication. <https://doi.org/10.1016/j.jogc.2025.103113>

Visit our website  
to learn more:



### Looking for more information?

Visit Prenatal Screening Ontario's website or speak with a genetic counsellor or a screening specialist on our Information Line:

 [prenatalscreeningontario.ca](https://prenatalscreeningontario.ca)

 [PSO@BORNOntario.ca](mailto:PSO@BORNOntario.ca)

 PSO Information Line:  
1-833-351-6490 or 613-737-2281

# Clinical Pathway for Alloimmunized Pregnancies

## Legend

Refer to MFM

## First Trimester ≥ 8 Weeks' Gestation

ABO/RhD blood type and antibody screen<sup>1</sup>

Antibody screen positive (RhD negative OR positive)

Refer to MFM for positive Kell antibodies or in all cases where a previous fetus/neonate was affected by severe HDFN.<sup>1</sup>

Antibody identification followed with initial titre. Repeat titre every 4 weeks until 28 weeks' gestation, then every 2 weeks until delivery or if titre increases two-fold for ALL clinically significant alloantibodies.<sup>1</sup> **Discontinue titres if Allo-FBGG result is antigen-negative.**

### Anti-K (Kell)

Refer to MFM (Titres may not be reliable predictors of HDFN risks for Kell antibodies)

Order Alloimmunized Fetal Blood Group Genotyping (Allo-FBGG) ≥ 20 weeks' gestation for anti-K (Kell)

Fetus **negative** for Kell (K) antigen

Repeat Allo FBGG for Kell (K) antigen at 28 weeks' gestation

Fetus **negative** for Kell (K) antigen

Routine prenatal care

Fetus **positive** for Kell (K) antigen or results **unknown/pending**

Anemia studies by MFM

### Anti-D, C, c, E

Order Alloimmunized Fetal Blood Group Genotyping (Allo-FBGG) ≥ 16 weeks' gestation for anti-D, C, c, E

1 Fetus **negative** for tested antigen(s)

Routine prenatal care

2 Fetus **positive** for tested antigen(s), or results **unknown/pending**

No previous fetus/neonate affected by severe HDFN

Antibody titre every 4 weeks until 28 weeks' gestation, then every 2 weeks until delivery or if the titre increases two-fold.<sup>1</sup>

Critical titre reached

Refer to MFM for initiation of anemia studies

### Other Clinically Significant Alloantibodies

No fetal blood group genotyping (Allo-FBGG) test available

Assume fetus is positive for antigen; consider paternal antigen testing (phenotyping), if paternity is certain<sup>1</sup>

Paternal antigen negative

Follow 1

Paternal antigen positive/unknown

Follow 2

## After Delivery

Send cord blood for antigen phenotype and DAT<sup>†</sup> for **all** alloimmunized pregnant women/individuals with clinically significant antibodies<sup>1,††</sup>

Corresponding antigen is **negative** and / DAT negative

Routine neonatal care

Corresponding antigen is **positive** and / DAT positive or negative

Screening for hyperbilirubinemia as per guidelines<sup>2</sup>

<sup>†</sup> Additional cord blood investigations, such as ABO, complete blood count (CBC), and bilirubin, may be warranted depending on the clinical context and as per practice guidelines.<sup>1</sup>

<sup>††</sup> If discrepant results are found between Allo-FBGG and cord blood results, use cord blood results and monitor neonate as per CPS guidelines.<sup>1</sup> Contact Sinai Health: Diagnostic Medical Genetics laboratory to report discrepancy: [FBGG.MSH@sinaihealth.ca](mailto:FBGG.MSH@sinaihealth.ca) or Tel: (416) 586-4800 ext. 5974

## References:

- Robitaille, N., et al. (2025). National consensus statements for the prevention of maternal Rhesus D alloimmunization and management of alloimmunized pregnancies: A modified Delphi process. *Journal of Obstetrics and Gynaecology Canada*. Advance online publication. <https://doi.org/10.1016/j.jogc.2025.103113>
- Ng, E., et al. (2025). Guidelines for detection and management of hyperbilirubinemia in term and late preterm newborns (≥35 weeks gestational age). *Canadian Paediatric Society*. <https://cps.ca/en/documents/position/hyperbilirubinemia-newborns>

## Disclaimer:

This clinical pathway is intended for informational use only and is not a replacement for established clinical guidelines. Medical practices may vary from the steps described here. If you are not a health-care professional, please consult a health-care provider for any questions regarding the information presented in this flowchart. If a patient's clinical presentation is not included in this flowchart, consultation with an appropriate specialist is recommended.

# Fetal Blood Group Genotyping for Alloimmunized Pregnancies

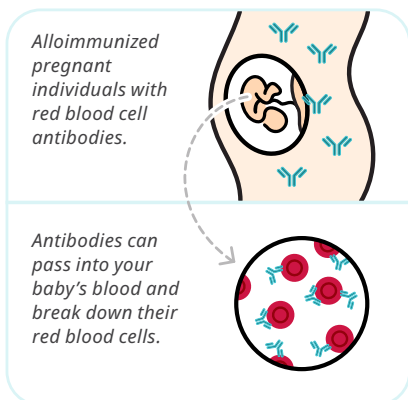
A Guide for Pregnant Women/Individuals with Red Blood Cell Antibodies



## Your Antibody Status and Your Baby's Blood Group Are Important in Pregnancy

**Your initial prenatal blood work will check for antibodies.** If red blood cell antibodies are found, it means you have been exposed to a blood group that is different from your own, most often through a prior pregnancy or a blood transfusion. A health-care provider will check to see if the antibodies are known to cause a condition called hemolytic disease of the fetus and newborn (HDFN). This can help you and a health-care provider make important decisions about your pregnancy care.

*This information is about the **Alloimmunized Fetal Blood Group Genotyping** test. It is for individuals who have **anti-D, anti-C, anti-c, anti-E, and/or anti-K (Kell)** antibodies.*



## Understanding Alloimmunization in Pregnancy

Alloimmunization happens when your body makes antibodies (proteins made by your immune system) against a different blood group. This can happen in pregnancy if your baby's blood group is different than your own or following a blood transfusion.

During pregnancy, these antibodies can pass into your baby's blood through the placenta. If your baby has a blood group that is different from yours, and you have an antibody to that blood group, your antibody can sometimes break down your baby's red blood cells. This condition is called HDFN. It can cause anemia (low red blood cells) in babies. As a result, some babies may need blood transfusions before or after they are born. After delivery, HDFN can also cause mild to severe jaundice (yellowing of the skin and eyes).

Not every pregnancy with alloimmunization will have complications, but a health-care provider will carefully watch for any signs and treat you if needed.

## Finding Out Your Baby's Blood Group During Pregnancy

**Alloimmunized Fetal Blood Group Genotyping (or Allo-FBGG)** is a blood test done in pregnancy that can check if your baby has certain markers on their red blood cells, called antigens, that your antibody can react to.

### → Benefits of Knowing Your Baby's Blood Group

Knowing your baby's blood group in pregnancy helps you and a health-care provider make important decisions about your care including:

- » **Monitoring your baby's health:** If the test shows your baby is at risk of HDFN, a health-care provider can monitor for signs and complications and refer you to a specialist if needed.
- » **Reducing the need for other tests:** If the test shows no risk of HDFN, you can avoid extra monitoring like blood work, ultrasounds, or specialist appointments.



**This test is done using a blood sample from you.** Tiny pieces of your baby's DNA can be found in your blood to determine if your baby has the antigen.



Allo-FBGG testing is **very reliable and safe** for you and your baby.

## How to Get This Test

The test can be done after **16 weeks** of pregnancy for **anti-D, C, c, and E** and after **20 weeks** for **anti-K (Kell)**.

1

### Discuss this test with a health-care provider

If it's right for you, they will give you a requisition for the test.

2

### Get your blood test

Take your requisition to a lab to have your blood drawn.

3

### Wait for your results

Results are usually available within 10 business days and are sent directly to a health-care provider.

4

### Discuss your results

A health-care provider will let you know your next steps and what pregnancy care is recommended for you.



### Who Can Get This Test?

Allo-FBGG testing is publicly funded for all pregnant women/individuals living in Ontario who have one or more of these antibodies:

- » anti-D
- » anti-C
- » anti-c
- » anti-E
- » anti-K (Kell)

## Your Results and What to Do Next

| Test Result                                                                                         | What It Means                                                                 | Next Steps                                                                                                                                            |
|-----------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
|  Antigen-Positive | Your baby has the blood group antigen, and is at risk for HDFN.               | A health-care provider will monitor your pregnancy for signs of HDFN. This might include additional blood tests, ultrasounds and seeing a specialist. |
|  Antigen-Negative | Your baby does not have the blood group antigen, and is not at risk for HDFN. | No change to your prenatal care is needed. Continue your regular appointments with a health-care provider.                                            |

\* If the test was unable to give a result (**inconclusive or no result**), a health-care provider may ask you to repeat the test or treat your pregnancy as if your baby has the antigen.

### → At Delivery

When your baby is born, your baby's blood group will be confirmed using a blood sample from the umbilical cord to decide if your baby needs any special monitoring after delivery. The cord blood results may be shared with the testing lab for ongoing quality assurance.

### → What If I Don't Have This Test?

If you are alloimmunized and do not have this test, a health-care provider will treat your pregnancy as if your baby has the antigen and monitor your pregnancy for signs of HDFN.

### Looking for more information?

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 [prenatalscreeningontario.ca](https://prenatalscreeningontario.ca)  [PSO@BORNOntario.ca](mailto:PSO@BORNOntario.ca)

 PSO Information Line: 1-833-351-6490 or 613-737-2281



Learn about your prenatal screening options at [myscreeningpathway.ca](https://myscreeningpathway.ca)

