



Serology Case: **Anti-G vs Anti-D plus Anti-C**

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St. Michael's

Inspired Care. Inspiring Science.

Disclosure

- No relevant conflicts of interest

Learning Objectives

1. Serological investigation of a positive prenatal screen
2. Importance of correct interpretation of antibody titration
3. Vital importance of correct antibody identification for pregnant female

And I quote...

“Learn from yesterday,
live for today, hope
for tomorrow. The
important thing is not
to stop questioning.”



Albert Einstein

Case Study

- 31 year old pregnant female (G5P1)
- Request for prenatal group and screen
- Pregnant for the 5th time (7 weeks gestation), referring lab reported:
 - Anti-D titre 1:8
 - Anti-C titre 1:32

Initial Testing

-A	-B	-D	Cont	A1C	BC	ABO/Rh
0	0	0	0	4	4	O Neg

Screening Cells	MTS Gel
R1R1	2+
R2R2	2+

Initial Testing

- Initial Panel showed pattern of anti-D + anti-C
- Patient antigen typing:
 - D neg, C neg, E neg, c pos, e pos

Titration Result

	Reciprocal of plasma dilution										
	1	2	4	8	16	32	64	128	256	512	1024
D+C- (R2R2)	3+	2+	2+	1+	0	0	0	0	0	0	0
D-C+ (r'r)	3+	3+	2+	2+	1+	1+	0	0	0	0	0

Anti-D titre 8

Anti-C titre 32

Unusual to have anti-D titre weaker than anti-C titre

Pregnancy History

- 1st pregnancy: ectopic in 2004, Antibody Screen Test (AST) negative, patient received RhIG
- 2nd pregnancy: term delivered in 2005, AST negative, patient received RHIG at 28 weeks and post delivery

Pregnancy History

- 3rd pregnancy: therapeutic termination at 7 weeks gestation in July 2005, **AST negative**, patient **received RhIG** post procedure
- 4th pregnancy: spontaneous miscarriage in 2008 during first trimester, **AST negative**, patient **received RHIG**

Pregnancy History

- Currently pregnant for the 5th time
-
- All 5 pregnancies with the same partner
- The Rh phenotype of the father of the fetus:
 - D+C+E-c+e+

Transfusion History

- In 2008 patient received 4 units of **Rh Negative** Red Blood Cells (RBC) for anemia due to hemorrhagic ovarian cyst

Is this truly anti-D?

- Patient received RhIG at appropriate intervals during each previous pregnancy
- Patient transfused only with Rh Negative RBC
- No recent RhIG

Is this truly anti-D?

- Patient transfusion and pregnancy history with unusual titre results suggested **anti-G** rather than anti-D plus anti-C

What is G?

- G antigen belongs to Rh blood group system
- G present on nearly all D and/or C positive rbc
- G is absent on nearly all D and C negative rbc

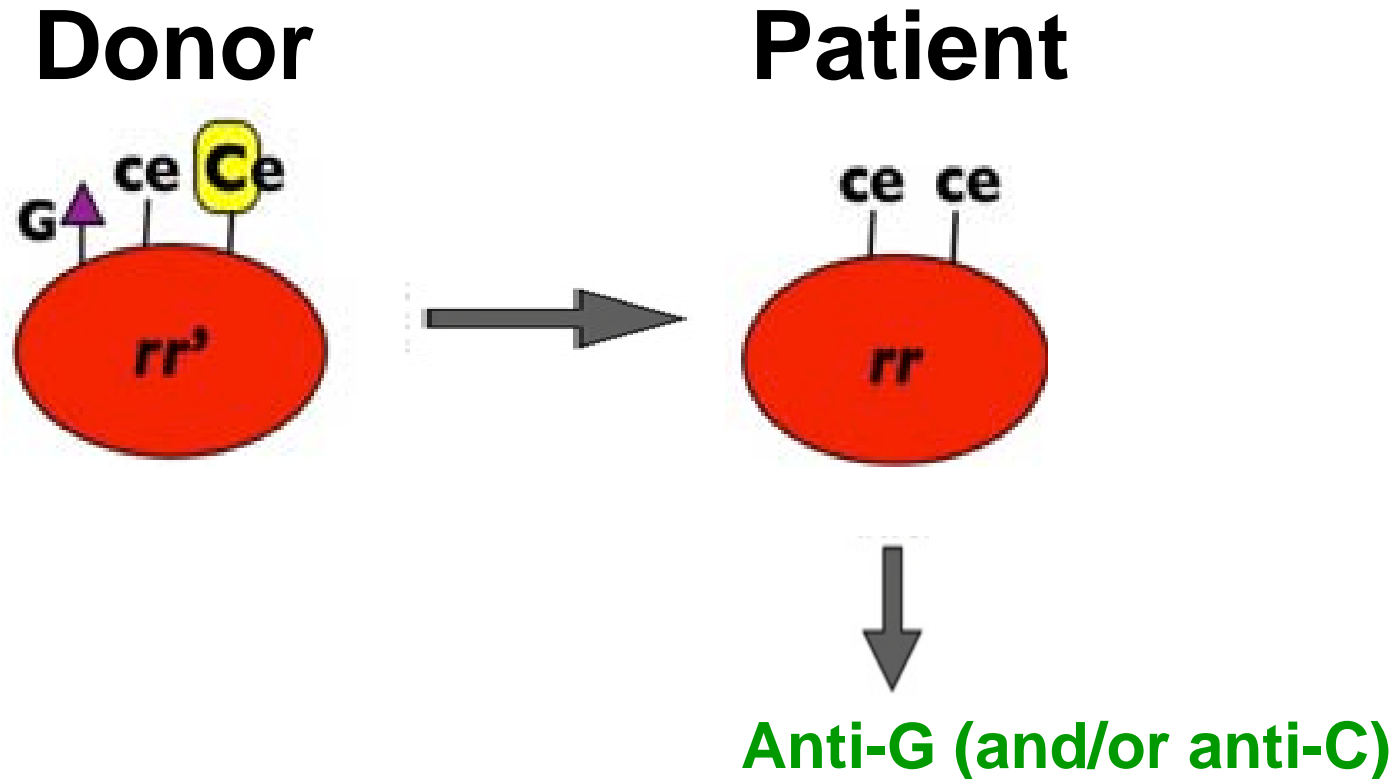
What is G?

Phenotypes with G present	Phenotypes with G absent
D+C+ (R1, RZ)	D-C- (r, r'')
D+C- (R2, R ₀)	
D-C+ (r', r ^y)	

What is anti-G?

- Anti-G looks like combination of anti-D & anti-C
- Anti-G can be stimulated by pregnancy or transfusion
- Anti-G can cause:
 - None to severe transfusion reaction
 - None to severe HDN (usually mild)

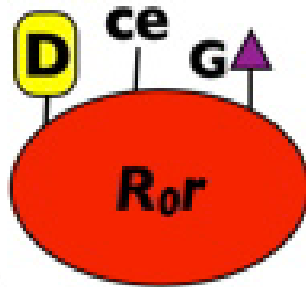
What is anti-G?



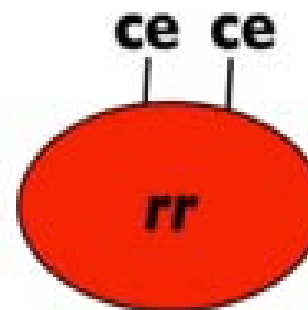
<http://www.bbguy.org/education/gandanti-G.asp>

What is anti-G?

Donor



Patient



Anti-G (and/or anti-D)

<http://www.bbguy.org/education/gandanti-G.asp>

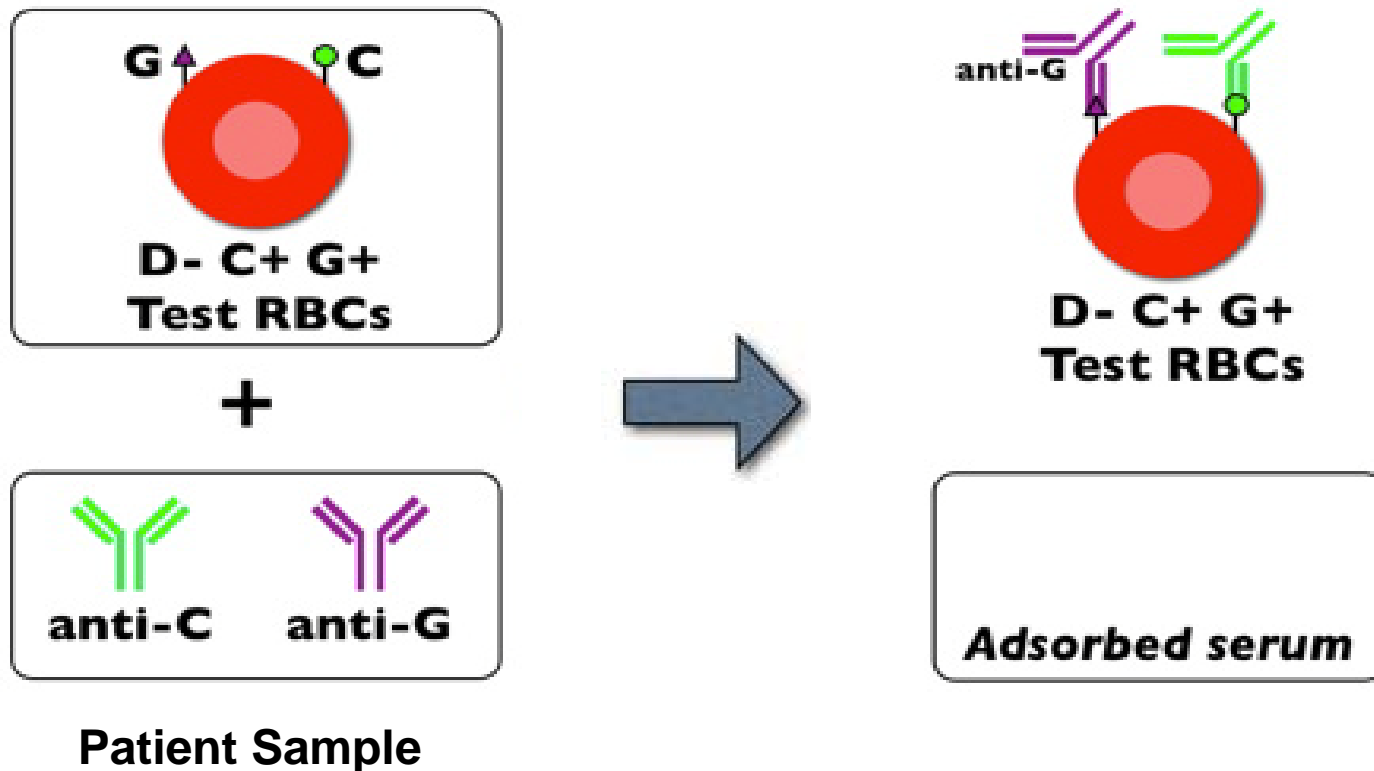
Confirmation of anti-G

- Specimen sent to reference lab for confirmation
- Results confirmed anti-G and possible anti-C
- Anti-D was NOT identified

Confirmation of anti-G

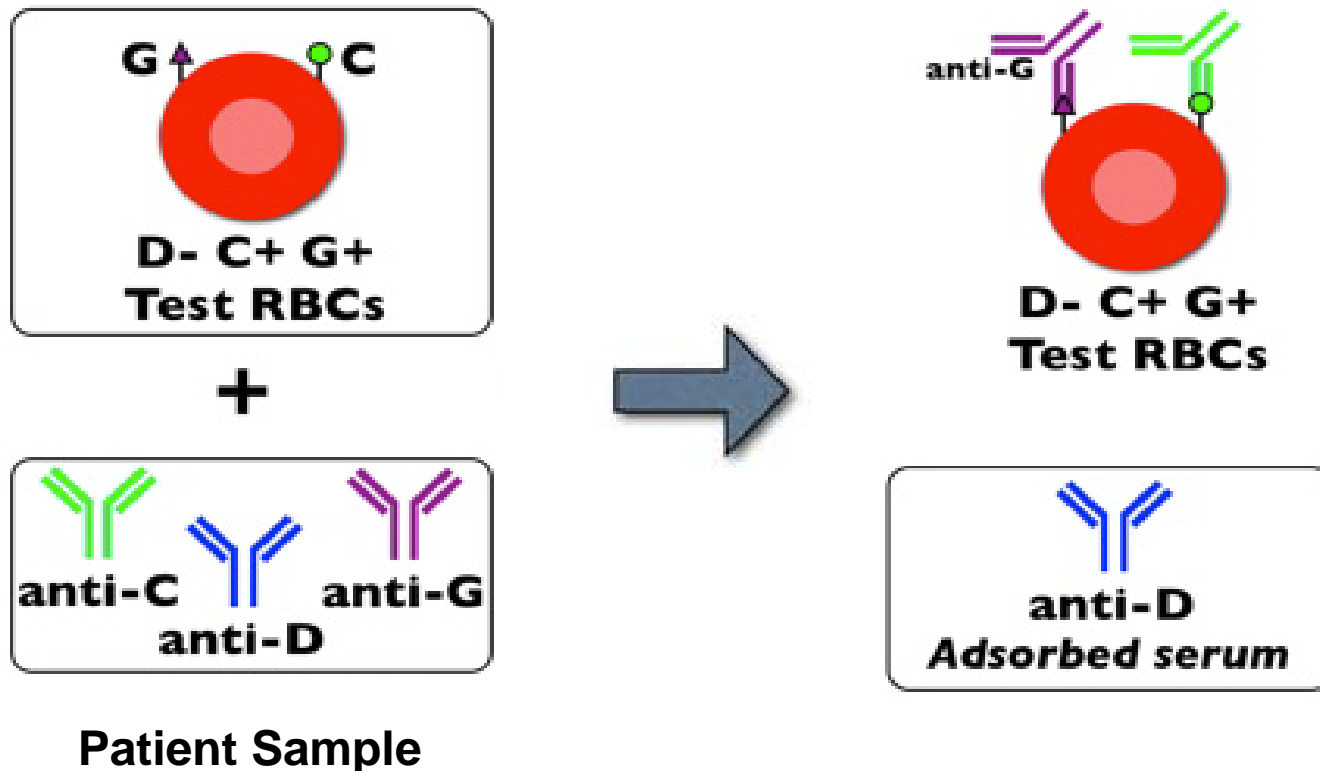
- Reference Lab results:
 - Patient plasma reacted with two cells that are D-C-G+
 - After alloadsorption 3x with r'r red cells, the alloadsorbed plasma was non-reactive, suggesting there is no anti-D

Confirmation of no presence of anti-D



<http://www.bbguy.org/education/gandanti-G.asp>

Confirmation of presence of anti-D



<http://www.bbguy.org/education/gandanti-G.asp>

Case Study Continued

- Anti-D was not identified, therefore the patient remains a candidate for RhIG
- RhIG was issued at 29 weeks
- Titre was monitored until 29 weeks when it reached level of 64, at which point fetal monitoring was recommended

Case Study Continued

- Patient delivered a full term male baby with Hgb of 216 g/L, bilirubin level of 98 $\mu\text{mol/L}$ (normal range $<130 \mu\text{mol/L}$)
- Total bilirubin peaked on day 2, level 161 $\mu\text{mol/L}$

Cord Blood Test Results

Test	Result	Comments
ABO & Rh	O Positive	
DAT	4+	
Eluate	Reactive with: D+C- cells, D-,C+ cells,	Anti-D (presumably due to RhIG) and anti-G eluted from cord cells.
Baby's Rh phenotype	D+C-E-c+e+	Probable Genotype: R ₀ r
Mother's Rh phenotype	D-C-E-c+e+	Genotype: rr
Father's Rh phenotype	D+C+E-c+e+	Probable Genotype: R ₀ r'

Case Study Continued

- In spite of 4+ DAT, baby's hemoglobin remained normal & baby did clinically well
 - HDFN caused by anti-G is usually less severe than with anti-D
- Infant was discharged on day 4

Case Study Continued

- Patient received post delivery RhIG
- Patient given Antibody Card
 - Blood Group, Antibodies Identified
 - Our hospital's Transfusion Medicine contact info
- Letter sent to Primary Care Physician
 - Blood Group, Antibodies Identified

Case Study Continued

- Anti-G most likely developed secondary to transfusion of Rh Negative G+ (D-C+) units

Discussion

- Rh negative females of childbearing age should ideally receive Rh negative, C negative RBC to prevent allo immunization to G antigen
- Every pregnant female with a pattern of anti-D and anti-C should be tested for the presence of anti-G

Discussion

- Suspect possible anti-G, if titre with D+C- cells \leq titre with D-C+ cells, patient never been transfused with Rh positive blood product and has always received RhIG
- Pregnant patient with anti-G remains a candidate for RhIG

Final Remarks

- **For transfusion:**

- Differentiation of anti-D, -C and -G is not necessary, just transfuse D-C- RBC

- **In pregnancy:**

- The presence of anti-G and/or anti-C versus the presence of anti-D is vital for decision to administer RhIG and to reduce the risk of HDFN

And I quote...

“The only source of
knowledge is
experience”



Albert Einstein

Thank you

