

### The RH factor

- RH Incompatibility Disorder
- Etiology: RH negative mother becomes sensitized to RH positive blood during pregnancy with a RH positive fetus. This is a big issue for mom and fetus, though we tend to treat it well these days.
- Incidence: 15% of all women are RH negative.
- Diagnosis
  - Lab test: Indirect Coombs: Test of maternal blood for RH antibody titre against RH positive blood cells.
  - Lab Test: Direct Coombs: Test of newborn blood for RH antibodies coating newborn's RBCs.
- Management
  - Goal: Prevent mother from coming in contact with fetal RH positive RBCs in pregnancy/post delivery.
  - Monitor maternal blood during pregnancy/post delivery
  - Goal is to have no fetal harm come due to this dissonance between blood types...want to keep mom from coming into contact with the fetal RBCs
- Repeat Indirect Coombs blood test at 28 wks.
- Give Rhogam at 28 wks prophylactically.
- Give Rhogam within 72 hrs after birth.

### Some Rhogam Scenarios

If a woman is having her first baby and she's Rh-, and baby is Rh+...she is not going to get Rhogam in pregnancy. No reason to. What if she had a ThAb? Absolutely, she would get Rhogam...it is the second pregnancy where this comes into play. Most of the time a woman was Rh- and has a TAB or SAB, she'll get Rhogam prophylactically.

A mother is Rh-, she is having her second baby. Her first one was Rh- also. Is there any threat to the first pregnancy? NONE! Second baby is Rh +...is she going to get Rhogam? Decision made at 28 weeks....but theoretically she should be OK b/c sensitization has not been triggered.

We have a mom, she is having second baby. baby is Rh+, mom is Rh-...she says this is her last baby. Does she need Rhogam? What if she gets tubes tied? She'll still get Rhogam because can't predict what will happen in the future. What if she goes to donate blood and she's Rh-? Let's say that unit of Rh- blood is transfused into a woman who has not yet had a baby...now that primagravida has a Rh problem b/c that blood is sensitized. EVERYBODY gets Rhogam after an Rh+ baby if they are Rh-.

Mom is Rh- at first pregnancy, she has twins and they are both Rh+, but she loses one of them early in the pregnancy...does she become sensitized and is there a risk to the surviving twin? Dr. HS says she'd probably get Rhogam.

### RH disease (erythroblastosis)

- Most people have RH + blood, meaning they have an inherited protein found on their RBCs.
- About 15% of White population and 7% of the African American population lack this factor, and are considered RH-
- If a RH – Mother and a RH + father conceive a child, the fetus may inherit the RH+ blood type of the father...usually the baby's blood turns out to be like mom's...but the RH part is the wild card.
- During pregnancy, labor, or expulsion of the placenta, fetal RBCs enter the maternal circulation.
- These RBCs are recognized as foreign, and the mother tries to fight off these by developing antibodies.
- If mom has had Rhogam, then body doesn't make the antibodies, because it thinks it already has them.
- In each subsequent pregnancy the antibodies cross the placenta and attack the fetal RBCs.

### Rhogam

- Rhogam is synthesized...the body reads it as "I've already done the work to make the antibodies, so I don't have to do it."
- RH Immune Globulin from sensitized person.
- Action: suppresses antibody formation in RH- mother with RH+ infant.
- Dosage: 1 vial (300ug) IM or microdose of 50ug IM.
- Precautions: must be given **within 72 hours after delivery** to prevent antibody formation by immune system.

- Other indications: miscarriage, abortion, abdominal trauma during pregnancy, chorionic villi sampling, ectopic pregnancy, amniocentesis.

### **Mom makes antibodies**

- Mother develops antibodies against the RH + fetal RBCs
- Mother now has RH + antibody titer
- The RH+ antibodies cross the placenta
- In subsequent pregnancies these antibodies will lyse any Fetal RH + RBCs. If next baby is Rh- there is no issue here. The issue is if the baby is Rh+.

### **What if it goes untreated?**

- Untreated leads to fetal anemia, ↑immature fetal RBCs, fetal jaundice, hepatosplenomegaly, cardiac decompensation, death if severe

### **Management goals**

- Prevent mother from producing RH+ antibodies
- Maintain RH+ fetal well being throughout pregnancy
- Evaluated by blood type, RH factor and Coombs testing
- Conduct Coombs Testing
  - Lab tests that reveal antigen-antibody reaction. Detects antibodies in blood
  - Direct coombs: detects the presence of cell bound antibodies that may damage RBCs. Venous blood or blood from umbilicus
  - Indirect Coombs reveals the presence of RH antibodies in maternal blood

### **If RH negative Mother is Sensitized:**

- Pathologic jaundice occurs in fetus
- Management includes:
  - Amniocentesis tests during pregnancy to determine amt. of fetal bilirubin in fluid (delta OD level).
  - Give fetal blood transfusions (PUB) with O negative blood prn during pregnancy.
  - At birth, send vial of fetal cord blood to lab
  - Direct Coombs is a test to determine level of RH antibodies in fetal blood...it looks for the presence of cell-bound antibodies that cause damage to the RBCs. We use venous or umbilicus blood in the fetus. (Indirect: looks at mom's blood)
  - Ratio 1:64, blood transfusions are done.
  - Phototherapy treatments
- Treatment
  - Rhogam given routinely at 28 weeks GA and within 72 hours of delivery
  - Rhogam given other times if possible exposure to fetal blood: trauma, miscarriage, amniocentesis, abortion,
  - Goal is to prevent mother from developing antibodies

### **If RH negative Mother is Sensitized**

- Management includes: Amniocentesis tests during pregnancy to determine amt. of fetal bilirubin in fluid (delta OD level).
- Give fetal blood transfusions (PUB) with O negative blood prn during pregnancy. Use US to get to the fetal abdomen and give the blood cells through there...the blood gets in to the right place! Think of peritoneal dialysis.
- At birth, we send vial of fetal cord blood to lab
- Direct Coombs test to determine level of RH antibodies in fetal blood Ratio 1:64, blood transfusions are done. Phototherapy treatments
- Once a mom is sensitized, every Rh+ pregnancy is vulnerable. They will give the Rhogam to try to minimize the effects.

### **Untreated RH Sensitization in Pregnancy**

- Pathologic jaundice in fetus
  - RH positive fetus develops:
    - Anemia

- Produces immature RBCs (liver)
- Develops hepatosplenomegaly
- Cardiac decompensations and cardiomegaly
- Ascites
- Death
- Erthroblastosis fetalis hydrops fetalis

### What is Rhogam?

- Immune Globulin or antibodies to RH+ blood
- Given to prevent development of maternal antibodies
- A 1:1000 dilution of Immune globulin is cross matched to mother's blood to insure compatibility
- Blood product precautions
- Indications for dosing of Rhogam
- 50 ug: after CVS, ectopic pregnancy, miscarriage or abortion < 13 weeks
- 300 ug: miscarriage/abortion>13 weeks, amniocentesis, abruption, trauma, bleeding, at 28 wks, within 72 hr of deliv
- >300 ug after large placenta hemorrhage or mismatched blood transfusion

### ABO Incompatibility

- Etiology: Mother is O blood type, infant is A or B blood type.
  - May occur with first or any infant as mother with O blood type naturally has anti-A and anti-B antibodies naturally in the blood.
  - Antibodies are larger, more difficult to cross the placental membrane.
- Management:
  - Direct Coombs test on fetal cord blood
  - Phototherapy if > 4 mg bilirubin in infant blood at birth. Most babies under the lights are there b/c of the ABO compatibility issues.
- ABO incompatibilities are more common than RH incompatibilities
- If a baby is born and within 24 hours is jaundiced...this is called pathological jaundice. This is d/t ABO compatibility. Physiologic jaundice is "normal" and this happens around day 2-3 b/c liver isn't working at full steam yet (peak bili around Day 4...the bad number for bili is > 18....this is when the nurses start to freak out. So if you have a baby at 16 on Day 4, you need mom to feed that bay to flush it out...you can also place baby in sunny window...if getting high then it needs to be under the lights. Home phototherapy is preferred...it's a little glow-y blue pad. Remember to keep baby under lights to the point that bili is lower than you want...b/c when you take them out it rebounds a bit. Other nursing interventions with light...cover the eyes, monitor temperature, can take baby out for half an hour to let mom breastfeed. Most babies are under lights for 3 days or so.
- **KEY MESSAGE = IF JAUNDICED IN FIRST 24 HOURS THIS IS PATHOLOGICAL!**
- Third type of jaundice is breastmilk jaundice...around day 10
  - If really bad, pull them off breast every other day
  - For the most part, it just goes away on its own

### ABO incompatibilities

- More common than Rh incompatibilities
- 4 major blood groups are A,B,AB, and O
- Type A has A antigens and has antibodies to Type B
- Type B has B antigens and has antibodies to Type A
- Type AB has A+B antigens and has NO antibodies
- Type O has no antigens and has antibodies to both A and B
- If mother has different blood type antibodies can cross the placental barrier into fetal circulation

### Results of ABO incompatibilities

- Usually milder fetal effect
- Weakly positive Direct Coombs (not as definitive a dx as with Rh issues)
- Common cause of jaundice in neonate
- Treatment is usually phototherapy

- Exchange transfusions rarely required
- Rarely causes neonatal anemia

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