INTRO TO ALLOIMMUNIZATION IN PREGNANCY

FLAME LECTURE: 108A

NEPOMUCENO / BURNS 3.2.20

OBJECTIVES

- Describe the pathophysiology and diagnosis of alloimmunization
- Discuss the use of immunoglobulin prophylaxis during pregnancy for the prevention of alloimmunization
- Discuss the management of a patient with Rh-D sensitization in pregnancy
- Prerequisites:
  - NONE

DEFINITIONS

- Alloimmunization: the development of maternal antibodies against the fetal antigens on the RBC membranes
  - These antibodies can attack fetal red blood cells and RBC progenitors → anemia, heart failure, hydrops, or hyperbilirubinemia
- These antigens (sugar and protein) coating the RBC surface are also associated with immune attack in other disorders, including:
  - Blood transfusion hemolytic reactions
  - Organ/tissue transplantation
  - Autoimmune hemolytic anemia
  - Hemolytic disease of the fetus and newborn (HDFN)

DEFINITIONS

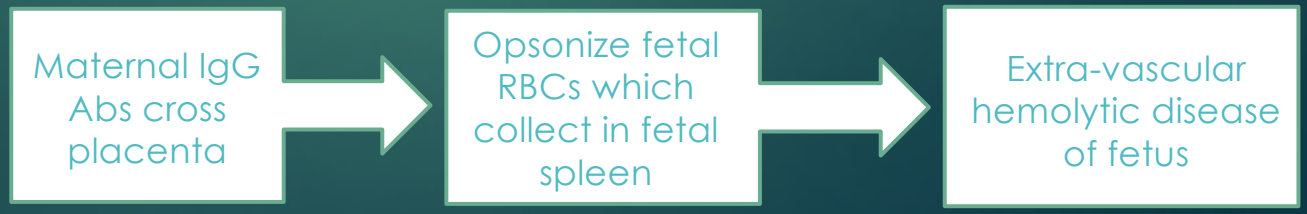
- The *International Society for Blood Transfusion* recognizes 35 blood group systems with 342 antigens
  - The most common antigen implicated in alloimmunization is the D-antigen in the Rh blood group system which this talk will focus on
  - Other blood group antigens that can lead to fetal anemia include:
    - Other Rh antigens: Rh(c), Rh(C), Rh(e), Rh(E)
    - ABO antigens: A, B
      - Less severe than Rh incompatibility in that fetal RBCs express less of the ABO blood group antigens compared with adult levels
      - Further, the ABO antigens are expressed by a variety of other fetal (and adult) tissues thus reducing the chances of anti-A and anti-B binding to fetal RBC antigens
    - Kell (k, K), Kidd (Jka, Jkb), and Duffy antigens (Fya)
    - MNS and s antigens

ETIOLOGY

- A Rh- mother does not innately have Rh(D) Abs flowing through her blood. If she became "Rh(D)-sensitized", she created these Abs after exposure to Rh(D) antigen from someone else
  - Following a blood transfusion with Rh+ blood
  - Intravenous drug use or needle stick
  - Maternal exposure to fetal Rh+ blood (i.e. father of the baby is RH+)
    - Miscarriage
    - Ectopic pregnancy
    - Antenatal bleeding / Abdominal Trauma
    - Delivery
    - Procedures (CVS, amniocentesis, PUBS, D&C)

PATHOPHYSIOLOGY REMINDER

- Once a Rh- mother is alloimmunized, the following scenarios are possible during pregnancy:
  - FOB is Rh- → child must be Rh- → no concern for fetal anemia because mother and fetus are both Rh-
  - FOB is Rh+ → child can be Rh- → no concern for fetal anemia
  - FOB is Rh+ → child can be Rh+ → risk of fetal anemia



EPIDEMIOLOGY

- Outside of the Basque population, a Rh- woman has an 85+% chance that her partner is Rh+, but of Rh+ males, 60% are heterozygous
  - 17% of susceptible Rh- women will become alloimmunized during a pregnancy spontaneously (if FOB is Rh+) without Rh(D) immune globulin (Rhogam)
  - Approximately 0.1-0.2% will become alloimmunized even with routine antenatal administration of Rhogam

Rh- Prevalence by Race	
Basque	30-35%
Caucasian	15%
African American	8%
African	4-6%
Indian	5%
Native American	1-2%
Japanese	0.5%
Chinese	0.3%

PATHOPHYSIOLOGY

- Of mother's who are alloimmunized, about 17% of fetuses/newborns will experience symptoms on the spectrum of HDFN (hemolytic disease of the fetus and newborn)
  - Mild/moderate hemolytic anemia with hyperbilirubinemia or jaundice
  - Severe hemolytic anemia with extramedullary hematopoiesis with reticuloendothelial clearance of fetal erythrocytes → hepatosplenomegaly, decreased liver function → hypoproteinemia, ascites, anasarca
    - With accompanying high-output heart failure and pericardial effusion this condition is often referred to as hydrops fetalis

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