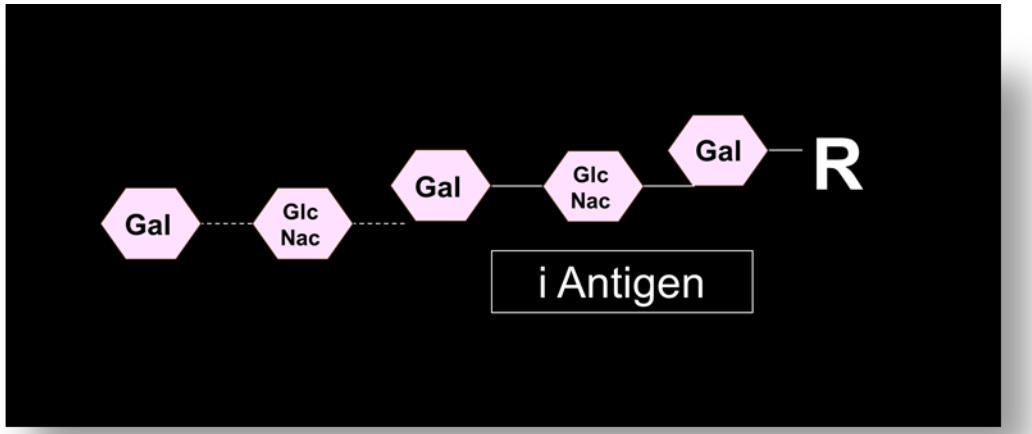
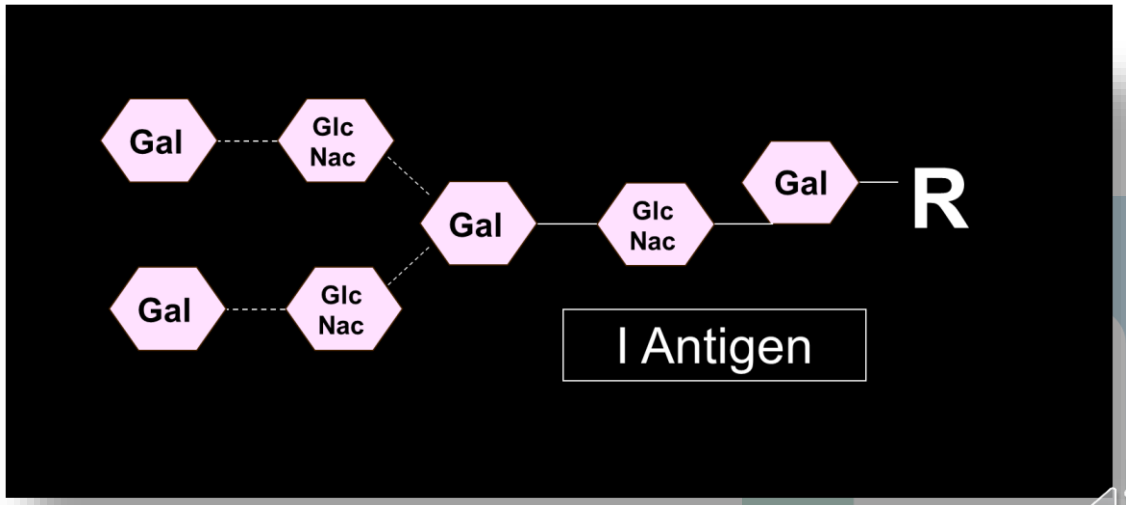
I Blood Group System

Andrea Nadas, MBA, MLS (ASCP)^{CM}

I and i Antigens

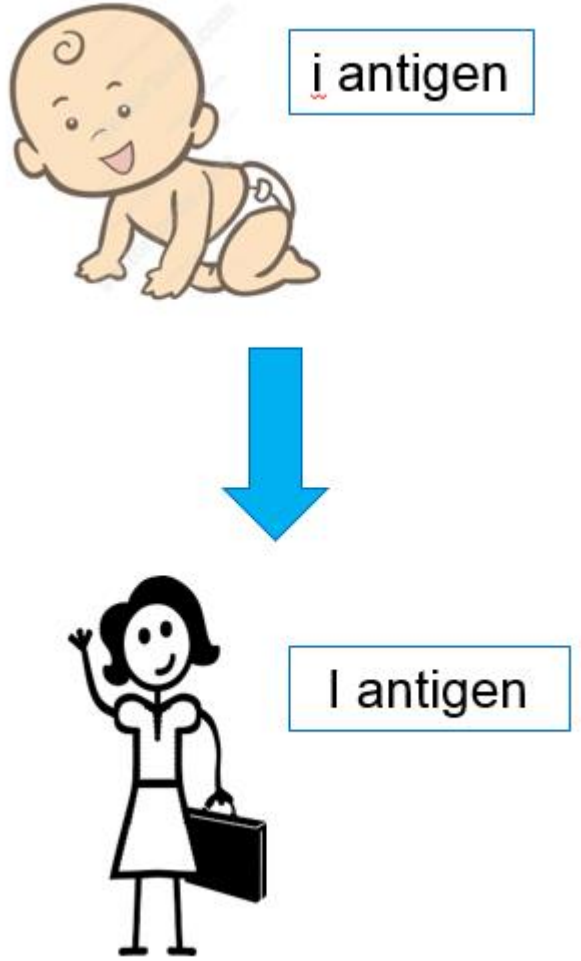
- Not antithetical
- Same precursor structure as ABO and Lewis
- i antigen:
  - Straight
  - In Ii Collection
- I antigen:
  - Branched
  - In I Blood Group System





I Antigen Development

- Infants rich in i antigen
- 18-24 months i is converted to I
- Adults rich in I antigen
- Rare adult i phenotype exists where i is never converted to I



I Antigen Sources

Cells:

- RBCs
- Leukocytes
- Platelets

Fluids:

- Saliva
- Human Milk
- Amniotic fluid
- Urine
- Ovarian Cyst fluid

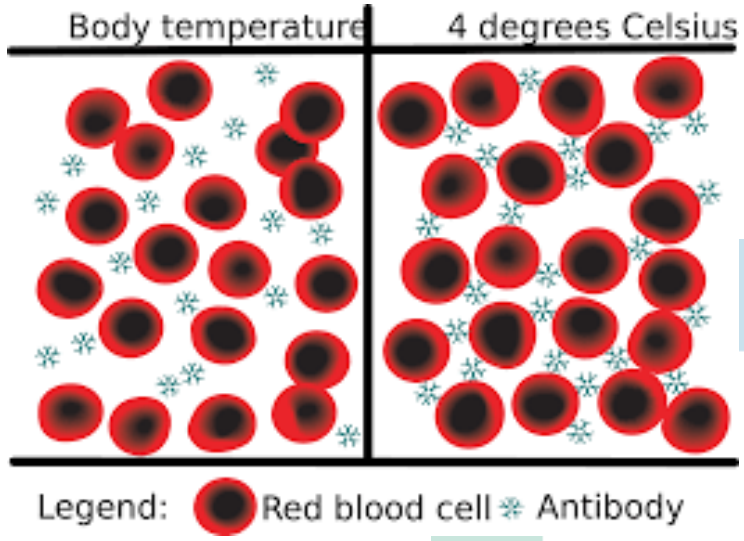
Autoanti-I

- Common benign cold autoantibody – found in virtually ALL sera
- Strong reactivity with adult RBCs
- Weak or no reactivity with cord RBCs
- Interferes with Blood Bank testing

Characteristic	I Activity
Reactivity with enzyme treated RBCs	Increased
Immunoglobulin Class	IgM
Temperature of reactivity	4°C and Room Temp
Type of antibody	Naturally Occurring
Binds Complement?	Yes
Causes HTR?	No
Causes HDFN?	No

Pathogenic Autoanti-I

- Cold Agglutinin Disease
- Strong IgM, high titers, reacts up to 30°C
- Binds in peripheral circulation
- Causes acrocyanosis or hemolytic anemia
- Often reacts to adult and cord RBCs equally well
- Some develop autoanti-I in response to *M. pneumonia* infection



Alloanti-I and anti-i

- Alloanti-I
  - Exists in most people with adult i phenotype
  - IgM
- Anti-i
  - Never been described
  - Autoanti-i very rare
    - Not common in healthy individuals
    - Potent example associated with infectious mononucleosis

Antibodies to Compound Antigens

- Include: Anti-IA, -IB, -IAB, -IH, -IP1, -IHLe^{b}, -iHLe^{b}
- Not mixtures of separate antibodies
- Both antigens must be present for reaction

Anti-IH

- Common compound antibody
- Usually in A1 individuals
- Agglutinates all O RBCs
- Compatible with A donor units

Amount of H substance on RBCs:
$O > A_2 > B > A_2B > A_1 > A_1B$

AB Patient with anti-IH:

Blood Grouping at room temperature (tube method):

Anti-A	Anti-B	Anti-AB	Anti-D	A cell	B cell	O cell
4+	4+	4+	4+	w+	2+	3+

Screen results (tube method):

	Immediate spin	37°C	AHG
Cell panel 1	3+	w+	w+
Cell panel 2	3+	w+	w+
Cell panel 3	3+	w+	w+

AHG: AntiHuman Globulin

Patient serum with different RBC phenotypes:

RBC phenotype	OI_{adult}	$Oh\ I_{adult}$	Oi_{cord}	$A_1\ I_{adult}$	$A_2\ I_{adult}$
Reaction	3+	0	0	w+	3 +

RBC: Red blood cell

Disease Associations

- Anti-I = Cold Agglutinin Syndrome and *M. pneumoniae*
- Anti-i = Infectious Mononucleosis
- Increased i antigen associated with shortened marrow maturation:
  - Acute leukemia
  - Hypoplastic anemia
  - Sickle Cell anemia
  - Thalassemia

THE FUTURE OF HEALTHCARE
SINCE 1921