

Passive Transfer of Immunity



Colostrum

- Source of IgG
- Other biologically active substances
 - Other proteins
 - Immune modulators
 - Pro and anti-inflammatory substances
 - Inflammatory cells
 - Neutrophils, plasma cells
 - Trophic substances
- Role
 - Establish an immune barrier GI
 - Targeting potential pathogens
 - Before invasion
 - Insuring GI development



Colostrum Protective Factors Tailored for the Neonate

- Defense agents in colostrum
 - Enhanced survival in the gastrointestinal tract
 - Protect without provoking inflammation
 - Inhibit inflammation
- Targeting of pathogens
 - Without collateral damage

Colostrum Protective Factors Tailored for the Neonate

- Agents in colostrum
 - Alter the physiologic state of the gastrointestinal state
 - Transform from fetal physiology
 - To physiology appropriate to extrauterine life
- Growth factors in colostrum
 - Favor proliferation of commensal enteric bacteria
 - Inhibit pathogens
 - Trophic factors
 - Epithelial growth and development

Colostrum Transfer of Protective Factors

- GI is the most likely portal for pathogens
 - Preventing luminal establishment of pathogens
 - Prevent proliferation of pathogens
 - Prevent invasion of pathogens
 - Protecting the neonate from sepsis



Antimicrobial Factors in Colostrum

- Proteins
 - Lactoferrin - bacteriostasis by Fe chelation
 - Lactoferricin - causing bacterial killing
 - Lysozymes - bacteriolysis
- MUCI - inhibits the binding of fimbriated *E coli*
- Lactadherdrin - binds viruses
- Oligosaccharides and glycoconjugates
 - Receptor analogues
 - Enteric pathogens and toxins
- Monoglycerides
- Fatty acids
 - Disrupt envelope viruses
 - Inactivate certain bacteria
 - Defend against *Giardia*

Antimicrobial Factors in Colostrum

- PAF-degrading enzyme
 - PAF is an important proinflammatory mediator
 - High levels in neonate
 - Protects mucosal cells from damage
- Erythropoietin
 - Protects against epithelium apoptosis
 - Trophic substance
- Epidermal Growth Factor (EGF)
 - Role in mucosal barrier function
 - Down-regulates apoptosis

Passive Transfer

- Why measure IgG levels?
 - Only measurement available
 - Surrogate for of the establishment of this immune barrier
 - Surrogate for transfer of immune competence
 - Quantity vs. quality

Failure of Passive Transfer Definition

- Failure to absorb adequate colostrum antibodies
- Complete if IgG < 400 mg/dl
- Partial if IgG 400 - 800 mg/dl
- Normal transfer > 800 mg/dl
- Normal foals often have IgG > 1000 - 2000 mg/dl

Failure to Absorb IgG

- Premature lactation
 - Dripping milk before parturition
 - Poor colostrum quality
- Delayed lactation
- Failure of foal to ingest adequate amounts
 - Musculoskeletal disease
 - Weakness
 - Abnormal behavior
- Other factors
 - Older mares
 - Foals born early in spring (Jan-March)
 - Breed differences
 - Arabians - highest colostrum IgG levels (6.1 mg/dl)
 - Standardbreds - lowest colostrum IgG levels (4 gm/dl)

Failure of Passive Transfer Septic Foals

- Catabolize all proteins
 - IgG levels drop rapidly
 - Some used specifically
 - Most is nonspecifically catabolized
- Replaced by plasma transfusions
- Also provide other important proteins

Failure of Passive Transfer Prevalence of Infection

- If the risk is very low
 - High false positive rate
 - Foals with FPT will remain healthy
- If the risk of infection is high
 - High false negative rate
 - Foals adequate IgG develop infections
- Has led to current recommendation

Failure of Passive Transfer Prevention

- Colostral quality
 - Physical characteristics
 - Thick ,sticky, yellow
 - Colostrometer
 - Specific gravity >1.060
 - Brix > 23%
 - Excellent quality >1.080
 - Brix > 30%
 - Lack of correlation with results

Failure of Passive Transfer Diagnostic Tests

- DVM Rapid Test™
- Snap® Test (ELISA)
- Foal Chek® (Latex Agglutination Test)
- ZnSO4 Turbidity Test
- Glutaraldehyde Coagulation Test
- SRID (Single Radial Immunodiffusion) Test

DVM Rapid Test™

- Anti-horse antibodies
 - Agglutination
 - Turbidimetry
- Plasma, colostrum
- Equine, camelid
- Technique currently used at NBC



Failure of Passive Transfer Snap[®] Test

- ELISA
- Rapid test
- Run on whole blood/plasma
- <400, 400-800 or >800 mg/dl
- Accurate, rapid test

Failure of Passive Transfer ZnSO₄ Turbidity Test

- Rapid test
- Run on serum
- Problems
 - Reagents lack stability
 - Hemolysis cause false positive results
 - Difficult to quantitate

Failure of Passive Transfer Glutaraldehyde Coagulation Test

- Rapid (1 hr) test
- Run on serum
- Problems
 - False positives with hemolysis
 - Difficult to quantitate

Failure of Passive Transfer SRID Test

- Single radial immunodiffusion
- Requires 24 hour test time
- Traditional "gold standard"
- Accuracy has been questioned

Failure of Passive Transfer Treatment - Oral Therapy

- Window for oral colostrum absorbed
 - Considered "closed" after 18 hours
 - IgG may rise after this time
- Advantage of colostrum
 - Provides local immunity
 - Effective laxative
 - Contributes to health of epithelium

Failure of Passive Transfer Treatment - Oral Therapy

- Frozen equine colostrum
 - No more than 18 months old
 - Properly stored and thawed
 - 0.5 liter of >1.060
- Colostrum substitutes (lyophilized IgG)
- Bovine colostrum
 - > 4 liters
 - IgG will drop more rapidly
 - May not be as effective

**Failure of Passive Transfer
Treatment - Intravenous Therapy**

- Fresh Plasma (random donor)
- Frozen Hyperimmune Plasma
- IgG Concentrates

**Failure of Passive Transfer
Frozen Hyperimmune Plasma**

- Number of commercial sources
- Hyperimmunized donors
- No anti-equine antibodies
- IgG levels > 2400 mg/dl
- Most convenient for most practitioners
- It should be stored properly
- 1 liter is enough except for septic foals

**Failure of Passive Transfer
IgG Concentrates**

- Endoserum[®] , Promune E[®] , Seramune[®]
- Less expensive
- Easily stored
- Inferior to whole plasma
- Lack immunogenic factors other than IgG
