INFECTION, SEPTIC SCREENING AND MANAGEMENT

Infection in the neonate
- Clinical presentation
- Early onset
- Late onset
General management and treatment
Group B streptococcal disease (GBS)
Candida infections
Hepatitis C
Herpes Simplex virus
Human Immunodeficiency Virus (HIV)
Septic screening
- Blood cultures
- Gastric aspirate
- Ear swab
- Lumbar puncture
- Suprapubic urine
- Eye swabs
- Nasopharyngeal aspirate
- Endotracheal aspirate
Anti-staphylococcal treatment
INFECTION IN THE NEONATE

Bacterial infection is a leading cause of morbidity and mortality in the newborn period. Every effort must be taken to prevent, recognise (with a high level of suspicion) and treat infection. Treatment must be both specific and supportive.

Blood cultures are required prior to commencing antibiotic therapy. Cultures should be obtained from a superficial vein under clean aseptic technique. Cord blood cultures are not recommended as they have a high rate of bacterial contamination.

There are a wide range of organisms that cause infection and they can be acquired in 2 ways:
- Early onset disease (transplacental or perinatally acquired)
- Later onset disease (postnatally acquired / nosocomial)

CLINICAL PRESENTATION

1. GENERAL OR NON-SPECIFIC:
   - Hypotonia, lethargy
   - Pyrexia, hypothermia, temperature instability
   - Poor skin perfusion
   - Poor feeding, intolerance of feeds
   - Unexplained jaundice
   - Metabolic acidosis
   - Unstable plasma glucose homeostasis
   - Apnoea and seizures.
   - Neutropaenia. Serial counts may help to establish a trend.
   - Thrombocytopenia may occur but is usually a late sign, can occur with or without disseminated intravascular coagulation (DIC).

2. SUGGESTIVE OR SPECIFIC:
   - Respiratory distress
   - Gastrointestinal: vomiting (may be bile-stained), diarrhoea, abdominal distension
   - Central Nervous System: irritability, seizures, and full fontanelle
   - Skin: septic lesions
   - Eyes, umbilicus: discharge.

RISK FACTORS

- Premature rupture of the membranes, clinical chorioamnionitis and/or discoloured liquor
- Preterm labour and birth
- Maternal peripartum pyrexia (>38 deg)
- Maternal group B Streptococcal colonisation, UTI
- Resuscitation required at birth.
- Multiple gestation
- Ongoing respiratory disease
- Invasive procedures and presence of catheters, cannulae, long lines, endotracheal tubes, chest drains etc
- Colonisation with pathogens
- Nursery colonisation with pathogens
- Inadequate hand washing
- Parenteral nutrition.
CONSEQUENCES OF INFECTION

Extremely preterm infants are at high risk of mortality and significant morbidity from infection. The site of infection is an important consideration. **Isolated septicaemia** may run a fulminant course, as in Group B Streptococcal (GBS) and gram negative sepsis. Sepsis secondary to Coagulase-negative staphylococci (usually late-onset infections) tends to be less severe. Congenital **pneumonia** is usually due to GBS or gram negatives. These neonates often require ventilation, and persistent pulmonary hypertension of the newborn (PPHN) can occur. Nosocomial pneumonia depends on the organism with which the neonate is colonised. **Meningitis** has a high (up to 50%) mortality rate in preterm infants, with survivors at risk of long-term neurological abnormalities.

INVESTIGATION OF SUSPECTED SEPSIS

**Early onset sepsis - First 24 hours** (Be aware of any maternal cultures)
- Blood cultures
- Gastric aspirate (if has not fed)
- Ear swab
- Tracheal aspirate (if intubated)
- FBC, U&Es, PGL for baseline
- Consider LP
- CRP
- CXR (if indicated)

**Later onset sepsis - Beyond 24 hours**
- Blood culture
- Culture of specific sites as indicated, eg trachea, skin, umbilicus
- FBC, U&Es, PGL for baseline
- CSF (Lumbar punctures should be performed in all cases of proven septicaemia)
- CRP
- CXR (if indicated)
- Suprapubic urine

**CRP**
- Acute phase reactant, synthesised in the liver in response to inflammatory process.
- High sensitivity & negative predictive value for both early-onset and late-onset sepsis.
- A single normal value cannot rule out infection as the sampling may have preceded the CRP rise.
- Serial estimations useful – there is an increase within 4-6 hours, with a peak at 36-50 hours, remains high with ongoing infection. Quickly decreases with resolution of infection because of short half-life (4-7 hours.)
GENERAL MANAGEMENT AND TREATMENT

IN ALL CASES, CLOSE MONITORING AND SUPPORTIVE MANAGEMENT IS ESSENTIAL.

1. EARLY ONSET INFECTION
   - Antibiotics should be administered to any neonate with clinical signs of sepsis.
   - The presence of risk factors for sepsis may indicate investigation, but are not in themselves an indication for antibiotic administration if the neonate is born at term and is clinically well.
   - Common organisms include GBS and gram negatives, including E. Coli & H. Influenzae.
   - Parenteral therapy with a penicillin and gentamicin should be started immediately after the septic screen. If the infant is ill - ie shows signs of systemic involvement - speed is of the essence.

2. LATE ONSET INFECTION
   - The microbiological colonisation (and sensitivity) of the nursery should be known, and previous colonisation of the infant should be taken into account.
   - Common organisms include S Epidermidis (coagulase-negative staphylococci, CONS) and gram negatives, including Pseudomonas & Klebsiella species.
   - Septic workup includes blood culture, lumbar puncture and suprapubic urine collection.
   - Antibiotic therapy must be targeted to the sensitivities of the likely causative organism. Empiric therapy is Vancomycin plus an aminoglycoside (Gentamicin or Tobramycin,) In our nursery, coagulase-negative staphylococci are almost uniformly flucloxacillin- and cephalosporin-resistant.
   - If a gastrointestinal cause is suspected, an amoxicillin-aminoglycoside combination + metronidazole would be the first choice.
   - In cases of CONS sepsis where a central line is in-situ, consideration should be given to removal of the line. The tip should be sent for culture.

To reduce development of antibiotic resistance, third generation cephalosporins and meropenem are restricted to infections with proven sensitive organisms not responding to first-line antibiotics or to overwhelming infections or meningitis. Discuss with neonatologist and/or a clinical microbiologist. See infection control manual 4.1 4.4 re Vancomycin Resistant Enterococci

Continuing treatment is based on laboratory and clinical findings. If deep cultures are negative and 2 CRPs taken 24 hours apart are normal and the infant has improved, antibiotics may be discontinued.

The typical course of antibiotics would be 3 days for suspected but unproven sepsis, 5-7 days for a more definite diagnosis, such as pneumonia, 7-10 days for a positive blood culture, and 3 weeks for meningitis.
GROUP B STREPTOCOCCAL DISEASE (GBS)

Early onset Group B streptococcal (GBS) disease is the leading cause of infectious mortality and morbidity in the newborn. Colonisation of the lower genital tract is common, with 10-30% of pregnant women having positive vaginal or rectal cultures. Neonatal early onset disease is vertically transmitted from the maternal genital tract at the time of delivery. The vertical transmission GBS colonisation rate from a GBS colonised mother is approximately 40 -70%, with 1-2% of colonised neonates developing invasive disease. Invasive GBS usually presents with respiratory symptoms rapidly developing to septicaemia and shock with or without meningitis. Untreated the condition is usually fatal.

Previously, there were 2 strategies to GBS prophylaxis (risk-based and culture-based.) While both strategies dramatically reduced the incidence of GBS disease, the culture-based strategy has been found to be 50% more effective at preventing GBS disease. Therefore, routine screening of all women at 35-37 weeks gestation for rectovaginal GBS colonisation is performed at our hospital. Intrapartum prophylactic antibiotics are administered to all women whose genital tracts are colonised with GBS.

RISK FOR NEONATES FOLLOWING MATERNAL INTRAPARTUM ANTIBIOTIC THERAPY

The management of the neonate either exposed to a colonised genital tract or delivered in the presence of risk factors for GBS disease has been controversial. In the past an empiric balance has been sought between the routine use of antibiotics in the neonate with inherent over-treatment and induced morbidities, and a wait and see approach whereby an opportunity to manage early invasive disease may be lost. Data arising from centres using either risk-based or culture-based obstetric determinants of intrapartum antibiotic prophylaxis now provides more evidential basis for neonatal management (see algorithm below.)
Management of newborn at risk of neonatal sepsis

GBS positive mother on screening or bacteriuria

- If chorioamnionitis, or maternal temp ≥ 38°C, or previous baby EOGBSD (regardless GBS status, IAP, maternal antibiotic treatment)
- GBS negative mother
- GBS unknown mother

Signs of neonatal sepsis

- Septic Screen and treatment with Penicillin and Gentamicin (duration varies)

Evaluation, includes:
- Clinical condition
- LAB
  - CRP – initial & 24h
  - FBC
- Observe for 48 hours
- Treatment if becomes unwell or CRP↑
- Discharge at 48 hours if well

Spontaneous preterm labour <37 wks
Or
ROM ≥ 24 hr *¹
Or
Needs positive pressure ventilation at birth for > 30 seconds

Mother received IAP ≥ 4 hours before delivery

- Routine neonatal care
- 24 hours observation
  - If well can discharge at 24 hours
  - Need parental talk & consultant approval

If during period of observation baby becomes unwell, needs evaluation, septic screen and penicillin and gentamicin

Abbreviations

GBS: Group B Streptococcus
EOGBSD: Early Onset Group B Streptococcus Disease
IAP: Intrapartum Antibiotic Prophylaxis
ROM: Rupture of Membranes

From AAP guidelines plus others

*¹, *², protocols for existing O&G guidelines
ANTIBIOTIC ADMINISTRATION TO NEONATES OF MOTHERS WITH ANTIBIOTIC ALLERGY

Penicillin G, other semisynthetic penicillins and cephalosporins are used frequently in the neonatal period for both therapy and prophylaxis. These antibiotics are exceedingly well tolerated in neonates. Acute anaphylaxis secondary to their use is rare, even when administered to neonates born of mothers with type I hypersensitivity reactions to penicillin and related agents. Further, there is no evidence that use of penicillin and related agents in the neonatal period predisposes to subsequent beta-lactam allergy. As neonatal administration of penicillin and related agents may be lifesaving, their use should not be delayed because of concerns of maternal antibiotic allergy.

Refer to Obstetrics Clinical Guidelines, Section 1.7.1 – Identification of mothers who are Group B streptococcal carriers

CANDIDA INFECTIONS

Candidiasis is an important cause of infection-related morbidity and mortality in the NICU. Most neonates are colonized by the Candida species via the maternal GIT or genitourinary tract. A variety of factors predispose infants to this invasive infection. Infants <1000g are particularly vulnerable and an overwhelming infection is often fatal. Candida survivors have a worse neurological outcome, especially with associated CNS involvement.

The following contributory and susceptibility factors should be borne in mind:

- Preterm infants, especially <1000g
- Prolonged antibiotic use
- Intubation and ventilation
- Parenteral Nutrition
- Central catheters
- Low APGARS
- Shock

The clinical picture can range from mild, such as thrush visible on the perianal area and in the mouth, through to widespread macular rash, vesicles, pustules and invasive dissemination to organs (lungs, brain, heart, kidneys, eye, liver, bone).

SIGNS AND SYMPTOMS

Systemic candidiasis is usually a late-onset infection. Signs and symptoms are often non-specific, and can mimic bacterial infection.

- Lethargy (handles poorly)
- Apnoeas and bradycardias
- Temperature instability
- Respiratory distress
- Abdominal distension/ NEC-like illness
- Decreased perfusion
DIAGNOSIS
Leucocytosis is usually marked, and thrombocytopenia is almost invariable. However, thrombocytopenia occurs in many cases of bacterial sepsis, so is not pathognomonic of systemic candida infection.

As candida may grow slowly in cultures, false-negative results of Blood cultures and Lumbar Punctures can potentially lead to misdiagnosis or delayed diagnosis. A high index of suspicion is necessary, especially in high-risk patients.

Once the diagnosis is confirmed, a renal and cranial ultrasound is indicated. A cardiac echo may be indicated where infective endocarditis is suspected. An ophthalmologic review is warranted.

PROPHYLAXIS OF CANDIDA INFECTIONS

- Minimise, and rationalise antibiotic use.
- Where possible, extubate infants early.
- Current practice for infants requiring any form of respiratory support (Ventilation or CPAP) is to administer oral nystatin 0.5ml tds until off such respiratory support. This practice is based on a small trial of 67 preterm infants <1250g, in whom oral nystatin reduced fungal colonisation and infection.
- There is some evidence from multicentre randomised trials, and also in a recent Cochrane review (2007) to support the use of prophylactic intravenous, followed by oral, fluconazole in preterm VLBW infants. Concerns relate to emergence of resistance to such drugs, although this has not yet been demonstrated.

TREATMENT OF SYSTEMIC FUNGAL INFECTIONS

- Consideration should be given to removal of central lines.
- The drug of choice for systemic candidiasis is Amphotericin-B. The drug is extremely well tolerated in neonates, with few renal adverse effects. Starting dose is 1mg/kg/day. The drug must be infused over 6 hours. In some instances where venous access is difficult, and parenteral nutrition cannot be ceased for the 6 hour infusion, consideration can be given to using liposomal amphotericin (Ambisome.) This formulation has no other specific benefits, but can be infused over 30-60 minutes. Dose is 3-5mg/kg. Note that Ambisome is far more expensive; seek advice from a neonatologist and/or clinical microbiologist.
- Fluconosine may need to be added, especially in cases of meningitis.
- Length of treatment will vary; systemic treatment may be continued with oral fluconazole, but there is a paucity of data evaluating its efficacy. Newer antifungal agents, such as voriconazole and caspofungin, have also not been well studied in neonates.
HEPATITIS C

Hepatitis C virus (HCV) is an RNA virus. It is an important cause of chronic liver disease and is relatively prevalent in Australia and South East Asia. The virus replicates in the liver and readily spills into the blood stream. The majority of acute infections become chronic. Treatment of chronic infection is available but cure rates vary depending on viral and possibly host factors. Chronic HCV infection is an important cause of hepatic dysfunction and hepatocellular carcinoma.

HCV is readily spread by exposure to infected blood; therefore injecting drug users are at highest risk for Hepatitis C infection. In addition, HCV can rarely be spread through sexual contact. Vertical transmission from affected mother to infant occurs. The risk is 5-10% for mothers who are HCV RNA positive (ie: PCR positive), but significantly higher (25-30%) if the mother is co-infected with HIV. Of the ~250 000 births per year in Australia, about 75 children with vertically acquired HCV infection will be born per year. There is no currently available method of preventing or reducing vertical transmission.

Groups at risk of increased prevalence of HCV include:
- People with a history of injecting drug use (this may only of been on a few occasions many years previously)
- People who were transfused with blood products prior to effective screening (1990)
- People who are/have been incarcerated
- People born in countries with high background HCV prevalence
- People with tattoos, body piercing: lower risk.

KEY POINTS
- No special precautions are necessary for the care of the newborn in the nursery. Standard precautions are sufficient. There is no risk of virus transmission from urine or stool.
- Check mother has been tested for other blood borne viruses, in particular HIV and Hepatitis B.
- Breast-feeding is generally considered safe; mothers should be warned of the increased risk of transmission if they have cracked nipples. Until the nipples heal the baby should be fed with formula and the mother should express her milk and discard it.
- No infants have been found to be viraemic at birth, so testing of cord blood or from the baby at birth is not necessary.

BREAST FEEDING

Breast-feeding does not appear to play a significant role in the mother-to-infant transmission of HCV. However, HCV RNA has been found in breast milk in women with very high circulating viral loads, but usually at a much lower level than in the blood. As mothers with very high viral loads are more likely to transmit the virus at birth, the significance of the HCV in the milk in these women is not certain. Current advice from Centre for Diseases Control is that breast-feeding is not contra-indicated in HCV positive women. Those women with cracked nipples should not breast feed whilst their nipples are damaged. Women co-infected with HIV should definitely not breast-feed, as this significantly increases the risk of HIV transmission.
TESTING OF BABIES

- Parents should be counselled and offered testing of their babies to see if they have acquired HCV. Anti-HCV antibodies passively derived from the mother decline after birth, and are usually absent by 18 months. Therefore, uninfected infants should be antibody negative by 18 months.

- PCR for HCV RNA can be undertaken from 3 months. PCR has a very low sensitivity in very young infants, so should not be done prior to this time.

- It is usually suggested that testing be delayed until the baby is over 18 months of age, because passively acquired maternal anti-HCV antibodies may be present in the infant until this time. Testing can be arranged through the PMH infectious diseases clinic or family GP.

- Diagnosis in the first years does not usually lead to any medical intervention. The infected infants should receive Hepatitis B vaccine, as they are more at risk of contracting hepatitis B and the infection may be more severe in a patient with established hepatitis C. Hepatitis A vaccine should be given to HCV infected children when they are 2 years of age.

- Children who are hepatitis C positive should be followed up by the gastroenterologists at PMH.

TREATMENT

Spontaneous clearance of HCV in infants who vertically acquired the virus has been reported. There are therapies available for people with HCV infections and ongoing liver disease, including interferon and ribavirin. Response rates vary depending on the HCV genotype and treatments used. Treatment of children with liver disease and HCV is a difficult area and specialist advice should be sought.

HOUSEHOLD CONTACTS

There is a very low risk of contracting HCV from household members. (provided they do not share shavers, toothbrushes etc).
HERPES SIMPLEX VIRUS

Herpes simplex viruses are enveloped double-stranded, DNA viruses. HSV infections are ubiquitous and are transmitted from people who are asymptomatic or symptomatic with primary or recurrent infections. Infection can occur with HSV-1 and HSV-2. In neonates HSV-2 causes 75% of infections and HSV-1 25%. HSV infection in newborns has an incidence of 1:3000 to 1:20000 depending on the geographical location. There is concern that with the increasing incidence of HSV-2 infection that the incidence of newborn HSV infection will increase.

TRANSMISSION

HSV is most commonly transmitted during birth through an infected genital tract or through an ascending infection. Congenital HSV intrauterine infection may also occur but is very rare. HSV can transmit through intact membranes. Rarely HSV is acquired through postnatal transmission from a parent or caregiver with orolabial HSV or herpetic whitlow.

The risk of HSV infection to a newborn if the mother has primary genital herpes is about 50%; the risk to an infant born to a mother shedding HSV as a result of a reactivated lesion is less than 5%. Distinguishing between primary and recurrent HSV infection in women by history and examination may be impossible. More than 75% of infants with HSV infection have been born to women with no history or clinical findings suggestive of active HSV infection during pregnancy.

CLINICAL MANIFESTATIONS

In newborns HSV can manifest as

1. Disease localised to skin, eye and mucous membranes (SEM disease)
2. Central nervous system disease
3. Disseminated disease involving multiple organ systems including liver, lungs and CNS.

Neonates may present any time between birth and 4 weeks. Disseminated disease has the earliest onset, often during the first week of life; CNS disease manifests latest, usually between 2-3 weeks. Skin lesions may not be present in 17-40% of newborns with HSV. In the absence of skin lesion diagnosis may be delayed. It is important to consider HSV infection in the differential diagnosis of all acutely unwell neonates especially if there is sepsis and a maternal history of HSV.

Disseminated disease presents with viral sepsis, and may be indistinguishable from sepsis of another cause, ie respiratory collapse, pneumonitis, liver failure, DIC. CNS disease presents with lethargy, poor feeding, bulging fontanelle and seizures.

DIAGNOSTIC TESTS

- Serology is of limited value, as IgG is of maternal origin.
- Surface swabs (transport in viral medium) for immunofluorescence, HSV culture and HSV PCR
  - Skin vesicles if present
  - Umbilical stump
  - Mouth or nasopharynx
  - Eyes (conjunctival swabs)
  - Rectum (via rectal swab)
  - Urine
  - Tracheal aspirate (if ventilated)
- HSV PCR from blood. This requires 0.5ml EDTA blood.
- Lumbar puncture for HSV PCR: indicated in all cases, where clinically stable.
Other tests:
- FBC, Coagulation screen, LFT
- Chest Xray if respiratory symptoms

**TREATMENT**

**Acute:** Aciclovir should be given whilst awaiting the results of laboratory investigations. Aciclovir must be given IV. *There is no place for oral acyclovir in neonatal treatment of acute HSV.*

**Dose:** see drug manual (high dose refers to 20mg/kg/dose 8 hourly in term infants). Amend dose weekly as necessary in view of any weight gain.

**Duration:** 14 days for SEM disease
- 21 days minimum for disseminated or CNS diseases

**Monitor:** high dose acyclovir can cause neutropenia and nephrotoxicity. At least weekly FBC and Urea/Creatinine should be performed.

**Contact precautions:** either in single room or isolette for the duration of IV therapy unless advised earlier by Infection Control/Clinical Microbiologist (see Infection Control Policy 2.2 Additional Infection Control Precautions). These babies continue to excrete HSV for some days. A review of all the latest culture/PCR results should be done before taking a baby out of isolation.

Despite treatment, the mortality rate in disseminated disease is 20-30%. Survivors of disseminated infection have adverse neurological sequelae in 13% of cases, while survivors of CNS disease have adverse neurological sequelae in 35% of cases.

**LONG TERM ORAL SUPPRESSIVE THERAPY AFTER ACUTE TREATMENT**

This is currently recommended, as relapses have been described following successful treatment. Discuss with a Clinical Microbiologist regarding duration of therapy; 6 months is recommended. Monitor for adverse effects.

**FOLLOW UP**

Infants with neonatal HSV infection should be followed up and evaluated for recurrent disease and neurological sequelae.

**MANAGEMENT OF INFANT WITH PRESENTATION COMPATIBLE WITH HSV**

Obtain virological specimens as detailed above, including CSF, and commence treatment with IV Acyclovir (high dose).

Contact precautions: either in single room or isolette for the duration of IV antiviral therapy. Isolation may need to be prolonged beyond this period pending results of virological investigations (see Infection Control Policy 2.2 Additional Infection Control Precautions)

Length of treatment will be determined by extent of disease. If there are CSF abnormalities there is a role for repeat CSF examination towards the end of the treatment course. Consultation with Clinical Microbiologist is advised.

Management of infant born vaginally or after prolonged rupture of membranes (greater than 4 hours) to a woman with clinically first apparent genital episode at delivery:

- From the asymptomatic infant collect surface swabs from the baby at 24 hours post delivery (in this situation CSF collection is not necessary). Pre-emptive/prophylactic therapy with high dose acyclovir i.v. for 10 days is recommended from birth. If disease
develops then CSF examination is recommended and treatment continued according to CSF results.

Management of infant born vaginally or after ROM for more than 4 hours to a woman with recurrent genital herpes but no obvious lesion at delivery:

- The parents should be educated about the signs of neonatal herpes, but as the risk of transmission is very low pre-emptive acyclovir is not recommended. Swabs and/or isolation are not required in this situation.

CONJUNCTIVITIS

A crusting or purulent eye discharge in the first few days of life. The most common organisms involved are Staphylococcus aureus, streptococci and gram negatives such as E. coli. Gonococcus can cause severe conjunctivitis (ophthalmia neonatorum) as can chlamydia. Recurrent conjunctivitis is more common if there is a blocked lacrimal duct. Gonococcal infection usually presents within 24 hours of delivery with profuse purulent conjunctival discharge. Chlamydial infections usually present after day 5.

Investigation - eye swabs for microscopy and sensitivity. Special swabs are necessary for diagnosing Chlamydia.

Treatment
- In mild cases, no treatment, other than regular cleaning of the lids with sterile saline swabs is required.
- Topical antibiotic ophthalmic drops - Neosporin, chloramphenicol, or framycetin. The most convenient dose times are before feeds.
- Gonococcal infection requires parenteral antibiotic therapy, usually with a third generation cephalosporin, such as Cefotaxime. Consultation with an ophthalmologist is warranted.
- Chlamydial conjunctivitis may require topical tetracycline and oral co-trimoxazole.
- Pseudomonal infections can cause severe ocular damage, including lens dislocation. Advice should be sought from an ophthalmologist. Therapy may include topical drops, such as framycetin as well as systemic antipseudomonal drugs, such as Ceftazadime.

SKIN INFECTIONS

Skin infection may manifest as scattered pustules (usually in creases), periumbilical cellulitis (omphalitis) and occasionally widespread desquamation (scalded skin syndrome). Staphylococcus aureus is the usual causative organism. Staph pustules must be distinguished from the rash of erythema toxicum.

Take swabs (to exclude MRSA).
More extensive disease requires systemic treatment with flucloxacillin. Staphylococcal scalded skin syndrome requires intravenous flucloxacillin.
HIV

MANAGEMENT OF NEONATES BORN TO HIV POSITIVE MOTHERS

Quick Reference Guideline For KEMH Delivery & Birthing Suite

2.13 MANAGEMENT OF THE HIV POSITIVE PREGNANT WOMAN AND HER NEONATE

OBSTETRIC MANAGEMENT OF THE HIV POSITIVE WOMAN

ANTENATAL

- Antiretroviral therapy (ART) is indicated in pregnancy for all positive women. The HIV physician will prescribe an individualised ART regimen for all HIV positive women.

INTRAPARTUM MANAGEMENT

The majority (70%) of perinatal transmission of HIV occurs around the time of delivery. Strategies to reduce the risk of maternal-child transmission:
- Maternal antiretroviral therapy
- Shortened duration of membrane rupture
- Avoidance of invasive fetal interventions
- Elective Caesarean Section – mode of delivery is an individualised decision

Vaginal delivery
- Commence IV zidovudine (AZT) - see regime below - as soon as the diagnosis of labour is made, irrespective of the antiretroviral regimen during pregnancy
- Avoid ARM
- Avoid fetal scalp electrode placement and fetal blood sampling

Elective Caesarean Section
- Commence IV AZT 4 hours prior to planned time of surgery (see regime below)
- Continue the infusion until delivery of the baby and cord clamping

Zidovudine (AZT) Regime

- 1000mg of AZT (5 vials of AZT 200mg/20ml) is added to 900 ml of 5% glucose or Hartmanns solution (total volume is 1000mls.)
- Loading dose - 2mg/kg maternal body weight IV for one hour, followed by maintenance dose.
- Maintenance dose - 1mg/kg maternal body weight/hour until birth of baby.

AZT compatible with Oxytocin, Magnesium Sulphate, Ranitidine, Morphine & many antibiotics. For complete drug compatibilities see full guideline.
POSTNATAL MATERNAL MANAGEMENT

- Complete avoidance of breastfeeding or mixed breast/formula feeding
- Consider lactation suppression with Cabergoline
- Antiretroviral Therapy (ART) will be prescribed by HIV physician
- Expert contraceptive advice essential

MANAGEMENT OF THE BABY OF A HIV POSITIVE WOMAN

At Delivery:

- Notify:
  - On call consultant Paediatrician/ Senior Registrar (KEMH)
  - On call paediatric Immunologist (PMH) via switchboard
  - Immunology Clinical Nurse Specialist (PMH) on page 8311 (available Monday – Friday, office hours)
- Bath the baby in the L&B Suite room
- All injections must be given after the bath
- If any injection necessary, carefully clean the site beforehand

Anti-retroviral therapy for the infant:

- Is started as soon as possible after birth and **always within 4 hours of birth**. Zidovudine (AZT) syrup (4mg/kg of body weight/dose orally BD for 6 weeks) is usually recommended but antiretroviral regimen is decided on case-by-case basis; refer to clinical notes
- See full guideline for alternative routes (IV or oral)/doses for infants who cannot tolerate oral Zidovudine (AZT).
- Zidovudine (AZT) syrup is kept in Labour & Birthing Suite drug imprest under the name: *Retrovir* (10mg/mL)
- Transfer Zidovudine (AZT) medication to SCN or ward with baby

Investigations for Infant:

- Bloods for HIV Proviral DNA (1ml EDTA) and FBC **must be obtained within 24 hours of birth**.
- Bloods for HIV RNA Viral Load (2ml EDTA) are **not routinely required and are only done if clinically indicated (poor maternal health or high viral load) and following discussion with paediatrician**.
- If HIV RNA Viral load is required in addition to the above investigations, the bloods **must be obtained within the first 24 hours of birth**.

Other Measures:

- **Do not** give BCG
- Naso/orogastric tubes should **only** be used if absolutely indicated and should be inserted by experienced staff.
SEPTIC SCREENING

1. BLOOD CULTURES
To obtain a blood sample for microbiological examination where clinically indicated.

KEY POINT
- A single blood culture bottle is all that is normally required. However, if an intra-abdominal collection or necrotising enterocolitis is suspected, blood for aerobic and anaerobic pathogens should be sent in separate bottles.

EQUIPMENT
Blood culture collection is a clean aseptic procedure, performed by medical staff or nursing staff deemed competent in the insertion of an intravenous catheter.

- Sterile dressing pack
- Alcohol swab
- 2ml syringe
- Blood culture bottle
- Needle
- Intravenous cannula

PROCEDURE
- Refer to procedure for intravenous line insertion if collecting blood from an intravenous cannula. When there is blood flowing back into the hub, insert needle into the hub and aspirate 0.5ml of blood, maintain asepsis.
- Remove seal from culture bottle.
- Inject blood into blood culture bottle.
- Ensure bottle is correctly labelled. It is important not to attach the patient label to the neck of the bottle as this interferes with processing of the sample.

2. GASTRIC ASPIRATE
To take a gastric fluid specimen for microbiological examination on all newborn infants admitted to the unit with suspected sepsis.

EQUIPMENT
- Gastric tube
- PH test strip
- 10ml syringe
- Yellow lid specimen container
PROCEDURE

- Refer to “GASTRIC TUBE INSERTION” procedure for instructions on how to insert a gastric tube.
- Gastric aspirate must be collected prior to the infant’s first feed.
- Once tube has been inserted, connect 10ml syringe and gently aspirate gastric tube to obtain secretions for microbiological examination, the fluid swallowed during birth may reveal organisms of the maternal genital tract that may cause perinatal infections.
- If the infant requires a gastric tube, leave the tube in and secure it. Ensure the position is checked.

3. EAR SWAB

To obtain a skin swab for microbiological examination. The ear folds being a place where maternal colonisation of organisms from the liquor or birth canal may persist following birth and may cause perinatal infection.

EQUIPMENT
Charcoal medium
Sterile swab stick
Agar plate - If the swab is collected out of office hours, then a smear of the swab should be placed on the agar plate as this allows the process of incubation to begin immediately.

PROCEDURE

- Do not collect ear swab if infant has been bathed.
- Remove swab stick from packet, taking care not to touch the tip.
- Swab in a circular motion, around the first curvature of the ear.
- Smear onto agar if required (out of hours). Avoid smearing the edges of the plate as contamination can occur, smearing an S shape down the centre of the plate is recommended.
- Place swab into charcoal medium.
4. LUMBAR PUNCTURE

Obtaining cerebrospinal fluid (CSF) for:
- Infants with suspected meningitis or sepsis.
- Drainage of CSF in communicating hydrocephalus.
- Diagnoses of metabolic disorder.
- Diagnostic procedure in seizure activity.

KEY POINTS
- This is a sterile aseptic procedure. Depending on the level of experience, only two attempts should be made to obtain CSF before handing over to another medical officer.
- Needles without a stylet should not be used because of the risk of an intraspinal dermoid.
- The position adopted for a lumbar puncture can cause physiological instability. Throughout the procedure the infant must be monitored for tolerance and stability and the procedure should be stopped if at any time the infant’s condition deteriorates.
- Infant must have continuous oxygen saturation and heart rate monitoring throughout the procedure and resuscitation equipment should be available.

EQUIPMENT
- Chlorhexidine swabstick 1.0% or Povidone-iodine solution (infants < 27 weeks)
- Dressing pack/gown/gloves/sterile drapes
- Lumbar puncture needle (size 22G or 23G)
- Specimen bottles – appropriate bottles for specific tests
- Sterile water
- Non-occlusive dressing (Tegaderm 4cm x 4cm)

FIG 1: DIAGRAM DEMONSTRATING AREA OF PUNCTURE AND POSITION OF INFANT DURING THE PROCEDURE.
PROCEDURE
- Hold the infant firmly in the lateral position, keeping the head and trunk well flexed. This allows for easy detection of landmarks.
- Observe infant's tolerance closely for possible airway obstruction, apnoea, bradycardias, hypoxia.
- Identify the L4-L5 interspace as site for lumbar puncture. The space above L4 should not be penetrated as this can lead to spinal cord and spinal nerve damage.
- Clean wide area thoroughly.
- Insert the needle in the midline with steady force aimed towards the umbilicus.
- Advance the needle slowly and then remove the stylet to check for appearance of fluid.
- Collect at least 10 drops in each sterile container.
- Maintain pressure on the area with sterile gauze until the site has stopped leaking.
- Wash off povidone-iodine solution or chlorhexidine solution.
- Place non-occlusive dressing over site and leave intact for 24hrs

5. SUPRA PUBIC URINE
Obtain a sterile sample of urine for a septic or metabolic screen.
Supra-pubic urine aspirate is performed by medical staff under clean aseptic conditions.

EQUIPMENT
- 2ml Syringe
- 23G Needle
- Alcohol wipe
- Sterile container
- Sterile water
PROCEDURE

- Position infant supine. Hold legs in frog-like position.
- Check infant has not just voided.
- Locate site of bladder puncture- 0.5cm – 2cm above the pubic symphysis in the midline of the lower abdomen.
- Prepare skin.
- Advance needle perpendicular to abdomen. to ensure correct anatomical position and avoid bowel perforation.
- Advance the syringe whilst applying minimal negative pressure.
- Do not advance any further once urine is obtained. to avoid trauma to the posterior bladder wall.
- Remove needle and apply pressure until bleeding has stopped.
6. EYE SWABS

To obtain an eye swab for microbiological examination in an infant with persistent discharging eyes.

KEY POINTS

- An eye swab for bacterial examination should always be the first line of action. If the eye fails to respond to treatment then a swab for chlamydial and viral examination should be sent. The incubation period for Chlamydia is from day 4 up to 2 weeks of age; therefore a sticky eye in the first 4 days of life is unlikely to be indicative of chlamydial infection.

- If the infant is delivered vaginally through active genital herpes lesions, an eye swab in viral medium should be sent on admission as part of the septic screen.

- Viral transport medium (VTM) contains antibiotics to keep the virus stable on transport to the laboratory, therefore it is important not to use VTM for chlamydial or bacterial examination.

EQUIPMENT

<table>
<thead>
<tr>
<th>Bacterial examination:</th>
<th>Chlamydial examination:</th>
<th>Viral examination:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal saline</td>
<td>Normal saline</td>
<td>Saline</td>
</tr>
<tr>
<td>Charcoal swab</td>
<td>Aluminium wire shafted swab</td>
<td>Swabstick</td>
</tr>
<tr>
<td>Glass slide and slide carrier</td>
<td>Teflon coated slide and slide carrier</td>
<td>Viral transport medium (VTM)</td>
</tr>
<tr>
<td></td>
<td>Clean scissors</td>
<td>Clean scissors</td>
</tr>
</tbody>
</table>

PROCEDURE

- Perform eye toilet to remove exudate from eye. If both eyes are discharging, a swab from each eye should be sent separately ensuring they are correctly labelled.

- Moisten swabstick with normal saline to provide optimum medium for bacterial/viral/chlamydial growth.

- Gently fold down lower eyelid and run swabstick across the inner surface rotating swab to ensure specimen collection. If for chlamydial examination continue on to the inner canthus and rotate the swab across the inner canthus - cells need to be collected not just exudate.

- Avoid causing trauma to eye mucosa.

- Smear swab along glass slide if applicable and place into transport medium.

- The chlamydial swab and viral swab will need to be cut with clean scissors.
7. NASOPHARYNGEAL ASPIRATE (NPA)

To obtain nasopharyngeal secretions for microbiological or virology testing in infants with clinical signs of a viral or bacterial upper respiratory tract infection.

KEY POINTS

- If collecting an aspirate for viral and bacterial testing it is important not too add VTM to the aspirate as it contains antibiotics to protect the virus, but it may destroy the bacteria.
- If collecting an aspirate just for viral studies add a few drops of VTM.
- If collecting an aspirate for bacterial studies add a few drops of saline.

EQUIPMENT

Specimen suction set
Suction apparatus
Vial of transport medium (VTM) – for viral studies only
Normal saline ampoule – for bacterial studies

PROCEDURE

- Attach the specimen set to the suction apparatus and turn on to no more than 50mmHg to minimise mucosal trauma.
- Kink catheter to stop suction, and then pass the catheter into the nasopharynx. Release catheter and slowly withdraw.
- BACTERIAL SAMPLE Suction a few drops of saline into the specimen set.
- VIRAL SAMPLE Suction a few drops of the viral transport medium into the specimen set.
  Remove the specimen set from the suction apparatus and seal with white cap.
8. ENDO TRACHEAL ASPIRATE
To obtain pulmonary secretions for microbiological examination in ventilated infants.

PROCEDURE
- Is a clean aseptic procedure.
- Select the appropriate size suction catheter or specimen collection trap
- Turn off continuous milk feed prior to performing the procedure to prevent aspiration of milk.
- Turn suction apparatus on at a set pressure, as per suction procedure. Link
- Connect suction catheter to suction tubing.
- Measure the depth of the catheter insertion required by noting the length the endotracheal tube is cut at and adding 7 cm. Correct measurement prevents deep suctioning which causes mucosal trauma.
- Remove flow sensor. If applicable, increase FiO₂ by 10% prior to suctioning.
- Insert catheter to predetermined length. Apply suction to T piece. Withdraw catheter while maintaining suction pressure, this should not take longer than 10secs to minimise the risk of cerebral and pulmonary vasoconstriction.
- Person assisting should then turn suction apparatus off.
- Disconnect suction catheter from tubing, wind catheter around the T piece and place catheter back into packaging.

ANTI-STAPHYLOCOCCAL PROCEDURE.
To reduce the transient colonization of potentially pathogenic bacteria.

KEY POINT
- Chlorhexidine emulsion 1%
- Use on infants in incubators on day 1 then on alternate days.
- Use on infants in open cots on day 1 then on alternate days until having routine baths.
- Should never be applied to excoriated or ulcerated areas of skin.

INFANTS IN INCUBATORS
1. Warm the chlorhexidine solution.
2. Increase the incubator temperature by 2 degrees.
3. Remove ECG leads if condition stable and not <27 weeks.
4. Weigh the infant (if applicable)
5. Minimal cleanse with cotton wool and warm water
6. Dry thoroughly, especially in body creases.
7. Apply chlorhexidine solution on a cotton wool sparingly to the body and head, paying particular attention to the cord stump and body creases. Do not apply to hands and face.
8. Replace ECG if removed
9. Return incubator temp to original level.
10. Check Axilla temp in 1 hour.

INFANTS IN COTS
1. Warm the chlorhexidene solution.
2. Remove ECG leads.
3. Weigh the infant (if applicable).
4. Bath and dry thoroughly.
5. Apply chlohexidene solution on a cotton wool sparsely to the body and head, paying particular attention to the cord stump and body creases. Do not apply to hands and face.
6. Replace ECG leads.
7. Check axilla temp in 1 hour if needed.

REFERENCES

- [www.cdc.gov/hepatitis](http://www.cdc.gov/hepatitis)
• Dore G. Law M, MacDonald M et al Epidemiology of hepatitis C virus infection in Australia J Clin Virology 2003:26;171-184
• Kimberlin D. Herpes Simplex Virus, Meningitis and Encephalitis in Neonates. *Herpes*. 2004 Jun;11 Suppl 2:65A-76A