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Adverse pregnancy outcomes can follow direct placental, fetal, or neonatal infection, or preterm birth associated with vaginal, cervical, intrauterine, or even nonpelvic infections. These latter infections appear to be associated with the majority of very early preterm births, and may explain some of the long-term neurologic damage associated with preterm birth. Bacterial vaginosis and its associated intrauterine infections likely contribute far more to the overall burden of adverse pregnancy outcomes than the more classical perinatal infections such as rubella and syphilis.

Pathophysiology of Preterm Birth: Emerging Concepts of Maternal Infection 561
 Kim A. Boggess

Preterm birth remains a significant health concern. Maternal reproductive infections such as bacterial vaginosis pose increased risk for preterm birth, although treatment of bacterial vaginosis has not proven to be universally effective in preterm birth prevention. Maternal oral infection such as clinical periodontal disease has also been identified as a risk factor for preterm birth, and pilot data suggest that oral treatment interventions undertaken during pregnancy may reduce preterm birth risk.

**Preterm Labor, Preterm Premature Rupture of Membranes,
and Chorioamnionitis** 571
Edward R. Newton

In this article, the author reviews the etiology and biochemical links between infection and preterm birth, the problem of preterm birth, and the management of infection-related risks of preterm birth. The management section reviews current opinions regarding prophylactic antibiotic therapy in the prevention of preterm birth, adjunctive antibiotic therapy in the treatment of preterm labor with and without rupture of membranes, and antibiotic therapy of intra-amniotic infection (clinical chorioamnionitis, IAI). Finally, the article reviews the risk of neurodevelopmental handicap potentially associated with IAI.

Prevention of Neonatal Sepsis 601
Stephanie Schrag and Anne Schuchat

Neonatal sepsis is a leading infectious cause of infant mortality. While use of intrapartum antibiotic prophylaxis in the United States has led to dramatic declines in perinatal sepsis caused by the bacteria group B streptococcus, interventions to prevent perinatal sepsis due to other causes have not yet been clearly defined. This article synthesizes information on neonatal sepsis disease burden, trends, and risk factors and reviews current and potential approaches to neonatal sepsis prevention.

**Bacterial Vaginosis in Pregnancy: Diagnosis, Screening,
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Mark H. Yudin

Bacterial vaginosis is the most common lower genital tract infection among women of reproductive age. It has been associated with a number of significant obstetric and gynecologic complications, such as preterm labor and delivery, preterm premature rupture of membranes, spontaneous abortion, chorioamnionitis, postpartum endometritis, postcesarean delivery wound infections, postsurgical infections, and subclinical pelvic inflammatory disease. This article focuses on bacterial vaginosis in pregnancy, and discusses approaches to diagnosis, screening, and management.

Treatment of Sexually Transmitted Infections in Pregnancy 629
Lisa M. Hollier and Kimberly Workowski

Sexually transmitted infections remain a major public health concern in the United States. An estimated 19 million infections occur each year. The economic burden imposed by sexually transmitted infections is impressive: direct medical costs have been estimated as high as \$15.5 billion annually. Sexually transmitted infections are relatively common during pregnancy, especially in indigent,

urban populations. Education, screening, treatment, and prevention are important components of prenatal care for women at increased risk for these infections. Treatment of these sexually transmitted infections is clearly associated with improved pregnancy outcome and reductions in perinatal mortality.

Herpes Simplex Virus in Pregnancy: New Concepts in Prevention and Management

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James Hill and Scott Roberts

Genital herpes simplex virus (HSV) infection is one of the most common viral sexually transmitted diseases in the United States. It is estimated that 45 million adolescents and adults are infected with genital HSV. Most genital herpes infections in the United States are caused by HSV type 2 (HSV-2), and 25% to 30% of women of reproductive age have HSV-2 antibodies. What is more striking is that genital herpes is frequently under-recognized, and that only 5% to 10% of these women have a history of genital herpes. Because such a small percentage of women are aware of being infected with HSV, the risk of maternal transmission of this virus to the fetus or newborn is a significant health issue.

Human Herpes Viruses in Pregnancy: Cytomegalovirus, Epstein-Barr Virus, and Varicella Zoster Virus

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Lisa M. Hollier and Heidi Grissom

Viruses of the human herpesvirus family can have profound effects on pregnancy. Primary maternal infection with cytomegalovirus (CMV) or varicella during pregnancy has been associated with fetal abnormalities and neonatal disease. Public awareness of the role of cytomegalovirus in the etiology of developmental disorders and chronic disabilities needs to increase. With time, we may see new interventions for treatment of infected pregnant women and prevention of long-term effects. Attention must be focused on development of a safe and effective vaccine. With the introduction of an efficacious varicella vaccine, the rate of varicella in pregnancy is expected to decrease dramatically. Physicians caring for women have the opportunity to prevent the complications of varicella by identifying and vaccinating susceptible women.

Diagnosis and Management of Human Parvovirus B19 Infection

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Mildred M. Ramirez and Joan M. Mastrobattista

Parvovirus B19 is a common infection in children occurring in winter and spring months that can affect pregnant women and their unborn fetuses. Adverse fetal sequelae may include red blood cell aplasia due to bone marrow suppression, anemia, myocarditis, nonimmune hydrops, and fetal death. Fortunately, several non-invasive testing schemes are available to assess the fetus, and invasive testing is reserved for fetuses who have marked anemia.

Diagnosis and Management of Toxoplasmosis

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Jose G. Montoya and Fernando Rosso

This article discusses the diagnosis and management of toxoplasmosis. Congenital toxoplasmosis continues to be a tragic outcome of a preventable and treatable infection. Education of patients, physicians, and health policy makers on the primary and secondary preventive measures of the disease, and their execution, will undoubtedly result in lower incidence, morbidity, and mortality rates from congenital disease due to *Toxoplasma gondii*.

Influenza and Pneumonia in Pregnancy

727

Vanessa R. Laibl and Jeanne S. Sheffield

Influenza is a significant cause of morbidity and mortality from febrile respiratory illness worldwide. Influenza in pregnant women has historically been associated with a higher rate of morbidity and mortality. Pneumonia is the sixth leading cause of death in the United States, and it is the number one cause of death from an infectious disease. Although pregnant women do not get pneumonia more often than nonpregnant women, it can result in greater morbidity and mortality because of the physiologic adaptations of pregnancy. Pregnant patients who have either of these conditions require a higher level of surveillance and intervention.

Tuberculosis in Pregnancy

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Vanessa R. Laibl and Jeanne S. Sheffield

There were approximately 2 million deaths worldwide from tuberculosis in 1997, 98% of them in developing countries. Factors implicated in the resurgence of tuberculosis in the United States in the late 80s and early 90s included increased immigration from countries with high prevalence, HIV infection, emergence of resistant strains, poverty, homelessness, drug abuse, and a decline in tuberculosis-related health services. With better control programs, cases began to decrease in 1993. In 1998, 18,361 cases of tuberculosis (6.8 per 100,000 population) were reported to the US Centers for Disease Control and Prevention (CDC), a 31% decrease from 1992. Pregnancy is not thought to change the course of tuberculosis; however, tuberculosis poses a risk to the pregnant woman and her fetus.

Urinary Tract Infections in Pregnancy

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Pooja Mittal and Deborah A. Wing

Urinary tract infections occur commonly in pregnancy. Bacterial colonization may occur in the lower and upper urinary tract, and is facilitated by the normal physiologic changes of pregnancy. Asymptomatic bacteriuria, cystitis, and pyelonephritis each pose a serious threat to the mother and fetus. Optimal treatment regimens and preventative strategies continue to be investigated.

**Emerging Infections and Pregnancy: West Nile Virus,
Monkeypox, Severe Acute Respiratory Syndrome,
and Bioterrorism**

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Denise J. Jamieson, Daniel B. Jernigan, Jane E. Ellis,
and Tracee A. Treadwell

As new infectious diseases, such as West Nile virus, monkeypox, and severe acute respiratory syndrome (SARS) are recognized in the United States, there are critical questions about how these infectious diseases will affect pregnant women and their infants. In addition, the implications of bioterrorist attacks for exposed pregnant women need to be considered. In this article, the authors address the following questions for a number of infectious disease threats: (1) does pregnancy affect the clinical course of these novel infectious diseases?, (2) what are the implications for prophylaxis and treatment of exposed or infected pregnant women?, and (3) are these novel infectious diseases transmitted during pregnancy, labor and delivery, or breastfeeding?

Epidural Analgesia for Labor Pain and Its Relationship to Fever

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James M. Alexander

The association between labor epidural and maternal fever is well established. The direct effect of epidural on maternal temperature appears due to its interference with heat dissipation and rarely results in overt fever. This effect is unlikely to adversely affect the fetus, the majority of women in labor do not appear to be at risk, and the full ramification of the fever is not yet well understood. Thus it seems unreasonable to avoid labor epidurals due to the risk of fever. Epidural analgesia remains one of the most effective forms of pain relief in labor and is a reasonable option for most women.

**The Use of Radiographic Modalities to Diagnose Infection
in Pregnancy**

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Jason A. Pates and Diane M. Twickler

The usefulness of sonography, plain film, CT, and MRI in diagnosing infections in pregnancy is discussed. Imaging modality choices for specific clinical indications in pregnancy are reviewed. The overall safety of most techniques in pregnancy is emphasized.

Postpartum Endometritis

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Sebastian Faro

Postpartum endometritis or a surgical site infection should be suspected if the patient develops an elevated oral temperature, 100.4°F or higher, with an associated tachycardia following the procedure. A tachycardia paralleling the temperature strongly

indicates infection. A thorough examination should be performed. Patients failing to respond to initial antibiotic therapy should be thoroughly evaluated for the possible emergence of a resistant bacterium or the development of an abscess or septic pelvic thrombosis. Antibiotic therapy should be continued until the patient is afebrile for 24 to 48 hours, the white blood cell count returns to normal, and the patient is tolerating oral liquids and solids, and ambulating without difficulty.

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