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**Date:** 3 September 2018

**Sources Searched:** Embase, Medline

## Lymphocytic Choriomeningitis Virus in Pregnancy

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### 1. Microcephaly Caused by Lymphocytic Choriomeningitis Virus.

**Author(s):** Delaine, Maia; Weingertner, Anne-Sophie; Nougairede, Antoine; Lepiller, Quentin; Fafi-Kremer, Samira; Favre, Romain; Charrel, Rémi

**Source:** Emerging infectious diseases; Sep 2017; vol. 23 (no. 9); p. 1548-1550

**Publication Date:** Sep 2017

**Publication Type(s):** Case Reports Journal Article

**PubMedID:** 28820372

Available at [Emerging infectious diseases](#) - from Europe PubMed Central - Open Access

**Abstract:**We report congenital microencephaly caused by infection with lymphocytic choriomeningitis virus in the fetus of a 29-year-old pregnant women at 23 weeks' gestation. The diagnosis was made by ultrasonography and negative results for other agents and confirmed by a positive PCR result for lymphocytic choriomeningitis virus in an amniotic fluid sample.

**Database:** Medline

### 2. Emerging and zoonotic infections in women.

**Author(s):** Theiler, Regan N; Rasmussen, Sonja A; Treadwell, Tracee A; Jamieson, Denise J

**Source:** Infectious disease clinics of North America; Dec 2008; vol. 22 (no. 4); p. 755

**Publication Date:** Dec 2008

**Publication Type(s):** Research Support, N.i.h., Extramural Journal Article Review

**PubMedID:** 18954762

Available at [Infectious Disease Clinics of North America](#) - from PubMed Central

**Abstract:**Emerging infections, many zoonotic, are caused by a variety of pathogens with global distribution. Previously rare pathogens have emerged; global travel facilitates their rapid spread. Human encroachment on remote areas has brought contact with zoonotic diseases never before characterized. Although systematic study of rare outbreaks can be challenging, knowledge of emerging pathogens and their effects on women is accumulating. This article discusses effects of lymphocytic choriomeningitis virus, West Nile virus, severe acute respiratory syndrome coronavirus, avian influenza A virus, viral hemorrhagic fevers, spirochetal illnesses, and Chagas' disease. The potential impact of candidate bioterror agents and issues of prophylaxis and therapy are discussed.

**Database:** Medline

### **3. Congenital Lymphocytic Choriomeningitis Virus in a Member of a Twin Pregnancy**

**Author(s):** Bou Ghannam A.; Chang T.; Jantausch B.A.; Vezina G.; Miller M.

**Source:** Journal of Pediatric Neurology; Apr 2017; vol. 15 (no. 2); p. 76-79

**Publication Date:** Apr 2017

**Publication Type(s):** Article

Available at [Journal of Pediatric Neurology](#) - from ProQuest (Hospital Premium Collection) - NHS Version

**Abstract:**We report a male infant, twin A of a dichorionic pregnancy, with a fetal ultrasound and subsequent MRI at 29 weeks of gestation revealing a small cranium (26 cm, < 3rd percentile for gestation) and marked ex vacuo ventriculomegaly. Twin B had normal ultrasound and brain MRI. Newborn exam was unremarkable and his weight and head circumference were both at 5th percentile. Placental pathology findings included focal acute vasculitis and chronic villitis. Postnatal brain MRI showed significant cerebral volume loss with extensive large cystic parietal encephalomalacia and diffuse cerebral cortical dysplasia (polymicrogyria). Common congenital infectious diseases investigation on maternal serum was normal. Twin A was admitted for bronchiolitis and possible seizure at 3 months of age. At this time, he had microcephaly and was not tracking light. Ophthalmology exam showed markedly abnormal macula with diffuse pigment changes and scarring that extended between the full arcades bilaterally. Congenital lymphocytic choriomeningitis virus (LCMV) infection was confirmed with negative IgM titer and highly positive IgG titer of greater than 1:256. Serologic tests for LCMV should be considered in infants who have central nervous system and retinal involvement but negative TORCH studies. © Copyright 2017 by Georg Thieme Verlag KG, Stuttgart New York.

**Database:** EMBASE

### **4. Neuroimaging of Fetal Infection**

**Author(s):** Robinson A.J.; Ederies M.A.

**Source:** Journal of Pediatric Neurology; Oct 2017; vol. 15 (no. 5); p. 192-200

**Publication Date:** Oct 2017

**Publication Type(s):** Review

Available at [Journal of Pediatric Neurology](#) - from ProQuest (Hospital Premium Collection) - NHS Version

**Abstract:**Infection during pregnancy is common and the developing fetal brain is vulnerable to vertical transmission due to immaturity of the fetal immune system. Infection is a major cause of multiple organ abnormalities, including the neuraxis, due to the neurotropism of the infectious agents. This review sets out to give an overview of fetal infection, review the general principles of the nature and timing of the infectious insult with respect to outcomes, review the neuroimaging of infection by ultrasound and magnetic resonance imaging (MRI), and review the various pathogens involved, including the two most common, cytomegalovirus (CMV) and Toxoplasma, and also other common viral and nonviral infections.

**Database:** EMBASE

## **5. Management of Infection for the Obstetrician/Gynecologist**

**Author(s):** Eppes C.

**Source:** Obstetrics and Gynecology Clinics of North America; Dec 2016; vol. 43 (no. 4); p. 639-657

**Publication Date:** Dec 2016

**Publication Type(s):** Review

**PubMedID:** 27816152

**Abstract:** Pregnant women have an increased morbidity and mortality for certain illnesses owing to the physiologic and immunologic changes in pregnancy. Certain infections are common during pregnancy, including urinary tract infections and pneumonia. Others are uncommon, but yield increased severity, including influenza. Human immunodeficiency virus, although it does not increase in pathogenesis during pregnancy, requires specific attention and management in the context of pregnancy. Copyright © 2016 Elsevier Inc.

**Database:** EMBASE

## **6. Congenital lymphocytic choriomeningitis virus: A neuropathological study**

**Author(s):** Fallet-Bianco C.

**Source:** Canadian Journal of Neurological Sciences; Aug 2015; vol. 42

**Publication Date:** Aug 2015

**Publication Type(s):** Conference Abstract

**Abstract:** Lymphocytic choriomeningitis virus (LCMV) carried and secreted by mice, infects great numbers of people. LCMV infection acquired during childhood or adulthood is usually moderately symptomatic with a full recovery. When the infection occurs prenatally, it results in a wide spectrum of severe brain lesions described mainly on imaging. Neuropathological data have never been reported. We present 2 fetuses with a prenatal diagnosis of microcephaly with ventriculomegaly, abnormal gyration, and ponto-cerebellar hypoplasia in one case. Parents elected to terminate the pregnancy. A complete autopsy demonstrated no dysmorphic features, no visceral or skeletal malformation. Histological examination of viscera did not show any significant lesion. Neuropathological examination confirmed microcephaly and ventriculomegaly with a thick yellowish band surrounding the ventricles. Identical histological lesions were observed in both cases associating a polymicrogyria and a diffuse necrosis of parenchyma with massive calcifications all around the ventricles. The most characteristic feature was the unusual aspect of necrosis, distinct from that observed in other infections, characterized by a finely granular appearance looking like sand. Small lymphocytic infiltrates were observed in the leptomeninges and in the choroid but not in the retina. The congenital LCMV infection was confirmed by serologic testing. This study confirms the strong neurotropism of LCMV and demonstrates that prenatal infection has some particular features such as absent systemic signs, and distinct appearance of the necrosis that allow to distinguish it from other congenital infections and other non infectious conditions.

**Database:** EMBASE

## **7. Congenital lymphocytic choriomeningitis virus: When to consider the diagnosis**

**Author(s):** Anderson J.L.; Leonard K.B.; Levy P.T.; Cole F.S.; Smyser C.D.; Tychsens L.

**Source:** Journal of Child Neurology; Jun 2014; vol. 29 (no. 6); p. 837-842

**Publication Date:** Jun 2014

**Publication Type(s):** Article

**PubMedID:** 23666045

Available at [Journal of Child Neurology](#) - from ProQuest (Hospital Premium Collection) - NHS Version

Available at [Journal of Child Neurology](#) - from PubMed Central

**Abstract:**Lymphocytic choriomeningitis virus is a rodent-borne arenavirus that can cause congenital infection affecting the developing central nervous system. When the infection occurs during pregnancy, the virus targets the fetal brain and retina, potentially causing ventriculomegaly, hydrocephalus, chorioretinitis, and neurodevelopmental abnormalities. It has been previously suggested that lymphocytic choriomeningitis virus be added to the list of congenital infections currently included in the TORCH acronym (toxoplasmosis, rubella, cytomegalovirus, herpes, and syphilis). We present 2 neonates with antenatally known ventriculomegaly that were diagnosed with congenital lymphocytic choriomeningitis virus infection after birth. In addition to ventriculomegaly, one had nonimmune hydrops fetalis and the other had intracranial hemorrhage. In view of the seroprevalence of lymphocytic choriomeningitis virus (4.7%-10%), our findings suggest that screening for congenital lymphocytic choriomeningitis virus infection should be considered in fetuses and newborns with ventriculomegaly as well as other abnormal neuroimaging findings such as intracranial hemorrhage. © The Author(s) 2013.

**Database:** EMBASE

## **8. A small for gestational age newborn with microcephaly, an uncommon case of congenital infection**

**Author(s):** Alrifai W.; Zayek M.; Estrada B.; Custodio H.

**Source:** Journal of Investigative Medicine; Feb 2013; vol. 61 (no. 2); p. 410

**Publication Date:** Feb 2013

**Publication Type(s):** Conference Abstract

Available at [Journal of Investigative Medicine](#) - from ProQuest (Hospital Premium Collection) - NHS Version

Available at [Journal of Investigative Medicine](#) - from Ovid (LWW Total Access Collection 2015 - Q1 with Neurology)

**Abstract:**Case Report: A 1612 gram female born at 37 weeks gestation was noted to be small for gestational age and microcephalic. She was born to a 27 year old mother who visited daily during pregnancy, a house infested with rodents. Prenatal tests were negative for rubella, hepatitis B, syphilis, and human immunodeficiency virus. Serial sonograms showed intrauterine growth retardation and hydrocephalus. Physical exam showed weight, length, and head circumference all below 3rd percentile. The rest of the exam was unremarkable. Computed tomography scan of the brain showed severe brain atrophy, periventricular calcifications, ventriculomegaly, porencephaly, and cystic transformation of the periventricular white matter. Lab testing was negative for cytomegalovirus, herpes simplex virus, enterovirus, toxoplasma, HIV, and parvovirus. An indirect fluorescent antibody test for Lymphocytic Choriomeningitis Virus (LCMV) revealed elevated IgM and IgG antibodies. Discussion: LCMV is an enveloped single stranded RNA arena virus, for which the common house mouse, *Mus musculus*, is both the natural host and reservoir. It is believed that

congenital LCMV infection is an underdiagnosed disease. Infection during pregnancy may lead to spontaneous abortion, survivors have significant risk for neurologic and ophthalmologic dysfunction. Neurologic manifestations include microcephaly, seizures, jitteriness and abnormalities in muscle tone. Neuroimaging may add, periventricular calcifications, ventriculomegaly, hydrocephalus, cerebellar hypoplasia, encephalomalacia, and porencephalic cysts. Eye involvement is another characteristic feature with chorioretinitis seen in 93% of infants. Systemic signs outside of the nervous system are infrequent, therefore, infants suspected to have congenital infection but have signs limited to the central nervous system (CNS), LCMV should be considered. Diagnosis is made by immunofluorescent antibodies, enzyme-linked immunosorbent assay, or complement fixation detecting both IgM and IgG antibodies. The outcome is poor with cerebral palsy and other neurodisabilities may be seen. Treatment is supportive and management should aim for early behavioral and developmental interventions. As a preventive strategy, pregnant women should avoid exposure to rodents and their excreta.

**Database:** EMBASE

### **9. Viral replication and immune response differ after infection of first vs third trimester human placenta**

**Author(s):** Theiler R.N.; Peters. C.J.; Botting S.K.

**Source:** Reproductive Sciences; Mar 2011; vol. 18 (no. 3)

**Publication Date:** Mar 2011

**Publication Type(s):** Conference Abstract

**Abstract:**Objective: Lymphocytic choriomeningitis virus (LCMV) is a known human obstetric pathogen, but its incidence in humans is thought to be low. We sought to exploit these properties to evaluate the innate immune response to an RNA virus infection of first trimester and term human placenta. Methods: Human placenta and chorionic villi were collected from term cesarean deliveries and first trimester elective abortions. Placental explant cultures were infected with LCMV and treated with LPS and poly I:C. Viral titer was measured by plaque assay, and TNF-alpha secretion by ELISA. Induction of cytokine transcription was measured by quantitative real-time RT-PCR. Results: Viral replication was observed in first trimester chorionic villi, with secretion of infectious LCMV into the medium. No secretion of virus was detected after LCMV infection of term placental explants. Term placental explants exhibited a robust innate immune response to LCMV, marked by secretion of TNF-alpha. Transcription of ifn-alpha, IL-6, and TNF-alpha was also upregulated by 24 hours after viral infection of term explants. In contrast, LCMV infection of first trimester chorionic villi did not induce transcription of ifn-alpha, IL-6, or TNF-alpha. Lambda interferons (IL-29 and IL-28) were induced by poly I:C treatment of both first trimester and term tissues, but were not significantly upregulated by LCMV infection. Ifn-gamma was not induced by LCMV infection. Conclusions: First trimester and term human placenta differ in their permissibility for LCMV infection. A robust innate immune response to viral infection in term placental tissue may correlate with the inability of the virus to propagate in this tissue. Alternatively, the virus may more easily evade innate defenses in first trimester chorionic villi compared to term placenta. These results may explain the increased transplacental transmission of maternal viral infections during the first trimester of pregnancy.

**Database:** EMBASE

## **10. Characterization of lymphocytic choriomeningitis virus infection of human placenta**

**Author(s):** Appleton J.; Theiler R.N.

**Source:** Reproductive Sciences; Mar 2010; vol. 17 (no. 3)

**Publication Date:** Mar 2010

**Publication Type(s):** Conference Abstract

**Abstract:**Background: Lymphocytic choriomeningitis virus (LCMV) is a prototypical arenavirus that usually causes asymptomatic illness in the immunocompetent patient. However, there has been a recent rise in reported cases of congenital LCMV intrauterine infection, with associated adverse outcome of pregnancy. Inflammatory cytokines, such as interferon (IFN)-gamma, interleukin (IL)-6, and tumor necrosis factor (TNF)-alpha have been linked to adverse pregnancy outcomes. However, the relationship between productive viral infection and these placental inflammatory mediators remains unknown. We used LCMV as a model to study the innate immune response to viral infection in the placenta and its relationship with viral replication. Hypothesis: LCMV infects human placenta and induces an innate immune response marked by cytokine production. Methods: First trimester trophoblast cell line HTR8-SV40(HTR) was cultured using standard methods. Placental villi were excised from term placentas. Inoculation was performed with LCMV Armstrong strain. Plaque assays were used to assess replication of virus in HTR cells and term explants. Immunoassay was used to detect TNF-alpha, IFN-alpha, IFN-gamma, and IL-6 secretion in term explants, with confirmation by quantitative real-time reverse transcriptase polymerase chain reaction (RT-PCR). Results: LCMV exhibited replication in HTR cells, but did not replicate in term explants. Secretion of TNF-alpha was found in term placental explants infected with LCMV. Placental explants also demonstrated induction of IL-6 and IFN-alpha by RT-PCR, but an effect on IFN-gamma was not found. These data suggest that while LCMV may be capable of productive infection in first-trimester placenta (as represented by HTR cells), term placental villi are unable to support LCMV replication. However, abortive viral infection may still induce an inflammatory response from the placenta. Conclusions: The innate immune response to LCMV infection of term placental explants may prevent productive viral replication via a type I interferon pathway. LCMV NS3 protein is known to block interferon stimulated gene transcription in other systems, and LCMV replication is also known to be inhibited by interferon. Further experiments will determine whether replication of LCMV in HTR cells induces a similar interferon response. The absence of IFN-gamma production in response to viral infection of term placenta suggests further studies to characterize the maternal innate immune system.

**Database:** EMBASE

## **11. Lymphocytic choriomeningitis virus: a prenatal and postnatal threat.**

**Author(s):** Bonthius, Daniel J

**Source:** Advances in pediatrics; 2009; vol. 56 ; p. 75-86

**Publication Date:** 2009

**Publication Type(s):** Journal Article Review

**PubMedID:** 19968943

**Database:** Medline

**12. A case of congenital lymphocytic choriomeningitis virus (LCMV) infection revealed by hydrops fetalis.**

**Author(s):** Meritet, J F; Krivine, A; Lewin, F; Poissonnier, M H; Poizat, R; Loget, P; Rozenberg, F; Lebon, P

**Source:** Prenatal diagnosis; Jun 2009; vol. 29 (no. 6); p. 626-627

**Publication Date:** Jun 2009

**Publication Type(s):** Letter Case Reports

**PubMedID:** 19253314

Available at [Prenatal Diagnosis](#) - from Wiley Online Library Science , Technology and Medicine Collection 2017

**Database:** Medline

**13. Eye manifestations of intrauterine infections and their impact on childhood blindness.**

**Author(s):** Mets, Marilyn Baird; Chhabra, Manpreet Singh

**Source:** Survey of ophthalmology; 2008; vol. 53 (no. 2); p. 95-111

**Publication Date:** 2008

**Publication Type(s):** Research Support, Non-u.s. Gov't Journal Article Review

**PubMedID:** 18348876

**Abstract:**Intrauterine infections are important causes of childhood blindness in both developed and developing countries. Chorioretinal scars are the most characteristic eye manifestation of a congenital or prenatal infection. The various ocular manifestations of congenital infections, summarized by the mnemonic TORCH, and recent additions to the "other" category (lymphocytic choriomeningitis virus and West Nile virus) are discussed.

**Database:** Medline

#### **14. Viruses and other infections in stillbirth: what is the evidence and what should we be doing?**

**Author(s):** Rawlinson, W D; Hall, B; Jones, C A; Jeffery, H E; Arbuckle, S M; Graf, N; Howard, J; Morris, J M

**Source:** Pathology; Feb 2008; vol. 40 (no. 2); p. 149-160

**Publication Date:** Feb 2008

**Publication Type(s):** Journal Article Review

**PubMedID:** 18203037

Available at [Pathology](#) - from Ovid (LWW Total Access Collection 2015 - Q1 with Neurology)

**Abstract:** In Australia, as in other developed countries, approximately 40-50% of stillbirths are of unknown aetiology. Emerging evidence suggests stillbirths are often multifactorial. The absence of a known cause leads to uncertainty regarding the risk of recurrence, which can cause extreme anguish for parents that may manifest as guilt, anger or bewilderment. Further, clinical endeavours to prevent recurrences in future pregnancies are impaired by lack of a defined aetiology. Therefore, efforts to provide an aetiological diagnosis of stillbirth impact upon all aspects of care of the mother, and inform many parts of clinical decision making. Despite the magnitude of the problem, that is 7 stillbirths per 1000 births in Australia, diagnostic efforts to discover viral aetiologies are often minimal. Viruses and other difficult to culture organisms have been postulated as the aetiology of a number of obstetric and paediatric conditions of unknown cause, including stillbirth. Reasons forwarded for testing stillbirth cases for infectious agents are non-medical factors, including addressing all parents' need for diagnostic closure, identifying infectious agents as a sporadic cause of stillbirth to reassure parents and clinicians regarding risk for future pregnancies, and to reduce unnecessary testing. It is clear that viral agents including rubella, human cytomegalovirus (CMV), parvovirus B19, herpes simplex virus (HSV), lymphocytic choriomeningitis virus (LCMV), and varicella zoster virus (VZV) may cause intrauterine deaths. Evidence for many other agents is that minimal or asymptomatic infections also occur, so improved markers of adverse outcomes are needed. The role of other viruses and difficult-to-culture organisms in stillbirth is uncertain, and needs more research. However, testing stillborn babies for some viral agents remains a useful adjunct to histopathological and other examinations at autopsy. Modern molecular techniques such as multiplex PCR, allow searches for multiple agents. Now that such testing is available, it is important to assess the clinical usefulness of such testing.

**Database:** Medline

## **15. Congenital viral infections of the brain: Lessons learned from lymphocytic choriomeningitis virus in the neonatal rat**

**Author(s):** Bonthius D.J.; Perlman S.

**Source:** PLoS Pathogens; Nov 2007; vol. 3 (no. 11); p. 1541-1550

**Publication Date:** Nov 2007

**Publication Type(s):** Review

**PubMedID:** 18052527

Available at [PLoS Pathogens](#) - from PubMed Central

**Abstract:**The fetal brain is highly vulnerable to teratogens, including many infectious agents. As a consequence of prenatal infection, many children suffer severe and permanent brain injury and dysfunction. Because most animal models of congenital brain infection do not strongly mirror human disease, the models are highly limited in their abilities to shed light on the pathogenesis of these diseases. The animal model for congenital lymphocytic choriomeningitis virus (LCMV) infection, however, does not suffer from this limitation. LCMV is a well-known human pathogen. When the infection occurs during pregnancy, the virus can infect the fetus, and the developing brain is particularly vulnerable. Children with congenital LCMV infection often have substantial neurological deficits. The neonatal rat inoculated with LCMV is a superb model system of human congenital LCMV infection. Virtually all of the neuropathologic changes observed in humans congenitally infected with LCMV, including microencephaly, encephalomalacia, chorioretinitis, porencephalic cysts, neuronal migration disturbances, periventricular infection, and cerebellar hypoplasia, are reproduced in the rat model. Within the developing rat brain, LCMV selectively targets mitotically active neuronal precursors. Thus, the targets of infection and sites of pathology depend on host age at the time of infection. The rat model has further shown that the pathogenic changes induced by LCMV infection are both virus-mediated and immune-mediated. Furthermore, different brain regions simultaneously infected with LCMV can undergo widely different pathologic changes, reflecting different brain region-virus-immune system interactions. Because the neonatal rat inoculated with LCMV so faithfully reproduces the diverse neuropathology observed in the human counterpart, the rat model system is a highly valuable tool for the study of congenital LCMV infection and of all prenatal brain infections. In addition, because LCMV induces delayed-onset neuronal loss after the virus has been cleared, the neonatal rat infected with LCMV may be an excellent model system to study neurodegenerative or psychiatric diseases whose etiologies are hypothesized to be virus-induced, such as autism, schizophrenia, and temporal lobe epilepsy. © 2007 Bonthius and Perlman.

**Database:** EMBASE

## **16. Congenital lymphocytic choriomeningitis virus infection: spectrum of disease.**

**Author(s):** Bonthius, Daniel J; Wright, Rhonda; Tseng, Brian; Barton, Leslie; Marco, Elysa; Karacay, Bahri; Larsen, Paul D

**Source:** Annals of neurology; Oct 2007; vol. 62 (no. 4); p. 347-355

**Publication Date:** Oct 2007

**Publication Type(s):** Research Support, Non-u.s. Gov't Research Support, N.i.h., Extramural Journal Article

**PubMedID:** 17557350

Available at [Annals of neurology](#) - from Wiley Online Library Science , Technology and Medicine Collection 2017

**Abstract:**OBJECTIVE Lymphocytic choriomeningitis virus (LCMV) is a human pathogen and an emerging neuroteratogen. When the infection occurs during pregnancy, the virus can target and damage the fetal brain and retina. We examined the spectrum of clinical presentations, neuroimaging findings, and clinical outcomes of children with congenital LCMV infection. METHOD Twenty children with serologically confirmed congenital LCMV infection were identified. The children underwent neuroimaging studies and were followed prospectively for up to 11 years. RESULTS All children with congenital LCMV infection had chorioretinitis and structural brain anomalies. However, the presenting clinical signs, severity of vision disturbance, nature and location of neuropathology, and character and severity of brain dysfunction varied substantially among cases. Neuroimaging abnormalities included microencephaly, periventricular calcifications, ventriculomegaly, pachygyria, cerebellar hypoplasia, porencephalic cysts, periventricular cysts, and hydrocephalus. The combination of microencephaly and periventricular calcifications was the most common neuroimaging abnormality, and all children with this combination had profound mental retardation, epilepsy, and cerebral palsy. However, others had less severe neuroimaging abnormalities and better outcomes. Some children had isolated cerebellar hypoplasia, with jitteriness as their presenting sign and ataxia as their principal long-term neurological dysfunction. INTERPRETATION Congenital LCMV infection can have diverse presenting signs, neuroimaging abnormalities, and clinical outcomes. In the companion article to this study, we utilize an animal model to show that the clinical and pathological diversity in congenital LCMV infection is likely due to differences in the gestational timing of infection.

**Database:** Medline

### **17. Lymphocytic choriomeningitis virus infection: Neglected teratogenic zoonosis**

**Author(s):** Barton L.L.

**Source:** Current Women's Health Reviews; Nov 2006; vol. 2 (no. 4); p. 229-232

**Publication Date:** Nov 2006

**Publication Type(s):** Review

**Abstract:**Lymphocytic choriomeningitis virus (LCMV), a rodent-borne arenavirus, has been causally associated with postnatal and in utero infection. Although the consequences of acquired LCMV infection are generally benign, primarily a flu-like illness and aseptic meningitis, encephalitis has been reported. Fatalities are however, rare. Congenital LCMV infection has been recognized in Europe and the United States, yet the syndrome is rarely considered and, therefore, remains under-diagnosed. Chorioretinitis and hydrocephalus have been noted in 90% of the affected infants. Blindness, mental retardation and seizures have been the most prominent sequelae in these children. Education of pregnant women regarding the risks rodents and their excreta pose is feasible and should be commenced without delay. © 2006 Bentham Science Publishers Ltd.

**Database:** EMBASE

### **18. Lymphocytic choriomeningitis virus: an emerging obstetric pathogen?**

**Author(s):** Jamieson, Denise J; Kourtis, Athena P; Bell, Michael; Rasmussen, Sonja A

**Source:** American journal of obstetrics and gynecology; Jun 2006; vol. 194 (no. 6); p. 1532-1536

**Publication Date:** Jun 2006

**Publication Type(s):** Journal Article Review

**PubMedID:** 16731068

**Abstract:**A report in May 2005 from the Centers for Disease Control and Prevention describing a cluster of lymphocytic choriomeningitis virus (LCMV) infections among 4 solid organ recipients has increased awareness of and clinical interest in this pathogen. Human infection with LCMV results from direct or indirect contact with rodents. LCMV has particular relevance to obstetrics, as it is likely an under-recognized abortifacient and fetal teratogen. There have been 54 cases of congenital LCMV reported since 1955, with 34 of the cases diagnosed since 1993. Chorioretinitis and hydrocephalus are the predominant characteristics among children diagnosed with congenital LCMV infection. Obstetricians should educate their pregnant patients about the risks of exposure to laboratory, pet, and wild rodents.

**Database:** Medline

### **19. Lymphocytic choriomeningitis virus: emerging fetal teratogen.**

**Author(s):** Barton, Leslie L; Mets, Marilyn B; Beauchamp, Cynthia L

**Source:** American journal of obstetrics and gynecology; Dec 2002; vol. 187 (no. 6); p. 1715-1716

**Publication Date:** Dec 2002

**Publication Type(s):** Research Support, Non-u.s. Gov't Journal Article

**PubMedID:** 12501090

**Abstract:**Lymphocytic choriomeningitis virus (LCMV), a rodent-borne arenavirus, is an often undiagnosed human fetal teratogen. We describe a neonate born with hydrocephalus and chorioretinitis after maternal second-trimester symptomatic LCMV infection. Previously reported affected infants are reviewed. We strongly suggest that obstetricians counsel their pregnant patients regarding the potential hazard that contact with infected pet, laboratory, and household mice and hamsters poses to pregnant women and their unborn children.

**Database:** Medline

### **20. Congenital lymphocytic choriomeningitis virus infection: decade of rediscovery.**

**Author(s):** Barton, L L; Mets, M B

**Source:** Clinical infectious diseases : an official publication of the Infectious Diseases Society of America; Aug 2001; vol. 33 (no. 3); p. 370-374

**Publication Date:** Aug 2001

**Publication Type(s):** Journal Article Review

**PubMedID:** 11438904

Available at [Clinical infectious diseases : an official publication of the Infectious Diseases Society of America](#) - from Oxford Journals - Medicine

**Abstract:**Lymphocytic choriomeningitis virus (LCMV) is an underdiagnosed fetal teratogen. This diagnosis should be considered for infants and children with unexplained hydrocephalus, micro- or macrocephaly, intracranial calcifications, chorioretinitis, and nonimmune hydrops. The immunofluorescent antibody test is the only reasonable, commercially available, screening diagnostic tool. The differential diagnosis of congenital LCMV infection includes toxoplasmosis, rubella, cytomegalovirus, herpes simplex virus, enteroviruses, human parvovirus B19 [corrected], and syphilis. The infection has also been misdiagnosed as various neurologic, ophthalmologic, and chromosomal syndromes. Further research, to determine the prevalence of this infection in human and rodent populations, and prospective studies, to delineate the clinical spectrum of congenital infection, are needed. The public and members of the medical profession should be made aware of the hazard that wild, pet, and laboratory rodents pose to pregnant women.

**Database:** Medline

**21. Congenital lymphocytic choriomeningitis virus infection: an underdiagnosed disease.**

**Author(s):** Enders, G; Varho-Göbel, M; Löhler, J; Terletskaia-Ladwig, E; Eggers, M

**Source:** The Pediatric infectious disease journal; Jul 1999; vol. 18 (no. 7); p. 652-655

**Publication Date:** Jul 1999

**Publication Type(s):** Case Reports Journal Article

**PubMedID:** 10440448

Available at [The Pediatric infectious disease journal](#) - from Ovid (LWW Total Access Collection 2015 - Q1 with Neurology)

**Database:** Medline

**22. Lymphocytic choriomeningitis virus: pediatric pathogen and fetal teratogen.**

**Author(s):** Barton, L L; Mets, M B

**Source:** The Pediatric infectious disease journal; Jun 1999; vol. 18 (no. 6); p. 540-541

**Publication Date:** Jun 1999

**Publication Type(s):** Journal Article

**PubMedID:** 10391186

Available at [The Pediatric infectious disease journal](#) - from Ovid (LWW Total Access Collection 2015 - Q1 with Neurology)

**Database:** Medline

### **23. Congenital lymphocytic choriomeningitis virus syndrome: a disease that mimics congenital toxoplasmosis or Cytomegalovirus infection**

**Author(s):** Wright R.; Johnson D.; Neumann M.; Ksiazek T.G.; Rollin P.; Keech R.V.; Bonthius D.J.; Hitchon P.; Grose C.F.; Bell W.E.; Bale Jr. J.F.

**Source:** Pediatrics; Jul 1997; vol. 100 (no. 1)

**Publication Date:** Jul 1997

**Publication Type(s):** Review

**PubMedID:** 9200383

Available at [Pediatrics](#) - from HighWire - Free Full Text Full text is available free online for 4 years following an initial 1-year embargo after publication.

**Abstract:**OBJECTIVE: To describe the clinical characteristics of intrauterine infection with lymphocytic choriomeningitis (LCM) virus, an uncommonly recognized cause of congenital viral infection. PATIENTS: Three infants born in the midwestern United States in 1994 and 1995 with clinical features and serologic studies consistent with congenital LCM virus infection and cases of congenital infection identified by review of the medical literature between 1955 and 1996. RESULTS: Twenty-six infants with serologically confirmed congenital LCM virus infection were identified. Twenty-two infants were products of term gestations, and birth weights ranged from 2384 to 4400 g (median, 3520 g). Ocular abnormalities, macrocephaly, or microcephaly were the most commonly identified neonatal features. Twenty-one infants (88%) had chorioretinopathy, 10 (43%) had macrocephaly (head circumference >90th percentile) at birth, and 3 (13%) were microcephalic (head circumference <10th percentile). Macrocephaly and hydrocephalus developed postnatally in one of the latter infants. Hydrocephalus or intracranial calcifications were documented in five infants by computed tomography or magnetic resonance imaging. Nine infants (35%) died, and 10 (63%) of the 16 reported survivors had severe neurologic sequelae, consisting of spastic quadriplegia, seizures, visual loss, or mental retardation. One-half of the mothers reported illnesses compatible with LCM virus infection, and 25% reported exposures to rodents during their pregnancies. CONCLUSIONS: These cases suggest that congenital LCM virus infection could be an underrecognized cause of congenital infection among infants born in the United States. Because of the clinical similarities of these congenital infections, cases of congenital LCM virus infection can be confused with infections with cytomegalovirus or *Toxoplasma gondii*.

**Database:** EMBASE

### **24. Lymphocytic choriomeningitis virus: an unrecognized teratogenic pathogen.**

**Author(s):** Barton, L L; Peters, C J; Ksiazek, T G

**Source:** Emerging infectious diseases; 1995; vol. 1 (no. 4); p. 152-153

**Publication Date:** 1995

**Publication Type(s):** Journal Article

**PubMedID:** 8903188

Available at [Emerging Infectious Diseases](#) - from PubMed Central

**Database:** Medline

**25. Mechanisms of antibody-mediated protection against lymphocytic choriomeningitis virus infection: mother-to-baby transfer of humoral protection.**

**Author(s):** Baldrige, J R; Buchmeier, M J

**Source:** Journal of virology; Jul 1992; vol. 66 (no. 7); p. 4252-4257

**Publication Date:** Jul 1992

**Publication Type(s):** Research Support, U.s. Gov't, Non-p.h.s. Journal Article Research Support, U.s. Gov't, P.h.s.

**PubMedID:** 1376367

Available at [Journal of Virology](#) - from PubMed Central

**Abstract:**The role of antiviral antibodies in resistance to lymphocytic choriomeningitis virus (LCMV) infection was explored. Immune serum and monoclonal antibodies prevented fatal T-cell-mediated immunopathology following acute LCMV infections. In addition, 10- and 14-day-old mice that received maternally derived anti-LCMV antibodies through nursing were protected from an otherwise lethal LCMV challenge. Detailed investigation of the mechanism(s) by which these antiviral antibodies provided was carried out by using anti-LCMV monoclonal antibodies. Protection correlated directly with the ability of the antibodies to reduce viral titers in the tissues of conventional (K. E. Wright and M. J. Buchmeier, J. Virol. 65:3001-3006, 1991) and nude mice. However, this reduction was not simply a reflection of virus neutralizing activity, since not all antibodies which neutralized in vitro were protective. A correlation was also found between immunoglobulin isotype and protection: all of the protective antibodies were immunoglobulin G2a (IgG2a), while IgG1 antibodies mapping to the same epitopes were not. Protection appeared to be associated with events controlled by the Fc region. Functional F(ab')<sub>2</sub> fragments which retained in vitro neutralizing activity were not protective in vivo. Furthermore, this Fc-associated function was not related to complement-mediated cell lysis, since C5-deficient mouse strains were also protected. These results suggest a role for antibody in protection from arenavirus infections and indicate that a distinct immunoglobulin subclass, IgG2a, may be essential for this protection.

**Database:** Medline

**26. Prenatal lymphocytic choriomeningitis (LCM): three new cases**

**Author(s):** Sheinbergas M.M.; Kilchavskiene V.V.; Tulevichiene J.P.

**Source:** Infection; 1984; vol. 12 (no. 2); p. 105-106

**Publication Date:** 1984

**Publication Type(s):** Article

**PubMedID:** 6539756

Available at [Infection](#) - from SpringerLink

**Database:** EMBASE

## **27. Hydrocephalus due to prenatal infection with the lymphocytic choriomeningitis virus**

**Author(s):** Sheinbergas M.M.

**Source:** Infection; 1976; vol. 4 (no. 4); p. 185-191

**Publication Date:** 1976

**Publication Type(s):** Article

**PubMedID:** 1017876

Available at [Infection](#) - from SpringerLink

**Abstract:**The results are presented of serological examinations in a total of 4235 subjects including blood donors (341 persons), pregnant women (1784), newborns (833), patients with malignant tumors (248), patients with influenza-like diseases (548), patients with abacterial meningitis (295), infants under one year with hydrocephalus (40), infants under two years with other nervous system diseases (110), mothers of seropositive children with hydrocephalus (12) and mothers of seronegative children with hydrocephalus (24). The investigations revealed 16 cases of serologically confirmed prenatal lymphocytic choriomeningitis virus infection. Immunofluorescent antibody to this virus was detected in the children in most cases at high titers and in their mothers at moderate and low titers. In 14 children hydrocephalus was manifest, one child was suffering from infantile cerebral palsy, and one child from congenital right side blepharoptosis. Foci of chorioretinal degeneration were found in 14 patients. During pregnancy six mothers had an influenza-like illness; the other ten mothers denied any disease associated with fever.

**Database:** EMBASE

## **28. Effect on the fetus of maternal infection with lymphocytic choriomeningitis (LCM) virus.**

**Author(s):** Mims, C A

**Source:** The Journal of infectious diseases; Nov 1969; vol. 120 (no. 5); p. 582-597

**Publication Date:** Nov 1969

**Publication Type(s):** Journal Article

**PubMedID:** 4186686

**Database:** Medline

## Strategy 494989

#	Database	Search term	Results
1	Medline	exp "LYMPHOCYTIC CHORIOMENINGITIS VIRUS"/	2564
2	Medline	("lymphocytic choriomeningitis").ti,ab	2903
3	Medline	(1 OR 2)	3585
4	Medline	(pregnan*).ti,ab	448978
5	Medline	exp PREGNANCY/	840380
6	Medline	(4 OR 5)	936037
7	Medline	(3 AND 6)	77
8	EMBASE	exp "LYMPHOCYTIC CHORIOMENINGITIS VIRUS"/ OR exp "LYMPHOCYTIC CHORIOMENINGITIS"/	3523
9	EMBASE	("lymphocytic choriomeningitis").ti,ab	2932
10	EMBASE	(8 OR 9)	4017
11	EMBASE	(pregnan*).ti,ab	559299
12	EMBASE	exp PREGNANCY/	606151
13	EMBASE	(11 OR 12)	806844
14	EMBASE	(10 AND 13)	75
15	EMBASE	exp "PLACENTAL TRANSFER"/	9156
16	EMBASE	(10 AND 15)	9
17	Medline	exp "INFECTIOUS DISEASE TRANSMISSION, VERTICAL"/	14435

18	Medline	(3 AND 17)	5
19	EMBASE	exp "VERTICAL TRANSMISSION"/	13261
20	EMBASE	(10 AND 19)	8