**Encephalitis**

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| **Encephalitis** | |
| *Classification and external resources* | |
| Coronal T2-weighted MR image shows high signal in the temporal lobes including hippocampal formations and parahippocampal gyrae, insulae, and right inferior frontal gyrus. A brain biopsy was performed and the histology was consistent with encephalitis. PCR was repeated on the biopsy specimen and was positive for HSV | |
| [**ICD**](http://en.wikipedia.org/wiki/International_Statistical_Classification_of_Diseases_and_Related_Health_Problems)**-**[**10**](http://en.wikipedia.org/wiki/ICD-10) | [A](http://en.wikipedia.org/wiki/ICD-10_Chapter_A)[83](http://apps.who.int/classifications/icd10/browse/2010/en#/A83)-[A](http://en.wikipedia.org/wiki/ICD-10_Chapter_A)[86](http://apps.who.int/classifications/icd10/browse/2010/en#/A86), [B](http://en.wikipedia.org/wiki/ICD-10_Chapter_B)[94.1](http://apps.who.int/classifications/icd10/browse/2010/en#/B94.1), [G](http://en.wikipedia.org/wiki/ICD-10_Chapter_G)[05](http://apps.who.int/classifications/icd10/browse/2010/en#/G05) |
| [**ICD**](http://en.wikipedia.org/wiki/International_Statistical_Classification_of_Diseases_and_Related_Health_Problems)**-**[**9**](http://en.wikipedia.org/wiki/List_of_ICD-9_codes) | [323](http://www.icd9data.com/getICD9Code.ashx?icd9=323) |
| [**DiseasesDB**](http://en.wikipedia.org/wiki/Diseases_Database) | [22543](http://www.diseasesdatabase.com/ddb22543.htm) |
| [**MedlinePlus**](http://en.wikipedia.org/wiki/MedlinePlus) | [001415](http://www.nlm.nih.gov/medlineplus/ency/article/001415.htm) |
| [**eMedicine**](http://en.wikipedia.org/wiki/EMedicine) | [emerg/163](http://www.emedicine.com/emerg/topic163.htm) |
| [**MeSH**](http://en.wikipedia.org/wiki/Medical_Subject_Headings) | [D004660](http://www.nlm.nih.gov/cgi/mesh/2013/MB_cgi?field=uid&term=D004660) |

**Encephalitis** is an [acute](http://en.wikipedia.org/wiki/Acute_(medical)) [inflammation](http://en.wikipedia.org/wiki/Inflammation) of the [brain](http://en.wikipedia.org/wiki/Human_brain). Encephalitis with [meningitis](http://en.wikipedia.org/wiki/Meningitis) is known as [meningoencephalitis](http://en.wikipedia.org/wiki/Meningoencephalitis). Symptoms include [headache](http://en.wikipedia.org/wiki/Headache), [fever](http://en.wikipedia.org/wiki/Fever), [confusion](http://en.wikipedia.org/wiki/Confusion), [drowsiness](http://en.wikipedia.org/wiki/Drowsiness), and [fatigue](http://en.wikipedia.org/wiki/Fatigue_(medical)). More advanced and serious symptoms include [seizures](http://en.wikipedia.org/wiki/Seizure) or [convulsions](http://en.wikipedia.org/wiki/Convulsions), [tremors](http://en.wikipedia.org/wiki/Tremors), [hallucinations](http://en.wikipedia.org/wiki/Hallucinations), and [memory problems](http://en.wikipedia.org/wiki/Memory_problems).

**Cause**

**Viral**

Main article: [Viral encephalitis](http://en.wikipedia.org/wiki/Viral_encephalitis)

Viral encephalitis can occur either as a direct effect of an acute infection, or as one of the [sequelae](http://en.wikipedia.org/wiki/Sequelae) of a latent infection. The most common causes of acute viral encephalitis are [rabies virus](http://en.wikipedia.org/wiki/Rabies_virus), [Herpes simplex](http://en.wikipedia.org/wiki/Herpes_simplex), [poliovirus](http://en.wikipedia.org/wiki/Poliovirus), [measles virus](http://en.wikipedia.org/wiki/Measles_virus), and [JC virus](http://en.wikipedia.org/wiki/JC_virus). Other causes include infection by [flaviviruses](http://en.wikipedia.org/wiki/Flavivirus) such as [Japanese encephalitis virus](http://en.wikipedia.org/wiki/Japanese_encephalitis_virus), [St. Louis encephalitis virus](http://en.wikipedia.org/wiki/St._Louis_encephalitis_virus) or [West Nile virus](http://en.wikipedia.org/wiki/West_Nile_virus), or by [Togaviridae](http://en.wikipedia.org/wiki/Togaviridae) such as [Eastern equine encephalitis virus](http://en.wikipedia.org/wiki/Eastern_equine_encephalitis_virus) (EEE virus), [Western equine encephalitis virus](http://en.wikipedia.org/wiki/Western_equine_encephalitis_virus) (WEE virus) or [Venezuelan equine encephalitis virus](http://en.wikipedia.org/wiki/Venezuelan_equine_encephalitis_virus) (VEE virus). Henipaviruses; Hendra (HeV) and Nipah (NiV), are also known to cause viral encephalitis.

**Bacterial and other**

It can be caused by a [bacterial](http://en.wikipedia.org/wiki/Bacteria) infection, such as bacterial [meningitis](http://en.wikipedia.org/wiki/Meningitis), spreading directly to the brain (primary encephalitis), or may be a complication of a current infectious disease [syphilis](http://en.wikipedia.org/wiki/Syphilis) (secondary encephalitis). Certain [parasitic](http://en.wikipedia.org/wiki/Parasitic) or [protozoal](http://en.wikipedia.org/wiki/Protozoa) infestations, such as [toxoplasmosis](http://en.wikipedia.org/wiki/Toxoplasmosis), [malaria](http://en.wikipedia.org/wiki/Malaria), or [primary amoebic meningoencephalitis](http://en.wikipedia.org/wiki/Primary_amoebic_meningoencephalitis), can also cause encephalitis in people with [compromised](http://en.wikipedia.org/wiki/Immune_deficiency) [immune systems](http://en.wikipedia.org/wiki/Immune_system). [Lyme disease](http://en.wikipedia.org/wiki/Lyme_disease) and/or Bartonella henselae may also cause encephalitis. [Cryptococcus neoformans](http://en.wikipedia.org/wiki/Cryptococcus_neoformans) is notorious for causing fungal encephalitis in the immunocompromised. [Streptococci](http://en.wikipedia.org/wiki/Streptococci), [staphylococci](http://en.wikipedia.org/wiki/Staphylococci) and certain [Gram-negative bacilli](http://en.wikipedia.org/wiki/Gram-negative_bacteria) cause cerebritis prior to the formation of a brain abscess.

[Autoimmune disease](http://en.wikipedia.org/wiki/Autoimmune_disease) may also cause encephalitis.

**Diagnosis**

Adult patients with encephalitis present with acute onset of fever, headache, confusion, and sometimes seizures. Younger children or infants may present irritability, poor appetite and fever.

Neurological examinations usually reveal a drowsy or confused patient. Stiff neck, due to the irritation of the meninges covering the brain, indicates that the patient has either meningitis or meningoencephalitis. Examination of the [cerebrospinal fluid](http://en.wikipedia.org/wiki/Cerebrospinal_fluid) obtained by a [lumbar puncture](http://en.wikipedia.org/wiki/Lumbar_puncture) procedure usually reveals increased amounts of protein and white blood cells with normal glucose, though in a significant percentage of patients, the cerebrospinal fluid may be normal. [CT scan](http://en.wikipedia.org/wiki/Computed_tomography) often is not helpful, as cerebral abscess is uncommon. Cerebral abscess is more common in patients with meningitis than encephalitis. Bleeding is also uncommon except in patients with [herpes simplex](http://en.wikipedia.org/wiki/Herpes_simplex) type 1 encephalitis. [Magnetic resonance imaging](http://en.wikipedia.org/wiki/Magnetic_resonance_imaging) offers better resolution. In patients with herpes simplex encephalitis, electroencephalograph may show sharp waves in one or both of the temporal lobes. Lumbar puncture procedure is performed only after the possibility of prominent brain swelling is excluded by a CT scan examination. Diagnosis is often made with detection of antibodies in the cerebrospinal fluid against a specific viral agent (such as herpes simplex virus) or by [polymerase chain reaction](http://en.wikipedia.org/wiki/Polymerase_chain_reaction) that amplifies the [RNA](http://en.wikipedia.org/wiki/RNA) or [DNA](http://en.wikipedia.org/wiki/DNA) of the virus responsible (such as [varicella zoster virus](http://en.wikipedia.org/wiki/Varicella_zoster_virus)). Serological tests may show high antibody titre against the causative antigen.

**Treatment**

Treatment is usually [symptomatic](http://en.wikipedia.org/wiki/Symptomatic_treatment). Reliably tested specific antiviral agents are few in number (e.g. [acyclovir](http://en.wikipedia.org/wiki/Acyclovir) for [herpes simplex virus](http://en.wikipedia.org/wiki/Herpes_simplex_virus)) and are used with limited success in treatment of viral infection, with the exception of herpes simplex encephalitis. In patients who are very sick, supportive treatment, such as mechanical ventilation, is equally important. Corticosteroids (e.g., [methylprednisolone](http://en.wikipedia.org/wiki/Methylprednisolone)) are used to reduce brain swelling and inflammation. Sedatives may be needed for irritability or restlessness. For *Mycoplasma* infection, [parenteral](http://en.wikipedia.org/wiki/Parenteral) [tetracycline](http://en.wikipedia.org/wiki/Tetracycline) is given. Encephalitis due to *Toxoplasma* is treated by giving a combination of [pyrimethamine](http://en.wikipedia.org/wiki/Pyrimethamine) and [sulphadimidine](http://en.wikipedia.org/wiki/Sulphadimidine).

**Prevention**

Post-infectious encephalomyelitis complicating [small pox](http://en.wikipedia.org/wiki/Small_pox) vaccination is totally avoidable now as small pox is now eradicated. Contraindication to Pertussis immunisation should be observed in patients with encephalitis. An immunodeficient patient who has had contact with [chicken pox](http://en.wikipedia.org/wiki/Chicken_pox) virus should be given [prophylaxis](http://en.wikipedia.org/wiki/Prophylaxis) with hyperimmune zoster [immunoglobulin](http://en.wikipedia.org/wiki/Immunoglobulin).

**Encephalitis lethargica**

Main article: [Encephalitis lethargica](http://en.wikipedia.org/wiki/Encephalitis_lethargica)

[Encephalitis lethargica](http://en.wikipedia.org/wiki/Encephalitis_lethargica) is an atypical form of encephalitis which caused an [epidemic](http://en.wikipedia.org/wiki/Epidemic) from 1918 to 1930. Those who survived sank into a semi-conscious state that lasted for decades. Neurologist [Oliver Sacks](http://en.wikipedia.org/wiki/Oliver_Sacks) used the Parkinson's drug [L-DOPA](http://en.wikipedia.org/wiki/L-DOPA) to revive those still alive in the late 1960s.

There have been only a small number of isolated cases in the years since, though in recent years a few patients have shown very similar symptoms. The cause is now thought to be either a bacterial agent or an autoimmune response following infection.

**Limbic system encephalitis**

In a large number of cases, called [limbic encephalitis](http://en.wikipedia.org/wiki/Limbic_encephalitis), the pathogens responsible for encephalitis attack primarily the [limbic system](http://en.wikipedia.org/wiki/Limbic_system) (a collection of structures at the base of the brain responsible for emotions and many other basic functions).

**Epidemiology**

The [incidence](http://en.wikipedia.org/wiki/Incidence_(epidemiology)) of acute encephalitis in Western countries is 7.4 cases per 100,000 population per year. In tropical countries, the incidence is 6.34 per 100,000 per year.

Herpes simplex encephalitis has an incidence of 2–4 per million population per year.

**Also see**

* [I'm Not The Me I Remember : Fighting Encephalitis](http://www.inspire.com/static/inspire/reports/inspire-encephalitis-global-fighting-encephalitis.pdf) A special report from Inspire and Encephalitis Global Inc. in recognition of Rare Disease Day 2012
* [Fighting Encephalitis Video](http://www.youtube.com/watch?v=g1oFPdzjyl8)
* [Awakenings](http://en.wikipedia.org/wiki/Awakenings)
* Chronic Fatigue Syndrome aka [Myalgic Encephalomyelitis](http://en.wikipedia.org/wiki/Myalgic_Encephalomyelitis)
* [Rasmussen's encephalitis](http://en.wikipedia.org/wiki/Rasmussen%27s_encephalitis)

[Mystery illness - ovarian teratoma associated encephalitis](http://www.abc.net.au/radionational/programs/healthreport/mystery-illness---ovarian-teratoma-associated/3665130)(audio report)

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  5. [**^**](http://en.wikipedia.org/wiki/Encephalitis#cite_ref-5#cite_ref-5) [What is encephalitis? (Ahmed Reda Abolmaaty Mansoura School of Medicine, Egypt)](http://www.interactive-biology.com/3321/what-is-encephalitis/)
* Shaw PJ, Walls TJ, Newman PK, Cleland PG, Cartlidge NE (February 1991). "Hashimoto's encephalopathy: a steroid-responsive disorder associated with high anti-thyroid antibody titers—report of 5 cases". *Neurology* **41** (2 (Pt 1)): 228–33.

**External links**

* [FACES 2012 : AN OPPORTUNITY FOR EDUCATION & SUPPORT](http://www.encephalitisglobal.org/faces2012.html) featuring DR. ARUN VENKATESAN, Director of the Encephalitis Center at Johns Hopkins University and DR. CAROL GLASER of the California Department of Public Health and the California Encephalitis Project
* [WHO: Viral Encephalitis](http://www.who.int/health_topics/encephalitis/en/)
* [MR & CT scan diagnosis of HSV encephalitis](http://rad.usuhs.edu/medpix/kiosk_image.html?mode=answer&pt_id=11497&imageid=55536&quiz=no) Medical Image Database.