

**HAEMOPHILUS INFLUENZAE - TYPE B**



*The shattered remnants of General Hood's Army, fall back into Atlanta, September 1864, (still from "Gone with the Wind" 1939).*

*"Atlanta is gone. That agony is over. There is no hope, but we will try to have no fear".  
(Mary Chesnut).*

*"I think I understand the purpose of the South properly. The best way to deal with them is to meet them fairly on any issue. We must fight them, cut into them, not talk to them, and pursue till they cry enough! War is the remedy our enemies have chosen, and I say let us give them all they want".  
(William Tecumseh Sherman).*

*On the same day that Grant stepped off into the Wilderness, Sherman's grand army of the west moved south from Chattanooga towards Atlanta 100 miles away. William Tecumseh Sherman and Ulysses S. Grant had survived hard times together. Their friendship had been forged in Kentucky when Sherman came close to breaking down, persuaded the war would never end.*

*"Grant stood by me when I was crazy. I stood by him when he was drunk, and now we stand by each other always", (William Tecumseh Sherman)*

*Sherman was an orphan and had graduated sixth in his class at West Point when he was only twenty. Tall, red-haired, intelligent, and irritable, he wore shoes rather than military boots, slept little, talked a lot, "Boiling over with ideas", a friend said. "He was always too busy to eat much. He talked and smoked cigars incessantly, giving orders, dictating telegrams, bright and chipper".*

*He hated politicians, profiteers, sentimentalists. above all, he hated reporters, whom he considered worse than spies because they printed military secrets just to sell newspapers.*

*"These dirty newspaper scribblers have the impudence of Satan. They come into camp, poke about among the lazy shirks, pick up camp rumors, and publish them as facts. they are a pest, and I treat them as spies, which, in truth, they are". (William Tecumseh Sherman)*

*He was convinced if he killed them all, there would be news from hell before breakfast. Family and friends called him "Cump". His men called him "Uncle Billy". He was ruthless in war.*

*Now Grant entrusted his friend with the second most important part of his grand strategy - to seize Atlanta and smash the combined confederate armies of Tennessee and Mississippi under Joseph E. Johnston. In Washington, Lincoln's chances for re-election were slim. "I'm going to be beaten", Lincoln wrote that summer, "and unless some great change takes place, badly beaten".*

*With Grant stalled at Petersburg, **Sherman had to win** .....*

*"Mine eyes have beheld the promised land! The domes and spires of Atlanta are glittering in the sunlight before us and only 8 miles distant". (William Tecumseh Sherman)*

*Finally, Sherman was at Atlanta. For more than two months, Confederate general Joseph Johnston had kept his army intact, dodging Sherman's superior force and looking for the right moment to attack. The opportunity never came. An increasingly frustrated Jefferson Davis now removed the popular Johnston. His troops were stunned.*

*"The news came like a flash of lightning, staggering and blinding everyone. Farewell, old fellow! We privates loved you because you made us love ourselves". (Sam Watkins).*

*Joseph Johnston's replacement was 33 year-old John Bell Hood of Texas. His arm had been mangled at Gettysburg, and he'd lost a leg at Chickamauga, but his recklessness remained intact. His men called him "old wooden head".*

*"Hood is a bold fighter. I am doubtful as to other qualities necessary". (Robert E. Lee)*

*Sherman was delighted with Hood, sure he would be attacked at last. Many of his units were now armed with Henry repeating rifles, capable of firing 15 shots without being reloaded. Outgunned rebels complained the Yankees could now load on a Sunday and keep shooting all week. To cut off Atlanta's rail links with Richmond, Sherman sent 35 year-old general James Macpherson's army east of the city.*

*McPherson was a special favorite of Sherman's - handsome, warm-hearted, intelligent. "If he lives", Sherman predicted, "He'll outdistance Grant and myself".*

*Northern papers cheered the Union advance and daily predicted Atlanta's fall. But on July 22nd, Hood rushed to counter the new Union threat. The battle of Atlanta had begun.*

*It raged all afternoon, the lines forming, falling back, reforming, attacking again. At 2:00, general McPherson himself went to inspect the imperiled Union position and rode right into a band of rebel skirmishers. Ordered to surrender, McPherson raised his hat politely, turned his horse about, and raced for the Union lines. The rebels shot him in the back. Sherman covered the body of his young friend with an American flag and wept.*

*"Sherman had the rare faculty of remaining calm under great responsibilities and scenes of great excitement. At such times, his eccentricities disappeared. His mind seemed never so clear, his confidence never so strong, his spirit never so inspiring in the crisis of some fierce struggle, like that of the day when McPherson fell in front of Atlanta". (General Jacob D. Cox).*

*Crying "McPherson and revenge, boys, McPherson and revenge", the Union army smashed down on the Rebels. In less than 30 minutes, Hood was forced to withdraw. At Ezra church, west of the city, Hood again tried to rout Sherman's army. Again he failed. One third of his army was gone - 20,000 men. And Hood fell back into Atlanta.*

*"I cannot describe it. I remember I went in the rear of the building, and there I saw a pile of arms and legs rotting and decomposing. I have no recollection in my whole life of ever seeing anything that I remember with more horror". (Sam Watkins).*

*Behind their ramparts, the Confederates waited for Sherman to attack.*

*"The Yankee gents can't get their men to charge our works", a Texan said, but Sherman saw no need to be so rash. He sealed off the city's supplies and waited. Federal guns began shelling the heavily fortified Confederate trenches and the city beyond.*

*"Saturday, August 21st. Another week of anxiety and suspense has passed, and the fate of Atlanta is still undecided. It is said that about 20 lives had been destroyed by these*

*terrible missiles since the enemy began to throw them into the city. It is like living in the midst of a pestilence. No one can tell, but he may be the next victim". (Atlanta Housewife)*

*Outside Atlanta, things were no better. "The enemy hold us by an inferior force". Sherman admitted as the siege dragged on. "We are more besieged than they are!"*

*"Both Grant and Sherman", George Templeton Strong predicted from New York, "are on the eve of disaster".*

*Every evening for a month during the siege, a Georgia sharpshooter played his cornet so beautifully that men on both sides stopped to listen.*

*Finally, on August 31st, the same day that George McClellan was nominated for President, Sherman hurled most of his army against the Macon & Western railroad in one more attempt to break Hood's grip. It worked. September 1, 1864, Hood abandoned Atlanta. Sherman's troops marched in the next day.*

*"Atlanta is ours and fairly won!"  
(William Tecumseh Sherman)*

*"September 3, 1864. Glorious news this morning - Atlanta taken at last. It is, coming at this political crisis, the greatest event of the war!"  
(George Templeton Strong).*

*"Dear General Sherman, I feel you have accomplished the most gigantic undertaking given to any general in this war and with a skill and ability that will be acknowledged in history as unsurpassed, if not unequalled."  
(U.S. Grant).*

*In Sherman's honor, Grant ordered a 100 gun salute fired into the Confederate works at Petersburg.*

*"Atlanta is gone. That agony is over. There is no hope, but we will try to have no fear".  
(Mary Chesnut).*

*Ken Burns, "The Civil War", 1990.*

*From one of the most famous scenes in the immortal "Gone with the Wind" we see the shattered remnants of General Hood's Confederate army inside Atlanta. As the camera zooms outward a tattered Rebel flag comes into focus in the foreground, a dramatic symbol of the demise of Hood's army. With Ulysses S. Grant stalled outside Petersburg unable to end the war in the east, and with Lincoln facing almost certain defeat in the coming Presidential elections, it seemed that although so close to military victory, the Union was now likely to be lost courtesy the political arena. If this wasn't bad enough the Democrat candidate that was opposing Lincoln was none other than General George B. McClellan, the General who he had dismissed as head of the army following his failure to go after Lee, in the immediate aftermath of the Battle of Antietam. McClellan was standing on a platform of reconciliation with the South and a negotiated end to the Civil*

*War. If McClellan won the election then the cause of Union would be lost - and in consequence hundreds of thousands of lives would have been lost in vain. Now politics was an even more vital theatre of conflict than the battlefield. The only way the situation could be saved would be a victory so significant on the battlefield, that it would catapult Lincoln back into politician contention. Lincoln simply had to have a major military victory, and with the election only weeks away he had to have it now.....then came William Tecumseh Sherman's stunning telegram - the most famous communiqué of the war; "Atlanta is ours and fairly won!"*

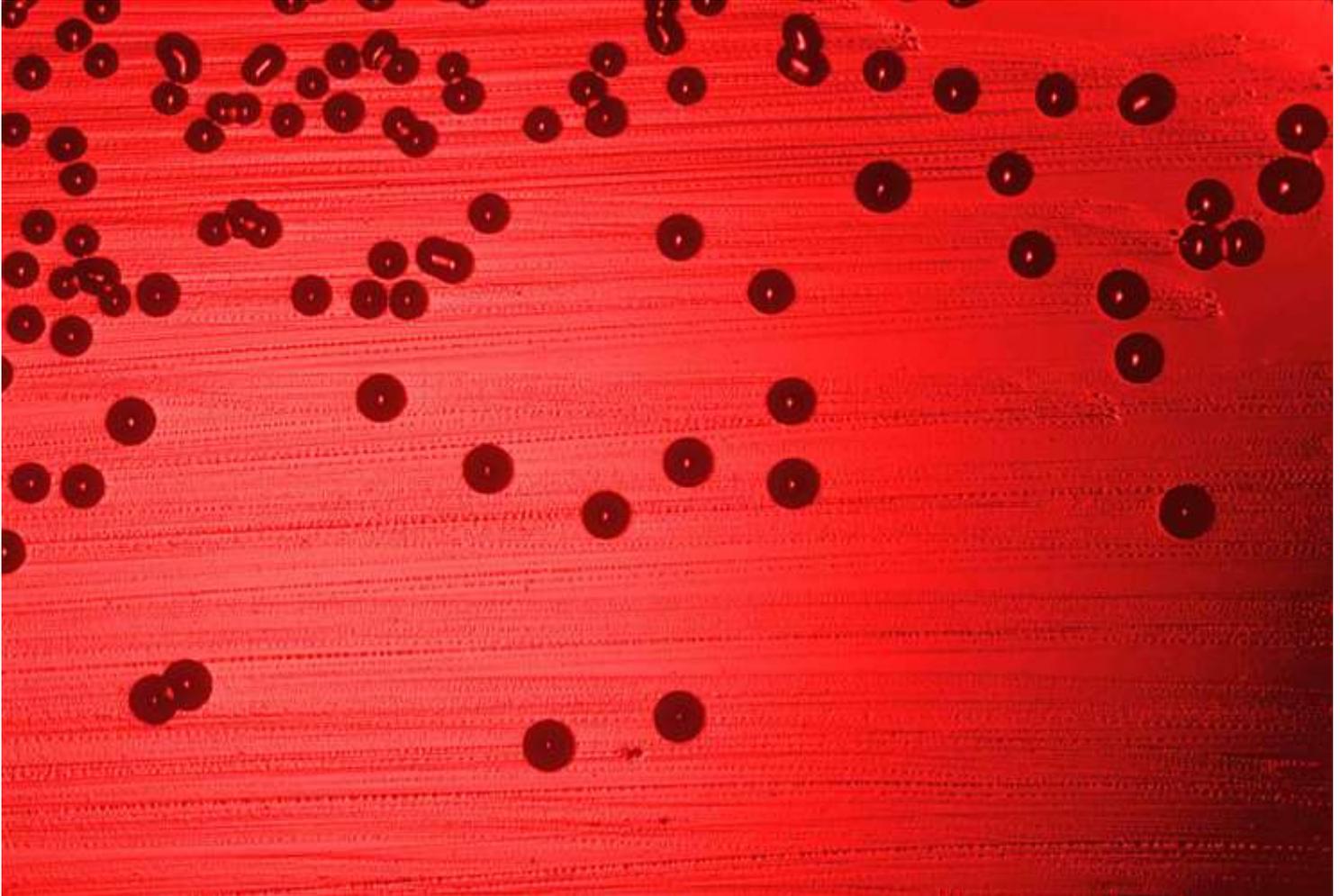
*Lincoln would go on to defeat McClellan in a landslide.*

*The famous scene of General Hood's defeated army shows us how easily susceptible soldiers of the day were to infectious disease - a major killer during the Civil War. Closely packed men, in a poor state of health, exposed to the elements, hypothermic or heat struck, starving, many with horrendous and septic wounds from battle, it was a rich milieu for the rampant spread of infectious disease, especially for the rural men, whose immune systems were not as used to disease as the city dwellers. If the wounded survived their injuries measles and pneumonia contracted in the hospitals of the day would still likely kill them in the end. Among the cases of pneumonia the organism Hemophilus influenzae would have been a major contributor. Even by the age of antibiotics in the second half of the twentieth century, this fearful organism remained a steady taker of young lives. It would not be until the last decade of the twentieth century that final victory over this pathogen would be achieved. The Battle of Atlanta was the military victory that Lincoln had to have, in order to gain the greater political victory. And so it was with the victory over the deadly enemy Hemophilus influenzae - vaccination gave us the necessary military victory, which in turn enabled an even greater political victory - free and universal immunization for all children.*



*...There is no hope, but we will try to have no fear ....Rhett Butler and Scarlett O'Hara comfort each other while Atlanta burns....*

## HAEMOPHILUS INFLUENZAE - TYPE B



*Blood agar plate culture of Haemophilus influenzae*

### Introduction

**Haemophilus influenzae type B** (or “**Hib**”) is an invasive pathogen that can cause life threatening disease.

Clinical disease can manifest as:

*Most seriously as:*

1. **Meningitis**
2. **Epiglottitis**
3. **Pneumonia**
4. Purulent bacterial pericarditis / endocarditis (uncommon)

*Less seriously as:*

4. Septic Arthritis/ osteomyelitis
5. Cellulitis
  - A rapidly progressing skin infection, usually involves the face, head or neck
6. Otitis media

The most serious manifestations are **meningitis** and **epiglottitis**

**Meningitis and epiglottitis are nearly always fatal without appropriate treatment.**

Due to widespread **vaccination**, Hib outbreaks are now fortunately **rare** in Australia.

**See also separate documents:**

- **Meningitis Bacterial (in Infectious Diseases folder).**
- **Epiglottitis (in ENT folder)**

### History

H. influenzae was first described in 1892 by the German physician and bacteriologist **Richard Pfeiffer** (1858 - 1945) during an influenza pandemic.

The bacterium was mistakenly considered to be the cause of influenza (hence the name “influenzae”) until 1933, when the viral cause of influenza was discovered.

In 1995 the species became the first free-living organism to have its entire genome sequenced.

Routine Hib vaccine was introduced in Australia in 1993 which greatly diminished the incidence of serious infection with this organism.

### Epidemiology

**Due to widespread vaccination, Hib outbreaks are now rare in Australia.**

Before the introduction of Hib vaccine to the routine immunization schedule in 1993, Hib disease was the **most common serious invasive bacterial infection in children.**

At this time, there were at least 500 cases of Hib disease annually in Australia in children under 6 years of age.

There were 10 - 15 deaths per year, and 40 % of survivors had neurological sequelae such as deafness and intellectual impairment.

Aboriginal and Torres Strait Islander children were at 5 -6 times greater risk of developing Hib disease and acquired it at a much younger age than non-Indigenous children.

By 1998, the number of notified cases in Australia had decreased by more than 90 %.

The number of notified cases has continued to fall. Invasive

Hib disease is now only **very rarely** seen in Victorian children. There has been no evidence of a shift in Hib cases to older age groups.

Hib epiglottitis may still occur, particularly in **adults** and **unimmunized children**. This diagnosis should still be considered when a person presents with fever and signs of upper respiratory obstruction resembling croup.

Other previously rare bacterial causes of epiglottitis may now be more likely diagnoses, particularly streptococci and Staphylococcus aureus.

## Pathology

### Organism

- **Haemophilus influenzae**, is a gram negative coccobacillus facultatively anaerobic pathogenic bacterium belonging to the Pasteurellaceae family

A coccobacillus (plural coccobacilli) is a bacterium with a shape intermediate between cocci (spherical bacteria) and bacilli (rod-shaped bacteria). Coccobacilli are very essentially very short rods which may be mistaken for cocci.

It is immotile and non-spore forming

Haemophilus influenzae is a normal part of the upper respiratory tract flora

There are un-encapsulated (non-typable) and encapsulated strains.

Encapsulated strains express six antigenically distinct capsular polysaccharides which are classified as serotypes **a, b, c, d, e** and **f**.

**Serotype b (Hib)** has a polyribosyl ribitol phosphate (PRP) polysaccharide capsule that is the major virulence factor for the organism and is the most **pathogenic** for humans.

### Risk factors:

These include:

1. The unimmunized

2. Asplenic patients
  - These are at greater risk of infection if they have not been appropriately immunized.
3. Immunosuppressed

### Reservoir

- Humans are the reservoir, via asymptomatic carriage, most commonly in young children.

### Transmission

- Hib is transmitted from person to person through respiratory droplet spread.
- It may also be rarely acquired through contact with infected respiratory discharges.

### Incubation Period

- The incubation period is uncertain, but is thought to be around 2 - 4 days.

### Period of communicability

- Hib is communicable for as long as the organisms are present in the nasopharynx.  
  
Certain circumstances, particularly close contact with a case (such as in a household, childcare or institutional setting), can lead to outbreaks or direct secondary cases.
- Patients are no longer infectious once they have received **24 - 48 hours** of appropriate antibiotic therapy.

### Susceptibility & resistance

Sustained immunity is conferred through:

- Immunization
- Prior infection over the age of 2 years

Infection may not confer immunity in children less than 2 years of age, who are unable to mount an antibody response to the type b capsular polysaccharide, even following invasive disease.

Maternal antibodies provide passive immunity for a variable time after birth.

*Most* secondary cases among close contacts occur within the **first week** after exposure, although later secondary cases have been reported.

Before Hib immunization, invasive disease caused by Hib rarely occurred after the age of 5 years. This was because the prevalence of antibody to Hib progressively increased from the age of 2 years, thought to be related to exposure to Hib (or cross-reacting organisms) colonizing the nasopharynx or other sites.

Children < 2 years of age are usually unable to mount an antibody response to the type b capsular polysaccharide, even after invasive disease.

### Clinical Features

Clinical disease can manifest as:

*Most seriously as:*

1. **Meningitis**
2. **Epiglottitis**
3. **Pneumonia**
4. Purulent bacterial pericarditis / endocarditis (uncommon)

*Less seriously as:*

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**Meningitis and epiglottitis are nearly always fatal without appropriate treatment.**

### Meningitis:

The onset can be subacute or sudden, with fever, vomiting, lethargy, meningeal irritation, a bulging fontanelle in infants, and stiff neck and back in older children.

The classical signs of meningitis, such as neck stiffness and photophobia, are often not detected in infants, who may present with drowsiness, poor feeding and high fever.

**See also separate document, Meningitis Bacterial (in Infectious Diseases folder).**

### Epiglottitis:

Epiglottitis is an infection and swelling of the epiglottis, the tissue in the throat that covers and protects the larynx during swallowing.

The patient is usually a child, and presents with signs of upper respiratory tract obstruction, and a characteristic soft stridor and drooling.

A pale, febrile, anxious child who remains upright to maximize their airway is suggestive of epiglottitis.

Progression of the infection can lead to complete respiratory obstruction.

Vaccination has made epiglottitis caused by Hib a rare illness.

**See also separate document, Epiglottitis (in ENT folder).**

### Investigations

Diagnosis is confirmed by a positive culture of H. influenzae from a normally sterile site, such as blood, cerebrospinal fluid, pleural fluid or joint fluid.

All isolates should further be serotyped by an approved reference laboratory to determine whether the isolate is **type b**.

### Management

#### Prevention:

#### Immunization:

- Routine childhood **immunization** is the most important preventive measure against Hib disease.

This is undertaken at **2, 4 6, and 12 months**.

**Unvaccinated contacts less than 5 years of age should be immunized as soon as possible**

- Hib vaccination is also recommended for some patients without a spleen.

Hib is an uncommon cause of post-splenectomy sepsis in adults and children.

Children older than 2 years who have received **all scheduled doses of Hib vaccine** do not require a booster dose after splenectomy.

A single dose of Hib vaccine is recommended for other splenectomised individuals who were **not vaccinated in infancy** or **are incompletely** vaccinated.

If possible, the vaccine should be given at least 2 weeks before splenectomy, or at least 7 days after, to optimize the immune response. Subsequent booster doses of Hib vaccine are not required.

#### Chemoprophylaxis:

- Chemoprophylaxis is indicated for **household contacts, or recent visitors who stayed overnight in the 7 days preceding the onset of the case's illness)**

**Household contacts** are defined as people living in the same house as the case.

**Contact the Health Department and seek expert infectious disease advice if considering the need for clearance antibiotics.**

#### Treatment:

Intravenous **ceftriaxone** or **cefotaxime** may be used for empirical therapy until antibiotic sensitivities are known.

**Respiratory isolation procedures are recommended for 24 hours after the start of treatment.**

Chemoprophylaxis is indicated for **household contacts (see above)**.

A suitable regimen for Haemophilus influenzae type b (Hib) chemoprophylaxis is:

- **Rifampicin 600 mg (neonate: 10 mg/kg; child: 20 mg/kg up to 600 mg) orally, daily for 4 days.**

#### *Alternatively:*

Although data are limited, ceftriaxone can be used if rifampicin is not suitable:

- Ceftriaxone 1 g (child 1 month or older: 50 mg/kg up to 1 gram) IM or IV, daily for 2 days

**Contact the Health Department and seek expert infectious disease advice if considering the need for clearance antibiotics.**

#### Notification:

Suspected and confirmed Haemophilus influenzae type b (Hib) infections (Group A disease) must be notified immediately by telephone, followed by written notification within 5 days.

This is a Victorian statutory requirement.

*School exclusion:*

A case of Hib must be excluded from primary school or children's services centers until at least 4 days of appropriate antibiotic treatment has been completed.



*“Atlanta is ours and fairly won!” Panic in the streets as William Tecumseh Sherman, puts Atlanta to the torch (still from “Gone with the Wind”, 1939)*

*“I think I understand the purpose of the South properly. The best way to deal with them is to meet them fairly on any issue. We must fight them, cut into them, not talk to them, and pursue till they cry enough! War is the remedy our enemies have chosen, and I say let us give them all they want”.*

*(William Tecumseh Sherman).*

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Dr J. Hayes.

Reviewed December 2018.