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Etiology and Pathogenesis

The pathogenesis of omphalitis begins with the inevitable bacterial colonization of the umbilical stump. Within hours of birth, the umbilicus is colonized by a diverse microbiome, often derived from the maternal genital tract, the environment, and caregiver handling. Infection ensues when these commensal organisms breach the skin barrier and invade the deeper, previously sterile tissues of the cord and surrounding structures.

Common Causative Agents

The bacteriology of omphalitis is typically polymicrobial, reflecting the mixed flora of the colonization site. The predominant pathogens can be categorized as follows:

Clinical Significance	Common Pathogens	Bacterial Classification
Most common isolates globally; S. aureus is frequently the primary pathogen, with Methicillin-Resistant S. aureus (MRSA) posing a significant therapeutic challenge. S. pyogenes (GAS) is notorious for its association with rapid, invasive disease and toxic shock syndrome (AAP, 2022).	*Staphylococcus aureus* (including MRSA), *Streptococcus pyogenes* (Group A Streptococcus)	**Gram-Positive**
Often implicated in more severe or systemic infections; these organisms are common in healthcare-associated infections and in settings with poor sanitation. They are associated with a higher risk of gram-negative sepsis and endotoxin-mediated shock (Medscape, 2025).	*Escherichia coli*, *Klebsiella pneumoniae*, *Proteus mirabilis*, *Pseudomonas aeruginosa*	**Gram-Negative**
A devastating, albeit rare, cause; C. tetani spores, introduced via contaminated instruments or substances applied to the cord, germinate in the anaerobic environment of the necrotic stump, producing a potent neurotoxin (tetanospasmin).	*Clostridium tetani*	**Anaerobic**
Often part of a polymicrobial infection; their role is increasingly recognized, particularly in foul-smelling discharge and in conjunction with other pathogens.	*Bacteroides* spp., *Peptostreptococcus* spp.	**Anaerobes**

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Risk Factors

A multifactorial set of conditions predisposes a neonate to developing omphalitis. These can be systematically categorized:

Source	Specific Risk Factors	Category
Celik *et al.* (2021)	Younger maternal age, primiparity, lower maternal education level, and poor maternal handwashing habits.	Maternal
Medscape (2025)	Low birth weight (<2500g), prematurity, congenital immune deficiencies (e.g., leukocyte adhesion deficiency), prolonged rupture of membranes (>24 hours), septic delivery, and iatrogenic trauma from umbilical catheterization.	Neonatal
Mullany *et al.* (2007)	Unhygienic cord-cutting practices (using unsterilized instruments), application of harmful traditional substances (e.g., animal dung, ash, mustard oil), home birth without a skilled attendant, prolonged hospitalization (nosocomial exposure), and being born during hot, humid seasons.	Environmental/Care-Related

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Diagnostic Workup and Severity Grading

Diagnosis is primarily clinical, but a thorough workup is essential to guide management. A common grading system (Medscape, 2025) is outlined below:

Management Implication	Clinical Presentation	Grade
Requires hospitalization and initiation of intravenous broad-spectrum antibiotics due to the high risk of progression. Close monitoring is essential.	Purulent, malodorous discharge from the cord stump (funisitis). Erythema is minimal and confined to the cord. No systemic signs.	Grade 1 (Mild)
Requires immediate hospitalization and IV antibiotics. Imaging (ultrasound) is indicated to rule out deep tissue involvement.	Erythema and induration extending to the periumbilical skin (cellulitis). No systemic signs of toxicity.	Grade 2 (Moderate)
A medical and potential surgical emergency. Requires aggressive IV antibiotics, intensive supportive care, and immediate surgical consultation for possible debridement.	Grade 2 signs PLUS systemic toxicity (e.g., fever, lethargy, hemodynamic instability) OR any signs of necrotizing fasciitis (skin bullae, crepitus, skin necrosis).	Grade 3 (Severe)

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