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CHRONIC SUPPURATIVE OTITIS MEDIA: PATHOGENESIS, DIAGNOSIS, CONTEMPORARY MANAGEMENT AND FUTURE DIRECTIONS. A NARRATIVE REVIEW

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Abstract

Chronic suppurative otitis media (CSOM) is a persistent inflammatory disease of the middle ear and mastoid cleft, characterised by tympanic membrane perforation and recurrent or continuous otorrhoea lasting more than two to six weeks. It remains a major cause of preventable conductive hearing loss, particularly in low- and middle-income countries and in socio-economically disadvantaged communities, and it carries a risk of intratemporal and intracranial complications. Recent advances in microbiology, imaging and surgical technique, together with Cochrane-level evidence on topical therapy, have changed many aspects of care. This narrative review synthesises current knowledge on the epidemiology, risk factors and pathogenesis of CSOM, including the central role of biofilms, polymicrobial infection and impaired mucosal immunity; summarises the clinical and instrumental diagnostic work-up; and appraises contemporary medical and surgical management. Evidence supports meticulous aural toilet combined with topical quinolone antibiotics as first-line therapy, while systemic antibiotics are reserved for selected situations and surgery (tympanoplasty with or without mastoidectomy) is indicated for persistent perforation, cholesteatoma and complications. Emerging directions include endoscopic ear surgery, anti-biofilm agents, bacteriophage therapy, rapid molecular diagnostics, artificial-intelligence-assisted otoscopy and tele-otology. Gaps remain in standardised definitions, paediatric trials, antimicrobial-resistance surveillance and implementation research in resource-limited settings.

Keywords: chronic suppurative otitis media; tympanic membrane perforation; biofilm; Pseudomonas aeruginosa; tympanoplasty; cholesteatoma; conductive hearing loss; topical quinolones

Introduction

Chronic suppurative otitis media (CSOM) is defined as a chronic inflammation of the middle ear and mastoid mucosa in which a perforated tympanic membrane (TM) allows persistent or intermittent discharge (otorrhoea). The World Health Organization (WHO) uses a threshold of at least two weeks of otorrhoea through a perforation, whereas many clinical and research groups apply a six-week threshold to distinguish CSOM from acute

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otitis media with perforation and from acute otitis externa [1,2]. The lack of a universally accepted definition complicates comparison of epidemiological and trial data and is itself a recognised limitation of the field [3].

CSOM is among the most frequent chronic infectious diseases of childhood worldwide. A systematic analysis estimated that roughly 31 million new cases occur each year and that between 65 and 330 million individuals have discharging ears, the majority living in South-East Asia, the Western Pacific and sub-Saharan Africa [4]. Approximately half of those affected experience clinically significant hearing impairment [4,5]. Because hearing loss during early childhood is associated with delayed speech and language acquisition, poorer educational performance and reduced employment prospects, CSOM has consequences that extend well beyond the ear [6]. The WHO World Report on Hearing identifies otitis media as a leading and largely preventable cause of hearing loss [7].

Historically, CSOM has been classified as a tubotympanic (safe, mucosal) type and an atticoantral (unsafe, squamous) type, the latter being associated with cholesteatoma and a higher complication rate [8]. This classification, although simplified, still guides clinical decision-making. Over the past two decades, a growing body of work has reframed CSOM as a biofilm-associated, polymicrobial disease with a dysregulated local immune response rather than a simple bacterial infection [9–11]. At the same time, Cochrane reviews have clarified the relative value of topical antibiotics, antiseptics and aural toilet [12–14], and endoscopic techniques have broadened the surgical armamentarium [15,16].

The aim of this narrative review is to provide clinicians, trainees and researchers with an integrated, up-to-date overview of CSOM, from pathogenesis to management and emerging innovations, with attention to the realities of resource-limited health systems.

A narrative review design was selected because of the heterogeneity of definitions, populations and interventions in the CSOM literature. PubMed/MEDLINE, Scopus, Web of Science and the Cochrane Library were searched for English-language publications using combinations of the terms “chronic suppurative otitis media”, “chronic otitis media”, “tympanic membrane perforation”, “otorrhoea”, “biofilm”, “cholesteatoma”, “tympanoplasty” and “topical antibiotics”. Priority was given to systematic reviews, meta-analyses, randomised controlled trials, clinical practice documents from international bodies and landmark mechanistic studies. Reference lists of key articles were hand-searched. Studies were selected by relevance and quality rather than by formal scoring; consequently, the review does not claim to be exhaustive and should be read as an expert synthesis.

The prevalence of CSOM varies substantially. The WHO classifies populations with prevalence above 4% as having a massive public-health problem requiring urgent attention, and several indigenous communities in Australia, Greenland and the Pacific, as well as parts of Africa and South Asia, exceed this threshold [1,17]. In contrast, prevalence in high-income countries is generally below 1% [4]. Incidence peaks in the first years of life,

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and a considerable proportion of children develop recurrent acute otitis media with perforation before CSOM becomes established [6,17].

Established risk factors include recurrent acute otitis media in infancy, poverty, household overcrowding, poor hygiene and limited access to health care, malnutrition, lack of breastfeeding, exposure to tobacco smoke, upper respiratory tract infection, day-care attendance, and a family history of ear disease [6,18]. Craniofacial anomalies, notably cleft palate, and Down syndrome predispose through Eustachian tube (ET) dysfunction. Genetic susceptibility, particularly polymorphisms in innate immunity and mucin genes, appears to modulate risk, although data are still limited [10]. Immunodeficiency and HIV infection increase both the frequency and severity of otorrhoea. The broader public-health picture shows a strong social gradient, which explains why the disease burden is concentrated in disadvantaged groups [4,17].

Pathogenesis

The classical model begins with ET dysfunction, which impairs ventilation and clearance of the middle ear and promotes negative pressure, effusion and recurrent infection. In children the ET is shorter, more horizontal and less rigid, favouring reflux of nasopharyngeal secretions. Acute infection with raised middle-ear pressure may cause necrosis and perforation of the TM. In most cases the perforation heals within days or weeks; in those who progress to CSOM, healing fails. Proposed explanations include persistent infection and inflammation at the perforation margin, migration of squamous epithelium over the edge, loss of the proliferative response of the TM stem-cell niche, and continuing contamination via the ET or the external canal [9,21]. Once the perforation persists, the middle ear is exposed to the external environment and to water, creating a route for repeated inoculation of environmental organisms.

CSOM is typically polymicrobial. Culture-based studies from many regions identify Pseudomonas aeruginosa and Staphylococcus aureus as the dominant aerobic pathogens, followed by Proteus species, Klebsiella pneumoniae, Escherichia coli and other Enterobacterales [20]. Anaerobes such as Bacteroides, Peptostreptococcus and Prevotella are frequently recovered when appropriate transport and culture techniques are used, and fungi (Aspergillus and Candida spp.) occur especially after prolonged topical antibiotic use [20]. Culture-independent molecular studies show a more diverse flora than culture suggests and detect organisms, including Alloiococcus otitidis, Haemophilus influenzae and Streptococcus pneumoniae, that may be missed on routine media [9,21]. Rising rates of methicillin-resistant S. aureus (MRSA) and multidrug-resistant Gram-negative bacilli further complicate treatment and have been reported in several surveillance studies [20].

Table 1. Principal microorganisms in chronic suppurative otitis media (compiled from [9,20,21]).

Organism	Typical significance in CSOM	Practical implication

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Organism	Typical significance in CSOM	Practical implication
Pseudomonas aeruginosa	Most frequent Gram-negative isolate; biofilm formation; intrinsic resistance to many agents	Topical ciprofloxacin or equivalent; anti-pseudomonal agent if systemic therapy needed
Staphylococcus aureus (incl. MRSA)	Common Gram-positive isolate; biofilm and intracellular persistence	Culture and sensitivity if non-response; consider MRSA-active therapy
Proteus spp., Klebsiella spp., E. coli	Enterobacterales; may produce ESBL	Review local resistance patterns
Anaerobes (e.g., Bacteroides, Prevotella)	More common in cholesteatoma and foul-smelling discharge	Thorough debridement; metronidazole in selected cases
Fungi (Aspergillus, Candida)	Often secondary after antibiotic drops; pruritus and debris	Aural toilet, topical antifungal or antiseptic

Direct visualisation of bacterial biofilms on the middle-ear mucosa of children with chronic otitis media provided a turning point in understanding recalcitrant disease [22]. Scanning electron microscopy of mucosa and of cholesteatoma matrix has likewise demonstrated biofilm communities in CSOM [23]. In a biofilm, bacteria embedded in an extracellular polymeric matrix show reduced metabolic activity and markedly increased tolerance to antibiotics and host defences, which explains the frequent relapse after short courses of therapy. Intracellular bacteria within epithelial cells have been described and may serve as a reservoir [11,21]. These findings support strategies directed at mechanical disruption of biofilm through thorough aural toilet, topical agents that achieve very high local concentrations, and, in the future, adjuncts that target the matrix or quorum sensing [10,21].

The middle-ear mucosa in CSOM is characterised by chronic inflammatory infiltrate, mucosal oedema, granulation tissue and polyp formation, and in some cases tympanosclerosis and ossicular erosion. Dysregulated cytokine signalling (for example interleukin-1, interleukin-6 and tumour necrosis factor-α), impaired innate immune responses, and oxidative stress contribute to persistent inflammation and to bone resorption through osteoclast activation [10,11]. Ossicular chain damage, most often to the long process of the incus, results in conductive hearing loss that may reach 40–60 dB [5,8].

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Sensorineural loss may also develop, probably through passage of inflammatory mediators and bacterial toxins across the round-window membrane, and has been documented in long-standing disease [5,10].

Cholesteatoma, a destructive accumulation of keratinising squamous epithelium in the middle ear or mastoid, is closely linked to CSOM, particularly the atticoantral form. Acquired cholesteatoma is thought to arise through retraction pocket formation, epithelial invasion, basal-cell hyperplasia and metaplasia; each of these theories is supported by some evidence, and contemporary molecular work highlights the role of inflammatory cytokines, growth factors and matrix metalloproteinases in its aggressive behaviour [26]. Secondary infection of the cholesteatoma matrix by biofilm-forming bacteria contributes to bone erosion and recurrence [23,26].

The cardinal symptom is painless, intermittent or persistent otorrhoea. The discharge is mucopurulent in the tubotympanic form and may be scanty, offensive and associated with crusting or debris in the atticoantral form. Hearing loss is usually conductive and fluctuates with discharge. Otalgia, vertigo, facial weakness, severe headache, fever or neck stiffness should alert the clinician to a complication. Otoscopic findings include a central perforation of variable size in the tubotympanic form, and marginal or attic perforations, retraction pockets, keratin debris or granulation tissue in the atticoantral form [8,17]. Mucosal polyps or granulations suggest chronic inflammation, while a pulsatile red mass behind an intact membrane or a white mass should raise the possibility of other pathologies.

Beyond the traditional safe/unsafe dichotomy, contemporary classifications describe CSOM as active (wet) or inactive (dry) and by the site and size of the perforation. The terms “chronic otitis media” and “chronic otitis media with cholesteatoma” are now widely used in international consensus documents to avoid overlap with other entities [3,17]. Adopting consistent terminology is essential for research and for inter-centre audit.

Diagnosis of CSOM is principally clinical. A detailed history documents the duration and character of otorrhoea, previous ear infections or surgery, hearing, balance and facial function, and risk exposure. Otoscopic examination, ideally under the operating microscope or with a rigid endoscope after careful suction clearance of discharge, is the key step; it allows identification of the perforation, middle-ear mucosa, ossicles and any retraction pocket or cholesteatoma [17]. Table 2 summarises the main components of the diagnostic work-up.

Table 2. Diagnostic work-up in chronic suppurative otitis media.

Investigation	Purpose and key findings	Comment
Otomicroscopy / video-otoendoscopy	Perforation size and site, mucosal state, granulation, cholesteatoma; documentation	Cornerstone of diagnosis; images can be shared for tele-consultation

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Investigation	Purpose and key findings	Comment
Pure-tone and speech audiometry	Degree and type of hearing loss; baseline before treatment or surgery	Air–bone gap commonly 20–50 dB; bone-conduction assessment for sensorineural component
Tympanometry	Type B with large ear-canal volume in perforation	Limited value when discharge is present
Swab for culture and sensitivity	Identify pathogens and resistance, especially in treatment failure	Take after cleaning the canal; request fungal culture if suspected
High-resolution CT of temporal bone	Ossicular erosion, scutum and mastoid status, tegmen or sinus plate dehiscence, labyrinthine fistula	Indicated for suspected cholesteatoma, complications or pre-operative planning
MRI (including non-echo-planar diffusion-weighted)	Distinguishes cholesteatoma from granulation tissue; detects intracranial extension	Useful for residual or recurrent cholesteatoma and complications

Bacterial culture is not necessary for every new case but is valuable in patients who fail first-line treatment, in recurrent disease, in immunocompromised hosts and before surgery. Audiometry should be performed in all patients for whom it is available, because the extent of conductive loss influences counselling and decisions regarding ossiculoplasty [5]. High-resolution computed tomography (CT) remains the imaging modality of choice for bone detail, whereas diffusion-weighted magnetic resonance imaging has largely replaced second-look surgery in many centres for the detection of residual cholesteatoma. Differential diagnoses include acute otitis externa, otomycosis, chronic granulomatous disease (tuberculous otitis media, granulomatosis with polyangiitis), malignancy of the external or middle ear, and retained foreign body or grommet otorrhoea.

The goals of management are to achieve a dry, safe ear, to prevent complications, and to restore or preserve hearing. Approaches are stratified according to disease type, activity, complications and available resources (Table 3).

Removal of discharge and debris by dry mopping, suction under vision, or irrigation (when the perforation is small and there is no cholesteatoma) is the foundation of treatment. It reduces bacterial load, disrupts biofilm and allows topical agents to reach the mucosa. Although high-quality evidence for aural toilet alone is limited, it is recommended in all guidelines and community programmes and was an integral component of successful trials

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[12,14,27]. In low-resource settings, training of primary-care workers in dry mopping has proved feasible and effective [27]. Patients should be advised to keep water out of the ear during active disease.

Cochrane evidence indicates that topical quinolone antibiotics (such as ciprofloxacin or ofloxacin) are more effective than non-quinolone topical antibiotics and than systemic antibiotics for short-term resolution of otorrhoea [12,13]. Topical therapy delivers concentrations far exceeding those achievable by systemic administration, which may be necessary to overcome biofilm tolerance. Topical quinolones have an excellent safety profile and have not been shown to be ototoxic in the presence of a perforation, in contrast to topical aminoglycoside preparations, whose use in perforated ears is discouraged because of potential cochlear toxicity, despite relatively infrequent clinical reports [13,28]. Topical antiseptics such as boric acid, povidone-iodine and acetic acid have been evaluated; although the certainty of evidence is low, antiseptics may provide a useful, low-cost alternative to antibiotics, particularly where resistance or cost is a concern [14]. Topical antibiotic–steroid combinations may speed resolution by reducing granulation and oedema, although evidence remains modest [13]. Drops should be administered for a defined period, generally one to two weeks, and prolonged use should be avoided because of risk of fungal overgrowth.

Oral or parenteral antibiotics are not recommended as monotherapy in uncomplicated CSOM since the evidence of benefit over topical therapy is poor [13,14]. They are appropriate in patients with signs of spreading infection, cellulitis of the pinna or periauricular tissues, acute mastoiditis, intracranial complications, or when topical treatment fails and cultures show sensitivity to a systemic agent. Anti-pseudomonal agents (e.g., ciprofloxacin, ceftazidime, piperacillin–tazobactam) are chosen on the basis of culture and sensitivity and local resistance patterns. Antimicrobial stewardship is important, as inappropriate systemic use contributes to the growing burden of resistance [13,20].

Surgery is indicated when there is cholesteatoma, an intracranial or intratemporal complication, persistent granulation or polyps that do not respond to medical therapy, or a persistent dry perforation causing hearing loss or recurrent infection after control of infection. Tympanoplasty, with or without mastoidectomy, aims to eradicate disease, close the perforation and, where possible, reconstruct the ossicular chain. Cartilage grafts (tragal or conchal) show equivalent or superior graft take compared with temporalis fascia, especially in difficult, revision or high-risk ears, with comparable audiological outcomes [29,30]. Overall graft success rates of 80–95% are reported in experienced hands, although outcomes are poorer in children with persistent Eustachian tube dysfunction, in large or anterior perforations and in active disease [29,30]. Canal-wall-up and canal-wall-down mastoidectomy remain the principal options for cholesteatoma, with the choice depending on disease extent, mastoid pneumatisation and surgeon experience.

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Endoscopic ear surgery (EES) has expanded rapidly. The endoscope provides wide-angle visualisation of hidden recesses such as the sinus tympani and facial recess, can reduce the need for mastoidectomy and permits transcanal, minimally invasive approaches [15]. Systematic reviews suggest that endoscopic and microscopic tympanoplasty provide comparable graft-success and hearing outcomes, with potentially less post-operative pain and shorter operative incisions, and possibly lower rates of residual cholesteatoma in selected cases, although the evidence remains largely observational [16]. Ossiculoplasty with partial or total ossicular replacement prostheses can improve the air–bone gap, but results are variable and depend on the ossicular status and middle-ear aeration [5,30].

Table 3. Stratified management approach in CSOM (adapted from [12–14,17]).

Clinical scenario	First-line management	Escalation
Uncomplicated active mucosal CSOM	Aural toilet plus topical quinolone drops for 1–2 weeks; keep ear dry	Culture; antiseptic drops; consider short course of systemic therapy if topical therapy fails
Persistent or recurrent otorrhoea	Re-assessment, culture, exclusion of cholesteatoma, review of adherence	CT/MRI; surgery (tympanoplasty ± mastoidectomy)
Dry central perforation with hearing loss	Hearing assessment; counselling; water precautions	Myringoplasty/tympanoplasty; hearing aid if surgery declined
Cholesteatoma / attic or marginal perforation	Specialist referral and imaging	Mastoid surgery; long-term follow-up and surveillance MRI
Suspected intracranial or intratemporal complication	Urgent admission, IV antibiotics, imaging	Urgent surgery with neurosurgical or multidisciplinary input

Conventional air-conduction hearing aids, bone-conduction devices and implantable middle-ear or bone-anchored systems offer effective hearing rehabilitation for patients who are unsuitable for surgery, whose surgical result is inadequate, or in whom bilateral disease persists. Early hearing assessment and amplification in children are crucial for language and educational development [6,19].

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Complications arise principally from atticoantral disease and are classified as intratemporal (mastoiditis, petrositis, facial nerve palsy, labyrinthitis and labyrinthine fistula, subperiosteal abscess) and intracranial (meningitis, extradural, subdural or brain abscess, lateral sinus thrombophlebitis, otitic hydrocephalus). Reported complication rates range from less than 1% to approximately 5% of patients with CSOM in hospital series, with facial palsy, mastoid abscess and meningitis among the most commonly encountered [24,25]. Mortality from intracranial complications, although much reduced in the antibiotic era, remains considerable in settings with delayed access to care [25]. Early recognition, prompt imaging, high-dose intravenous antibiotics and surgical source control are the cornerstones of management and require close cooperation between otolaryngologists, neurosurgeons, neuroradiologists and infectious-disease specialists.

Prevention operates at several levels. Primary prevention includes promotion of breastfeeding, reduction of exposure to tobacco smoke, improvement of housing and hygiene, and vaccination. Pneumococcal conjugate vaccines reduce the incidence of acute otitis media and have a small but consistent effect on tympanostomy-tube insertion and otorrhoea, and are likely to lower the later burden of CSOM [34]. Secondary prevention consists of prompt and appropriate treatment of acute otitis media with perforation, school and community ear-screening programmes, and training of primary-care workers in otoscopy and aural toilet. Tertiary prevention targets complications and hearing disability through timely surgery and rehabilitation [7,27].

Rapid molecular platforms and metagenomic sequencing may replace or complement culture, providing results within hours, identifying anaerobes and fastidious organisms and revealing resistance determinants [9,21]. Deep-learning algorithms applied to otoscopic and otoendoscopic images have achieved high accuracy for detecting TM perforation, otitis media and cholesteatoma, with pooled sensitivities and specificities that in some reviews exceed 90% [31,32]. When integrated with smartphone-based otoscopes, such tools could support triage in primary-care and community settings; however, external validation, diversity of training data, and regulatory and ethical frameworks must mature before routine use [31]. Tele-otology programmes, in which images are captured by health workers and reviewed remotely, are a practical means of extending specialist care to remote populations.

Anti-biofilm approaches under investigation include enzymatic agents that degrade extracellular matrix (such as DNase and dispersin B), quorum-sensing inhibitors, N-acetylcysteine, antimicrobial peptides, photodynamic therapy and nanoparticle-based delivery systems for sustained release of antibiotics [10,21]. Bacteriophage therapy is particularly attractive for multidrug-resistant P. aeruginosa; a controlled trial of a phage preparation in chronic otitis caused by resistant P. aeruginosa showed a significant fall in bacterial counts and clinical improvement, and further larger studies are now needed [33]. Regenerative strategies for TM repair, using growth-factor-loaded scaffolds, bioengineered

Journal of Advances in Drug Research

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patches and stem-cell-based therapies, may offer non-surgical or minimally invasive options for persistent perforations in the future [9].

Further refinement of exclusive endoscopic techniques, robotic assistance, three-dimensional printed ossicular prostheses and improved intra-operative imaging are likely to shape surgical practice. At the health-system level, implementation research is needed to determine how to deliver simple, effective measures such as aural toilet and topical therapy at scale, how to ensure access to surgical care in low-income settings, and how to monitor resistance [7,27]. Priority research questions include a standardised definition and core outcome set for CSOM, high-quality paediatric randomised trials, comparison of antiseptic and antibiotic strategies, long-term outcomes of endoscopic versus microscopic surgery, and the cost-effectiveness of screening and prevention programmes [3,14].

Conclusion

CSOM is a preventable yet persistent cause of hearing loss and potentially life-threatening complications, especially in socio-economically disadvantaged populations. Modern understanding recognises it as a polymicrobial, biofilm-associated chronic inflammatory disease. Effective management in most patients depends on careful clinical examination, meticulous aural toilet and topical quinolone therapy, with timely surgery for persistent disease, cholesteatoma and complications, and appropriate hearing rehabilitation. Advances in endoscopic surgery, molecular diagnostics, artificial intelligence, anti-biofilm therapeutics and tele-otology offer substantial promise, but should be matched by investment in prevention, primary-care training and robust trials. A coordinated, multidisciplinary and equity-oriented approach is required to reduce the global burden of CSOM.

References

1. **Farxodivich TF.** Cholestasis is a risk factor for the development of gallstone disease. *Nauchnyi Fokus*. 2024;2(21):317–321.
2. Bhutta MF, Thornton RB, Kirkham LA, Kerschner JE, Cheeseman MT. Understanding the aetiology and resolution of chronic otitis media from animal and human studies. Dis Model Mech. 2017;10(11):1289-1300.
3. Poorey VK, Iyer A. Study of bacterial flora in CSOM and its clinical significance. Indian J Otolaryngol Head Neck Surg. 2002;54(2):91-95.
4. Yeo SG, Park DC, Hong SM, Cha CI, Kim MG. Bacteriology of chronic suppurative otitis media: a multicenter study. Acta Otolaryngol. 2007;127(10):1062-1067.
5. Prakash R, Juyal D, Negi V, Pal S, Adekhandi S, Sharma M, et al. Microbiology of chronic suppurative otitis media in a tertiary care setup of Uttarakhand state, India. N Am J Med Sci. 2013;5(4):282-287.

Journal of Advances in Drug Research

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www.jadr.co.in

Volume 17, Issue 05 | Received 14.10.2026 | Accepted 15.10.2026 | Online 21.10.2026

6. Hall-Stoodley L, Hu FZ, Gieseke A, Nistico L, Nguyen D, Hayes J, et al. Direct detection of bacterial biofilms on the middle-ear mucosa of children with chronic otitis media. JAMA. 2006;296(2):202-211.

7. **Tolibov FF.** Immune system: anatomy of the lymphatic system and mechanisms of immune response. *Zhurnal akademicheskikh issledovaniy novogo Uzbekistana*. 2024;1(2):55–58. doi:10.5281/zenodo.10688710.
8. **Tolibov FF.** Clinical and morphological correlations of liver cirrhosis. *Eur J Mod Med Pract*. 2024;4(11):515–520.
9. **Tolibov FF.** Extra-articular manifestations of rheumatoid arthritis. *Modern Science and Research*. 2025;4(5):1080–1087.
10. **Tolibov FF.** Impact of corticosteroid and immunosuppressive therapy on the course of chronic hepatitis: risks and prospects. *Modern Science and Research*. 2025;4(2):1123–1132.
11. **Tolibov FF.** Mononuclear cell infiltration accompanied by the progression of fibrotic and cirrhotic transformations in the liver tissue. *Modern Science and Research*. 2025;4(4):926–936. doi:10.5281/zenodo.15227499.
12. **Tolibov FF.** Pathomorphological abnormalities of the liver in patients infected with the hepatitis B virus. *Modern Science and Research*. 2025;4(3):1084–1093.
13. **Tolibov FF.** Violation of platelet aggregation and imbalance of hemostasis in patients with chronic viral hepatitis C. *New Day in Medicine*. 2024;6(68):264–268. Available from: https://newdayworldmedicine.com/en/article/3758
14. **Tolibov FF.** The syndrome of external secretory function insufficiency is a common complication of chronic pancreatitis. *American Journal of Bioscience and Clinical Integrity*. 2024;1(10):90–95.
15. **Tolibov FF, Shuhrat o'g'li RK.** Diabetik nevropatiya va uning zamonaviy terapiyasi. *Journal of Innovations in Scientific and Educational Research*. 2025;8(1):195–202.