

*Ministry of Defence*

## **Synopsis of Causation**

### **Otitis Externa**

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## **Disclaimer**

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This synopsis has been completed by medical practitioners. It is based on a literature search at the standard of a textbook of medicine and generalist review articles. It is not intended to be a meta-analysis of the literature on the condition specified.

Every effort has been taken to ensure that the information contained in the synopsis is accurate and consistent with current knowledge and practice and to do this the synopsis has been subject to an external validation process by consultants in a relevant specialty nominated by the Royal Society of Medicine.

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# 1. Definition

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- 1.1. Otitis externa is an inflammatory process affecting the [external auditory canal](#). The term is usually employed to describe the commonest variety: acute diffuse otitis externa (syn. swimmer's ear, tropical ear), but there are other forms.
- 1.2. Adults of all ages are affected and the incidence is similar in males and females. It is extremely uncommon in children.
- 1.3. It may occur secondary to an underlying chronic otitis media.

## 2. Clinical features

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### 2.1. Otitis externa of infective origin

2.1.1. **Acute diffuse otitis externa.** This is the commonest variety of otitis externa. The ear itches and becomes increasingly painful, with [erythema](#) and swelling of the external auditory canal. Pain is characteristically elicited by movement of the ear or jaw, for example when eating, and discharge is frequently present.

2.1.2. **Acute localised otitis externa** occurs as a pustule or furuncle, commonly due to *Staphylococcus aureus*. The condition is amenable to antibiotic therapy and is short-lived.

2.1.3. **Chronic otitis externa** Diffuse otitis externa which persists for 6 weeks or more may be categorised as chronic. Chronic infection of the middle ear, chronic suppurative otitis media, either mucosal or attico-antral, with drainage through a perforated [tympanic membrane](#) may masquerade as chronic otitis externa.

2.1.4. **Malignant otitis externa** (necrotising otitis externa) is a serious but rare condition, consisting of an infection of the external ear canal, mastoid, and base of the skull, usually caused by *Pseudomonas aeruginosa*. The condition occurs primarily in elderly patients with diabetes mellitus or in [immunocompromised](#) individuals.

### 2.2. Non-infectious otitis externa

2.2.1. **Dermatological conditions** A number of chronic skin diseases may affect the [external auditory canal](#) and predispose to otitis externa. Evidence of these conditions is usually found elsewhere on the skin and there is often a history of repeated attacks of otitis externa.

2.2.2. **Otitis externa due to contact dermatitis** Contact dermatitis, which may be irritant or allergic in nature may affect the external auditory canal, and a wide variety of agents may be responsible including the mould materials used for hearing aids.

2.3. Repeated or prolonged attacks of otitis externa may lead to [fibrosis](#) and [stenosis](#), resulting in a conductive hearing loss. Surgical treatment is effective in at least 80% of these cases<sup>1</sup>.

### 3. Aetiology

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- 3.1. The [external auditory canal](#) provides a suitable warm and humid environment for bacterial and fungal growth. In addition the passage is curved and at one point constricted, impeding the exit of secretions and cellular debris. The lining of the inner portion is thin and vulnerable to trauma. However, natural defence mechanisms normally prevent infection; cerumen (wax) possesses antibacterial and antifungal properties and a unique epithelial migration occurs in the deep canal, which carries debris with it towards the [external auditory meatus](#).<sup>2</sup>
- 3.2. When these defences fail, or the [epithelium](#) of the external auditory canal is damaged, otitis externa may result. The most frequently identified organisms are *Pseudomonas aeruginosa* and *Staphylococcus aureus*. However the condition is occasionally due to fungi such as *Aspergillus* spp., and *Candida albicans* is a frequent cause of otitis externa in children with chronic mucocutaneous [candidiasis](#).<sup>3</sup> Mixed bacterial and fungal infections are not uncommon.
- 3.3. The exact mechanism whereby the condition is triggered remains unclear. The following probably act as precipitating agents:

#### 3.3.1. **Moisture** This may result from

- Swimming. Excessive exposure to water results in an overall reduction in cerumen, drying of the canal and pruritus. In one series of 100 patients with a first attack of otitis externa, regular swimming, showering and hair washing were significantly more common compared with unaffected controls<sup>4</sup>
- High humidity. High ambient humidity further encourages bacterial and fungal growth in the external auditory canal

#### 3.3.2. **Trauma** This may arise from:

- Mechanical removal of cerumen; for example by means of cotton buds, swabs or other objects; or fingernails. Probing by the patient damages the epithelial lining and provides an entry for infection
- Over-zealous drying, towelling

#### 3.3.3. **Insertion of other foreign objects** The warmth and humidity of the canal are increased by prolonged occlusion of the external auditory meatus by, for example:

- Hearing aids
- Ear plugs

#### 3.3.4. **High environmental temperatures** Although the condition is said to be more prevalent in the tropics, the literature contains few objective studies to support a direct association

between high ambient temperature alone and otitis externa. When combined with high humidity however the growth of infectious agents is encouraged.

3.3.5. **Chronic dermatological disease.** A number of dermatological conditions may affect the canal, and so predispose to infection, for example:

- Eczema
- Psoriasis
- Seborrheic dermatitis
- Acne

3.3.6. **Contact dermatitis** due to irritant or allergic factors may be complicated by bacterial infection. Examples of agents which may be responsible include hearing aid moulds, ear plugs, metals used in ear rings, anti-infective and cerumenolytic ear drops and other preparations.<sup>5</sup>

3.3.7. **Constitutional factors** A number of constitutional factors may predispose an individual to otitis externa. For example, cerumen is generally acidic (pH 4-5) and this helps to inhibit bacterial and fungal growth; it has been found that patients with chronic otitis externa have a higher (i.e. less acidic) auditory canal pH than normal controls.<sup>6</sup> Cerumen also exerts a protective role in shielding the [epithelium](#) from maceration due to water and if produced in abnormally small amounts may render the individual more vulnerable to infection.

3.3.8. **Bacterial contamination of water** It has been proposed that contamination of water by organisms such as *Pseudomonas aeruginosa* might cause or contribute to otitis externa, but this is widely disputed.

## 4. Prognosis

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- 4.1. Acute otitis externa usually responds promptly to topical treatment. Factors which may lead to a more prolonged and chronic course include:
- Concurrent chronic otitis media
  - Undiagnosed primary contact or allergic otitis including sensitisation to medication applied to the ear, e.g. neomycin
  - Fungal infection
- 4.2. Recurrent otitis externa may occur in some individuals, and this is thought to be due to constitutional factors, such as an abnormally narrow or tortuous external auditory canal or the production of abnormally large or small quantities of cerumen. Susceptible individuals can usually avoid recurrence by careful drying of the ears after immersion, and the use of acidifying drops.
- 4.3. Malignant (necrotizing) otitis externa carries a 20% mortality rate in adults. Intracranial complications are the most frequent cause of death.<sup>7</sup>

## 5. Summary

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- 5.1. Otitis externa is a common inflammatory/infective process of the [external auditory canal](#), which usually responds to topical treatment including thorough aural toilet and simple preventative measures.
  
- 5.2. The [external auditory canal](#) provides a suitable environment for bacterial and fungal agents, and an infective process is encouraged when the normal defence mechanisms are disrupted. Excessive moisture, trauma (often arising from the patient's own activities, foreign objects and high humidity) may trigger an infection. Chronic dermatological disease, including contact dermatitis, may be a causative factor, and a constitutional predisposition may exist in some cases.



## **6. Related Synopses**

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Sensorineural Hearing Loss

Conductive Hearing Loss

Blast Injury to the Ears

## 7. Glossary

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auditory	Pertaining to the hearing mechanisms of the body. (External) auditory canal: the passage leading to the ear drum.
candidiasis	Yeast infection.
conductive deafness	Hearing impairment caused by interference with sound transmission through the external canal, middle ear, or ossicles.
epithelium	Cellular lining.
erythema	Redness of the skin.
external auditory meatus	Outer opening of the auditory canal.
fibrosis	The formation of fibrous scar tissue.
immunocompromised	Refers to individuals whose immune system is not functioning properly, as for example in HIV infection, chemotherapy.
stenosis	Narrowing to the extent of complete closure.
tympanic membrane	The ear drum.

## 8. References

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- <sup>1</sup> Roland PS. Chronic external otitis. *Ear Nose Throat J* 2001;80(6):12-16.
  - <sup>2</sup> Sander R. Otitis externa: a practical guide to treatment and prevention. *Am Fam Physician* 2001;63(5):927-36.
  - <sup>3</sup> Klein J. Otitis externa, otitis media, and mastoiditis. In: Mandell GL, Bennett JE, Dolin R, editors. *Mandell: principles and practice of infectious diseases*. Philadelphia: Churchill Livingstone; 2000. p. 669-70.
  - <sup>4</sup> Russell JD, Donnelly M, McShane DP et al. What causes acute otitis externa? *J Laryngol Otol* 1993;107(10):898-901.
  - <sup>5</sup> Sood S, Strachan DR, Tsikoudas A, Stables GI. Allergic otitis externa. *Clin Otolaryngol* 2002;27(4):233-6.
  - <sup>6</sup> Martinez Devesa P, Willis CM, Capper JW. External auditory canal pH in chronic otitis externa. *Clin Otolaryngol* 2003;28(4):320-4.
  - <sup>7</sup> Handzel O, Halperin D. Necrotizing (malignant) external otitis. *Am Fam Physician* 2003;68(2):309-12.