

Mycetoma

Report by the Secretariat

1. In May 2015, the Executive Board at its 137th session considered an earlier version of this report.¹ During the discussions,² it was agreed that the Board would discuss the matter again on the basis of a more extensive report.
2. Mycetoma is a chronic, progressively destructive inflammatory disease of the skin, subcutaneous and connective tissue, muscle and bone. It can be caused by a large variety of microorganisms, but has essentially two distinct etiologies: bacterial and fungal. Infections with bacteria such as *Actinomyces madurae*, *Streptomyces somaliensis* and *Nocardia brasiliensis* cause actinomycetoma, and those with fungi such as *Madurella mycetomatis* are responsible for eumycetoma. The latter is the most common causative agent of mycetoma worldwide.
3. Mycetoma was first reported in the modern literature in 1694. The disease is commonly known as “Madura foot” after the description of a case reported in the mid-19th century in the Indian town of Madura. Although it usually affects the foot, other parts of the body such as legs, back, hands, head and neck may also be involved. The disease commonly affects young adults, particularly men aged between 20 and 40 years.³ Infection is thought to be acquired by traumatic inoculation of fungi or bacteria into the subcutaneous tissue following minor trauma or a penetrating injury, commonly thorn pricks. People of low socioeconomic status who walk barefoot and manual workers, such as agricultural labourers and herdsmen, are those worst affected. Infection is not directly transmitted from person to person and no animal reservoir has been shown to be involved in transmission.
4. Mycetoma has numerous adverse medical, health and socioeconomic consequences for patients, communities and health services in affected areas. The disease occurs in tropical and subtropical environments characterized by short rainy seasons and prolonged dry seasons that favour the growth of thorny bushes. Cases occur predominantly in the so-called “mycetoma belt”, which stretches between the latitudes of 15° south and 30° north of the equator, and involves central and southern America (Mexico and Venezuela (Bolivarian Republic of)), Africa (countries of the Sahel subregion from Senegal in the West to Sudan and Somalia in the East), the Middle East (Saudi Arabia and Yemen) and southern Asia (India).

¹ Document EB137/11.

² See document EB137/2015/REC/1, summary record of the second meeting, section 3.

³ Men are four times more likely than women to suffer from Mycetoma.

5. The global burden of mycetoma cannot be determined accurately as there is a lack of accurate data on its incidence, prevalence and distribution. A systematic review and meta-analysis carried out in 2013 reported a total of 8763 cases from 50 literature studies published since 1956. Most of the cases (75%) were reported from the following countries: Mexico (2607 cases), Sudan (2555 cases) and India (1392 cases).¹ However, more than 7200 mycetoma patients have been registered in Sudan at the national Mycetoma Research Center, currently a WHO Collaborating Centre, since its establishment in Khartoum in 1991. The prevalence in some villages in Sudan where mycetoma is endemic is reported to be potentially as high as 8.5 per 1000 inhabitants.² Globally, mycetoma is not a notifiable disease and it is not monitored in any national surveillance systems. More accurate surveillance and burden of disease data are therefore essential in order to evaluate its significance as a public health problem.

6. The different causal organisms of mycetoma produce an almost identical clinical presentation. It is characterized by a triad of painless subcutaneous masses, multiple sinuses (small cavities or fistulae opening onto the overlying skin) and discharge containing visible grains (granules representing colonies of infective agents). Mycetoma usually spreads contiguously to involve the skin, deep structures and bone but can also spread to more distant sites through the blood and lymph. If left untreated, the disease leads to destruction, deformity and loss of function, which may be fatal.

7. The incubation period for the disease is widely variable. Given its slow progression, painless nature, ignorance about the disease and its causes, and scarcity of medical and health facilities in the areas where it occurs, many patients present late with advanced disease, when amputation may be the only available treatment. Secondary bacterial infection is common, and lesions may then cause pain, disability and, if untreated, fatal septicaemia.

8. The causative organisms can be detected by examining either the discharge from wounds or surgical tissue biopsies. Visual examination and microscopy are helpful in orienting the diagnosis as they enable the characteristic grains to be detected. The grains can then be cultured or examined by histopathology in order to identify the causative organism accurately. Other useful techniques for the diagnosis of mycetoma include serodiagnosis or DNA sequencing. Imaging techniques can help to determine the extent of the lesion. None of these techniques is commonly available in areas where the disease occurs.

9. Preventing infection is difficult, but people living in or travelling to endemic areas should be advised not to walk barefoot, as footwear and clothing in general can protect against puncture wounds. Treatment options depend on the causative organisms. Bacterial mycetoma (actinomycetoma) requires long-term treatment with a combination of antibiotics, tailored to the type of bacteria involved. For the fungal type (eumycetoma), treatment is based on the administration of antifungal agents for prolonged periods, usually preceded or followed by surgical excision of the lesions. Whereas actinomycetoma is largely amenable to early medical treatment, treatment of eumycetoma is frequently unsatisfactory, has many side-effects, is expensive and is not readily available in endemic areas. Recurrence rates are therefore high.

¹ van de Sande WWJ. Global burden of human mycetoma: a systematic review and meta-analysis. *PLoS Negl Trop Dis.* 2013;7(11):e2550. doi:10.1371/journal.pntd.0002550.

² Mohamed HT, Fahal A, van de Sande WWJ. Mycetoma: epidemiology, treatment challenges and progress. *Res Rep Trop Med.* 2015;6:31–6.

WHO'S RESPONSE TO MYCETOMA

10. WHO's response is made as part of the Organization's wider efforts to overcome the global impact of neglected tropical diseases, a diverse group of communicable diseases that prevail mainly under tropical and subtropical conditions. Although the importance of these diseases differs at national, regional and global levels, their common characteristic is that they affect poor and difficult-to-reach populations. In 2005, the Secretariat established a dedicated technical response capacity for the control of neglected tropical diseases. Since then, the operational focus has shifted from individual diseases or conditions to interventions. Action against a specific disease using the most appropriate set of interventions in any given setting is therefore guided by adequate knowledge of the disease's epidemiology and the availability of appropriate prevention, detection and control measures that can be successfully implemented even in low-resource settings.

11. WHO recognizes that a number of tropical, poverty-related diseases or conditions, including mycetoma, remain neglected. Opportunities exist to advance knowledge of such diseases or conditions in order to: facilitate advocacy in support of awareness; stimulate the generation of further knowledge; and encourage the development of appropriate control tools and strategies for inclusion in the WHO portfolio of neglected tropical diseases. In support of this effort, the UNICEF/UNDP/World Bank/WHO Special Programme for Research and Training in Tropical Diseases, operating through WHO's regional offices, runs a competitive small grants schemes for implementing research into infectious diseases of poverty, with yearly calls for proposals. The Programme also provides postgraduate training support (at doctorate and master's degree levels) for the relevant research and provides support to countries in identifying evidence-based research priorities. These competitive schemes can be used to investigate poverty-related diseases that remain neglected.

12. Elaborating a public health strategy for the prevention and control of mycetoma will undoubtedly require significant investment in research and product development, so that cost-effective prevention, diagnosis, early treatment and case management can be practised in low-resource settings. Some product development partnerships have begun to provide support to research and development; the Drugs for Neglected Diseases *initiative*, for example, will test a promising new treatment for eumycetoma as part of a 2015–2023 business plan.¹ It will be essential to mobilize additional resources in order to facilitate the inclusion of public health interventions against mycetoma among those advocated by WHO against neglected tropical diseases.² At present, early diagnosis and treatment with currently available tools is the most appropriate approach for lessening the disease burden imposed by mycetoma.

13. The Secretariat – through the UNICEF/UNDP/World Bank/WHO Special Programme for Research and Training in Tropical Diseases, and the WHO regional offices – will intensify its efforts to advocate for improved surveillance and control of mycetoma. It will continue to solicit focused support from international donors and partners and to provide technical assistance to the WHO Collaborating Centre on Mycetoma in Khartoum and to the health ministries of Sudan and other

¹ http://www.dndi.org/images/stories/pdf_publications/DNDi_Business_Plan_2015-2023.pdf, accessed 9 October 2015.

² WHO recommends five public health interventions to accelerate the prevention, control, elimination and eradication of neglected tropical diseases: innovative and intensified disease management; preventive chemotherapy; vector ecology and management; veterinary public health services; and provision of safe water, sanitation and hygiene. (See Investing to overcome the global impact of neglected tropical diseases: third WHO report on neglected diseases 2015. Geneva: World Health Organization; 2015 (http://apps.who.int/iris/bitstream/10665/152781/1/9789241564861_eng.pdf?ua=1, accessed 16 October 2015)).

affected Member States so that knowledge of the disease can be advanced sufficiently to permit the development of control strategies and tools that are suitable for implementation under all circumstances, including in low-resource settings. In this respect, mycetoma will serve as a model for advancing the agenda of other tropical, poverty-related diseases that currently remain neglected.

ACTION BY THE EXECUTIVE BOARD

14. The Board is invited to note the report.

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