

## Noma: a neglected enigma



Noma is a disease surrounded by riddles. It manifests itself only in the poorest populations in developing countries, enclosed by ignorance and extreme poverty. The worldwide prevalence of noma is unknown—estimates range from 30 000 to 140 000 cases.<sup>1</sup> Most cases of noma worldwide occur in the so-called noma belt, which is situated directly south of the Sahara and runs across Africa from Senegal to Ethiopia. Another puzzle is that child mortality and malnutrition are prevalent on the Indian subcontinent, but noma is not reported there.<sup>2,3</sup> The prevention and treatment of noma is not a priority in the countries where the disease is prevalent. Moreover, deaths from noma are not included in the mortality statistics of these countries. The cause of noma—the biological mechanism that ignites the gangrene—remains a mystery. Although the disease is clearly an opportunistic infection, we still do not know whether some of the commensal microorganisms in the oral microbiota play a particular part in the expanding gangrene. Also puzzling is how an unknown percentage (a common estimate suggests 10%) of noma patients survive the often extensive gangrene without any medical treatment. Antibiotic treatment of noma has not been subject to medical research, except for in some old observational studies.<sup>4</sup> Furthermore, after one and a half centuries of surgical experiments, a good surgical treatment for a frequent sequela of noma, complete trismus of the mouth, has still not been found.<sup>5</sup>

The study by Baratti-Mayer and colleagues, undertaken in Niger, focuses on risk factors for noma. It is admirable that this large group of Swiss scientists, almost all members of the only scientific group on noma in the world, GESNOMA, has embarked on such a large and well-organised prospective, matched, case-control study to assess the risk factors for noma, and even more admirable that they have collected their data successfully under very difficult circumstances.

Their results confirm that malnutrition has a paramount role in the development of noma, and that poverty is associated with the disease. They also confirm a link between noma and recent illnesses of respiratory and intestinal origin. A new aspect to their study is the inventory of the oral microbiota in patients with noma and in controls. Their results do not confirm the role of *Fusobacterium necrophorum* (present in herbivores) as a

trigger organism for noma, as suggested by Enwonwu and colleagues<sup>6</sup> who hypothesised that the presence of herbivore livestock was a potential risk factor for noma. Baratti-Mayer and colleagues also describe differences in the intraoral microbiota of noma patients and controls, with a lower amount of *Fusobacterium* genus and spirochetes in patients with noma than in healthy controls. This result is intriguing because previous findings by Stewart,<sup>7</sup> Eckstein,<sup>8</sup> and Emslie<sup>9</sup> showed the presence of spirilliform and fusiform microorganisms (called *Borrelia vincenti* and *Fusififormis fusiformis* at that time), often in large numbers, in biopsy samples taken from the transitional zone between the gangrene and healthy tissue, which suggested an important infiltrating role for these two microorganisms. In this context, the results of this study do not solve the puzzle of the trigger of this devastating gangrene but rather magnify it. Invasive diagnostics with, for example, needle biopsies from this transitional zone could help to elucidate the nature of this gangrene.

An interesting finding, which is not commented on in the Discussion section, is that all 82 patients with noma received amoxicillin and metronidazole, resulting in a mortality rate of 8.5%. This article is, as far as I know, the first publication reporting treatment results of a series of noma patients since 1966, when Michael Tempest reported a similar mortality rate of 8% in 250 patients treated with penicillin.<sup>4</sup> This finding implies that a combination of amoxicillin and metronidazole is a good treatment to give to patients with noma, and perhaps also a penicillin, in view of the results of half a century ago.

However, a major problem is that most patients with noma worldwide do not have access to medical facilities because they are not available or are too expensive. Patients might consult a traditional healer, whose treatment (often a branding iron or caustic herbs) will lead to a deterioration in the patient's condition. Western non-governmental organisations have also provided treatment in the past. Unfortunately, such programmes are now in jeopardy because of political instability and concomitant insecurity for aid workers from developed countries.

Noma is a disease that can be prevented completely by a particular level of economic welfare for the poorest

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See [Articles](#) page e87

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people in society. This degree of welfare has been reached by most of the world's population, which has expanded across the planet for thousands of years. An old companion on this journey of expansion, which is found on the edges of human being's habitat (and is the case for every animal), is hunger and death. Death by starvation is expressed in many ways, of which noma is iconic as the "face of poverty".<sup>10</sup> We want to eradicate phenomena such as extreme poverty, famine, and starvation, as seen in the definition of the Millennium Development Goals and the recent G8 focus on nutrition. The future will show us whether or not these goals are the starting points of a feasible global health target.

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I declare that I have no conflicts of interest.

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