

### Difficult years

The next few years were difficult ones, with many changes of staff and disagreements about policy and management. Over all hung the constant criticism that the *Family Doctor* publications group was failing to earn its keep.

The lowest level was reached in 1971 and closure seemed imminent. It was at this point that my colleague Ken Goldsmith and I approached the *Family Doctor* committee and asked to be allowed the chance to take over, and we became business manager and executive editor, respectively, in 1972. Each year since then has seen an improvement in our position. We increased our publishing activities, paid off fully the outstanding debts, including the launching costs of *Family Doctor* magazine, and now exist on our own earnings, at no cost to the BMA.

I am glad that we have had no major problems and no public rows in these past 12 years. I am not a combative personality and prefer to get quietly on with the job in hand—giving the public sound information and advice on health matters, and persuading and helping doctors first to write it, and then in many cases to rewrite it for them, to make it suitable for lay readers.

The biggest crisis I had to face was in 1978. I had accompanied the chairman of council (Sir James Cameron) and the secretary of the association (Dr Elston Grey-Turner) to Paris for

the launch there of a French version of *You and Your Baby*. It was a grand occasion and we were honoured by the presence of Madame Simone Weil, at that time the French Minister of Health, at our reception, and all the top officials of the French Medical Association. The BMA party decided to stay on in Paris over the weekend, but I flew back early on Saturday morning as I had tickets that evening for *Götterdämmerung* at Covent Garden. (Things don't change much, do they?) On Sunday evening I watched the television news showing a warehouse at St Pancras still burning after the biggest fire since the blitz. *Götterdämmerung* indeed—for it was the *Family Doctor* warehouse, no less, and we lost every single publication we possessed, and most of our records.

Phoenix-like we rose from the flames and we were back in business in two months with everything we wished to keep going revised, reprinted, and replaced within a year, thanks to the splendid cooperation of our printers, and all out efforts from the staff.

Earlier this year I had lunch with my old friend Dr Doris Odlum, president of the Samaritans and at the age of 93 still going strong. I told her that I had been advised to take early retirement as soon as possible. "How long have you been at *Family Doctor*?" She asked. "Twenty seven years." I said. "Well Brownie, don't have any regrets, you've had a very good innings." Dear Doris. I rest your case.

## Ancylostoma duodenale and the Saint Gothard anaemia

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This year sees the celebration of the centenary of the official opening of the Saint Gothard railway tunnel, and we felt that it would be of interest to recall the epidemic of ancylostomiasis to which so many of the workmen fell victim. This problem of hygiene rightly had wide scientific and political repercussions at the time, as well as echoes among the public. The anaemia, which first appeared in 1880 when the tunnel was being bored, led to major advances in parasitology, by way of research into the aetiology, epidemiology, and treatment of ancylostomiasis. Even to this day, this infestation, which has claimed innumerable victims in tunnels and mines, is still a serious medical and social problem in several tropical countries.<sup>1</sup>

### Background

At the beginning of 1880 a large number of workmen, mostly from Piedmont, returned home because they had severe anaemia, which had rendered them unable to work. Nevertheless, their condition did not improve but became worse, and several workers died. In February 1880 an Italian workman who had been employed in boring the Saint Gothard tunnel died of "pernicious anaemia" in hospital in Turin. During the necropsy Professor Perroncito found no fewer than 1500 ancylostomas in the duodenum and jejunum.<sup>2</sup> Less than a year later together

with Concato he reported, first to the Academy of Medicine at Turin<sup>3</sup> and then to the Academy of Sciences in Paris,<sup>4</sup> three further cases of workers on the Saint Gothard tunnel suffering from severe anaemia in whose faeces numerous ancylostoma ova had been found. The three workers stated that hundreds of their workmates at the tunnel workings had had symptoms similar to their own for a long time.

Two Turin doctors, Bozzolo and Pagliani, then went to Airolo and confirmed the presence of parasite ova in the faeces of numbers of workmen working in the tunnel. Nevertheless, they had strong reservations about the aetiological association between this parasitic infestation and what they called an "epidemic pernicious olighaemia," a disease which, as Dr Caglioni said about Airolo, resulted in "meeting these sad yellow faces everywhere in the streets of Airolo, faces which were upsetting to see."<sup>5</sup> The roots of the disease, the two doctors thought, were rather to be found in the deplorable conditions of general hygiene, both in the workers' private lives and at their place of work. The alarm about the mysterious Saint Gothard disease was sounded by certain Italian newspapers, with considerable repercussions on public opinion. Motions were submitted to the Italian parliament, which found itself faced with the serious political problem of guaranteeing acceptable living conditions for the thousands of Italian workers employed on the Saint Gothard tunnel.

### The controversy

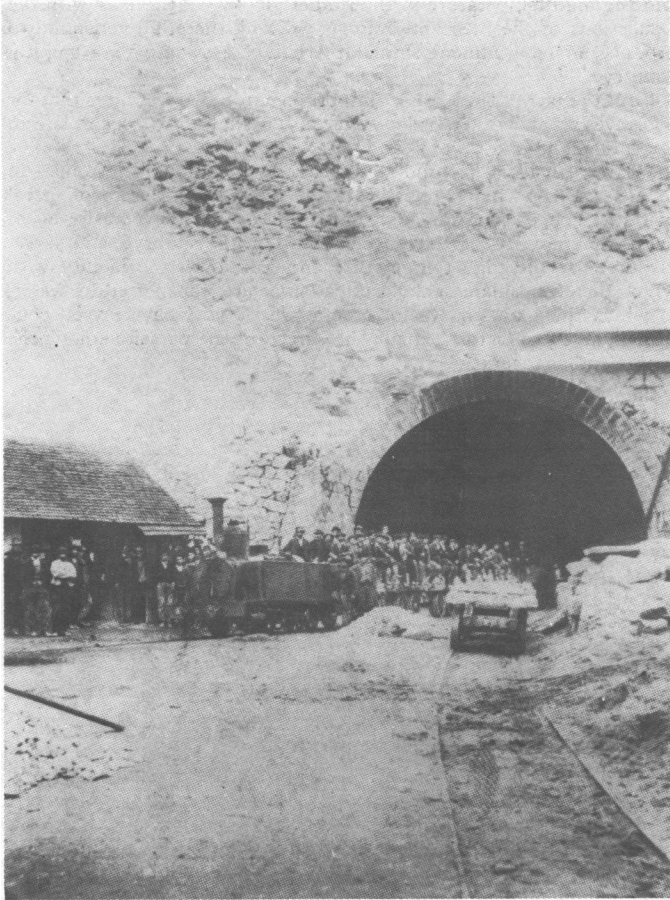
On 18 March 1880 the Federal Council commissioned Dr Sonderegger to carry out an investigation. After visiting the site, he at first concluded that the Saint Gothard disease was nothing other than a form of the well known "miners' disease,"

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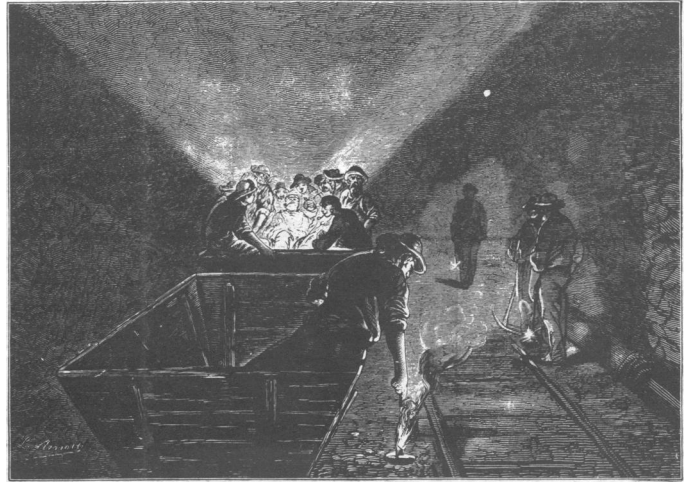
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which was also called "mountain cachexia"—a disease which for decades had affected coal miners working in a number of pits in Belgium and France and which had also occurred in mines of different types in Germany, Hungary, and Italy. He later had to revise this opinion.<sup>6 7</sup> It is illuminating to see just how Dr Sonderegger began his report on the investigation he had been instructed to carry out by the federal government: "Miners' anaemia or ankylostoma?" That was how the question was put. It was thought at that time that miners' anaemia was due to intoxication from contact with or inhalation of unknown substances present in the air in the mines. In response, Professor Perroncito obtained stools from workmen with typical symptoms of Saint Gothard disease, but who were working in a mine in Germany, and demonstrated the presence in the stools of numerous ankylostoma ova. The arguments between the



proponents and adversaries of the parasitic origin of Saint Gothard disease became more and more bitter, even during scientific and political meetings at the highest level. Dr Lombard wrote in the *Archives des Sciences Physiques et Naturelles de Genève* as follows: "... the presence of ankylostoma as a cause of the disease suffered by the tunnel workers, is pure hypothesis ... in spite of the assertions of some people who have written on the subjects this parasite has not been observed by the doctors treating the patients," and in concluding his article, stated "The facts have been conscientiously studied and are sufficiently clear to confound what I will call the *legend of ankylostomiasis and the legend of the ubiquity of Saint-Gothard tunnel anaemia*" (our italics).<sup>8</sup>

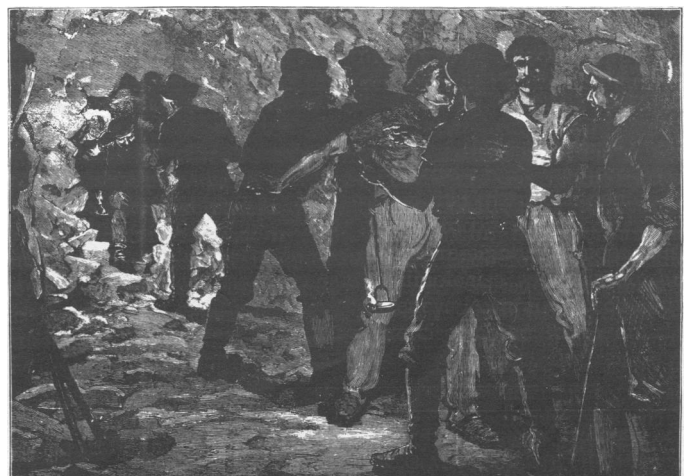
An important factor for understanding the reasons for the controversy is that, though there was ample knowledge about the biological cycle, embryology, and development of the parasite, there was complete ignorance about the means by



which it entered the body. This gap in knowledge was fully exploited by the opponents of the theory of the parasitic aetiology of this disease.

In fact, to the claim by Bozzolo and Pagliani<sup>5</sup> that "the impurity of the water used for drinking in the galleries has contributed to the spread of the ova of the ankylostomum" Lombard<sup>8</sup> could reply, "These gentlemen are evidently unaware that the employers of the tunnel workers have for some years provided a supply of drinking water which leaves nothing to be desired. . . . The water is obtained from the Tremola and is led through metal pipes beginning 1800 metres above the tunnel. The water thus reaches the lower parts of the tunnel without having had any contact with the tunnel itself. It comes from Lake Sella, above the hospice, and runs over a granite bed so that it is the purest water in the Airolo region. Furthermore, it is worthwhile adding that the Italian worker in general is very careful in the choice of water he drinks, and that he is careful to avoid drinking water which, often muddy, runs at his feet."

What was not known was that the workers became infected precisely to the level at which their legs were immersed in this water, as may be confirmed by examining the life cycle of the parasite as it is known today. Lombard tried to refute the work of Concato and Perroncito by countering them with the observations made by the doctors of the Saint Gothard company, Dr Giaccone for the Airolo site and Dr Fodere for the Goeschenen site. These doctors, however, did not possess the necessary diagnostic equipment to see the ova of the parasites in the stools. Lombard himself admitted this lacuna in the



THE COMPLETION OF THE ST. GOTHARD TUNNEL, FEB. 29, 1880—THE MEETING OF THE WORKMEN

investigations, when he said of Dr Giaccone, "Not having a microscope, he could not look for ova in the faeces." In the meantime numerous cases of anaemia among the workers at the Goeschenen site began to be reported.

### Clinical findings and treatment

The doctors who were most active in helping these patients and who, thanks to their investigations, also solved the problem of the treatment of Saint Gothard disease, were Edoardo Perroncito at Turin<sup>9 10</sup> and Ernesto Parona at Varese, both of



whom cared for large numbers of Gothard workers.<sup>11 12</sup> Together with his clinical research, Perroncito also studied the biological cycle of *Ancylostoma*, culturing them from ova obtained from his patients and obtaining two larval stages. He studied the effects of the most widely different physical and chemical treatments on the larvae, until he finally obtained his first therapeutic successes with high doses of ethereal extracts of male fern. The disappearance of ova in the stools corresponded with a definite and progressive improvement in the patient's general condition, with restoration to full health after a few months.

Necropsies on patients who had died disclosed no pathognomic lesion, apart from the presence of *Ancylostoma*, which might justify another diagnosis. On the basis of these results, the parasitic nature of Saint Gothard disease and, in a more general fashion, of miners' anaemia was universally and definitively recognised, as Dr Bugnion summed up in 1881 in the *British Medical Journal*<sup>13</sup> and in the *Revue Medicale de la Suisse Romande*<sup>14</sup>: "While the high temperatures in the tunnel and the lack of light played a part in the development of the anaemia in the workmen, it can be stated that the most important part was played by the ankylostoma, and I do not think that anyone today can argue against a statement which is based, not on a few articles in newspapers but on positive proven facts."

### Epidemiology

After the solution of the problems of diagnosis and treatment of the disease, it was now necessary to attack the problems of epidemiology and infestation, and to explain how it was that a disease characteristic of lowlands and hot or temperate climates could manifest itself so dramatically in the very heart of the Alps. Even at that period those who studied the problem were able to supply an answer that is still valid today about the

various biological and ecological mechanisms underlying the Saint Gothard epidemic. We quote the clear and convincing arguments of Parona<sup>11</sup>:

"The appearance of *Ancylostoma duodenale* at the very heart of the Alps, at an altitude of 1155 metres above sea level . . . is the more surprising in that to date we knew only of the endemic areas of the Po valley and the malarial zones. While it must be pointed out that the majority of the Gothard workers came from the provinces of Venice and Upper Piedmont, a large number nevertheless came from the endemic areas. While this explains the transportation of the parasite to a new area, it does not explain the magnitude of its spread or the severity of the epidemic. . . .

"Waterflow was very slow, and water accumulated on the floor of the tunnel, particularly where oblique cuttings were made, and here the water might come up as far as the knees or above, and the workers had to spend several hours at a time under these conditions.

"In this way the extreme humidity of the tunnel and the excessive humidity of the air, vitiated as it was by the fumes of explosives, and the high temperature in the tunnel (36-38°C), together with the exhalations of the men and animals working there, all conspired to produce an environment similar to that of a swamp or a tropical country.

"But the fact of the greatest importance in this question is that for many years the workers' excreta had been allowed to accumulate in the tunnel and had never been cleared away.

"If we consider the prodigious fecundity of the ankylostoma—in severe cases one may find 150 to 200 ova per centigram of faecal matter—each patient spreads millions of ova of the parasite every day. The rapidity of the development of the embryo and larva, favoured by the high temperature and humidity, the facility with which the encapsulated ankylostoma larvae are transported by water, in which they can survive for several weeks, as I have myself confirmed, all these factors explain the spread of the parasite among the Saint-Gothard workers."



L'ENTRÉE DU TUNNEL DU CÔTÉ SUD DE D'AIROLO, CANTON DU TESSIN

### Conclusion

We have tried to show how the epidemic of anaemia among the Saint Gothard miners contributed to advancing our knowledge of ancylostomiasis. Today we can say that the clinical aspects of ancylostomiasis were first described in Europe under the name of "miners' anaemia," even though the condition is a tropical one. Undoubtedly it was during the epidemic that occurred while boring the Saint Gothard tunnel that it was first discovered that the features of Saint Gothard anaemia corresponded with those of miners' disease in other regions, and thereafter that the pathogen causing "miners' anaemia" was none other than *Ancylostoma*.

The numerous parasitological studies carried out during the Saint Gothard epidemic gave rise to a further confirmatory series of studies in widely differing countries and environments.

Perroncito himself at the end of 1881 showed the presence

of *Ancylostoma* in anaemic workers in the mines of St Etienne and Valenciennes in France. The observations reported from the Saint Gothard tunnel were confirmed throughout the world, by demonstration of the wide spread of the *Ancylostoma*, the essential factor in miners' anaemia, and generally in ancylostomiasis in hot humid countries.

*Ancylostoma* were in fact successively reported in mines in Austria, Germany, Belgium, and Russia. Lutz found them at Sao Paulo, in Brazil, in 1880-5, Stiles found them in North America, and later A E Boycott and J S Haldane found them in workers in the Cornish mines at Dolcoath and at Newcastle upon Tyne.<sup>15</sup> For having inspired these studies in England, Professor Perroncito received a doctorate "honoris causa" in science from the University of Manchester in 1905, with the citation "on the 25th anniversary of the discovery of the parasitic nature and of the treatment of miners' anaemia."<sup>16</sup>

His work on Saint Gothard anaemia also brought him other prizes and high honours: we shall mention merely the spontaneous offer by De Sanctis, the Italian Minister for Public Instruction, to support his work financially. We should also refer to his collaboration with the Academy of Sciences in Budapest to carry out studies on the miners of Chemnitz in Hungary. Nevertheless, it was principally the therapeutic and preventive measures developed and recommended after the epidemic at the Saint Gothard tunnel that were successfully applied in improving the hygiene of mines and eliminating the *Ancylostoma*.<sup>17</sup> So outstanding successful were these preventive measures that when the Simplon tunnel was bored (between 1898 and 1906) not a single case of ancylostomiasis was found, thanks to rigorous hygienic discipline.<sup>18</sup>

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## References

<sup>1</sup> CCTA/WHO African Conference on Ancylostomiasis. Report. *WHO Tech Rep Ser* 1963;No 255:5-27.

- <sup>2</sup> Perroncito E. Observations helminthologiques et recherches expérimentales sur la maladie des ouvriers du Saint-Gothard. *C R Seances Acad Sci* 1880;**90**:1373-5.
- <sup>3</sup> Concato L, Perroncito E. Memoria letta alla Regia Accademia Medicina. *Giornale della Regia Accademia di Medicina di Torino* 1880; Mavzo. (Quoted in Bugnion E. *Rev Med Suisse Rom* 1881;**1**:269-89, 405-50.)
- <sup>4</sup> Concato L, Perroncito E. Sur l'anchylostomiase. *C R Seances Acad Sci* 1880;**90**:619-20.
- <sup>5</sup> Bozzolo C, Pagliani L. Lettera da Airolo. *La Perseveranza* 1880; 9 Mavzo. (Quoted in Perroncito E. *La malattia dei minatori dal S. Gottardo al Sempione: una questione risolta*. Torino: Carlo Pasta, 1910.)
- <sup>6</sup> Sonderegger A. Ankylostoma duodenale. *Blatt für Schweizer Aerzte* 1880;**10**:646-8.
- <sup>7</sup> Sonderegger A. Die kranken Gotthardtunnel-Arbeiter. Bericht an das Eidg. *Blatt für Schweizer Aerzte* 1880;**10**:393-6.
- <sup>8</sup> Lombard H-C. La maladie des ouvriers employés av percement du tunnel du Saint-Gothard. *Archives des Sciences Physiques et Naturelles* 1880;**3**:516-30.
- <sup>9</sup> Perroncito E. L'Anemia dei contadini foracai e minatori in rapporto coll'attuale epidemia negli operai del Gottardo. Studio e osservazioni, profilassi e cura. In: *La malattia dei minatori dal S. Gottardo al Sempione: una questione risolta*. Torino: Carlo Pasta, 1910.
- <sup>10</sup> Perroncito E. Note sur l'action de l'extrait d'aspidium filix mas sur les ouvriers du Gothard atteints d'oligémie épidémique. *Rev Med Suisse Rom* 1881;**1**:163-8.
- <sup>11</sup> Parona E. L'anchilostomiasi e al malattia dei minatori del Gottardo; note clinico-anatomiche. *Annali Universali di Medicina e Chirurgia, Milano* 1880;**153**:177-202.
- <sup>12</sup> Parona E. L'estratto etereo di felce maschio e l'anchilostomiasi dei minatori del Gottardo. *Osservatore, Torino* 1881;**17**:19-49.
- <sup>13</sup> Bugnion E. On the epidemic caused by ankylostomum among the workmen in the St Gothard Tunnel. *Br Med J* 1881;**1**:382.
- <sup>14</sup> Bugnion E. L'ankylostome duodénal et l'anémie du Saint-Gothard. *Rev Med Suisse Rom* 1881;**1**:269-89, 405-40.
- <sup>15</sup> Boycott AE, Haldane JS. An outbreak of ankylostomiasis in England. No 1. *J Hyg (London)* 1903;**3**:95-136.
- <sup>16</sup> Perroncito E. Address on some points concerning human intestinal parasites. Conference held in the University of Manchester, on the occasion of the bestowal of the title of Doctor of Science Honoris Causa. 1905; 27 January. In: *La malattia dei minatori dal S. Gottardo al Sempione: una questione risolta*. Torino: Carlo Pasta, 1910.
- <sup>17</sup> Perroncito E. *La malattia dei minatori dal S. Gottardo al Sempione: una questione risolta*. Torino: Carlo Pasta, 1910.
- <sup>18</sup> Volante G. Intorno alle condizioni igieniche e sanitarie in cui si svolse i lavori della Galleria del Sempione. In: Perroncito E. *La malattia dei minatori dal S. Gottardo al Sempione: una questione risolta*. Torino: Carlo Pasta, 1910.



Nineteenth century engraving of doctor and patient.