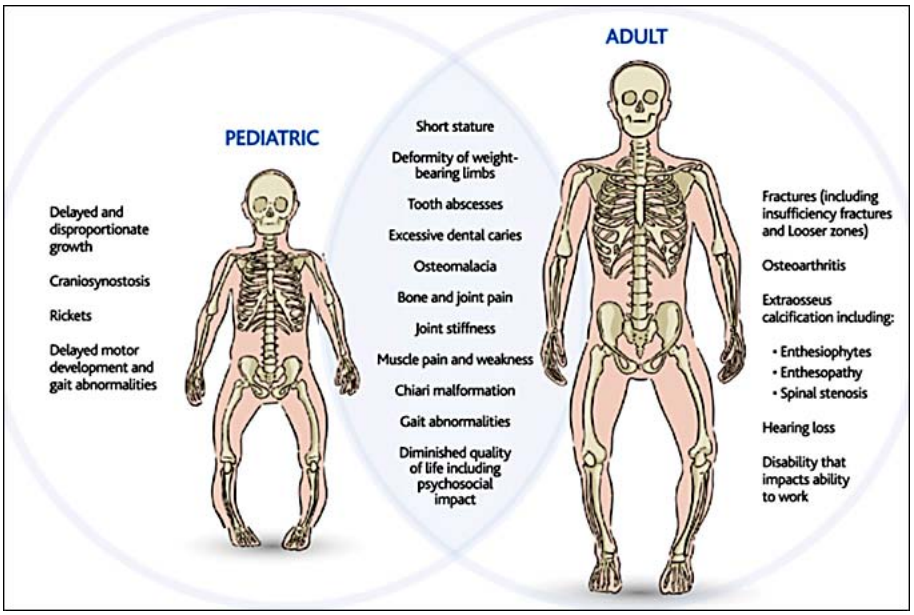
Chapter 7.

In Sickness and ...

The Cough. Noel Counihan

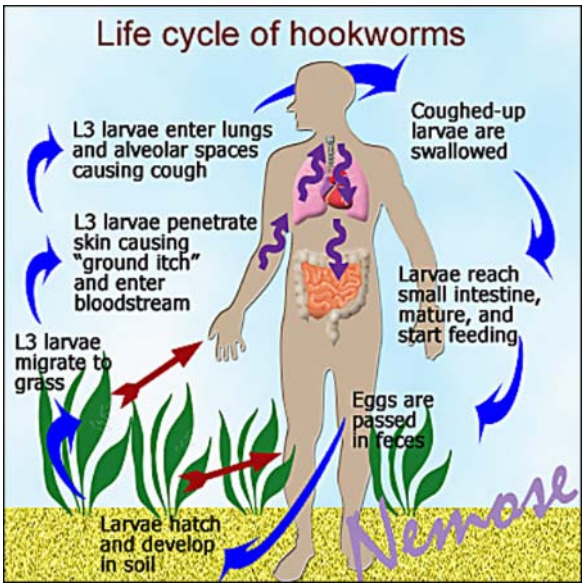
While the mine owners believed that they were promoting the health of their workforce by providing them with their food, this was not necessarily the case. In the long term, greed affected the quality of the food particularly the bread, as much as the scarcity of animal proteins. This meant that insufficient calories were consumed for the energy expended by the men and, more particularly, the boys. The poor development of adolescents caught up in the Industrial Revolution had come to the attention of medical men through out Europe. While in Cuevas, one doctor, José Doménech Sáez, published a memorandum in 1888 on the health of those working in the local mining sector in which he echoed the findings of his counterparts, that those men who had been working since a young age in the mines had failed to achieve their growth potential. Not only that, but the average height of the general population of the surrounding district was diminishing even though the mines were enjoying their most profitable period. The 'casual exploitation', described in Chapter 5, affected not just the miners themselves, but as the bread-winners, the wider population. The inevitable outcome of poor diet was poor growth, and this was further compounded by the fact that the men and boys worked from dawn to dusk for moths on end. Lack of the sunshine vitamin, vitamin D, so necessary for the absorption of calcium and phosphates, combined with few calcium rich foods in the diet, inhibited the bone growth of the youngsters with some, no doubt, suffering from rickets.



The effects of vitamin D deficiency on the bones of an adult and child. Researchgate.net

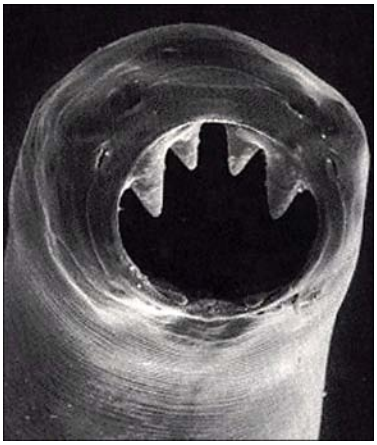
The causes of diseases affecting the workforce are complex and the simple diagnosis of them often overlooked this, and also, the possibility of multiple underlying health issues. Not that this made much difference to the sufferers, as treatments were neither curative, nor even palliative.

There was a condition known as miner's anaemia and while vitamin D deficiency is often associated with this, it is thought that the primary cause was parasitic hookworms. The life cycle of Ancyclostomo duodenale, the hookworm, is relatively simple because it only has one host, us humans. The eggs are passed through the faeces of the human host onto the ground where they develop into its first stage, the larvae. After moulting twice, they develop into filariform, the infectious stage, stop growing and wait for a passing human. When the host is infected through direct contact, for example via a small cut or abrasion, the parasite then migrates to the circulatory system until it reaches the lungs. The host then coughs it up and swallows it, allowing it to reach the small intestines. If infection occurs through ingestion, the parasite passes to the small intestine directly Once in the gut, the hookworms latch on to the inner wall by biting with their teeth and proceed to feast, mature and reproduce, laying up to 30,000 eggs a day. The eggs are then excreted from the host and the cycle begins anew. Iron deficiency anaemia results from the blood lost as the adults feed, and protein deficiency is also a consequence of long term infection. Hookworm infection was particularly damaging to the younger workers as the protein deficiency led to arrested musculoskeletal growth.



The life cycle of a hookworm. *infection landscape.org*

Hookworm filariform (L3 in diagram). *Microbeworld.org*



The fearsome teeth of the worm itself. *Wikipedia*

The unsanitary conditions in which the men lived and worked greatly facilitated the life cycle of the hookworm. There was little, or no, water available for personal hygiene, and no toilets underground, or indeed above ground. Evidence of a latrine has so far been found at just one mine in the whole Sierra. (See The Better Baritel in the Some Sidelines section of the website). However there was water underground, the toxic thermal water that created the perfect warm, damp environment for the larvae to thrive in. As nearly every man would have had some form of cut or abrasion on his body, and often worked barefoot, there was an easy pathway for the filariform to enter the bloodstream.

The conditions in which the men lived and worked were also the perfect breeding ground for that other scourge of the poor, tuberculosis, or pulmonary consumption as it was known. This was before the days of antibiotics and before there was any understanding of its cause. Despite the Frenchman, Jean Antoine Villemin, proving in 1868 that it was contagious, it was not generally recognized that it was a disease passed on through airborne droplets from when an infected person coughed or sneezed, so it was attributed to a variety of circumstances. Rose, in his 'Untrodden Spain and Her Black Country' listed these as:

Breathing the unwholesome, confined, sulphurous air of the mine; by working with wet feet; by the exertion of climbing up the perpendicular ladders quickly and eagerly to get to the surface, which induces profound perspiration and also palpitation of the heart.

The sudden changes in temperatures both inside the mine workings and on exiting the mine into the chill evening or early morning air, were also believed to induce tuberculosis.

Robert Koch discovered the bacillus in 1882, and in 1921 Albert Calmette and Camille Guerin's vaccine, the Bacille Calmette-Guerin, or BCG, was used for the first time. I thought that TB had largely been eradicated by the BCG vaccination so I was surprised to read a hundred years after its development the following extract, published in 2016 by sciencedirect.com in an article entitled Tuberculosis in the mines of Zambia:

'TB being an airborne disease means that enclosed areas such as mining sites with poor ventilation create favourable environments for TB transmission. TB is one of the main health risks which have been found to be associated with mining. Mine workers in Southern Africa including Zambia tend to have poor living and working conditions thereby having increased risk of TB and in addition working in the mines increases exposure to silica dust leading them to developing silicosis which increases their risk of developing pulmonary tuberculosis.'

I also found a scientific study into the treatment of tuberculosis among the poor in South Africa, where it was found that traditional herbal remedies were effective.[1] The most common treatment is wormwood, lemon oil and mint, and I wondered if this ancient remedy had ever been used in Spain. Artemesia Absinthium, Wormwood or Ajenjo in Spanish, would have certainly been more efficacious than bleeding, which was the common way of treating those patients who could afford a doctor.

Artemesia Absinthium, or Wormwood is still used as a treatment for tuberculosis in Africa. *wikipedia*

While not the cause of tuberculosis, pneumonia and bronchitis, the conditions in which the men worked certainly exacerbated them. One disease that was definitely caused by the work environment was silicosis. José Doménech Sáez observed and commented on the condition in his memorandum. Known as Miners' Fatigue, Doménech described the classic symptoms of silicosis, Chronic, nagging cough, shortness of breath on exertion, weakness and fatigue, fever, difficulty breathing, weight loss, night sweats and chest pain. He also added to the list discolouration of the sputum caused by breathing the acrid smoke from the lamps and candles, but which could equally have been a symptom of TB, lung cancer, or even of lead poisoning, which was the most probable cause of the discolouration of the teeth that he also cited. While on the right track when he attributed the blame to the workers' environment, Doménech did not identify exposure to silica dust as the culprit although he wasn't too wide of the mark when he blamed the black dust that was everywhere in the air. In their book, 'Mines, Cables, Railways, Foundries and Mineral Loading', Andrew Dewey and Juan Antonio Sóler Jódar make this observation,

'Undoubtedly, observations like those of Dr. Doménech would have ended up quickly identifying the environment of the mine and specifically the dust as the first cause of this disease. But paradoxically, the discovery of the tuberculosis bacillus in the 1880's decade, one of the most important events in the history of medicine, was the one that relegated the role of dust to a second tier as a cause of lung disease. In this new scenario, tuberculosis bacillus was the main causal agent of diseases, so that the medical interest in dust reduction amongst workers in the late nineteenth and early twentieth centuries only found justification as an alleged carrier of the tuberculosis bacillus.'

***Footnote 1**. Medicinal Plants Used for the Treatment of Tuberculosis by Bapedi Traditional Healers in Three Districts of the Limpopo Province, South Africa. Semenya and Maroyi.*

The incidence of silicosis did not decrease with the introduction of more modern technology, but rather increased with the greater use of the infamous ‘widow maker’ pneumatic drills. The safer, air and water, rock drills were invented by the Holman Brothers in Camborne in 1882 and were used in Cornish mines from that date, but they were rarely used in Spain until well into the 20th century.

Single line hammer drill. *Crónicas Mineras de Roglio Mouzo Pagán*

Single line jack-leg drill. *William J Priest*

Men continued to waste away with few seeing their 35th birthday. Even so, children followed their father’s footsteps into the mines in order to support their widowed mothers. Sadly, the same is still true in some mining areas around the world today.

Nigerian miners grinding gold ore, with significant exposure to both lead and silica dust. *okinternational.org*

Doménech also described a condition which afflicted those men and boys who worked with the donkeys and mules, transporting ore to the foundries. Affecting principally the head, face and hands, he describes it as starting with small red patches, graduating to blisters and then black pustules. It sounds as if he was describing ringworm, a fungal infection, caused not by worms but by mould-like parasites. If left untreated, the parasites can invade the lower areas of the skin particularly through hair follicles. These can become infected with bacteria, causing the blisters which develop into the black pustules as described by Doménech. Ringworm is a zoonotic disease, in that it can be passed from animals to humans, as well as between humans.

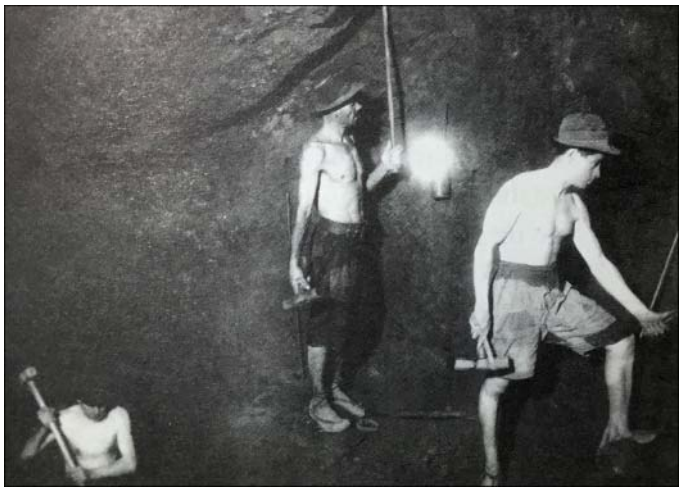
Left, the characteristic ring-like patch which gives ringworm its name. *skinhealth.ind*

Right, Tinea barbae. The parasites invaded the subcutaneous layer of skin via the hair follicles. *auroh.*

A horse with ringworm. *thevetexpert*

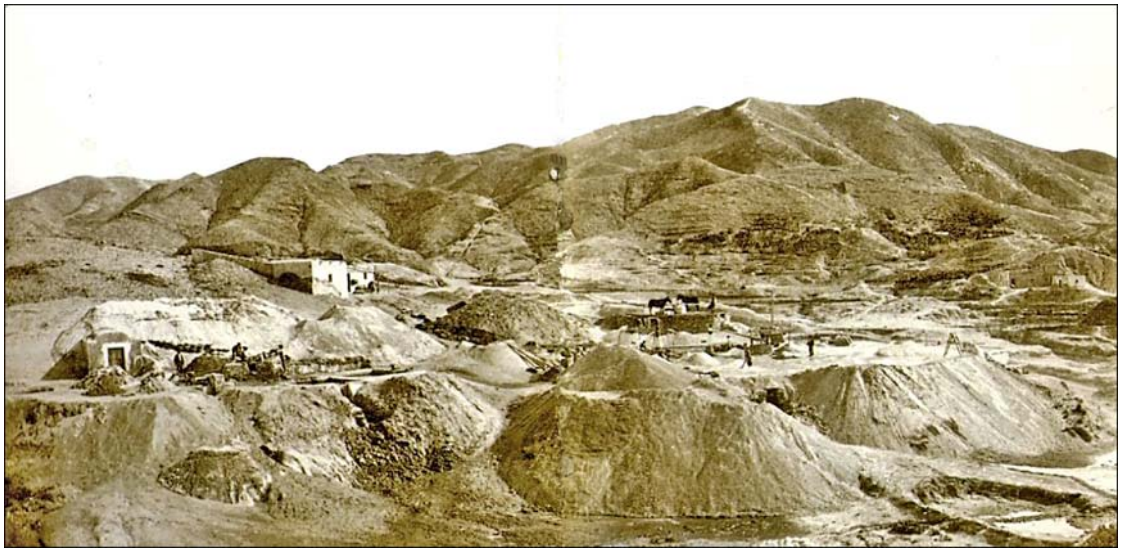
The most well known of the conditions that blighted the lives of the miners and associated workers was lead poisoning and there was no doubting what caused it. The effects depended on the contamination load with an incremental severity of symptoms as the amount of lead in the bloodstream increased. As well as the tell-tale ‘Burton line’, the black line along the gums, early signs were nausea, diarrhoea, constipation, fatigue and a metallic taste in the mouth. These gave way to anaemia, severe abdominal colic and paroxysms, then encephalopathy, delirium and finally fatal seizures. The poisoning was through inhalation, ingestion or direct contact with the mouth, nose, or the mucous membrane of the eyes, and through breaks in the skin. A shocking 95% of inhaled contaminant goes into the bloodstream and 15% of that which is ingested does.

Of all of the workers, possibly the least affected were the miners themselves, but they were not immune. The increased use of dynamite and the fact that there were no specific blasting times meant that there was more lead laden dust in the mine’s atmosphere. The Spanish practice was to bore and blast the lead vein rather than the surrounding sterile. This increased the amount of lead dust, but, by the same token, blasting the sterile increased the silicosis risk, so they could not win either way. Other countries, notably Germany, blasted at the end of work periods in order to give the dust time to settle before the next shift started.



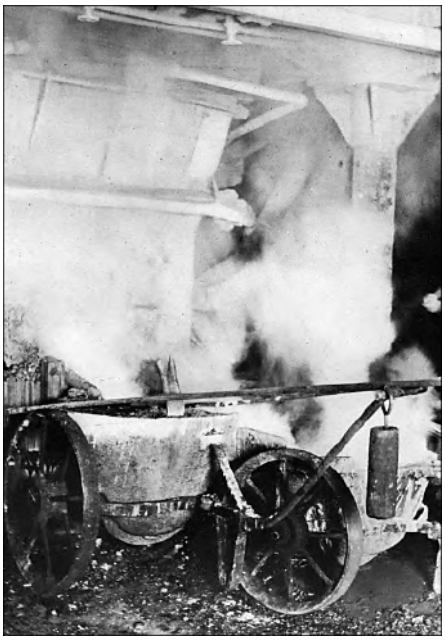
Hand drilling exposed the miners to less lead dust than using pneumatic drills.
Memoria de Cartagena.es

The amount of leaded dust that the surface workers must have inhaled doesn't bear thinking about, long days, winnowing and sifting, shovelling and bagging pulverized galena. There was dust generated at the lavaderos where the ore was wet-processed, but there was less in the air than in the dry processing carried out at the pit-head. However, the ground underfoot was heavily contaminated and the slightest wind would have blown it around, also, inadequate hand washing facilities increased the risk of poisoning through ingestion.



The lavadero at el Tomillar. The wind would have blown the leaded dust into the air. *Rodrigo.*

Smelt mills were the most dangerous environment, where the men were exposed to toxic, lead and sulphurous fumes and leaded dust. There were flume hoods over the furnaces, not for the benefit of the workers, but to direct the flume into the condensation tunnels in order to recuperate lead from the deposits on their walls. Then There Were Mines, Volume 1, Chapter 2.10 refers to the men and boys recuperating the lead from the tunnels being equipped with a handkerchief to cover and protect their mouths and noses and a day off to purge their systems. There were no hoods over the areas where the furnaces were charged and discharged, nor over other areas in the foundry where the molten ore was manipulated. Dust was allowed to accumulate, drinking water was frequently dispensed from buckets without covers and there were no hand washing facilities.



Left, fumes in an American foundry in 1914. *Royal Meeker*

Above, a Spanish foundry operating with inadequate ventilation even in 2007! *OEFA*

A measure of the concern of mine owners for their workforce can be deduced from the fact that it was only when livestock died from grazing in the vicinity of the foundry at Los Lobos that any move was made to direct the fumes away from the workplace.

The flume chimney was moved away from the village of Los Lobos only after livestock had died from lead poisoning. *Author's photo.*

Contamination of the land used for grazing and crop growing, as well as contamination of both ground and drinking water put the whole of the local population at a certain level of risk. Although the Jara, or Spanish broom, which gave the Jaroso its name, is growing in abundance again, analysis of soil samples in the area, even today, make for uncomfortable reading.

Prevention was better than cure, but few steps were taken. Rose tells of a conversation with two managers of a large smelting works in Linares, where certain measures were taken:

'They found it possible to keep off the foe, in great measure, by exercise, if possible, great personal cleanliness, frequent doses of simple aperients (laxatives) as compound rhubarb pills, and above all, by regular and judicious use of acids, which do much towards neutralising the poison. A few drops of some preparation of sulphuric acid in water,- a bottle of this is put at the service of the miners at every mine, they come with a tin mug of water, and take thirty one drops in it – or lemonade, tartaric acid, and the like. They assure me they had found of the greatest possible benefit.'

A Google search of 'sulphuric acid in relation to prevention of lead poisoning' yields several treatises from the late 19th century extolling its virtue, but this view seems to have tailed off in the 20th century.

Bayo devotes a whole chapter in his ;Datos y Observaciones Sobre la Industria Mineria', to the work of a French doctor, Tanquerel des Planches. Said doctor faithfully documented the symptoms of lead poisoning and a day by day account of his treatment regime for the severe colic that it caused. It is a wonder that anyone survived his administration of emetics and opiates daily, and laxatives twice or even three times a day.

Lead poisoning was treated emetics, opiates and laxatives. *Farmacia Minelli.*

An Apothecary balance. *antiques.knowtolove.com*

The formulæ of the doctor's prescriptions were:

- *A simple sudorific tisane:* an infusion of guayacan, the tree of life, to promote sweating. Guayacan was also used as a treatment for syphilis.
- *A Sudorific laxative:* an infusion of guayacan and senna in equal parts.
- *Cassia water with grains of emetic*: Essence of tamarind made from 10 ounces of fruit combined with senna water together with antimony and potassium tartrate, (tartar emetic).
- *Emeticated Holy water:* Ordinary water with antimony and potassium tartrate.
- *Purgative potion:* Infusion of senna containing a concoction of sweetened dates, buckthorn syrup and jalapa, the 4 o'clock plant.
- *Painters' Purgative.* (Artists also suffered from lead poisoning.): A massive dose of senna, with sodium sulphate, sweetened dates and ground jalapa.
- *Mild laxative:* walnut oil and red wine.
- *Theriac lozenge:* an antidotal large tablet containing numerous ingredients, principally opium with myrrh, saffron, ginger, cinnamon and castor to name but a few.

Left, flowers of the guayacán. *pixabay*

Senna flowers. *healthline*

Tamarind. *Souschef*

Purging buckthorn. *CumbriaTreeGrowers*

Jalapa or four o'clock plant. *sonremedioscaseros*

Many of the plants in these prescriptions are still used in herbal preparations today and like wormwood as a treatment for TB, and eucalyptus which was widely used alongside quinine for malarial fever, their possible role in current medicine is being re-evaluated. For example, buckthorn syrup, as well as being a laxative, is also a vermifuge – a medicine used to destroy parasitic worms – so helping to eliminate hookworms from the digestive tract of men infected by them.

However, Bayo gave the soundest advice of all on the treatment for lead poisoning he urged miners and those working in the foundries:

'At the first indication of discolouration of the gums, or any other discomforts which might signal the onset of the disease, go immediately and look for other work, preferably field work, and don't return until you are in better health.'

Bayo also understood the reasons why few would follow his advice for as he wryly commented:

'*The desire to earn higher wages can cause them to be unable to earn nothing for a long time and even worse than that, to lose their life.'*

By 'the desire', we can assume that he meant 'the need'.