Wool has been woven into the industrial history of the world, and has been an important factor in the progress of nations from savagery to civilisation. In all ages, “flocks and herds” have represented peace and prosperity, and only within recent years has it become known that fleeces, hides, flesh, and other products of animals which die from anthrax sometimes convey the disease to man. . . .

Previous to 1837, when alpaca and mohair were imported from Peru and Asia Minor respectively for use as textile fibres, no specific disease had been associated with wool. Ten years afterwards, owing to recurring deaths of sorters, a suspicion arose that these materials were in some way or other the cause of the peculiar, rapid, and fatal illness which became known as “woolsorters’ disease.” When these sudden deaths followed each other at several months’ interval they did not attract much attention, but when sorters died within a few weeks from a similar and unusual disease, the workpeople became alarmed,
and their fears were increased when no reasonable explanation could be given as to the nature of the illness, its prevention or its cure. In the hope of solving the mystery, many post-mortem examinations of the bodies of wool-sorters were made by leading medical men in the large towns of the West-Riding, and the suspected materials and dust arising from these were submitted to experts for microscopical examination and chemical analysis. These investigations and reports extended over more than thirty years without arriving at a satisfactory explanation. In 1877 a case of this disease came under the writer’s observation; the man was apparently well in the morning on leaving home for work, and died seventeen hours after the first feeling of illness. It was evident that this fatal collapse without pain or distress was not from any well-known disease. In 1879, when visiting such a patient—who died twelve hours afterwards—he took some blood from the arm, and within a few minutes two or three drops of it were injected under the lumbar skin of a rabbit, a guinea-pig, and a mouse respectively. The animals died within sixty hours, and the blood of each showed the presence of bacilli. Another animal was inoculated with the blood from one of these, and it died in a shorter time. The fluids from this animal were found to be crowded with the Bacillus anthracis, and the disease was recognized to be anthrax. (Lancet, vol. ii., 1879, pp. 920, 959.)

Anthrax is a contagious disease, and of the widest distribution. It readily attacks most wool-bearing animals, and is found in all countries, being very prevalent on the Continent of Europe, in Asia, South Africa, and South America, and occurring less commonly in the United Kingdom, North Africa, North America, and Australasia. The incidence of anthrax among animals in Great Britain varies very much, some counties having no outbreak year after year, while from others it is never absent. It is most prevalent in the West-Riding and the counties of Leicester, Northampton, and Norfolk, in all of which foreign wool, hair, hides or other animal products are used in industrial processes. The number of sheep and lambs in Great Britain in 1900 was 28,000,000, and the number reported to the Board of Agriculture to have died from anthrax during the year was 40. For 1899 the number of deaths was 69. The risk of infection from home-grown and colonial wool is so slight that it may be disregarded. The most noxious wools are those from foreign countries where anthrax is prevalent, the wool being dry, dusty, of low quality.

The essential cause of anthrax is a micro-organism, the Bacillus anthracis, the spores of which can only produce their specific effect when they gain access to the circulating blood by way of the skin, the lungs, or the stomach; hence there are three types of the disease: the cutaneous, the pulmonary, and the intestinal.

1. Cutaneous Anthrax.—This presents two varieties, viz., malignant pustule and erysipelatous anthrax. The malignant pustule was first noticed in England in 1854, and recorded in 1863. It must have occurred frequently in the Bradford Worsted District for more than thirty years before it was diagnosed as anthrax in 1880. This form of cutaneous anthrax in wool-workers is very much the same as that which appears in hide-dressers and others.

2. Pulmonary Anthrax.— “Wool-sorters’ Disease.”—From the year 1846, when this disease was first noticed in the neighbourhood of Bradford, to 1877, it had not been known to attack other persons than the sorters of alpaca and mohair. In subsequent years it was found that camel’s hair, Persian, and other dry, dusty, low class foreign wools, were also infective; and further, that any person might be attacked if exposed to the inhalation of anthrax spores in the dust arising from the products of dead animals.

Symptoms.—The absence of troublesome symptoms is very remarkable. There may be no rigor, pain, cough, vomiting, purging, or other distressful conditions. Even when dying, the patient may not feel particularly ill. In ordinary cases, at the commencement, there is a chilliness or slight shivering, the tongue is moist and thinly coated, thirst is present, and the appetite indifferent, with some nausea and uneasiness at the stomach; vomiting is common (if this is only at the commencement it is not of much moment, but if persistent or commencing after two or three days it is of serious import, indicating the extension of the disease to the stomach and bowels.) The lungs are always affected, although sometimes only slightly. Nearly all patients have a feeling of tightness, weight, and oppression about the chest, which embarrasses the breathing. Cough is generally present, but never very troublesome; in one-third of the cases it was absent, or very slight. In most there is no expectoration, but in mixed cases, which continue over five days, there is some.
which is occasionally rusty coloured. . . There is a dusky, leaden hue, with coldness of the face, ears, and fingers in the collapse stage. . . . The skin is always moist and often bathed with perspiration. The temperature seldom reaches 103º; when more than this, the infection is mixed, causing septic pneumonia. Generally the temperature is from 3º to 5º higher in the rectum than in the axilla. As the illness advances, the temperature falls. The urine is scanty and high-coloured. . . .

Incubation.—The period of incubation is uncertain. The exact time of infection cannot be fixed as in cases of traumatic cutaneous anthrax. No case of pulmonary anthrax has been recorded which was due to only one exposure to infection. Sorts of noxious materials may work exposed to the risk of infection almost daily for years without any noticeable effect from it. It is only when the virus gains access to the blood stream through some accidentally open gateway that serious illness follows. Judging from what takes place in cutaneous cases we may presume that when the spores pass the respiratory epithelial barrier they will produce some local specific effect within twenty-four hours. Infective material may be present on the skin or the mucous membranes several days before it gains access to the blood and produces any noticeable effect. . . .

3. Intestinal Anthrax.—Only one case of pulmonary intestinal anthrax has been observed in wool-workers, and that recently. A wool-sorter, aged 29, on leaving work felt weak and as if he had a lump at the stomach. The following day he was sick and restless; on the third day the pulse was 86, temperature 99.2º; on the fourth day brown-coloured blood was vomited, and several tar-like stools were passed. Thirteen hours before death he was in a collapsed condition; pulse 112, small and almost uncountable; respiration 26.

The lungs were not involved. Duration of illness, 4 1/2 days. . . .

Preventive Measures.—Noxious wools of foreign origin sometimes include “fallen fleeces,” which are easily recognised; these should be picked out, classed apart, and disinfected by steam.

The Precautionary Regulations agreed upon at Bradford in 1884 were adopted by the Home Office in 1899, and have the force of legal enactments. They provide that bales of alpaca, pelitan, cashmere, Persian and camel’s hair, shall be opened over a dust-extracting fan, so arranged that the current of air shall draw the dust away from any workman in
woolsorters’ disease. They all died, and he found anthrax bacilli in their blood. Bell reasoned that mortality could be considerably lessened if fresh air were blown through the wool for 24 hours before workmen handled it. He also advocated treating the wool with antiseptic and disinfecting it with steam. Wool manufacturers were, however, reluctant to undertake these precautions, and a newspaper war on the subject waxed strong. The woolsorters demanded that manufacturers carry out the medical recommendations, while manufacturers protested that the medical profession was not unanimous as to the best method of disinfecting the wool. Dr Bell wrote about woolsorters’ disease in the 

Bradford Observer:

I will not enter into the particulars as to its cause, nature, and symptoms (these are more suited for the medical press), except to say that it is produced by the inhalation of living organisms derived from the fleeces of animals that have died from anthrax. It may readily be communicated from man to animals, and their blood when examined after death abounds with bacteria (bacillus anthracis) like caterpillars without legs—millions in a drop. In May 1880, a man named Samuel Firth contracted the disease and died. Bell attended the man and wrote on the death certificate that the man had died from woolsorters’ disease as a result of his employer’s neglect in not having the wool disinfected beforehand. He sent the certificate to the police, forcing them to order an inquest; the jury recommended a series of specific measures to prevent the disease and, since no relevant legislation existed, forwarded the recommendations to the sanitary committee of the Bradford Corporation. They conferred with representatives of the woolsorters, the manufacturers, and the local medical community and came out with a series of voluntary guidelines. These were reaffirmed and expanded in 1884 and were continued by voluntary compliance until 1899, when they were adopted as official policy by the British Home Office.

These preventive measures were only partially effective because neither Bell nor other physicians realized how resistant anthrax spores could be; nonetheless, deaths from woolsorters’ disease declined dramatically throughout this period. The woolsorters recognized Dr Bell’s contributions by presenting him at a public dinner with a gold watch and chain “as a token of the regard in which he was held by those whose cause he had so nobly maintained.”

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