Who has done more for Health – Doctors, Engineers or Scientists?

by **David Perrett** on 21st May 2021

Professor David Perrett has an emeritus academic position at Barts and the London School of Medicine & Dentistry; and is also a prominent member of GLIAS (Greater London Industrial Archaeological Society). He had first spoken on this subject about a dozen years ago – but realising that the world had changed in the meantime has had to make revisions.

In the early 18th century grave stones would commonly list many children who had pre-deceased their parents. In the mid 19C child mortality was still 150 per 1000. Devastating diseases were rife; significantly smallpox from the time of Justinian; the Black Death; syphilis; and measles.

Smallpox: Edward Jenner is renowned for the introduction of vaccination in 1798 – though Professor Perrett said it had been practised perhaps from 1600 in Asia, and had been observed in Constantinople by Lady Montague, who successfully tried it in 1721. In 1774 Benjamin Jesty, a farmer, was convinced that the folk tale that milkmaids who had contracted cowpox did not catch smallpox was true, and applied cowpox to his family to protect them. Some feared such an injection would turn them into a cow. Jenner, however, made the procedure acceptable.

Doctors - Operations, with no knowledge of infection by germs or of a need for cleanliness - were done by surgeons in blood bespattered aprons, with their own set of tools, in theatres open to an audience (hence the term operating theatre). A lack of anaesthetics meant that surgeons had to work at great speed before the patient suffered too much pain. Death due to sepsis, rather than poor surgery, was common.

Engineers – The Romans had good hydraulic engineers, but their expertise was lost.

In London, the Thames and its tributaries stayed quite clean until the 17C. Wells, dug to a water table maintained by rainfall on the high ground surrounding the London basin were another source. Having a convenient source of clean water was highly desirable and money could be made in providing it. From 1582 a waterwheel under the northern arch of old London Bridge pumped the river water up into the City; this being repeated under successive arches. The New River was opened in 1613.

By the 18 & 19C social problems between rich and poor were exacerbated. It was possible to make money by providing a piped water supply to the better off, with a pump in the street for lesser folk. Water pipes might be of lead or a series of crudely jointed bored elm logs.

However, there was no money to be made in dealing with waste. The horse population of London was comparable to the human population...

Cess pits allowed liquid waste to seep into the surrounding ground (where bacteria would cleanse it) but retained solid matter until cleared by a night-soil man. In congested areas cess pits could be too close for wells to escape infection. When flushing water closets came in cess pits overflowed. Builders built houses but not drains. Drainage might be down the nearest ditch, or down the middle of the road - eventually it would reach the Thames. By 1850 Thomas Cubit said the Thames had itself become a cess pit.

The name associated with the introduction of water closets is Thomas Crapper; but Bramah's syphon was critical - Crapper added the chain! Doulton introduced the mass produced salt glazed impervious stoneware pipe (though early pipe joints had problems).

Cholera broke out in 1817 in Bengal; it came first to Britain at Sunderland in 1831. Outbreaks then occurred in 1848, 1853 & 1866. There was no cure, nor knowledge of how it was spread; though it was generally thought to be airborne. In 1854 John Snow, an anaesthetist in Soho, plotted the cases that occurred in the district – and found that they centred round a water pump in Broad Street. He removed the pump handle, and the cholera quickly subsided. It was found that a leak in the pump supply had allowed it to be contaminated. The pump is still (close to) its original position, sans handle, but not connected to a water supply.

The Great Stink of 1858 badly affected the newly built Houses of Parliament which had natural air ventilation from low level grilles, through the various rooms, and up chimneys in the Victoria and (now) Elizabeth towers. Grilles facing the Thames took in the raw stink.

The Cholera and Great Stink forced government to set up the Metropolitan Board of Works, and to appoint Bazalgette who rapidly produced a plan which was approved by the end of 1858, and completed in 1869. The system was paid for by a coal tax, collected at places 15 miles around London (marker posts still survive).

London was not the first – Liverpool followed the medical advice of William Henry Duncan about improving the sanitary conditions of their rapidly expanding slum areas, and in 1846 appointed James Newlands as Borough Engineer (the first such in the Britain) to implement a sewage system - which he did by 1848. It was Newlands who devised egg shaped sewers (the base narrow so that a small amount of water would flow fast enough to keep it clear, but wider higher up for larger amounts of water), as later adopted in London.

Bazalgette's plan was to have Low, Middle and High Level sewers to channel sewage from west to east, intercepting tributaries of the Thames, which had borne the brunt of the sewage directly into the river. These sewers led out to Beckton and Crossness where the sewage could be discharged into the river on a falling tide. The sewers had a fall of 4 feet per mile, for gravity flow. Those from further west reach a point, such as at Abbey Mills, where they need to be pumped up to a higher level to continue to the outfall. Professor Perrett distinguished between lifts (pumps lifting the sewage) and pumps (pumps propelling the sewage).

This solved the immediate problem, but London's population would double in the next half-century. And the sewage was not swept out to sea by the falling tide, but only a few miles before the next rising tide brought it much of the way back.

Activated sludge was the first mitigating process, introduced just before WW1. It enabled liquid and solid waste to be separated, the activation being by organisms already in the sewage, aided by aeration. The sludge could be sold to farmers, and the liquid, mainly water, fed to the river.

Water supply also saw improvements, where incoming water was filtered by putting it through a sand bed. This not only filtered the water but gave organisms time to purify it. This was developed in 1829 by James Simpson at the Chelsea Waterworks, by periodically scraping of the top surface of the sand to remove contaminants.

Scientists – Extracts from the bark of the cinchona tree, native to Peru, was used to treat malaria from the mid-16C. Quinine was first scientifically studied in 19C.

Aspirin, Acetyl Salicylate, has natural sources, but is now made by 'Big Pharma', starting out from pure chemicals – as they do for many other drugs.

Harry Brierley invented Stainless Steel in 1913; but who first used it to make the hypodermic needle?

X-Rays – are now one of a number of imaging technologies.

Nuclear Magnetic Resonance (NMR), first used in 1964, can see soft tissue.

Ultrasound, was used to find cracks in ships' plates, but is now another bodily imaging technology.

Electricity - Medicine would not be where it is without it – for lighting, air conditioning, and myriad instruments, now including DNA analysers.

Conclusion - Professor Perrett had originally thought the most important medical advance was in Sanitation, saying that 15 doctors were equivalent to one hydraulic engineer.

But in the present world he felt that Scientists had the edge.