

# SMALLPOX AND ITS CONTROL: THE LOCAL CONNECTION\*

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During 1996-98 were celebrated the bicentenary of Edward Jenner's first vaccination and the twentieth year since the last natural case of smallpox anywhere in the world. This paper describes the impact of smallpox and efforts to control it, using local data where possible, and emphasises the contributions made by local workers to this story. For convenience 'local' is defined as within a 15 mile radius of Liverpool; this includes Chester and St Helens but excludes Manchester. Wider and more authoritative perspectives are available elsewhere.<sup>1</sup>

## *Smallpox before Jenner*

By the third quarter of the eighteenth century smallpox was recognised as a major killer, and methods for its prevention and control had been introduced. Much credit for this is due to John Haygarth (1740-1827) who practised medicine in Chester for 31 years from 1767.<sup>2</sup> Unfortunately, Haygarth's meticulous observations on smallpox and his 'Rules for Preventing the Smallpox',<sup>3</sup> although influential at the time, were not fully appreciated for nearly two hundred years.

Smallpox killed 20% or more of those infected and was responsible for about 20% of all deaths. From Haygarth's figures for Liverpool (*Table 1*) it can be calculated that the smallpox cases matched the number of christenings and burials, and just about everyone in populous areas caught the disease eventually:

**Table 1: Smallpox in Liverpool (after Haygarth)**

Year	Christenings	Burials	Smallpox deaths
1772	1160	1085	219
1773	1192	1126	200
1774	1207	1420	243
<b>Total</b>	3559	3643	662 (18% of total deaths)

\* Résumé of a paper delivered to the Liverpool Medical History Society on 6 March 1997.

<sup>1</sup> D. Baxby, *Jenner's Smallpox Vaccine* (London: Heinemann, 1981); D. Hopkins, *Princes and Peasants - smallpox in history* (Chicago: Chicago University Press, 1983); F. Penner et al, *Smallpox and its Eradication* (Geneva: WHO, 1988).

<sup>2</sup> J. Elliot, 'A Medical Pioneer: John Haygarth of Chester', *Brit. Med. J.*, (1913)(1), 235-42.

<sup>3</sup> J. Haygarth, *Sketch of a Plan to Exterminate the Casual Smallpox from Great Britain* (London: Johnson, 1793).

It was particularly severe in young children, being responsible for about 1 in 3 of all childhood deaths in general and for even more in epidemic years (*Table 2*):

**Table 2: Epidemic smallpox in Chester, 1774: age-specific mortality (after Haygarth)**

Age groups (yrs)	< 1	1-2	2-3	3-5	5-10	<10	>10	Total
All deaths	99	52	45	62	30	288	258	546
Smallpox deaths	51	38	42	49	22	202	0	202
Small pox deaths As % total deaths	51	73	93	79	73	70	0	37

As well as being a major killer smallpox left survivors badly scarred and often blind. Also, because it was not a disease of poverty, anyone could get it and individual deaths could have a major impact. For example, the death of Queen Anne's heir led directly to the Act of Settlement of 1701 which brought the Protestant Hanoverians to the English throne and excluded the Catholic Stuarts.

Attempts were made to prevent smallpox by 'inoculation' (later called 'variolaion') — the deliberate introduction of smallpox virus into the skin in the hope that a mild immunising infection would result. This was introduced into Western society in 1721 by Lady Mary Wortley Montagu who had seen it used in Turkey, but was not used extensively until the 1760s.<sup>4</sup>

Haygarth was interested in variolation and by 1778 had set up a society to control smallpox in Chester. Pioneering the use of isolation hospitals, he developed a plan to 'exterminate' smallpox from Great Britain. However though inoculated smallpox was generally less severe than the natural disease (killing around 1 in 200), it was still a risk to those inoculated. Also, those few who contracted the natural disease from contact with an inoculated individual ran the risk of fully virulent disease. Haygarth's plans (published in 1785 and 1793) attracted interest at home and abroad, but what was needed was a safe alternative to variolation.

### ***Jenner and vaccination***

The safe alternative was provided by Jenner who was the first to prove that inoculation with cowpox, a mild disease which was not transmitted to contacts, induced immunity to smallpox.<sup>5</sup> Edward Jenner (1749-1823), a student of John Hunter, was a well-trained doctor-scientist who obtained his FRS in 1789 for his proof that it was the newly-hatched cuckoo which ejected the eggs and nestlings of its foster-parents from the nest. He began investigating the old milkmaids' tale — that cowpox offered protection

<sup>4</sup> G. Miller, *The Adoption of Inoculation for Smallpox in England and France* (Philadelphia: University of Philadelphia, 1957)

<sup>5</sup> Baxby, Jenner's Smallpox Vaccine; D. Baxby, 'The Jenner Bicentenary; the introduction and early distribution of smallpox vaccine', *FEMS Immunol.Med.Microbiol.*, 16(1996), 1-10.

against smallpox — and in 1796 and 1798 carried out the small series of vaccinations which made his name. Jenner's initial claim was based on relatively few vaccinations and what was needed was extension and confirmation of his findings.

George Pearson, a fierce critic of Jenner who sought credit for his own work on vaccination, began distributing supplies of vaccine and it was this material that arrived on 'Merseyside' in 1799. Attempts to introduce vaccination in Liverpool failed because the material was inactive; the first success in the region was achieved in St Helens in November 1799. In fact, these first vaccinations were done not by a medical man but by Rev. William Finch (1753-1815), the minister of St Helens Chapel. An entry in the Parish Register for 1799 reads:

31 David son of David Scarborough Clogger of St Helens born 4 March:  
baptised 31 March\*

\* [original footnote] This child, on the seventeenth of November following was the first, in these parts that was inoculated with vaccine matter.  
By me, W. Finch, Mins.

Finch had obtained vaccine from Rev. Robert Holt of Finmere, Buckingham, and by March 1800 had vaccinated 714 individuals; he published his results in the *Medical and Physical Journal* that year.<sup>6</sup>

A number of things are of interest here to both local and medical historians. Obviously vaccine would be sent to experienced variolators open-minded enough to test the new procedure, but we know nothing of Finch's experience. What was the connection between Holt and Finch? Clergymen promoted or attacked variolation (and later vaccination) in their pulpits but published examples of actual inoculations by clergymen are extremely rare. Very little biographical detail about Finch has been published<sup>7</sup> and more information would round out our knowledge of this obviously interesting character.

However, we do know that, although not medically-qualified, Finch's vaccination studies were very well regarded. In 1802 Jenner was collecting information on the value of vaccination to include in his petition to Parliament. He had obviously seen Finch's paper and wrote to him for some background information because<sup>8</sup>

I wish to be prepared with Testimonies of the efficacy of the Cowpox as a preventive of the Smallpox from the most respectable authorities.

Finch's reply supportive of vaccination and Jenner was published in Jenner's petition.<sup>9</sup> In 1806 Robert Willan, the 'Father of Dermatology', collected data on vaccination and was supplied with information on 'Liverpool and some neighbouring towns' by John Rutter who was highly complimentary of Finch:<sup>10</sup>

In St. Helen's and its vicinity, the practice has been carried out to a great extent; not less than 6000 have been vaccinated there, of which number 3000 of all ages under sixty years were

<sup>6</sup> W. Finch, 'To the Editor'. *Med.Phys.J.*, 3(1800), 415-20.

<sup>7</sup> W. Peck, 'A Clerical Pioneer of Vaccination', *Brit.MedJ.*, (1913)(1), 352.

<sup>8</sup> *Ibid.*

<sup>9</sup> G.C. Jenner, *The Evidence at Large as Laid before a Committee of the House of Commons, Respecting Dr. Jenner's Discovery of Vaccine Inoculation* (London: Murray, 1805).

<sup>10</sup> R. Willan, *'On Vaccine Inoculation'* (London: Phillips, 1806).

vaccinated by the Rev. W. Finch, Minister of St. Helen's Chapel ... Mr. Finch is entitled to great praise for introducing the practice into that populous part of the county, and for his zealous exertions to extend its utility.

Finch did very few vaccinations after about 1801, possibly because the medical men of the town were becoming more involved.<sup>11</sup>

### ***Smallpox and Liverpool***

In an overcrowded seaport such as Liverpool there were some cases of smallpox almost every year. In some instances they were indigenous, in others brought by sea, and occasional epidemics occurred, the reducing mortality reflecting some effect of poor vaccination coverage (*Table 3*):

**Table 3: Smallpox in Liverpool: epidemic years**

<b>Year</b>	<b>Cases</b>	<b>Deaths (%)</b>
1871	?	1919*
1876	?	386
1877	1660	299 (18%)
1884	832	106 (12%)
1902-3	2778	161 (6%)

\* Part of a major European epidemic which killed c.43,000 in England and Wales

Although these occasional epidemics attracted attention they have to be seen in perspective. In 1902-03, for example, there were nearly 10,000 cases of measles with 393 deaths, and 1268 deaths from 'diarrhoea'.<sup>12</sup>

The last large epidemic of smallpox in Liverpool in 1902-03 caused some controversy because government authorities claimed that cases arose by airborne spread from smallpox hospitals, a charge vigorously contested by the City Health Department.<sup>13</sup> No 'cure' was ever to be found for smallpox once the symptoms became obvious, but during the 1902-03 epidemic the protective effect of vaccination of contacts early in the incubation period was amply demonstrated.<sup>14</sup>

As the twentieth century progressed smallpox was gradually eliminated from Britain but Liverpool, as a major port, was always susceptible to importations. This was especially true at the end of World War 11 with troops returning from abroad. This was the start of Liverpool's prominence as an internationally-recognised centre for smallpox research. In 1943 A.W. Downie, already an expert on animal poxviruses, was appointed Professor of Bacteriology,<sup>15</sup> and in 1946 A.B. Christie became Superintendent of the

<sup>11</sup> J. Hugh-Jones, 'The History of a Medical Practice Established at St Elyns in 1779', *Medical Historian*, 7(1994), 41-58.

<sup>12</sup> Health Department, *Report on the Health of the City of Liverpool* (Liverpool: City of Liverpool, 1904).

<sup>13</sup> W.E. Hope, *Observations on the Report of Dr. Reece on Smallpox and Smallpox Hospitals at Liverpool 1902-03* (Liverpool: City of Liverpool, 1905).

<sup>14</sup> W. Hanna, *Studies in Smallpox and Vaccination* (Bristol: Wright, 1913).

<sup>15</sup> D.A.J. Tyrell and K. McCarthy, 'Obituary — Allan Watt Downie', *Biog.Mem.F.R.S.*, 35(1990), 99-112.

Infectious Diseases Hospital at Fazakerley.<sup>16</sup> Christie's clinical skill allied to Downie's development of rapid laboratory diagnostic tests restricted the local spread of smallpox, but occasionally someone incubating the disease although not yet obviously ill, would pass through Liverpool and start epidemics elsewhere. Downie's laboratory was responsible for smallpox diagnosis nationally until 1947 and for the north of England until 1962.

Workers trained in Liverpool developed increasingly rapid, sensitive and reliable tests for diagnosis, including means for differentiating the two varieties of smallpox which previously could only be distinguished retrospectively by examining mortality rates. They also studied the immunity induced by vaccination and smallpox itself and investigated a variety of related animal viruses. Downie also made trips, particularly to Madras, to study smallpox at first hand and his combined clinical and laboratory studies confirmed Haygarth's early views on the incubation period and the infectivity of patients.

### *Eradication*

When the World Health Organisation (WHO) was planning the intensive campaign to eradicate smallpox, Downie chaired important committees to implement this and even after retirement continued to advise and run training schools in diagnosis.<sup>17</sup>

The intensified campaign started in 1967 and the last natural case of smallpox anywhere in the world occurred in Somalia in 1977. There followed two years of intensive investigations before the success of the campaign was proposed in 1979 and accepted in 1980. Liverpool-trained workers were involved in the campaign and one, K.R. Dumbell,<sup>18</sup> was a member of the International Commission which certified that smallpox really had been eradicated.

It is sometimes said that smallpox was eradicated by mass vaccination and that it was one of, if not the, most infectious disease known. Neither statement is true. Observations made during the campaign showed that smallpox spread very slowly, largely by close contact, and that one case infected very few individuals. The focus switched from mass vaccination to 'surveillance-containment - the detection and isolation of cases, with vaccination used in a more controlled way. The circumstances would not have been unfamiliar to Haygarth, and the modern substitution of vaccination for variolation essentially meant that his plan to 'exterminate' smallpox from Great Britain in 1793 eventually bore fruit on a global scale almost 200 years later

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<sup>16</sup> A.B. Christie, *Infectious Diseases* (Edinburgh: Livingstone, 1969).

<sup>17</sup> A.W. Downie (Chairman), *Smallpox Eradication; Report of a WHO Scientific Group* (Geneva: WHO, 1968).

<sup>18</sup> F. Fenner *et al.*