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Medical History

Sir Sheldon Francis Dudley, his Contributions to Diphtheria and the Aftermath of the Sinking of *HMS Curacao* by the *Queen Mary*

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INTRODUCTION

Off Londonderry, the *Queen Mary*, of over 81,237 gross tons, collided at a speed of 28 knots (33.5 mph) with the Royal Navy's anti-aircraft cruiser *Curacao*. The cruiser was sliced in two at 2:20 p.m. on Friday, 2 October 1942. Both halves sank within two to five minutes.

Twenty-seven RN officers and 412 ratings were aboard the two halves of *Curacao*; 338 men perished (Fig. 1).^{1,2} Of the 918 crew and 10,230 U.S. GIs on board the *Queen Mary*, none were hurt. As per orders the *Queen Mary* continued at twelve, then twenty knots for Greenock¹. There, the U.S. 29th Infantry Division troops entrained for the South of England, with photographs of the sinking of the Belfast-based *HMS Curacao*¹.

The bows of the *Queen Mary* that cut through the *Curacao* and 20 feet of her stem were repaired in a dry dock in Boston, Massachusetts from 14 October to 2 November 1942³.

RESCUE

The RN destroyers *Bramham*, *Cowdray* and *Skate* arrived 2 hours after the incident at around 4:20 p.m. to reach the 101

survivors – two were badly injured. Sea temperature was 13-16°C⁴. A “Most Secret” signal was sent to the Admiralty from Ballykelly: “*Curacao* sunk 55.50 N 08.56W. Survivors including Captain picked up by two destroyers returning Londonderry...”¹.

Lieutenant-Commander Baines, Commanding Officer of the *Bramham* and his First Lieutenant, David Mountbatten, Marquess of Milford Haven expertly controlled the rescue operations with loudhailers. Black tar oil was widespread and hazardous¹.

ADMIRALTY CONTROL

From the time that *Bramham* and *Cowdray* set off with the 101 survivors of the *Curacao*, the Admiralty imposed strict secrecy^{5,6,7}.

Upon arrival at Londonderry, the 101 survivors were confined in Church premises with curtains drawn and lights on all that Friday night⁷. The Admiralty, with the tacit acceptance of Vice Admiral Sir Sheldon Francis Dudley, newly knighted and appointed Head of RN Medical Services, empaneled a Secret Court of Enquiry for Sunday, October 4, 1942 on board the *HMS Argus* anchored at Gourock in the Clyde¹. The RN destroyer *Saladin* transported the survivors from Lough Foyle to Gourock. Survivors were then entrained in a sealed train non-stop for the 425 mile journey to Greenwich⁷.

By 1942, regional censorship units had been established in Belfast, Birmingham, Bristol, Cardiff, Glasgow, Leeds and Manchester. Approximately 250 active Official Censors were based in these cities and in London⁵. Early in 1942, Byron Price of the Associated Press led a dozen U.S. experts on censorship to the UK. The issue of a U.S. Government Code of Wartime Practices was approved as in force. The UK was classified as a U.S. War Zone. According to UK Defense (General) Regulations 1939 No. 3:



Fig 1. The Queen Mary, HMS Curacao Incident (oil on canvas), Harley Crossley (1938-2013), Bridgeman Images.

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“...No person shall

1) obtain, 2) record, communicate to any other person or publish, or

3) have in his possession any document containing, or any other record whatsoever of, any information being, or purporting to be, information with respect to any of the following matters, that is to say

a) the number, description, armament, equipment, disposition, movement or condition of any of His Majesty's forces, vessels or aircraft...”⁵

At the War Cabinet Meeting on 9 October 1941, it had been decided to review what measures should be taken to “prevent the publication by the Press of articles likely to react unfavourably on this country's relations with foreign powers”⁸. Therefore a week after the sinking off Londonderry, informal discussions took place with representatives of the War Cabinet and UK and US Medical and Legal leaders. The following aspects of the Greenwich incarceration of *Curacoa's* Belfast –based ratings were considered:

Firstly, there seemed, despite two hours afloat in salt water in a 20-30 foot Atlantic swell, to be no serious physical sequelae to the survivors⁹. Secondly, the GI's on the *Queen Mary* had



Fig 2. Sir Sheldon Francis Dudley (1884-1956), Surgeon, Vice-Admiral and Chief of Medical Services Royal Navy. Bromide print by Walter Stoneman, 1936. From the collections of the National Portrait Gallery, London, image no. NPG 167276 . Reproduced with their permission, solely for this Medical History.

taken photos, and thirdly, the Greenwich site of incarceration had previously linked Dudley to a hostile question in the House of Commons^{10,11} .

Dudley had been appointed Royal Navy Pathologist to Greenwich in 1921 (Fig. 2). Among his duties was “supervision of the pupils of the Royal Hospital School”¹⁰. One thousand boarders and 100 day boys stayed at the Royal Hospital School for three years of three terms per year.

Detailed medical records were maintained for each boy. “Hygienic conditions and sanitary discipline were good”¹⁰. Frequent examinations of the throat and nose included cultures. Space between dormitory beds was adequate and according to accepted standards. Incidence of “certain bacterial diseases, and particularly diphtheria, was considerable”¹⁰.

Dudley said these schoolboys were an almost ideal ‘experimental herd’. The result of this public statement led to a question in the House of Commons ‘on the ethics of making helpless schoolboys the subject of experiments’^{10,11}.

On 23rd March 1933 the Royal Naval School was moved from its historic Greenwich buildings to Holcomb, Suffolk¹².

MEDICAL LEADERSHIP

Surgeon Vice-Admiral Sir Sheldon Francis Dudley, Medical Director-General of the Royal Navy from the summer of 1941 until the end of World War II, had qualified in 1906 from St. Thomas's Hospital before immediately joining the Royal Navy. His forbears had settled in County Tipperary during the 1620s, and his uncle was Rector of Glenarm, County Antrim¹⁰. In 1913, Dudley married Ethel Franklyn, a widow with one son. Dudley played rugby for United Hospitals and then for United Services. During World War I, Dudley served as Senior Medical Officer of the Royal Navy Air Service at Dunkirk; for this service in 1919 he was appointed OBE. In 1920 Dudley won the Liddle, London, Prize for a paper on the epidemiology of influenza^{10,13}. In 1922 Dudley won the Gilbert Blane Medal and Neech Prize for an essay on “The Carrier Problem”¹⁴. In 1923 Dudley was appointed Professor of Pathology at the Royal Navy Medical School, Greenwich: Dudley's office was close to the Royal Hospital School, “whose thousand boys provided an ‘ideal community’ for testing his epidemiological views”, according to the *British Medical Journal*¹⁵.

Schick in 1913 described the intradermic test for susceptibility and immunity to the infectious disease caused by *B. diphtheria*¹⁶. A negative reaction indicates the presence of antitoxin. In 1922 Dudley began throat cultures and Schick tests for the 950 boys of the Royal Navy Boarding School at Greenwich. The “new” boarders were thrice as often susceptible to developing clinical diphtheria as “old” boarders. In nine months, 92 percent of the boys who developed clinical diphtheria became immune. The period of “carrying” diphtheria bacilli was always short. During seven months 30 percent of the boys were recognizable carriers (Fig. 3) (Table 1)¹⁷.

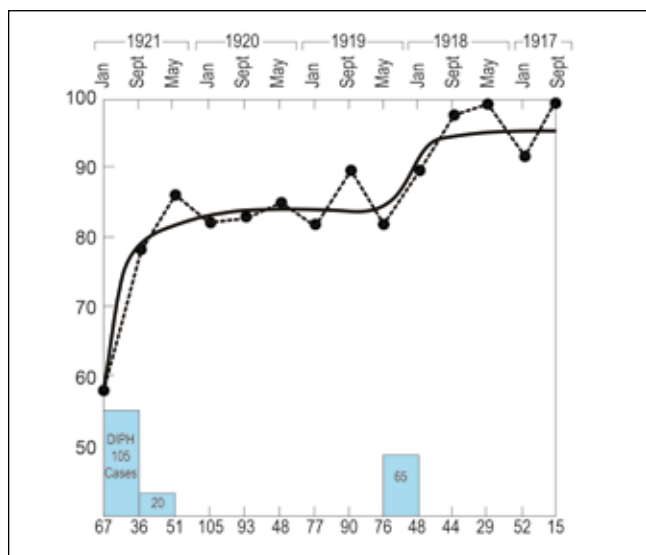


Fig 3. "831 Residential Schoolboys; Relation between number of terms in school, Schick reaction and diphtheria outbreaks. Number of boys 'new boys' out of 831 tested joining school each term.

Note: Shaded rectangles on bottom line represent character and density of diphtheric infection. The numbers associated with these rectangles include carriers of morphological diphtheria: Bacilli as well as clinical diphtheria cases." Redrawn from Dudley, 1922¹⁷.

Dudley wrote special reports for the Medical Research Council (MRC), "The Schick Test, diphtheria and scarlet fever" (1923)¹⁸, "The spread of droplet infection in semi-isolated communities" (1926)¹⁹, and "Active immunization against diphtheria: its effect on the distribution of antitoxic immunity and case and carrier infection" (1934)²⁰. Dudley's 1931 Milroy Lecture, "Lessons on the distribution of infectious diseases in the Royal Navy", became of seminal importance in World War II²¹. Dudley's work led to mass X-ray screening for tuberculosis²², aided the eradication of diphtheria and was cited as justification for control and prevention of inadequate bed, bunk and hammock spacing²³. For the *Queen Mary*, this reduced troop carrying capacity from 15,000 to 12,000 Allied warriors³. During World War II, Dudley chaired the Shipwreck Research Committee of the Medical Research Council²⁴. Dudley's work on infectious disease control and vaccination resulted in much progress²⁵.

Dudley's 1931 Milroy Lecture summarized his experience of infectious disease as then Surgeon-Captain in the Royal Navy and emphasized the longitudinal contribution of the RN's study population since 1856²¹. He associated transmission of infectious diseases with population density aboard ship and in training facilities. Dudley's 1921 study of epidemic influenza had described transmission of infectious disease as a function of "infectivity of the specific germ and the density, that is, the number per unit area, of people susceptible to that degree of infectivity"¹³. His later investigations made use of the RN's "unbroken statistical record" on cholera, cerebrospinal fever, fevers, pneumonia and other infectious diseases^{25,26}.

TABLE 1.

Dudley's Conclusions: Royal Hospital School Of Greenwich

(1)	" 'New' boys were three times as often susceptible to diphtheria as 'old boys' (Fig. 3).
(2)	A graph (Fig. 3) is shown which indicates that the 'old' boys became immune during outbreaks of diphtheria, and that between outbreaks no immunity was developed.
(3)	The fact that the 'old' boys were older was insufficient to account for the more frequent immunity.
(4)	In the course of three months 32 per cent of the susceptible boys became immune.
(5)	In the course of nine months 92 per cent of the boys who developed clinical diphtheria became immune.
(6)	The period of 'carrying' diphtheria bacilli was always short, and it is estimated that during seven months 30 per cent of the boys were recognisable carriers.
(7)	Under these circumstances it is probable that all boys in the school had the opportunity of being affected by the diphtheria bacillus to a slight unrecognizable degree." ¹⁷

DEVELOPMENTS AFTER SEALED TRAIN TO GREENWICH

The Allied Surgical Consultants protested the Greenwich incarceration. The survivors of the *Curacoa* were thereupon released for a fortnight's home leave, but still sworn to secrecy⁷. They were then forthwith assigned to Landing Ship Tanks (LSTs) and Minesweepers: the Belfast connection with Northern Ireland therefore continued at Salerno, Normandy D-Day to the Scheldt and its V weapon bombardment^{27,28}.

The Royal Naval Medical Services report listed 347 deaths by drowning in 1942. Since this figure was preceded by 234 reported deaths by drowning in 1941 and followed by 632 in 1943²⁹, it remains uncertain whether some or all of the 338 *Curacoa* deaths were included.

During the World War II years, the weekly Epidemiological Notes published in the *British Medical Journal* attest to the importance of standardised reporting and, demonstrated no increase in infectious diseases in Northern Ireland³⁰. As Medical Director-General of the RN, Dudley equated the importance of control of infectious disease and general hygiene with strategic military operations, especially outside of Western Europe, and noted that "the number killed in Bengal by preventable disease in one year was five times the 300,000 killed by high explosive in the armies of the British Empire during five years of war"²⁵.

A YEAR AFTER DUDLEY'S DEATH

In 1957 a Grant from the Northern Ireland Hospitals Authority supported the establishment of the Virus Reference Laboratory of the Department of Microbiology at Queen's University Belfast^{31,32}, to provide both serological testing and virus isolation. The laboratory continued work begun



in that Department to diagnose poliomyelitis, aseptic meningitis and encephalitis, influenza (types A, B and C), psittacosis, *Rickettsia burneti*, adenoviruses and others. The work of these investigators and their colleagues led to recommendations for immunization of schoolchildren that would reinforce immunity to diphtheria, tetanus and poliomyelitis at the time of school entry, and also provide primary immunization for children with no previous immunization history^{33,34,35}. Pertussis was subsequently added to their investigations of a quadruple vaccine for infants³⁵.

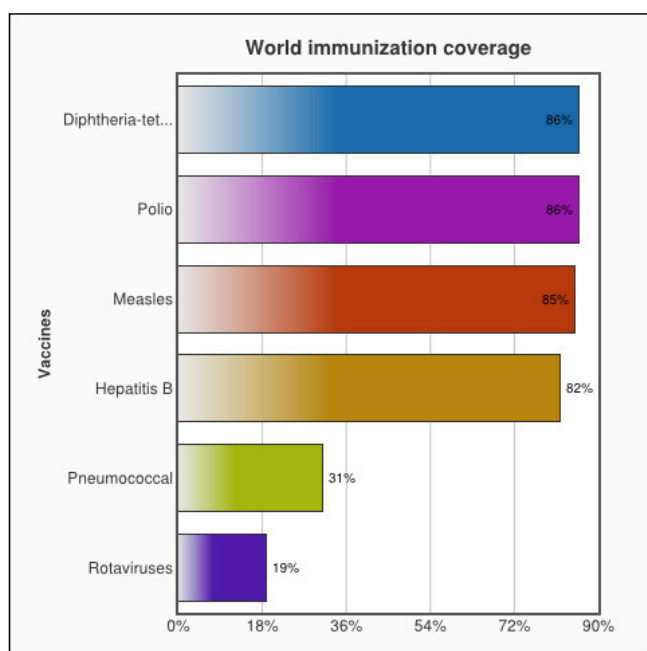


Fig 4. World Health Organization (WHO) immunization data, 2015³⁶

According to the World Health Organization (WHO), immunization currently prevents two to three million deaths each year from diphtheria, tetanus, pertussis and measles, but improved global vaccination coverage could prevent an additional 1.5 million deaths each year. While estimates of unvaccinated infants worldwide are as high as 19.4 million, in 2015 the recommended series of three doses of diphtheria-tetanus-pertussis (DTP3) was administered to approximately 86 percent of infants worldwide³⁶ (Fig. 4).

Improvements in surveillance and timely reporting of infectious disease outbreaks have both promoted ongoing vaccination campaigns for rapidly evolving pathogens

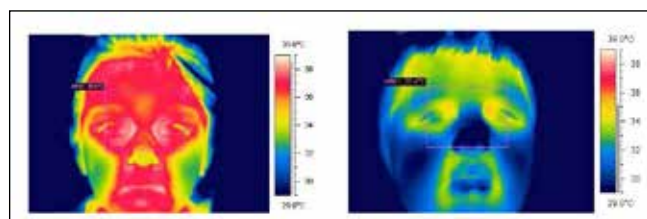


Fig 5. Thermograms of the face of a young male child. Left: during fever; right, a normal healthy child of the same age. Reproduced by permission of the authors exclusively for this Medical History⁴⁵.

such as influenza viruses, and are key factors in controlling the spread of diseases for which vaccines have yet to be developed^{37,38,39,40,41}. Training of Emergency and Primary Care Physicians and Health Care workers in requisite information transfer has played a crucial role^{41,42}. Mass screening of travellers at international checkpoints during disease outbreaks using thermographic fever screening, questionnaires and other means may play an increasing role in global containment of emerging infectious diseases^{43,44,45,46} (Fig. 5).

MORE ON SECRECY

The Secrecy Order on the fate of the *Curacao* was lifted just after VJ Day. The GI-taken photos of the sinking, totally split, cruiser were available for trials in the UK's High Court, the Court of Appeal and the House of Lords^{1,47}. The Captain of the *Queen Mary*, Cyril Illingsworth⁴⁸ was subsequently knighted and the Captain of the *Curacao* received the DSO for mine-sweeping in the Mediterranean⁴⁹. The Marquess of Milford Haven received a DSC and OBE in 1942⁵⁰. Sir Sheldon Francis Dudley had been elected FRS in 1941¹⁰.

At the end of World War II Dudley was awarded the United States Legion of Merit in 1946 on the recommendation of General Dwight Eisenhower to the U.S. Congress with the approval of President Harry S. Truman^{51,52}. The citation was for his supervision of the Atlantic Transportation from and to the USA of their two million troops: of this two million over a quarter of a million had come to Scotland on the *Queen Mary*³.

In his later years Dudley published his views on the UK's healthcare system⁵³ and education⁵⁴. Dudley died on May 6, 1956, aged 71, and was survived by his wife Ethel¹⁰.

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