

SAM: Good afternoon, ladies and gentlemen. My name is Sam, I have the great privilege of working here at the college, not only assisting Hayley, our events officer, as principal chair stacker or unstacker, it's also my great privilege to be director of the Hunterian Museum. And I have thoroughly enjoyed being involved in this year's commemoration to celebrate the death of Lord Lister, antiseptics pioneer, 100 years ago last month. It's my great pleasure to welcome you to the second of our Lister lectures. Supported generously by Johnson & Johnson. And it's also my great pleasure to introduce our speaker today, Sir Barry Jackson. One is faced with the wonderful difficulty when introducing such a speaker as to which of his many accomplishments to draw attention to in doing so, but I promise to be brief, Sir Barry was surgeon consultant to St Thomas' Hospital, he has been closely involved with this college latterly as president, a status that Lister himself never achieved, it might be worth noting. Amongst his other organisations he has been Master Barber, he happens to be chair of the trustees of the Hunterian collection to which we answer, but I will close the introduction and our invitation to this obviously has nothing to do in his role in the governance of what we do here. He has a very long-standing interest in the history of surgery and in the spread of Lister's ideas in particular, several decades worth of activity in this area, and it will be based on this expertise that Sir Barry will speak to us today on: carbolic, casebook and controversy. Thank you very much. (Applause).

SIR BARRY JACKSON: Thank you, Sam for that introduction. And it's nice to see some familiar faces in the audience, long-standing friends, thank you very much indeed, those of you who I have known for many years for coming to listen to this. I also know that many in the audience were here a fortnight ago when Professor Harold Ellis gave the first of these Lister Centenary Lectures at the College in brilliant and his own inimitable style. It's a great privilege for me to see Professor Ellis here today for way back in the 1960s, he was my first chief when I was house surgeon at the Westminster Hospital and Medical School and he was the inaugural professor of surgery there. His superb teaching and his expertise gave me the foundation on which my future career was based, and Harold, I would thank you warmly from the bottom of my heart, but if this lecture turns out to be a dud, I blame it all on you!

Ladies and gentlemen, I have called my talk carbolic, casebook and controversy, so let me start with carbolic. And here I must apologise to some of you for any overlap that you might have heard if you were here two weeks ago, when Professor Ellis spoke, but I have tried to keep that overlap to a minimum, but I recognise that some of you are here for the first time. As you know, Joseph Lister, later Sir Joseph Lister, and later still Lord Lister, Baronet, order of merit, fellow of the royal society, Privy Councillor, array of honours which no other surgeon has ever received, he is famed for his use of carbolic acid or phenol, as it is sometimes known, as an antiseptic in surgical wounds and thereby preventing infection which before Lister was almost invariably the case, owing to the germ-laden hands of the surgeon, the germ-laden instruments, and the germ-laden skin of the patient. He first used carbolic in compound fractures of an arm or a leg and showed that life threatening infection could be prevented with preservation of the limb. Previously, amputation was the standard treatment of such an injury, and I remind you, the non-medics in the audience, that a compound fracture is one where the skin and soft tissues are torn and there is a communication between the surface wound and the underlying fracture, allowing the introduction of bacteria. His epoch making publication, the opening of which is on the screen, was published in five parts over a four month period in The Lancet in 1867. It introduced what became known as the germ theory of disease, a theory which postulated that germs, bacteria, as we now call them, then completely unknown, were the cause of infection. Sadly, many people today don't know anything about Lister's surgical contributions but they all know his name well enough as a consequence of a commercial antiseptic to be found on the shelves of every chemist's shop. When you gargle, think of Lister! This product (Listerine) was first introduced in the United States and dates from the 1880s, soon after Lister had visited the States on a lecture tour. By 1883, it was being widely advertised in American medical journals as a general purpose antiseptic, this one, in the Louisville Medical News, and furthermore, it was also being advocated as a dressing for surgical operations. As well as for many other conditions. However, I can assure you that it has no

place in a modern operating theatre. Sadly, Lister never gave permission for his name to be used in this way, and thereby missed out on earning a small fortune in commission. But Lister was not the first to successfully use antiseptic dressings in the management of compound fractures. As early as 1802, John Crowther and his two brothers, living in the West Riding area of Yorkshire, published an account of 28 consecutive patients with compound fractures treated over a two-year period with hot beechwood tar dressings, without mortality, and with preservation of the limb in every case. Beechwood tar is a type of creosote, which is itself a derivative of phenol. Joseph Lister, eat your heart out. But no interest of any sort seems to have been taken by the readers of this article, and there's no further mention of the technique in later issues, and amputation remained the standard treatment of the day. The great French surgeon Baron Larrey, who became famous for his work in the Napoleonic Wars, used dressings of benzoin, an antiseptic derived from a plant and best known to us today as the base of Friar's Balsam. Larrey published successful results in 12 patients in 1824, but again his method was largely ignored. Although a Guy's surgeon, Thomas Bryant, who you see here, also used benzoin dressings very successfully in a few cases of compound fracture. So Lister was not the first. The reason of course was that none of these early surgeons had any conception as to why their methods worked, or considered applying their techniques beyond the treatment of compound fractures. Had their methods received a proper trial, the successful management of such injuries might have become widespread many years earlier. Apart from wood tar and benzoin, a number of other antiseptics had been used as wound dressings over the years, for example mercuric chloride and silver nitrate, but what is not widely known is that carbolic acid itself had also been used as a wound dressing and as a general antiseptic before Lister. Among others, Turner and Lund in Manchester, doctors in Edinburgh and Wolfe in Aberdeen had all published articles about carbolic as an antiseptic in the 1860s before Lister's initial paper. They are all forgotten, if indeed they were ever remembered, while Lister is hero worshipped today, 100 years after his death. Now, before continuing with the story of Lister and carbolic, we should remember that there were others in the history of germ theory and its application to surgery, namely those individuals who recognised the importance of cleanliness and handwashing in the prevention of puerperal fever after childbirth. That is the overwhelming infection of the birth passages and almost always fatal. Ignaz Semmelweis, working in Vienna in the late 1840s, is much the best known of these early pioneers. He insisted that handwashing in chloride of lime was essential before vaginal examination, but failed to convince his colleagues, even though the death rate from puerperal fever in women admitted under his care dropped dramatically from around 15%, which had been the norm, to 2%. In the United States, Oliver Wendell Holmes of Boston preceded Semmelweis in advocating handwashing. With plain water, in his case. As well as recommending a change of clothing before entering the delivery suite. And the now little known Charles White of Manchester was earlier still, in the late 18th century. However, in no case was their practice accepted by the medical community at large; nor did they take the important step of extending the principle of cleanliness beyond the lying-in wards. Sadly, Charles White is now better referred for keeping the mummified body of one of his female patients concealed in a clock case in his living room for 55 years. Apparently she was terrified of being buried alive. And Oliver Wendell Holmes of Boston is better known for coining the term anaesthesia, when ether as an anaesthetic was introduced. And more Semmelweis was so distressed by the continued lack of recognition of his important finding that he became mentally disturbed, was admitted to an asylum, and it is ironic that he died of septicaemia just one day after Lister treated his first patient with carbolic acid dressings.

Now, those of you who were here a fortnight ago heard from Professor Ellis that it was while Lister was working in Glasgow, at the Royal Infirmary in the mid 1860s, that he learned of Louis Pasteur's experiments in Paris on fermentation and putrefaction. These experiments had convincingly shown that there was something invisible to the naked eye in the air which caused putrefaction. Pasteur postulated the invisible something comprised microorganisms that were too small to see and which he called germs. Tiny particles called animalcules have been seen under microscopes since the introduction of microscopy in the 17th century but their significance in the causation of infection was unknown. Indeed, at first it was not even realised that some of these animalcules seen under the microscope were the same as Pasteur's germs. However, Lister was intrigued. About the same time that he learned of past other's experiments, he also learned that carbolic acid was being used in Carlisle to reduce the

smell arising from raw sewage, and that this treatment had coincided with a diminution in the number of cases of typhoid in the city. These two events, raw sewage treatment and a concomitant reduction in typhoid, generated in Lister's mind the idea that it might be that Pasteur's invisible germs which entered a wound multiplied and caused infection, he reasoned that if that were the case, then infection would not occur if the germs could be killed, or somehow prevented from entering the wound. And it was this that was the vital mental leap that his predecessors had not made. He then began with meticulous attention to detail to develop techniques both to kill the germs and to prevent their access to the wounds, and he chose carbolic acid as the agent for his endeavours. Of course, we now know that he could have chosen any other antiseptic of comparable strength, and obtained equally good results, but that's a mere detail, the important thing is the causative link between germs and infection had been made.

Lister's original scheme of treatment required that the dressings be soaked in a solution of carbolic acid, so as to kill any germs that might already be present in the wound, and then to allow the formation of a sterile scab beneath the dressing which acted as a mechanical barrier preventing ingress of further germs which were present in the air. In The Lancet paper, he describes how he first applied his method on 12th August 1865 in the case of an 11 year-old boy, James G, later known to be James Greenlees, who had a compound fracture in the lower leg, resulting from being run over by a cart in a Glasgow street. A lint dressing, soaked in carbolic acid, was applied to the wound, and splints applied to the leg. When the dressing was removed, four days later, there was no evidence of suppuration, and the boy went on to make a full recovery. However, progress was slow at the start, for he reported in that paper only 11 patients, all of whom had compound fractures and had been collected over a period of almost two years. It was not until April 1867 that he first used carbolic dressings for an elective operation, that is to say a non-emergency operation. And in this operation, he removed a large tumour embedded in the upper arm, irrigated the wound with carbolic acid, and dressed it with carbolic dressings, and the patient made a good recovery. By the July of 1867, just two years after his first patient, his universal application of carbolic dressings and his remarkable results in abolishing infection had convinced him that his speculation of a germ theory of disease was correct. At a meeting of the British Medical Association in Dublin, and a paper titled: on the antiseptic principle in the practice of surgery, he reported that in his wards during the previous 9 months, not a single instance of pyaemia, hospital gangrene or erysipelas had occurred. Erysipelas of course is a spreading infection of the skin which in those days was extraordinarily common. In the following year, he experimented with different strengths of carbolic lotion and carbolic paste and with various types of wound dressing, refining and modifying his technique such that some surgeons who had adopted his principles complained that they could hardly keep up with his ideas and changes. He introduced carbolised catgut ligatures which, shock horror, he cut short in the wound, rather than leaving them hanging from the wound, so as to allow drainage, a practice which had been carried out for centuries. He drained wounds by strips of carbolised lint, instead of by hanging threads. He introduced carbolic soap towels around the operative field, and of course he thoroughly soaked the instruments and his hands in carbolic before operating. He also devised the famous carbolic spray, so famous indeed that it was pictured on a postage stamp in 1965 at the time of the centenary of his discovery of antiseptics. And the spray was introduced in 1871, and was initially a bulky affair, and was known as a donkey engine, you can see one in the Hunterian Museum upstairs. And Professor Ellis illustrated one last time. But this was soon replaced with a portable table bottle as seen in this contemporary illustration. I might add that operations on the kitchen or dining room table, as seen here, were common in those days, and on the many patients who couldn't afford the cost of going into hospital. A fine spray of carbolic lotion soaked the wound, the patient, the surgeon and the floor, so much carbolic was absorbed, not only by the patient but also by the surgeon, that carboluria resulted in blue/green urine, was commonplace. Lister used the spray when he operated on queen Victoria, but unfortunately, some of the spray vapour got into the queen's eye, which must have been very uncomfortable and caused considerable distress to the queen and complaint, somewhat nobly, Sir William Jenner, who was the queen's physician, who was in attendance and was responsible for directing the spray at the time, nobly took the blame, and when Lister left Balmoral, the Queen complimented him on his work, saying "a most disagreeable duty most agreeably performed".

The huge publicity around the spray ensured that entrepreneurs were quick to catch on, as evidenced by this advertisement in a popular magazine advocating its use as a face massage. I hope not carbolic acid, as that would have caused a very unpleasant complexion indeed, as the carbolic was irritant to the skin, and caused considerable soreness. Indeed, it has been said that like Masons, when surgeons met and shook hands, they would recognise each other by the roughness of their hands. How did the spray work? It comprised a boiler here with water, a burner underneath here, with a flame, which heated the water to cause it to boil, a safety valve on the top here, and an exit for the steam that was generated along this nozzle here. The carbolic lotion was in this jar here, with a pipe going down. As the steam came out of the nozzle, the very fine nozzle at the point here, by means of a suction effect, a ventouri effect, it sucked up carbolic lotion through this pipe to mix with the steam, so you got a fine jet of steam with carbolic mixed with it, which sprayed the patient. Over the years, there were various modifications, of course. This one, by Robert Gibbons, took nine pints of carbolic lotion, so that there was never a need for a wait in the middle of an operation for the boiler to be refilled. However, the spray was in vogue for a relatively short period of time, perhaps about a dozen years, as it became realised that it was not the air that was causing the infection, but the germs on the skin of the patient, on the surgeon's hands, and on the instruments, and by the late 1880s nearly all surgeons had stopped using the spray, and Lister himself stopped using it in 1887. Lister's surgical results were outstanding. And you would have thought that with such excellent results, the use of carbolic dressings would be quickly adopted by everyone. However, far from it. Unlike the rapid spread of anaesthesia, the road to universal acceptance of Lister's teachings was far from straightforward. There was scepticism and controversy, often involving the greatest names in surgery of the day.

Before we get on to controversy, however, let us make a diversion to East Anglia, and a casebook. I have a confession to make, all my life, I have been a book collector and I can't pass a second handbook shop without entering. I'm what some call a bibliomaniac. One sunny afternoon, some several years ago now, I visited a Buckinghamshire country mansion which you see in this aerial photograph. It was then owned by a book dealer, Peter Eaton, who was a well-known antiquarian bookseller in London, and he used this house, which was his home, as his warehouse. It contained over 50 rooms, each packed from floor to ceiling with uncatalogued books for sale. And in many rooms, there were piles of books heaped on the floor. And in one of those piles, I noted there was a leather bound volume without any title on the spine, I pulled it out to see what it was, and discovered it was a surgical casebook. On opening the cover, I found there was a book plate of a Thomas Marsters Kendall FRCS and as you can imagine, the book was immediately purchased and added to my list of other purchases to be properly examined when I returned home. Inside, there were 158 pages of handwritten case histories, submitted under the care of Mr Kendall, and here is an example of a woman admitted in 1865 for an excision of a fibrous tumour over the right shoulder. The operation was carried out under chloroform anaesthetic and she made a good recovery, being discharged cured, at the bottom, as you can see. Here is another case history, this time of a 19 year-old youth with a gunshot injury to his hand. But sadly one that had a less happy outcome. The patient died 16 days after the onset of pyaemia, spreading infection in the skin, and into the bloodstream. And this was again in 1865. On further analysis, I found that the casebook contained the histories of 143 patients admitted between January 1865 and April 1871. The gender and the case mix you can see here on the screen. The list of diagnoses shows that orthopaedic problems and soft tissue injuries were the most common, with various tumours and a smattering of minor conditions. The various forms of acute abdomen, of course, did not exist as a diagnosis at that time, but there were four patients with bladder stones, calculi. Most of the injuries were caused by agricultural tools such as threshing machines and scythes suggesting to me that Kendall practised in a rural community. The operations that he performed were typical of the time, excisions of surface tumours and amputations head the list, with various minor procedures such as laying open fistulas and draining abscesses. Most were performed under chloroform anaesthesia, but a few were carried out under local anaesthetic using a spray of ethyl chloride. There were no intra-abdominal operations but there were three operations for extraction of bladder stones each carried out through a perineal approach, that is in the crutch.

Here is one of them, in a 49 year-old man admitted in February 1866 with a sudden stoppage of water and blood in his urine. The operation had to be postponed owing to an outbreak of erysipelas in the ward, wrongly spelt,

incidentally, by the house surgeon who presumably wrote this note, but a month later he was readmitted and the operation was performed under chloroform anaesthetic using the so-called lateral approach.

Two months later, a successful outcome was recorded with the words "cured" penned in a flourish at the bottom of the page.

His post-operative results were impressive. There were very few complications. Erysipelas infection being the most common. His mortality rate was also highly commendable, at only 7%, after what would be considered - all of which would be considered major surgery. The list of the operations and a - are listed here on the screen, 7%. Compare that with what was the norm in many other hospitals, including the London teaching hospitals, Guy's and St Thomas', my own hospital, and you will see that the results were very impressive indeed of Mr Kendall. And of course, some of the patients didn't have operation at all, they were treated by the standard medical treatments of the time, the few drugs that were available, leeches which were still commonplace and of course alcohol. Now, who was this Thomas Kendall FRCS and - Kendall FRCS and where at the work? So I turned to the biographical details in Plarr's Lives of the Fellows of the College, that is the standard biographical text of all Fellows of this Royal College, and found his entry, which showed he qualified from St George's Hospital in 1842 with the membership of the Royal College of Surgeons and licensure of the Society of Apothecaries. He passed the FRCS in 1857 and became a consultant in King's Lynn at the West Norfolk and Lynn Hospital, seen here on this slide as it was in Kendall's day. He died at the early age of 51 when the casebook entries end. His obituary in the local newspaper, The Lynn Advertiser, described him as a warm hearted and charitable man held in much esteem by a large circle of friends and by the inhabitants of the town and neighbourhood generally. Now, why, you may well ask, am I telling you about one of my book collecting finds? The answer is to be found in the case history of a nine year-old boy, Lewis Clarke, who was admitted in June 1867, with necrosis of the tibia, that is death of the tibia, caused by osteomyelitis. On 22 of that month, he underwent removal of necrotic bone under chloroform anaesthesia. And the following month, in July, he underwent further removal of necrotic bone, and on this occasion, the wound was dressed with carbolic acid lotion. The date was 15th July, two weeks before the publication of the last instalment of Lister's ground breaking paper in The Lancet, do you remember it was several issues over four months.

This is the first mention in the casebook of carbolic dressings being used. Previously, the dressings were either simple water dressings, or something called styptic colloid. The boy did well, and at the end of the case history, there is the comment: discharged cured, a very good case. Nowhere else does such a comment appear. And from an analysis of the various handwritings in the volume, I believe this to have been penned by Thomas Kendall himself. Subsequent to this case history, the vast majority of operation entries referred to carbolic acid dressings being used. As shown here, in a 19 year-old woman who had an operation on the septic knee joint. Sometimes, the house surgeon wrongly writes "carbonic acid", as here. And here again. But there is no doubt that carbolic acid was meant. This particular entry is the case history of a man who jumped out of a first floor window in bare feet in August 1869. He sustained a compound dislocation of a bone in the great toe. And as you can see, carbolic is misspelt as carbonic twice, but there is no doubt that carbolic was actually used and meant, for six months later, this very same case history, in manuscript here, was published in The Lancet. And the text explicitly refers to carbolic acid lotion being used as highlighted on the screen.

Sadly, there's no hard evidence that Kendall began using carbolic dressings because he had read Lister's publications. Lister's name is not mentioned anywhere in the volume. But the coincidence of dates in Kendall's first use of carbolic, and his immediate change in surgical practice, is, to my mind, remarkable. And I venture to suggest that Thomas Kendall, a humble country surgeon in East Anglia, was one of the very first to recognise the importance of the antiseptic principle in surgery and in my opinion he merits a small but valid place in medical history.

As a rider to this story, I am ashamed to tell you that the surgeons in my own hospital, St Thomas', didn't even try carbolic, let alone use it regularly, until four years after Kendall first used it. And that brings us on to controversy.

Let's return to a slide I showed earlier, quoting Lister in 1867, at a meeting of the British Medical Association. During the last nine months, not a single instance of pyaemia, hospital gangrene or erysipelas has occurred. You would have thought there would have been a great excitement amongst his surgical colleagues, and also among the many readers of his later articles, with a rapid spread of practice of antiseptic technique. But that was not to be. Despite Lister's several articles over the next three years in *The Lancet* and the British medical journal describing the methods, the vast majority of surgeons were unconvinced of his methods and were not shy of writing letters to the journals to say so. To each of these letters, which were sometimes really overtly hostile to Lister, of his technique, Lister responded in measured and considered tones which was typical of his Quaker background. Even in his own hospital, in Glasgow, the Glasgow Royal Infirmary, there was hostility by his surgical colleagues. One of them was a James Morton and he was so opposed to Lister's ideas that he not only wrote strongly worded letters of objection in *The Lancet* but he also published a lengthy article in which he firmly denied Lister's results, from his allegedly first hand knowledge of the wards of the Infirmary. He went even further, he denied that germs were dangerous, or that they caused infection, and he even threw doubt on the importance of Pasteur's findings. History doesn't relate whether he later came round to the realisation of his errors and offered an apology to his former colleague, but he did go on to become the president of the Royal College of Physicians and Surgeons of Glasgow. One hardly need say that when he died, he had many laudatory obituaries but none of them mentioned his earlier opposition to Lister, and the germ theory of disease. Now, over the next ten years or more, controversy reigned over Lister. Surgeons were divided in their views about his antiseptic methods, as were the medical students who listened to him and watched him operate, first in Glasgow and then in Edinburgh, where he moved in 1869. In both published articles and in medical society meetings throughout the country, antiseptic surgery was the issue of the day. Although a few surgeons were his disciples from the beginning, the vast majority were sceptics. This was often because they claimed to have tried Lister's methods, but had not been successful in preventing infection. The reality was that they thought they had tried Lister's methods, but in fact, they hadn't, because they didn't fully understand or even accept the underlying principles. The stumbling block was the germ theory. Many surgeons were unable to come to terms with the idea that wound infection was caused by minute living organisms which at the time had not been isolated. Some abandoned antiseptics entirely and denied the germ theory completely. Others simply waited, being apathetic in the sense that they did nothing. They were waiting for proof of the theory. Which eventually came in the 1880s. Even the pathologists were at sixes and sevens. At a meeting of the Pathological Society of London in 1875, one speaker believed that germs were produced by disease, rather than disease by germs. And the joke was heard: shut the door, or Professor Lister's germs may come in.

The *Lancet*, however, championed Lister and suggested that a special ward should be set aside in a London hospital where strict antiseptics should be used. Then it would be easier to compare results of the operations on patients nursed in that ward with the results of operations on patients looked after elsewhere without antiseptic principles. But this sensible suggestion was disregarded. Arguments raged, and nowhere was the opposition more fierce than in London. It was the vocal opposition of many of the London surgeons, some of whom were the acknowledged surgical leaders of the day, that led - surgical leaders of the day, that led Lister to move from Edinburgh to King's College Hospital London, in 1877. He believed that by coming to work in the capital, he would be in a better location to convince the die-hard sceptics of the rightness of these views. Now, you will see from this roadmap that at the time of Lister coming to King's College Hospital, it was not in Denmark Hill, where it now is, but it is sited just a mere stone's throw from where I stand now. Here is the college of surgeons in Lincoln's Inn fields, you came in through the front entrance. Portugal Street runs along the back, and that was where King's College Hospital was sited, just a stone's throw from the hospital. Here is the operating theatre in King's College Hospital, Portugal Street, in which Lister was to try to demonstrate his techniques to the sceptics. And many of those sceptics were closely involved with this College. Several of them to become President. So where better for Lister to work than just round the corner.

This portrait in the College collection is of Sir William Fergusson, senior surgeon at King's, master technician, an acknowledged leader of British surgery at the time, the author of the standard book on surgery, as well as in many

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important papers, and in 1870, President of this Royal College. He was also a leading sceptic of Lister, and his principles. As were many of his colleagues at King's. Such that the medical students there were afraid to support Lister because of their seniors and their examiners were hostile to his views, and therefore, his classes remained small.

In this room, there are several pictures around the wall of the Council of the Royal College at various times in its history. This picture of the Council in 1884 hangs in the corridor just outside this room, most of you will have walked past it as you came here. By this time, of course, in 1884, the germ theory and Lister's work had finally been accepted, and aseptic surgery, that is prior sterilisation of the instruments by heat, and the dressings as well, aseptic surgery was beginning to replace antiseptic surgery. Carbolic was on the way out. Pictured here on this large portrait are all the leading surgeons of London in the late Victorian era. However, I regret to tell you that most of them had been hostile to Lister's work in the early years. Joseph Lister himself is here, ringed, having been elected to the Council four years earlier and his teachings, as I say, now accepted. And there's also another famous name, Spencer Wells, of artery forceps fame, and two years before this picture was painted, President of this College. But I'm sorry to say he was a sceptic for some ten years before he was won over. Here is a much better portrait of Spencer Wells, which hangs in the great hall, just through here, in a place of pride. Look at him closely. Do you recognise him? You should, for you saw him earlier. Here he is in his picture in his textbook of 1882 using the spray, obviously after his conversion. But it's to this central group of figures around the President in the Council portrait that I particularly want to draw your attention. For here are pictured the single most hostile of all surgeons, as well as one of the most supportive. Ladies and gentlemen, this is Mr William Savory, Fellow of the Royal Society. Later Sir William Savory, Baronet, surgeon to Queen Victoria and President of the college. As well as these distinctions, he also distinguished himself in his early career by being the most outspoken of all the leading surgeons against Lister's teachings. In 1879, some 12 years after Lister's first publication, he was invited to give the main surgical address at the annual meeting of the British Medical Association and he used this forum to launch into a violent attack on Lister's methods in front of a large audience. His lecture was published, and widely commented upon, and it merited a two page leading article in the British Medical Journal where the anonymous leader writer tried to temper Savory's inflammatory remarks. However, much as Savory pooh-poohed Lister's work, he did have the grace to say, at the conclusion of his lecture: I have the consolation in the assurance that if I am in error, these words of mine will prove no serious obstacles to the progress of truth. He was certainly a diplomat, as would be expected from someone on the staff of Barts. We also have pictured here another William, William MacCormack. He also became President of the College, a Baronet and surgeon to the Queen, but in contrast to Savory, MacCormack was at St Thomas' and arguably one of the foremost exponents of Listerism in London. He promoted Lister's teaching at every opportunity. It was MacCormack who in 1880 arranged for 15 of the leading surgeons in London, including Lister himself, to assemble at St Thomas' to hear an address on the subject and then engage in open debate before a large audience. Reading the published account of this debate, which was so prolonged that it had to be adjourned and continued two weeks later, it's clear that the doubters were by then in a small minority, and they were won over at that meeting.

The London surgeons were the last to be convinced. Scotland had already been converted. But it was Europe which was the way ahead of the game. German surgeons in particular had adopted Lister's methods at an early stage and by the 1880s Germany had become the leading surgical centre in the world. Notable among the many great German surgeons of that era was Theodore Billroth, the acknowledged founder of abdominal surgery. The subtitle of this book on clinical surgery is: reports on surgical practice between the years 1860 and 1876. The very first chapter is titled "Antiseptic treatment of wounds", and the first sentence begins:

"In 1875, I first began to employ the antiseptic method regularly."

He then goes on to explain how he sent one of his assistants to England to learn Lister's methods first hand, and how he then practised antiseptic surgery with the greatest diligence. He went on to perform a first successful removal of the stomach for cancer, and also many other successful intestinal operations. Successful as a result of Lister's

methods. It was he and others practising in Germany who led the way from antiseptic surgery to aseptic surgery, so that by the 1890s, the face of surgery had changed forever. Listerism had come of age, controversy had ceased.

But to finish, I must mention one other President of the College. Sadly, the College owns no portrait of Sir Henry Howse of Guy's Hospital, but here is a photograph. Unlike most of the other College Presidents, he was someone who espoused Listerism from the very beginning. Indeed, he was so devoted to everything Lister, he has the distinction of being the very last surgeon in the country to regularly use a carbolic spray, almost until the year 1900. Sir Henry, therefore, is the perfect introduction to my surprise finale, which I hope will come through the door, an original Lister spray, working, in action, so you can see how it actually works. Hayley, please.

We need the lights up. Do feel free - it won't explode.

Right, now, you can see the flame alight. The boiler should be boiling. Let's check it, with the valve, yes. We hope there's a good head of steam up there. And if I turn the tap ... and steam is coming out. And with a bit of luck, the potassium permanganate which allow you to see the thing becoming purple. Are the lights fully up in it's cold because the cold water here cools the spray that comes out. And you need a dark background to actually see - but you can't see the spray. Have we got a jacket? Let me put my jacket on it. You'll be able to see it against the jacket. Can you see the spray? Right. Now, you want to be convinced that it is sucking up from here. We need to give that a bit of a stir, it hasn't really coloured up as quickly as I would have hoped. But if we just wait, you will see that become purple in due course, with the - have we got a stirrer? Have we got something to stir up the potassium permanganate? It's taking the time to dissolve. The chemist sells potassium permanganate in tablets now rather than the crystals that I used to use in chemistry lesson.

So anyone volunteering to come and lie on the table? Can we give it a stir? That's wonderful. Thank you.

Right, well, that's the lecture. Whilst you're waiting for the purple to appear, I'm very happy to answer any questions that anyone has. Yes?

FLOOR: On the subject of the spray ... if Queen Victoria got some in her eye, how did the surgeons manage spraying it over patients with their own eyes, would that have been some of the - a small reason why there was so much hostility?

SIR BARRY JACKSON: That's a very good question.

I imagine that there were instances of some of the spray getting in the surgeons' eyes, it happened to Queen Victoria so it can certainly happen to anyone else, so it's quite possible. I've never read anywhere that that caused any hostility. There is this well authenticated instance with Queen Victoria which is well reported. But it's a good suggestion. I don't know. Maybe you hit on something that I didn't know. Yes.

FLOOR: Can you explain the impact of carbolic acid on the eventual use of rubber gloves?

SIR BARRY JACKSON: Well, yes.

This was gone into in some detail last time. There was a famous American surgeon called William Halstead who operated using strong antiseptics of the time, and his theatre sister, who worked with him, theatre nurse, scrub nurse as they are called in the States, she developed a very severe eczema condition of her hands as a consequence of the antiseptic and Halstead found a pair of rubber gloves made by a firm Goodyear, now best known for making car tyres, for her theatre scrub nurse to wear these rubber gloves when she was working with him, which she did, and of course her hands gradually improved. Halstead then thought, this is a good idea, why don't I use them, and his assistants presumably felt the same way, so he wrote about them, and gradually, slowly, not quickly, more and more surgeons started to use them, and glove makers started to make them, but operating with bare hands went on



for several years after that beginning with Halstead in the United States. And the nice thing about it is that Halstead married his theatre sister.

FLOOR: Could you comment on the nature of the change among surgeons, is it particularly within the surgical community, you have outlined the immense opposition against Lister, even Theodore Billroth who embraced this was ... anthrax was caused by bacillus. What is it about surgeons that makes them resistant to change?

SIR BARRY JACKSON: What is it about some surgeons, not all surgeons fall into this category.

Just think of Sir Henry Howse of Guy's Hospital, who accepted it right at the beginning. No, I don't think there is anything special about it. I just think that they found it difficult to make the mental leap to the fact that there was something they couldn't see that was causing infection, I think that was the real thing.

Lister, and his supporters, felt that the evidence that they had, even though they couldn't see the bacteria, although they could, under the microscope, but it hadn't been shown definitely that these caused infection, and that people just pooh-poohed this, that it couldn't be the case. There were many theories of the cause of infection at that time, but bacteria, a term then completely unknown, was not one of them. They were won over.

FLOOR: I wondered about the difference in mortality with the picture you showed of the patient having surgery at home. With the spray. Rather than in hospital.

SIR BARRY JACKSON: Well, the infection rate in most London hospitals was about - the mortality rate, from operations, was about 15 or 18%, and for some operations, much, much higher than that. If you took amputations, it could be higher than that, in some instances.

And it was for this reason that certain operations were never performed, you couldn't - to open an abdomen, and do an operation on the inside of the abdominal cavity, was absolutely out, because you knew that the patient would get peritonitis and that would be fatal, so for anybody that did have an operation, virtually 100% mortality.

In the country, well, the theory is perhaps that contributing to the high infection rate in the London hospitals, and the big hospitals in cities, was that they were much dirtier than the hospital out in the country, where there was the country air, and the atmosphere was probably a lot cleaner than in London, soot and smoke and so on in the big cities but not in the small towns, and that's possibly the explanation.

Final question, lady at the front and then the lady there.

FLOOR: ... it may have been difficult for the surgeons to believe what they couldn't see, just as nowadays it's difficult for ourselves to believe in dark matter or black holes, because we can't see them. What I wanted to ask you was: was this carbolic acid antiseptic used in the Boer War for war surgery?

SIR BARRY JACKSON: Yes.

I don't think carbolic acid was used, but antiseptics were used quite widely.

FLOOR: Rather than aseptic surgery, or were they combined?

SIR BARRY JACKSON: In the Boer War, 1901, there was a combination, by that time, there were - aseptic surgery had been established in the 1890s, and so by the time of the Boer War - but of course, you can't always compare some surgery in wartime with what goes on in peacetime in the hospital environment.

And emergency operations in the Boer War on the field of battle or in the surgical tents that were put up was rather different, so antiseptics would certainly have been used.

FLOOR: I've got two comments. One was on the lady before last, you were talking about abdominal operations, and yet Pepys had an operation for stones, that is in the 17th century.

SIR BARRY JACKSON: Yes, and the reason why he had that - operations for stones had been performed for many, many hundreds of years, successfully, in many cases, and the reason it was successful is that the approach to the bladder was not through the tummy, as you might imagine, it went up through what we call the perineum, the crutch area, it went up and did not enter the abdominal cavity.

So when the infection developed, as it quite often did, the infection drained away to the exterior and didn't go round the patient as a septicaemia and cause the patients to die.

So Pepys was also lucky that the surgeon who operated on him, I am pleased to say a St Thomas' surgeon, whose picture is in the Council room here, he operated - the first case of the week, sort of thing, and he had cleaned and washed his instruments from the bloody operations he had done the previous week, so he was the first patient, so the instruments that he used were relatively clean, I'm not suggesting they were sterile, but they were clean, they had been washed. And that may have assisted the fact that he didn't get overwhelming infection. And Pepys, of course, celebrated every year the successful result of his bladder stone operation, even though it rendered him sterile.

FLOOR: The other question, you were saying about them using creosote, now I understood that they were using that in warships in the 18th century because they had creosote on board, and the sailors, quite often they got a leg blown off or something like that, and they used to use creosote, and also in the battlefield.

SIR BARRY JACKSON: Absolutely.

Antiseptics of varying sorts had been used for many years in different situations, creosote being one, as you rightly say. As I say, it is a derivative of phenol. Because the important thing is that although Lister used carbolic acid, he could have used any antiseptic, and got exactly the same results as he did, but he happened to choose carbolic by chance really.

SAM: On that note, I feel we should let our hard working speaker take a pause. I would like to thank Johnson & Johnson for supporting this series.

SIR BARRY JACKSON: Did it turn off? Oh dear, a failure. Sorry, Sam.

SAM: Our speech to text colleagues. If you have any queries, there are cards in the back. You can also pick up a poster about this series as a whole. We are celebrating Lister in a three day congress the week after next. And then with the final Lister lunch from Sir Roddy MacSween on Lister as pathologist, next month, and it remains only to thank, finally, our speaker for such an entertaining and illustrative wonderfully illustrative talk, thank you. (Applause).