

# MOULDS IN ANCIENT AND MORE RECENT MEDICINE

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Since the early 1940s mould metabolites, eg penicillin, have been widely used to treat bacterial infections, although the medical use of moulds is not new. Imhokep, the notable ancient Egyptian healer, although he did not discover penicillin some 40 centuries before Fleming, is known to have treated surface infections with mouldy bread. Other examples of the use of moulds on infections occur in more recent folk medicine. Mouldy jam was used in rural areas of Quebec, Canada, and mouldy bread was used in parts of Devon and in Kansas, USA (Townend, 1944; Koch, 1987). Holy-men of central Asia also prepared a paste made from chewed barley and apple which, when mouldy, was used as a poultice on surface wounds. Reference is also given in the Jewish *Talmud* to the therapeutic use of kutach bavli or chamka, a mash of mouldy corn soaked in water or date wine. Further, John Parkington, London apothecary and King's herbarian, advised in 1640 that moulds have a curative effect when applied to infections (Kavaler, 1967).

Most historians have tended to dismiss these accounts of the ancient and folklore use of moulds arguing that the quantities of antibiotics involved would have been too small to be effective. The widespread reference to mould therapy in all cultures throughout the ages, however, provides at least circumstantial evidence for its effectiveness. While holy-men may have carefully nurtured single mould cultures producing specific antibiotics, it is more likely that the substrates they used selectively isolated species of *Penicillium* and *Aspergillus* capable of producing a wide range of antibiotics such as citrinin, patulin, penicillin and penicillic acid. Even trace amounts of these compounds, produced locally at the site of the infection, could have helped heal surface wounds. It is

also interesting that tetracycline (an antibiotic produced by *Streptomyces* sp.) has been detected in the bones of the so-called X Group, an early Christian civilisation living in Sudanese Nubia (AD350) (Bassett et al, 1980). These people lived on a staple diet of wheat, barley and millet which they stored in mudbins. Bassett et al (1980) concluded that this stored food probably became contaminated with tetracycline-producing micro-organisms and that the tetracycline ingestion, at apparently therapeutic levels, may explain the known low level of infectious disease amongst these people.

Unfortunately few details of the folklore use of moulds in medicine remain, making it difficult to assess the effectiveness of this form of treatment. The publicity following our recent research on the first therapeutic use of penicillin by C G Paine (Wainwright & Swan, 1986, 1987) led to a number of people writing to me describing their experience of the pre-antibiotic use of moulds to treat infections. One particularly interesting letter came from a local woman, Mrs. Brenda Ward, whose story led to research which is the basis of the following account of the therapeutic use of moulds in Sheffield during the late 1920s. Although, as yet, uncorroborated by case-notes this story provides a fascinating and detailed insight into the pre-antibiotic use of moulds to treat bacterial infections.

At about the same time as Cecil Paine was using crude penicillin, another Sheffield doctor, James Twomey, took a completely different approach to the use of moulds in therapy. Twomey, born in Kanturk, Co Cork, was a junior partner in a family practice based at a surgery in Attercliffe, an area in Sheffield's industrial heartland. In late July 1929, he used a mould preparation to treat Mrs



Fig. 1. Impetigo, the skin disease from which Brenda Whitnear suffered.

Ward (nee Brenda Whitnear) who was then eight-years old, Brenda had contracted a severe case of impetigo, which covered her face and a small area of her elbow, knees and arms, forming characteristic dry, yellow crusts (Fig.1). This highly contagious infection caused by *Staphylococcus aureus* can be treated with antibiotics and is now rarely seen. Before penicillin was developed, it was a common disease of childhood and although usually treatable, it could occasionally lead to serious complications such as liver damage. The young Brenda's infection, which began in April, continued to worsen throughout the summer of 1929 and she eventually developed a fever punctuated by bouts of delirium. Her ninth birthday passed but despite the use of conventional therapy prescribed by Dr Kelly, her family doctor and Twomey's senior partner, her condition continued to deteriorate. Then Twomey was asked for his opinion. After examining Brenda he advised her mother to buy some ordinary domestic starch (hot water variety) and make a paste about the consistency of lemon curd. The starch paste was then to be left

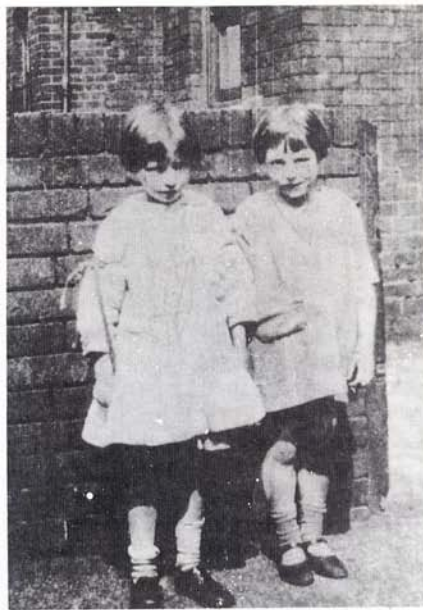


Fig. 2. Brenda Whitnear (on the left) the year after she was treated with the mould-poultice.

for a few days in the pantry at the head of the cellar when Dr Twomey would explain how the treatment was to proceed. On his return Twomey found, as he had expected, that the surface of the starch was covered with a luxuriant growth of green mould. Next, he told Brenda's mother to scrape out the mouldy starch and apply it to a mask placed over the young girl's face so that the mould was in close contact with the infection. Brenda had occasionally used a mask like this, made from a pillowcase with eye and mouth holes cut to hide the severity of the infection from visitors, somewhat in the style of the 'Elephant Man'!

The mouldy starch poultice was used throughout August until the impetigo cleared and Brenda was allowed to return to school in September. By chance Mrs Ward had kept the doctor's receipt covering the cost of the treatment from 9 April-14 September 1929, which amounts to a sum of £2.13s.0d., but unfortunately the receipt gives no details of the novel treatment employed. Mrs Ward remembers seeing the starch paste before it was applied to her face and describes what she calls 'rounds of



mould growth', appearing pale yellow at first, then orangey-bronze, and finally blue-green' — a perfect layperson's description of the development of colonies of a fungus, probably a species of *Aspergillus* or *Penicillium*. Twomey appears not to have left any records of his mould therapy, so the rationale behind his treatment can only be worked out by a combination of detective work and deduction. So I set up a number of dishes containing various starch pastes and left them in my own pantry to see if Twomey's work could be repeated. The dishes were left open and within a few days the surface of the starch was covered in mould. A hot-water, domestic starch (obtained from Boots, the Chemist) proved ideal, apparently selectively isolating species of *Penicillium* and *Aspergillus*. When a sample of starch contaminated with the former fungus was tested against *Staphylococcus aureus* on nutrient agar it formed a small inhibition zone, showing that it was producing an antibacterial agent.

As starch poultices were often used by doctors of this period to soften impetigo crusts prior to the application of antiseptics, Twomey could have stumbled upon this therapy after accidentally using mouldy starch. Alternatively, he may have used a folk treatment which he learned in his native Ireland. It is also possible that Twomey developed a modification of Fleming's discovery, details of which appeared in the *British Journal of Experimental Pathology* at about the same time as he treated Brenda Whitneer. It seems unlikely, however, that a general practitioner would have read such a specialist research journal or that Twomey would have had time to modify Fleming's method before he used his mould-starch therapy. His use of a live mould on a bacterial infection, is obviously distinct from the lineage of crude penicillin therapy developed by Fleming and independently developed by Paine. Surprisingly, live cultures of *Penicillium notatum* were successfully used in the early 1940s when penicillin had been purified but was not yet widely available. In this treatment, the mould was grown on surgical gauze on agar

and then applied to wounds or infected skin in a way similar to that employed by Twomey (Wainwright, 1987). It is not known if Twomey used a penicillin producing mould, but it is equally likely that he used one of the many species of *Penicillium* and *Aspergillus* which produce a variety of antibiotics, or even a mixed culture of antibiotic producers.

Unfortunately, it is unlikely that we will ever learn what inspired Twomey to use this somewhat bizarre form of treatment. Sadly he was never to know of the miraculous effect which penicillin had on medicine. In May 1938 he visited London and on Tuesday 17th collapsed in the street, suffering from what the *Hull Daily Mail* described as an 'affection of the throat'. Ironically, he died in St Mary's Hospital, Paddington, where ten years earlier Fleming had discovered penicillin. It is also likely that the infection that killed him could have been cured by this antibiotic. Although Twomey's work had no effect on the development of penicillin it provides us with a fascinating insight into the use of moulds in medicine prior to the development of penicillin and the 'golden age of antibiotics'; as well as providing evidence to show that the folklore of this form of treatment was probably more effective than is generally believed.

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