

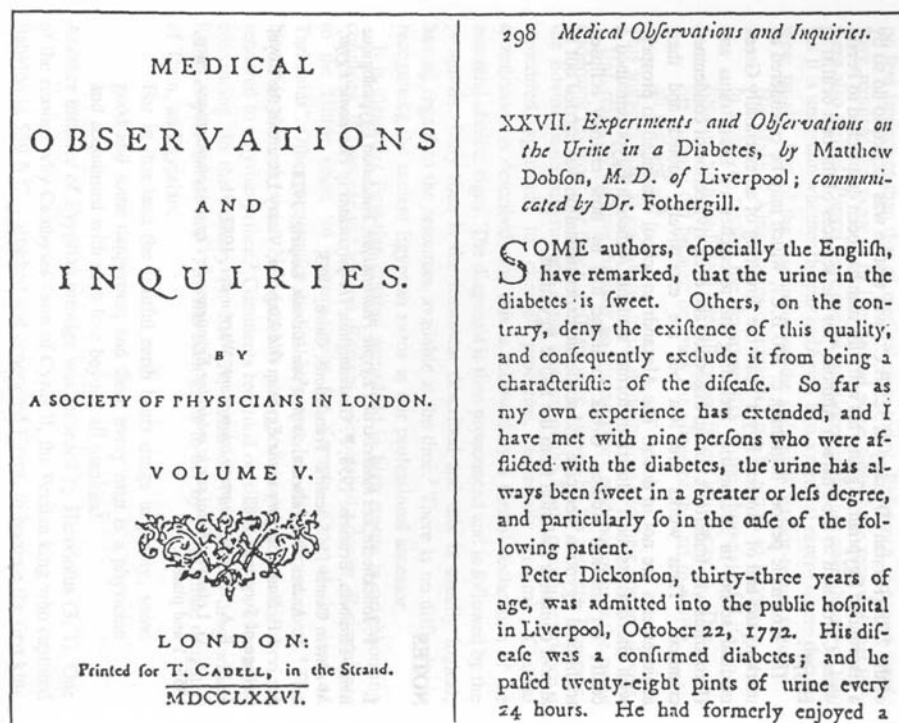
Mathew Dobson (1735-1784) and diabetes

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Mathew Dobson was born in Yorkshire, the son of a Nonconformist minister. He became a gifted natural philosopher and experimental physiologist as well as a skilled clinical observer with a wide range of interests.¹ Originally destined for the ministry, he did not follow in his father's footsteps as had been intended. Instead he studied medicine in Edinburgh, where he graduated in 1756 and in the same year presented a dissertation on menstruation ('Dissertatio Medica Inauguralis de Menstruis'). When Dobson arrived in Liverpool in 1762 he found a bustling port whose population had risen from 18,000 in 1745 and was to reach 35,000 in 1772. The first Liverpool directory of 1766 listed four physicians (including Dobson himself, living in Harrington Street), seventeen surgeons (some of whom were described as surgeons and apothecaries), and seven druggists and apothecaries.

Dobson was appointed Physician to the Liverpool Infirmary in 1770. Although the foundations of the Infirmary had been laid in 1745, it was not opened until 1749, building having been delayed by the Jacobite incursion into Lancashire. During the ten years after his appointment to the infirmary, Dobson published many papers, particularly in the *Philosophical Transactions* of the Royal Society and in *Medical Observations and Inquiries*. He was the first Liverpool doctor whose medical writings attracted attention in London and the first to be elected F.R.S. (in 1778). Unfortunately ill-health forced him to retire, and he moved to Bath where he died on 25 July 1784.'

Dobson researched into a variety of medical conditions. But his studies of a patient with diabetes mellitus paved the way for many of the advances in the understanding and treatment of diabetes which were made in the nineteenth and twentieth centuries.²



Earlier understanding of diabetes

Diabetes mellitus is a disease which was recognised in antiquity, but medical understanding of it has been characterised by cycles of discovery, neglect, and rediscovery. This history can be divided into three sections: the ancient period, during which the clinical features of the disorder were described; the diagnostic period, from the sixteenth century onwards, in which diabetes mellitus was distinguished as a disease entity; and the experimental period that began in the mid-nineteenth century during which the glucoregulatory role of the pancreas became clear and the biochemical disturbances of diabetes were initially characterised.³

The Ebers papyrus, dating from about 1550 B.C., testifies to the long history of the prevalence of diabetes. This papyrus contains descriptions of various diseases including a polyuric state resembling diabetes mellitus. The treatment recommended, which was no more bizarre and probably no less successful than some prescribed over 3,000 years later, was a four-day course of a decoction of bones, wheat, grain, grit, green lead and earth. The term '*diabetes*' (which is Ionian Greek and means 'to run through' or 'a siphon'), was first used by Aretaeus of Cappadocia in the second century A.D. as a generic description for conditions causing increased urine output. Aretaeus wrote an accurate factual description of the condition which is instantly recognisable today (see Appendix) and concluded that it was due to a fault in the kidneys. Despite the clarity of his account, Aretaeus was unable, however, to distinguish the various non-diabetic disorders presenting with polyuria. Like Aretaeus, the Roman physician Galen (131-201 A.D.) thought diabetes to be a rare disease and apparently only encountered two cases. He employed alternative terms for diabetes including '*diarrhoea urinosa*' and '*dipsakos*', the latter emphasizing the cardinal symptoms of excessive thirst and drinking.

The association of polyuria with a sweet-tasting substance in the urine was first reported in Sanskrit literature dating from the fifth to sixth centuries A.D., at the time of two notable Indian physicians, Susruta and Charuka. The urine of polyuric patients was described as tasting like honey, being sticky to the touch and strongly attracting ants. Indian descriptions of this period appear to distinguish two forms of diabetes, one affecting older, fatter people and the other thin people who did not survive long. During the same era, Chinese and Japanese physicians also described diabetes and the sweetness of diabetic urine, which apparently attracted dogs. They also observed that people with diabetes were prone to develop boils and an affliction which clinically resembles tuberculosis. The fact that diabetic urine tastes sweet was subsequently emphasised by Arabic medical texts during the ninth to eleventh centuries, when Arabic medicine was at its peak of achievement. Avicenna (960-1037 A.D.) described accurately the clinical features of diabetes and mentions two specific complications of the disease, namely, gangrene and the 'collapse' of sexual function.

The recorded advances during the diagnostic period were largely made in Europe, although some centuries apparently elapsed before European physicians made the key observation that diabetic urine was sugary. The sixteenth century Swiss physician Von Hohenheim - who accorded himself the name 'Paracelsus' in recognition of his own scientific achievements - reported that diabetic urine contained an abnormal substance which remained as a white powder after evaporation. (His observations on diabetic urine were made at a time when 'uroscopy' or inspection of the urine was a highly developed

art.) He concluded, however, that this substance was salt and that diabetes was due to the deposition of salt in the kidneys, causing 'thirst' of the kidneys and polyuria. In the seventeenth century Thomas Willis (1621-1675), a physician at Guy's Hospital in London, made reference to the sweet taste of diabetic urine and thereby duplicated the observation which had first appeared in Eastern medical writings over one thousand years earlier. Willis made several other astute observations about the disease which still ring true today. He stated that diabetes had been rare in classical times

but in our age, given to good fellowship and gusling down chiefly of unallayed wine, we meet with examples and instances enough, I may say daily, of this disease ... wherefore the urine of the sick is so wonderfully sweet, or hath an honied taste ... As to what belongs the cure, it seems a most hard thing in this disease to draw propositions for curing, for that its cause lies so deeply hid, and hath its origin so deep and remote.

Another celebrated physician of the seventeenth century, Thomas Sydenham (1624-1689), speculated that diabetes was a systemic disease arising in the blood where 'chyle' was incompletely digested and its non-absorbed residue had to be excreted.

The contribution of Dobson to the understanding of diabetes

In 1772 Dobson admitted to hospital a 33-year old man, Peter Dickonson, who had typical diabetes. His symptoms were severe thirst, hunger, polyuria, weight loss, dry skin and fevers. Apparently Dickonson was passing 28 pints of urine every 24 hours! This figure may have been 'a slight' exaggeration but undoubtedly Dobson's patient was experiencing the osmotic diuresis of uncontrolled diabetes. Dobson published his account of a series of experiments and observations on the urine and the blood of Peter Dickonson in the journal, *Medical Observations and Inquiries* in 1776.⁴ This was the journal of a medical society in London, a very select body, 'the number of members ... probably never more than a handful'. This small group of leading physicians met on alternate Monday evenings at the Mitre Tavern in Fleet Street. The papers read before it appeared in six volumes of *Medical Observations and Inquiries* published between 1757 and 1784, and the society was disbanded in 1784. Attending meetings in London was a major expedition for a Liverpool physician at that date, therefore Dobson's paper on diabetes was presented by a friend, John Fothergill.⁵ In his paper Dobson noted that he had treated nine persons with diabetes (a very modest clinical load in comparison with diabetic clinics in present day Liverpool). He described five experiments and concluded with eight observations and queries.

[Excerpts from Dobson's paper]

EXPERIMENT II Eight ounces of blood taken from the arm of this patient, exhibited, after standing a proper time, the following appearances ... The serum was opaque, and much resembled common cheese whey; it was sweetish, but I thought not so sweet as the urine.

EXPERIMENT V Two quarts of this urine were, by a gentle heat, evaporated to dryness, under the inspection of Mr. Poole, apothecary to the hospital, and Mr. Walthall, one of the house apprentices. There remained after the evaporation, a white cake which ... was granulated, and broke easily between the fingers; it smelled like brown sugar, neither could it, by the taste, be distinguished from sugar,

except that the sweetness left a slight sense of coolness on the palate. These experiments suggested the following:

OBSERVATIONS AND QUERIES

1. That the fluid which was separated by the kidneys of this patient had very little of the nature or sensible qualities of urine, but contained a substance which readily passed through the vinous, acetous and putrefactive fermentations.
2. It appears from Experiment V that a considerable quantity of saccharine matter is passed off by the kidneys, in this case of diabetes, and probably does so in every instance of this disease, where the urine has a sweet taste. From Experiment II it further appears, that this saccharine matter was not formed in the secretory organ, but previously existed in the serum of the blood.
3. This idea of the disease, also well explains its emaciating effects, from so large a proportion of the alimentary matter being drawn off by the kidneys, before it is perfectly assimilated, and applied to the purposes of nutrition. The diabetes proves, in some cases, a very rapid consumption; I have known it terminate fatally in less than five weeks, In others, it becomes a chronic complaint.
4. This idea of the nature of the diabetes, suggests more clearly and explicitly the method of cure. For if it is a disease of the system in general, if it is to be considered as a species of imperfect digestion and assimilation, the obvious indication of cure are, to strengthen the digestive powers, to promote a due sanguification, and establish a perfect assimilation through the whole economy.

Dobson's paper is a classic. He confirmed that the urine was sweet to taste and after evaporation contained a large amount of white, granular material indistinguishable from sugar. He also made the crucial observation that the blood serum was also sweet to taste. In other words he was the discoverer of hyperglycaemia. From this and various other experiments he deduced that diabetic urine always contains sugar which is not formed in the kidney 'but previously existed in the serum of the blood'. He concluded that the final emaciation in diabetes occurs 'from so large a proportion of the alimentary matter being drawn off by the kidney, before it is perfectly assimilated and applied to the purpose of nutrition'. This simple observation, that diabetes is associated with a persistently raised blood sugar concentration, led diabetes research in the right direction, towards a study of the mechanisms by which the body deals with carbohydrate foods - and hence to the view that treatment lay with enhancing the assimilation of nutrients.

The fate of his famous diabetic patient, Peter Dickonson, is not known. Dobson kept him in hospital for several months, trying several treatments and ensuring that 'the body was kept constantly open, either with rhubarb, or the infusion of senna joined with rhubarb'. Dobson eventually was 'desirous that Dickonson should have an opportunity of drinking the waters of Matlock and provided for the expenses of his journey'. The patient however, never went to Matlock and 'whether he was ashamed of having mis-applied what was given for his relief, or he relapsed into the more dangerous stages of the disease, was not learned as he came from a remote part of the country'. Perhaps Peter Dickonson had experienced enough of Dr Dobson's 'rhubarb remedy'!

Dobson's other researches and activities

Dobson had many other research interests. A medical commentary on 'Fixed Air' (i.e., carbon dioxide) dedicated to William Cullen received monographic treatment. Other publications included papers on the treatment of internal hydrocephalus with doses of mercury salts and observations on the petrifying properties of the water at Matlock. He conducted experiments on the physiological stress experienced by humans at critical high temperatures. In a communication to the Royal Society he described these experiments performed in the 'sweating room of the Liverpool Infirmary'.⁶ In this apartment, nine feet square, he observed the effect of heat on himself and colleagues. In the company of 'an ingenious surgeon of this place'. Henry Park (1745-1831), the temperature was raised to 224° Fahrenheit. They reported 'no painful suggestion of heat'. Park's pulse rose from 65 to 120 beats per minute after ten minutes but the thermometer in his mouth only registered 99°F. A further ten minutes in the chamber enabled three eggs to be cooked by the heat of the chamber alone. As it happened, Park outlived Dobson by 47 years, remaining in practice until his 75th year (during which he had the distinction of delivering the birth of William Ewart Gladstone, in Liverpool in 1809). 'His good spirits were unailing: fatigue, cold and wet made no impression on him' - was his robust health partly due to the training he received in Dobson's 'sweating room'?

Liverpool in Dobson's day was generally considered a fairly healthy environment. In Enfield's *History of Liverpool* published in 1774, two chapters were contributed by Dobson. He declared 'the dryness of the soil, the purity of the waters, the mildness of the air, the antiseptic effluvia of the pitch and tar, the acid exhalations of the sea, the frequent brisk gales of wind, the daily visitations of the tides, render Liverpool one of the healthiest places in the Kingdom, in proportion to the number of inhabitants'.⁷

In addition to his medical and scientific writings Dobson became the first President of the Liverpool Medical Library in 1779. For over fifty years the Liverpool Medical Library was situated variously at the Liverpool Infirmary on Shaw's Brow and the Liverpool Dispensary in Church Street. Eventually sufficient funds were raised to erect a separate building, the Liverpool Medical Institution, which was opened in May 1837. Unfortunately little else has been recorded of Dobson's life and activities. Even the cause of his ill health leading to a premature retirement and removal to Bath remains obscure. His death was recorded in *The Gentleman's Magazine* of August 1784, as follows:

At Bath, after a few days illness, Mathew Dobson, M.D. His death was occasioned, it is said, by a cold caught by the damps in Spring Garden, where he had imprudently sat upon the grass.⁸

No portrait of him can be found to add to the collection at the Liverpool Medical Institution. A portrait used to hang in Liverpool Infirmary but in 1874 this was badly damaged, apparently by a mischievous house surgeon with a pea-shooter, and was then lost. In 1912 Williams commented as follows: 'through a lack of knowledge of their noblest traditions on the part of the Infirmary students, the only known portrait of Dobson was ruthlessly destroyed'. Today, this versatile Liverpool physician and researcher deserves to be especially remembered, since his paper on diabetes mellitus considerably advanced the understanding of a disorder now so common and disabling.

APPENDIX

Clinical description of diabetes by Aretaeus of Cappadocia

Diabetes is a dreadful affection, not very frequent among men, being a melting down of the flesh and limbs into urine. The patients never stop making water and the flow is incessant like the opening of aqueducts. Life is short, unpleasant and painful, thirst unquenchable, drinking excessive and disproportionate to the large quantity of urine, for yet more urine is passed. One cannot stop them either from drinking or making water. If for a while they abstain from drinking, their mouths become parched and their bodies dry; the viscera seem scorched up; the patients are affected by nausea, restlessness and a burning thirst, and within a short time, they expire.

(Adapted from N.S. Papaspyros, *The history of diabetes mellitus*, 2nd ed., Stuttgart, 1964, 7-8.)

NOTES

1. For Liverpool medicine in general, see T.H. Bickerton, *A medical history of Liverpool from the earliest days to the year 1920*, London, 1936; J.A. Shepherd, *A history of the Liverpool Medical Institution*, Chester, 1979; and for Dobson in Liverpool, see O.T. Williams, 'Mathew Dobson, Physician to the Liverpool Infirmary, 1770-1780: One who extended the confines of knowledge', *Liverpool Medico-Chirurgical Journal*, 32, 1912, 245-54. Unreferenced statements in this paper are from these writings.
2. For this claim, see 'Mathew Dobson (1735-1784). Clinical Investigation of diabetes mellitus', an editorial in the *Journal of the American Medical Association*, 1968, 205: 698.
3. For general studies of the 'history' (i.e., the development of the medical understanding) of diabetes, see N.S. Papaspyros, *The history of diabetes mellitus*, 2nd ed., Stuttgart, 1964; V.C. Medvei, *A history of endocrinology*, Lancaster, 1982.
4. Matthew [sic] Dobson, 'Experiments and observations on the urine in diabetes', *Medical Observations and Inquiries*, 6 vols, London, 1757-1784, 5 (1776): 298-316.
5. [For Fothergill, see John Coakley Lettsom, ed., *The works of John Fothergill M.D. ... with some account of his life*, London, 1784; *Memoirs of John Fothergill M.D.*, 4th ed., London, 1786. Editors.]
6. M. Dobson, 'Experiments in a heated room', *Philosophical Transactions of the Royal Society*, 65, 1775, 463-9.
7. M. Enfield, *An essay towards the history of Liverpool*, Warrington, 1773, 31. Dobson's comments were made in the context of recorded deaths in 1772 of 1,085 persons (499 aged less than 5 years) out of a population of 35,000. The recorded deaths were mainly due to consumption, smallpox, 'convulsions', fevers and whooping cough. However, it is difficult to deduce Liverpool's comparative mortality from these figures, for various reasons (e.g., the contemporary intense in-migration, causing an abnormal proportion of young couples and hence babies, would in turn produce a large number of infant deaths and hence total deaths, although not necessarily higher age-specific mortality rates than the national average of the time, or in other towns). So Dobson's comments may not have been excessively optimistic.
8. *The Gentleman's Magazine*, 52/2, August 1784, 636 (I am indebted to Virginia Cook for tracing and passing on this reference).