

Portraits in medical genetics

Journal of Medical Genetics 1989, 26, 116–118

Joseph Adams (1756–1818)

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SUMMARY Joseph Adams was eclectic in his interests and wrote on a variety of medical subjects. His last book published in 1814 was on hereditary disease and based on a lifetime's careful clinical observations. In it he distinguished between what would now be defined as dominant and recessive disorders; defined the term congenital; emphasised the role of inbreeding in producing clustering of certain inherited disorders; introduced concepts now known as founder effect, incomplete penetrance, and variable age at onset; emphasised the importance of environmental factors in precipitating disease in certain genetic disorders; and, finally, recommended the establishment of registers for the purpose of preventing genetic disease. But because he proposed no scientific explanation for these various ideas, they were largely ignored by his contemporaries. Nevertheless, it would seem right to regard Joseph Adams as perhaps the first clinical geneticist.

Joseph Adams was essentially an apothecary by training and gained most of his professional experience through an apprenticeship to his father. But though he never studied for a medical degree at a university, he made a number of important contributions to clinical medicine. He was a strong advocate of the recently introduced vaccination against smallpox. He was interested in epidemics and the spread and containment of leprosy, jail fever, plague, and other diseases. He also wrote on cancer of the breast and venereal disease, but perhaps his most singular contribution was in relation to the transmission of hereditary disease. He was perhaps the first clinical geneticist.

Adams's contribution to genetics

His book *A treatise on the supposed hereditary properties of diseases* was published in 1814 and was dedicated to Sir Joseph Banks, then President of the Royal Society.¹ It was intended for the general reader and is quite short, consisting of only 125 pages. In the book Adams sets forth his ideas on the transmission of hereditary traits and their possible prevention.

Firstly he made a clear distinction between what he referred to as *family* and *hereditary* traits:



FIGURE Joseph Adams. (Reproduced by kind permission of the President and Council of the Royal College of Surgeons of England.)

Received for publication 27 July 1988.
Accepted for publication 3 August 1988.

“The distinction between a *family* and *hereditary* peculiarity consists in this; that the first is confined to a single generation, to brothers and sisters, the children of the same parents; and the second is traced from generation to generation.” (p 12)

Thus he distinguished between what would now be considered the pedigree patterns of autosomal recessive and autosomal dominant traits. He emphasised that this distinction was important because by confusing them we may “. . . excite an unnecessary apprehension in the rising generation”.

He correctly defined the term ‘congenital’:

“Diseases either appear at birth, in which they are called *congenital* or *connate*; or they arise afterwards.” (p 13)

He then proceeded to show that congenital disorders are more often familial (recessive) than hereditary (dominant). The former tend to be more serious, resulting in death in early life:

“*Connate* or *congenital* diseases are more commonly family, than hereditary: some of them being mortal, cannot indeed be transmitted, of which connate hydrocephalus or watery head is one among other instances.” (p 14)

But he observed that in some other congenital disorders which are compatible with survival (such as congenital cataract and deaf mutism), the offspring are not affected. He recognised that inherited diseases often follow a similar course within a family and therefore where there is an early age of onset:

“. . . those of the children who have passed that age without any of the symptoms may be considered as free from the constitutional disposition.” (p 21)

He also foresaw that inbreeding (which he refers to as breeding “in and in”) might result in a concentration of genetic disorders and account for:

“. . . many endemic peculiarities found in certain sequestered districts, which have hitherto been imputed to the water and other localities. And may we not trace a provision against such a deterioration of the race, in that revealed law, by which any sexual intercourse between near relations is forbidden, on pain of death?” (p 34)

Such a clustering of cases might of course be the result of shared environment as in the case of goitres in Switzerland and in parts of Britain (Derbyshire neck) which Adams also discussed (pp 87–8). When discussing the transmission of “idiocy”, he introduced a concept which we would now refer to as the ‘founder effect’:

“May we not then impute its general prevalence in that secluded spot, to the accidental settlement of a family in which it was hereditary to produce ideots, and to the frequent intermarriages of their descendents which was very likely to happen where poverty and the wildness of the country would prevent migration from or colonization among them?” (p 88)

He pointed out that in inherited diseases which may manifest later in life there are those where the susceptibility is entirely genetic (a disposition) and those where environmental factors are involved (a predisposition). From which it follows:

“That when the susceptibility is such as amounts to a *disposition* . . . our hopes of prevention must be very feeble; and our hopes of cure must rest principally on the completion of the constitutional changes. But that when the susceptibility amounts only to a *predisposition* . . . it may often be prevented or cured.” (p 30)

This has a remarkably modern sound and presages the much later concept of ecogenetics, so that when:

“. . . some external cause is always necessary to induce the disease we may hope to prevent it by avoiding such causes, or to cure it by removing them.” (p 23)

Adams extended the idea of predisposition in order to account for the occasional appearance of a disorder in only certain members of a family while others, who have affected descendants, remain healthy. Thus he seems to have been aware of what would now be referred to as incomplete penetrance.

He also discussed the idea of organisms, including man, being best adapted to the environment in which they live with only the fittest surviving. But it is in the prevention of genetic disease where he is particularly interesting. Though he was somewhat doubtful if family limitation might always be affective, he did advocate the use of genetic registers for this purpose:

“That to lessen anxiety, as well as from a regard to the moral principle, family peculiarities, instead of being carefully concealed, should be accurately traced and faithfully recorded, with a delicacy suited to the subject, and with a discrimination adapted to the only purpose for which such registers can be useful.” (p 41)

These various ideas have been justifiably hailed as being unique in their time.² But though Adams’s book is based on many careful observations it was essentially no more than a guide. As Motulsky² has pointed out, the most important fact was the lack of any scientific basis for Adams’s observations. They were strictly empirical and did not lead to the

formulation of any general rules, and because there was no scientific basis for his observations, they were largely ignored by his contemporaries. This, in part, may also have been because Adams was not recognised as being a bona fide physician or scientist.

His life

Joseph Adams was born in 1756 in London, the youngest son of an established apothecary who was a relative of Sir Thomas Adams, a former mayor of the City.

He was duly apprenticed to his father and carried out hospital studies at St Bartholomew's, Guy's, and St George's Hospitals. It was at the latter hospital that he became a pupil of John Hunter whose scientific attitude influenced Adams a great deal. He later wrote a book about his teacher³ to whom it is said he "... displayed a partiality bordering upon enthusiasm!"⁴ He was certainly a warm admirer and defender of John Hunter.

For some years Adams practised as an apothecary and in his late thirties wrote a book on poisons and cancer⁵ which was widely acclaimed at the time. In 1796 he obtained an MD from Aberdeen and being not entirely satisfied as an apothecary in London, he settled in Madeira as a physician and soon produced books on the island,⁶ as well as a treatise on cancer of the breast.⁷ After eight years in Madeira he returned to Britain where he was appointed in 1805 as physician to the Smallpox Hospital, a singular distinction for an apothecary. "Even the Laws of the Hospital and the statutes of the College of Physicians were dispensed with on this occasion."⁴ Four years later in 1809 he was admitted a Licentiate of the College of Physicians without examination.^{8,9} At this time the merits of smallpox vaccination were being widely discussed and evaluated and Adams soon became a firm advocate.¹⁰ Also as a result of his experiences in Madeira, he had become interested in epidemics and the containment of diseases such as leprosy, jail fever, plague, and typhus, and on this subject he also wrote a useful book.¹¹ In his writings he attempted to distinguish between endemics and epidemics, contagious and infectious diseases. It was his last book, published in 1814 when he was 58, which was devoted to hereditary diseases and based on a lifetime of clinical experience and careful observations.¹

The circumstances of his death were somewhat

extraordinary. While out walking on a Sunday in June 1818 he stepped in a rut and sustained a compound fracture of the right tibia and fibula. However, he recovered and seemed to be doing well when, two weeks later on 20 June, he suddenly collapsed and died. No necropsy was carried out but it seems likely that he succumbed to a pulmonary embolus. He was in his 62nd year and, though married, had no children. He was buried in Bunhill Fields with the simple motto "Vir justus et bonus".

During his life he was elected President of the Medical Society of London as well as the London Philosophical Society, and was for some years editor of the *London Medical and Physical Journal*. According to a contemporary obituary he was considered by some to be a little too ambitious and overly sensitive to criticism ("... overweening desire for contemporary reputation, and an undue irritability to critical animadversion"),⁴ qualities which may have stemmed from an awareness of his own lack of proper medical training and acceptance by the scientific community. Nevertheless, he appears to have been a kindly man and much liked by his friends.

I am most grateful to Ms Marcia Lavine for her help in tracing various references and to Mrs Isobel Black for secretarial assistance.

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