

Obituary Notice

R. A. McCANCE
(9 December 1898–5 March 1993)



Professor McCance died in Cambridge in March 1993, aged 94. He was a Founder Member of the Nutrition Society, served on the Editorial Board and was elected an Honorary Member in 1973, a distinction he greatly valued. He was always a staunch supporter of the Society and about forty of his papers are published in the Journal or Proceedings.

Robert Alexander McCance was born in Northern Ireland, in what was then 'real country' north of Belfast. His father was a linen merchant and owned linen works near the family home. He went to school at St. Bees, Cumbria, and he always retained a great affection for the school, becoming a Governor many years later.

In 1916, as his schooldays were ending, he applied for a commission in the Royal Naval Air Service. He was called up in 1917, and was trained to fly Camel single seater aircraft. He was appointed to the battle cruiser *Indomitable* where he was given the dangerous job of flying two-seater aircraft from a platform made of planks of wood laid over the mid-ship gun turrets. The platform was so short that the plane could not reach flying speed during take-off. It swooped down towards the sea, and great skill was required on the part of the pilot to make it take to the air. It was perhaps these experiences that gave him his dislike of flying in later years.

Mac, as he became known to his friends and colleagues, was demobilized in 1919 and, after consultation with his father, decided to make his career in agriculture in Northern Ireland. His two older brothers had gone to Oxford, but he was advised to go to Cambridge where he could take the Diploma in Agriculture. As a preliminary to the course he spent 6 months working on a farm near his home, learning to milk by hand, and doing such farm work as thinning turnips, harvesting and 'scaling' manure.

He came up to Cambridge to Sidney Sussex College in October 1919, to what was to him a strange new world. When he arrived his tutor, Dr Knox-Shaw, advised him not to enter the course in Agriculture immediately, but to take the less specialized Part I Natural Sciences course first, with Chemistry, Botany and Physiology as subjects. As it turned out this was wise advice, for during his first year the 'troubles' in Ireland worsened and a future in agriculture there became uncertain. He got a first-class honours degree, and then took the Part II Physiology course under Sir Joseph Barcroft, who became one of his great heroes. This was followed by 3 years in the Biochemical Department under Sir Frederick Gowland Hopkins, where he obtained his PhD.

By now his mind had turned from Agriculture to Medicine, and in 1926 he went to King's College Hospital, London, to complete his medical studies. It was while he was still a medical student that the germ originated that later grew and developed into 'The Chemical Composition of Foods'. Dr R. D. Lawrence, himself a diabetic and one of the first to have been given insulin, was in charge of the diabetic clinic and the primitive biochemical department. The intake of carbohydrate was very important in regulating the blood sugar of diabetics in the late 1920s but the values used for the carbohydrate in foods were those of Atwater, published in the USA around 1900. Only raw foods had been analysed, and carbohydrate had not been determined directly, but was calculated by difference. Everything that was not water, protein, fat or ash was counted as carbohydrate; this therefore included all the complex carbohydrates that later came to be called dietary fibre. This was clearly unsatisfactory, so Dr Lawrence got a grant of £30 per year from the Medical Research Council so that he could enlist the help of a biochemically trained medical student, R. A. McCance, to analyse raw and cooked fruit and vegetables for carbohydrate. In his spare time Mac analysed 107 plant foods, each on six separate occasions. He boiled the material with acid and determined the reducing sugars. The results were published in 1929 as a Medical Research Council Special Report 'The carbohydrate content of foods' by R. A. McCance and R. D. Lawrence, price two shillings. This was Mac's first major publication, and it contained, besides the section on 'The carbohydrate content of plant foods', another and longer one written by Mac on 'The food value of vegetable carbohydrates'. This deals in detail with the significance of non-starch polysaccharides in the human diet and was written 40 years before dietary fibre became hot nutrition news. This review, by a medical student, ranks among the classics of nutrition literature.

Professor Cathcart was making dietary surveys in Glasgow at that time and he wanted information about the composition of meat and fish. He suggested that Mac should do some analytical work to provide the information. Mac had by now qualified in Medicine and was in charge of clinical biochemistry for the hospital. He agreed to do this if he could have some help; a chemist and a technician were appointed. Meat and fish were extensively studied and the analyses included determinations of water, protein and non-protein nitrogen, fat and inorganic constituents, sodium, potassium, calcium, magnesium, iron, phosphorus and chloride. Time-consuming chemical methods had to be used, and Mac himself was always responsible for the sodium determinations. The results were published as another MRC Special Report 'The chemistry of flesh foods and the losses on cooking'. This cost two shillings and sixpence. Later, after I had joined the team, plant foods were analysed for the same constituents as the meat and fish, as well as for copper and for the separate sugars, fructose, glucose and sucrose, and for starch. Further analyses of other foods, including cereal and dairy products, provided the material for the first (1940) edition of 'The chemical composition of foods'.

Mac was a born investigator, always ready for a new idea or opportunity for research, and other studies, more exciting than food analysis, were going on in the new and larger biochemical laboratory of King's College Hospital in the 1930s. Patients provided Mac with some of his problems but he worked them out on himself and his colleagues. There were no ethical committees in those days, but he was always acutely aware of his responsibilities when he was making experiments on human beings, and he never made an experiment on others that he did not also make on himself. His studies on experimental salt deficiency and on the absorption and excretion of iron, calcium,

magnesium, phosphorous and trace elements, and the effect of phytate on their absorption are described in a review on 'Self-experimentation in nutrition research' to be published in *Nutrition Research Reviews*.

In 1938 Mac was invited to return to Cambridge as Reader in Medicine and in 1945 he became the first Professor of Experimental Medicine in Britain. This was a title he chose himself, but one which the hospital always disliked. He was a disciple of Claude Bernard whose book 'An introduction to the study of experimental medicine' published in 1865, was a treasured possession. It furnished him with many aphorisms for his lectures, which he always quoted in the original French.

Mac anticipated that there would be a severe food shortage in Germany after the Second World War, and he persuaded the Medical Research Council to set up a unit where experts might go to investigate the effects of moderately severe undernutrition in a previously well-nourished population. This lasted for 3 years and was a great experience for all who were there. Mac's particular interest was in the incidence and causes of hunger oedema, and his historical and scientific account of it is another classic.

The loss of shipping and lives during the war led to the Admiralty seeking Mac's advice on survival at sea after shipwreck. It also led to his investigations in the 1950s with colleagues, E. M. Glaser, G. R. Hervey and W. R. Keatinge, to discover the best means of saving the lives of shipwrecked persons who managed to scramble aboard a lifeboat or life raft, but who might not be rescued for many days. The results of these studies showed that l-hyoscine was the best preventative of sea-sickness, that on no account should sea water be drunk if fresh water was in short supply and that glucose sweets should be included in the survival rations, for these provide water of metabolism as well as energy. Cold was the greatest hazard, and a new covered life raft was designed and tested off Tromsø in the cold, off Singapore in the heat and in rough weather in the Atlantic. The recommendations are now standard practice in the Navy.

Perhaps one of Mac's most unexpected contributions to human physiology were his studies on the newborn infant. These began in the 1930s with a chance observation by a colleague, Dr Winifred Young. She had been his house physician while the experimental salt deficiency studies were going on. She then went to Birmingham to work under Sir Leonard Parsons, where one of her tasks was to test the urine of newborn infants for sugar and albumen. By force of habit she tested them also for chloride, and found that they contained none. She quickly reported this to Mac, who at once began studies on the renal function of newborn infants and animals. He found that, by all the tests he used, the kidneys of the newborn appeared to be inefficient compared with those of the adult, although the composition of the body fluids remained normal. This led to the realization of the importance of growth in maintaining the stability of the internal environment, so that as long as the infant or young animal is fed on mother's milk, the rapid growth of the body requires so much of the ingested nutrients that the newborn could almost do without kidneys at all. This led to Mac's great interest in growth and the effect of early nutrition on later development. The studies on undernutrition in Germany led to his well-known experiments on young pigs. If these rapidly growing animals are severely undernourished from 10 days of age they can be reared so long as they are kept warm; animals only 3% of their expected weight were regularly produced and studied in many different ways.

Mac retired in 1966 and was at once asked by the Medical Research Council to go to Uganda to take care of the Infantile Malnutrition Research Unit in Kampala until a

permanent Director could be appointed. Dr R. F. A. Dean, one of the team in Germany, who had been Director of the Unit from the outset, had recently died. Mac thoroughly enjoyed the new experiences and opportunities for research. He returned to Cambridge in 1968 and spent the last 25 years of his life there.

Mac was a great cyclist. He bought a bicycle when the war started in 1939, and over the years he cycled 200 000 miles, with an average of more than 20 miles a day. Much of the mileage was accounted for by the journey to and from his home at Bartlow, 13 miles from Cambridge, and he used his cycling time to think up new ideas for research or to solve problems arising from those already under way. However, as time went on he had several falls, each of which left him more incapacitated. During his later years he spent his time reading, writing and enjoying visits from his former colleagues and students, some of whom kept in touch with him right to the end.

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