Professor Sir James Black: Nobel laureate who designed the first modern drugs for high blood pressure and peptic ulcers

Sir James Black invented the first modern blood-pressure drug, propranolol, and the first modern ulcer drug, cimetidine, which rank among the most important medical advances of the 20th century, having saved countless lives and abolished overnight the need for ulcer surgery. Sir Michael Rawlins, chairman of the National Institute for Clinical Excellence, regarded Black as "the greatest drug-hunter of the 20th century. Not only did he develop two entirely novel classes of drug, beta-blockers and H2 antagonists, which had a major impact; but he also introduced a unique approach to drug discovery by using agonists as the starting point for the development of specific antagonists."

Black was born into a Baptist family in Uddingston, South Lanarkshire and brought up in Fife. He was the fourth of five sons of a mining engineer and colliery manager. They were a musical family and imbued him with a love of singing. He was educated at Beath School in the Fife mining town of Cowdenbeath, where, he said, he coasted through his schooldays but for an intense period spent studying music from 12 to 14, followed by two years of mathematics, mentored by his brilliant teacher Dr John Waterson, who "more or less manhandled me into sitting the competitive entrance examination for St Andrews University". As a timid 15-year-old he was interviewed for a scholarship and was awarded the Patrick Hamilton entrance scholarship, unaware that the family budget would not have stretched to another university student. An elder brother, William, had studied medicine there.

As a condition of the scholarship he lived in St Salvator's Hall, a modern residence designed on the Oxbridge model, where his fellow students were from a wide range of classes, a mind-broadening experience for a boy from the Fife coalfields. He found hard, disciplined study more enjoyable than daydreaming. One of the teachers who inspired him was professor D'Arcy Wentworth Thompson, the polymath who wrote the science classic On Growth and Form. While at St Andrew's, Black met Hilary Vaughan at a student ball and they married when he graduated, two years later. He joined the physiology department under Professor R. C. Garry, and taught Hilary for a year; he said she was the best student he'd ever had. She went on to study poetry and law.

Garry was trying to discover how the intestine absorbs sugar selectively. A research student had shown that sodium iodoacetate eliminates the selectivity of the intestine and destroys intestinal cells. Black, wondering if the substance was a general poison and questioning what it did to blood pressure, discovered that it seriously and permanently reduced it. This led to the question which influenced his thinking from then on: when and to what extent does local blood act as a metabolic throttle?

Pitiful academic prospects and the need to repay a student loan drove the Blacks to move a year later to Singapore, where Black lectured in physiology at the King Edward VII College of Medicine and continued research into intestinal blood flow and absorption. They returned to the UK in 1950 with no home or job, but Black "knocked on physiology department doors and encountered more sympathy than I expected". A chance meeting with Professor Garry in Oxford Street led to a post with Professor William Weipers at the University of Glasgow's veterinary school. Over the next eight years Black established a physiology department with state-of-the-art teaching and research laboratories. He worked mainly with two academic surgeons: George Smith, who was interested in the effects of histamine and 5HT on acid secretion in the stomach, and Adam Smith, concerned with increasing blood supply to the heart when the arteries were narrowed.

By 1956 Black had the aim of finding a specific adrenaline receptor antagonist. He approached ICI Pharmaceuticals for help and ended up working for them at Alderley Park, Cheshire, for six years.
These were, he said, some of the most exciting years of his life, an "educational tour de force." Working with two brilliant medicinal chemists, John Stephenson and Bert Crowther, he learned about pharmacology and deductive organic chemistry. He was convinced that the histamine antagonists of the day blocked only the alpha receptors and that a beta agonist was needed to block, say, histamine-stimulated acid secretion.

Then Edward Paget, head of pathology at ICI, took a post at Smith Kline and French and asked Black to find him a biologist to run their biological research, adding, half in jest, "how about you?" Black took the job, agreeing to run the lab if he could have a free hand to pursue his beta-receptor research. By 1972 cimetidine (trade name Tagamet) was in development and Black was looking for a new project: "I was now totally committed to arranging marriages between bioassay [establishing a substance's potency or nature by testing it on living tissue] and medicinal chemistry."

Attracted by the possibility of freedom from commercial constraints, he accepted the chair in pharmacology at University College London. He wanted to establish the combination of bioassay and medicinal chemistry as an academic pursuit, which he felt was "as exciting as astrophysics or molecular biology". In teaching, he wanted to establish a pharmacology course based on chemical principles, biochemical classification and mathematical modelling. He failed to achieve either of these: his ideas on education had curricular difficulties.

When John Vane of the Wellcome drug company invited Black to join him, he accepted eagerly. He spent 1977 to 1984 there, but found, as others had done, that the company was traditional, feudal and conservative: "Entrenched attitudes can absorb reformist efforts like a punch bag." But he made good progress with his own research in analytical pharmacology. His problems were resolved when the Wellcome company offered him the chance to establish a small independent research unit, and funded it. King's College, London and its medical school welcomed the unit, based in Dulwich and called the James Black Foundation. It had modern, purpose-built premises in Denmark Hill and did not-for-profit research. Black was given the title of professor of analytical pharmacology. He regarded his five years there as the most productive and happy of his life and in 1988 he received the Nobel prize for his work there on beta-blockers and ulcer drugs.

He was Chancellor of Dundee University in his later years and the university now has a centre named after him. His first wife died while he was at Denmark Hill and he later married Rona McLeod MacKie, professor of dermatology at Glasgow University.

Black was universally liked for his modesty, tolerance, courtesy and good humour, and respected for his work. "To have invented one new class of drug, the beta-blockers, would have been impressive," said Jeff Aronson, president of the British Pharmacological Society. "To have invented a second, the histamine-receptor antagonists, would have been exceptional. But to have invented two new classes of drug that revolutionised the management of the conditions for which they were intended – and in the case of the beta-blockers had other major unexpected benefits, for example in angina – was outstanding." He was given a Lasker award – a sort of mini-Nobel – in 1976 and was made a Fellow of the Royal Society in the same year. He produced 200 research papers, many of major importance.

Caroline Richmond

Science, James Black once told me, is best kept as a low-profile activity, and I never met any man more genuinely concerned that he should not become a "celebrity", writes Tam Dalyell. None the less, he effectively used the award of a Nobel Prize to plead for a way to be found of making more money available to universities without the sort of strings that can lead to controversial research not being supported. He believed most revolutionary work begins by being, at the very least, mildly controversial. One reason for his success with beta-blockers, he told us, was that he had been "quite naive", and had never doubted that what was in the 1950s a controversial theory was quite right and could be exploited.

No university could have found a more suitable choice for the exalted position of Chancellor than Dundee, with its international reputation for biochemical excellence. As a Scottish MP, I can testify to Black's interest in the encouragement of school pupils, and particularly of young teachers of science. As he saw it, he owed his career to the inspiration of Dr John Waterson at Beath High
School, concluding that what matters to children is the calibre and enthusiasm of individual science teachers.

Black's father ended his working life as the manager of the huge Cardowan Pit, outside Glasgow. Of his five sons, one became a Church of Scotland minister, one a psychiatrist in Vancouver, a third a civil engineer, and another a teacher. Public service was their ethic, and Black never asked for anything in the way of royalties for his work, arguably the most lucrative pharmaceutical advance in the 20th century.

A close colleague, Professor Desmond Laurence, head of pharmacology at University College, London, pointed out that Black was a man of geniality, as well as genius. He and his wife, Professor Rona McLeod MacKie, led a cheerful social life based on an extensive interest in and knowledge of the arts. My own experience chimes exactly with Professor Laurence's observation: "You know he's completely his own man. Not only is it intellectually exciting to work with him, there's always a laugh as well." Above all I shall remember Sir James Black for his delicious chuckle.

Tam Dalyell