Rosalyn Sussman Yalow

(1921–2011)

The second woman to win the Nobel prize in medicine.

The radioimmunoassay (RIA) technique — for which Rosalyn Sussman Yalow received a share of a Nobel prize in 1977 — has revolutionized almost every field of medicine. It uses radioisotope tracers to measure the concentration of tiny amounts of substances in the blood and other body fluids. Being able to measure levels of hormones, drugs, vitamins and viruses suddenly made it possible for researchers and clinicians to diagnose problems and treat patients with appropriate doses of medication, and to probe the causes of numerous diseases.

Yalow, who died on 30 May aged 89, trained in physics and never took a course in biology. Yet in the second half of her career she knew more physiology and medicine than many physiologists and physicians. Her inexhaustible capacity for work — combined with her brilliance and determination — were key to her achieving a front-line position in medical research unthinkable to most women of her time.

Yalow was born to Jewish parents in New York City. After high school, she attended the all-female Hunter College, part of the city's municipal college system, where tuition was free. Rejecting her mother's suggestion that she become a schoolteacher, Yalow insisted on a career in physics. At Hunter, she was captivated by nuclear physics in particular.

FEMALE PIONEER

In part because of the shortage of male applicants, many men having been drafted into the army before the United States entered the Second World War, Yalow was offered a place at the University of Illinois at Urbana-Champaign graduate school in 1941. She was the only woman among the university's 400 staff and the first female graduate student to study physics there since 1917.

When Yalow finished her doctorate in 1945, with straight As, she initially encountered closed doors on trying to pursue the career she so desired. After working as an assistant engineer at the Federal Telecommunications Laboratory in New York City and then as a teacher at Hunter, she finally landed a research post at the Bronx Veterans Administration Hospital in 1947. Here, she was tasked with developing the use of radioisotopes in medicine.

Yalow was fascinated by what she correctly perceived to be the enormous potential of radioisotopes. But she soon decided that she needed a physician to join her. In what was perhaps the most momentous decision of her career, she selected Solomon Berson — an internist with no previous research training. Berson was "the most brilliant person she had ever met", she concluded after a short conversation with him.

For more than two decades, the unusually creative and strong-willed pair worked day and night with incredible solidarity and mutual respect. During the early 1950s, they used radioisotopes to assess iodine and albumin metabolism; they injected the substances, labelled with radioisotopes, into patients' blood and monitored the decline in radioactivity emitted. A few years later, the clinical scientist I. Arthur Mirsky urged them to use radioisotopes to test his hypothesis that diabetes was caused by overly rapid degradation of insulin by the enzyme insulinase.

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By injecting radioactive insulin into patients, Yalow and Berson found that insulin disappeared from the blood more slowly in people previously given an injection of insulin than in untreated patients. They concluded that the former had produced an insulin-binding antibody. (Insulin bound to a large molecule is harder to excrete or degrade.)

Reviewers for *The Journal of Clinical Investigation* initially rejected the paper describing their results (the rejection letter starred in Yalow's Nobel-prize acceptance speech). Undeterred, Yalow and Berson went on to discover that adding increasing amounts of unlabelled insulin to a known amount of antibody bound to radiolabelled insulin progressively displaced the latter from the antibody. By measuring how much labelled insulin was freed up, they could work out the concentration of unlabelled insulin in a sample. These observations led to the groundbreaking 1960 paper describing the development and use of the RIA method for insulin.

Over the next decade, Yalow and Berson's group described RIAs for human growth hormone, adrenocorticotropic hormone, parathyroid hormone and gastrin. In each case they gained important insights into the compounds' physiology and biochemistry. Meanwhile, other investigators used the method to measure myriad other substances.

Yalow's laboratory was extraordinarily generous. The few research fellows trained there were always given full credit for their efforts. Visiting scientists from every continent were welcomed to learn about the RIA procedures, and often left bearing gifts of precious antibodies. Indeed, Yalow and Berson refused to patent the method even though it had huge commercial potential.

Despite her appetite for hard work, Rosalyn strove to balance her career with caring for her family. She would frequently run home to prepare meals for her husband Aaron and their two children before returning to the laboratory. She shunned feminist organizations and classic 'feminism', but was a forceful advocate for equal opportunities in science, appearing before high-school girls whenever invited, and encouraging them to pursue scientific careers.

When Berson died in 1972 at the age of 53, Rosalyn was devastated. Many who did not know her well suspected that he was the 'brains' and she the 'muscle'. She disproved the doubters: between Berson's death and her receiving the Nobel Prize in Physiology or Medicine (with medical scientists Roger Guillemin and Andrew Schally), she published dozens of important papers on the structure and function of various hormones. ■

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