SIGNALS

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Signals

THE INSIDE STORY OF OUR HORMONES

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For Sibella, Teddy, Hal and Rafa Bear, with love

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AUTHOR'S NOTE

In writing this book, I have drawn directly from real-life patient cases. Each story is medically accurate; however, I have taken great care to respect and protect my patients' right to confidentiality, and have anonymised them by changing identifying details. Where I have depicted a colleague, a medical student or one of my own teachers, I have, if necessary, modified certain elements to preserve their privacy. The events that I describe relating to my own story all happened, and I have written about these to the best of my recollection.

INTRODUCTION

I used to think I was in control of my life. But I don't believe that any more. Learning about hormones changed everything.

The illusion of our autonomy, though, can be persuasive, because when all is functioning well, we barely notice our hormones, the chemical signals that carry messages within the body. By animating every aspect and every moment of life, it is our hormones' control over us that defines our very idea of what a normal life feels like. We expect to wake up refreshed, to maintain a stable weight, to be in a reasonable mood, while perhaps overlooking that these processes are governed by the body's hormones far more than by our behaviour, agency or willpower. Yet when this network of hormone signals and the endocrine glands that transmit them breaks down, we see with hindsight how precarious, how precious that expectation of a normal life was.

Endocrinology is the medical specialty concerned with these diseases of the body's hormones. In the outside world, when I tell people I'm an endocrinologist, most will say, 'What's that?' 'Hormones,' I'll reply. 'Oh, like HRT,' they'll say. 'My wife's on HRT.' And they are right: we do deal with HRT, or hormone replacement therapy, but menopause is just one example of the potency of our hormones, which choreograph every phase of life.

Hormones build a new human being *in utero*, before engorging the mother's breasts with milk to nourish the baby. Hormones grow the helpless newborn into a rough-and-tumble toddler who gains height through the hormones that lengthen the bones. Hormones take the child's body at puberty and conjure from it the adult form, directing the ovaries to mature their eggs or the

testicles to produce sperm, each of these gametes containing the potential to create new life.

Meanwhile, aside from these big-ticket life events, day-to-day, minute-to-minute our hormones are controlling our morning get-up-and-go and daily energy levels; how we cope with stress, from a rush-hour traffic jam to the splintering of a broken heart; whether libido is flourishing or going through a fallow patch; the weight flashing up on the bathroom scales and the amount we need to eat to feel full.

In my professional life, I don't usually encounter hormones when they are working beautifully like this. Instead, if you sit with me, on my side of the desk, you'll hear stories of living in a body that feels uneasy, out of sorts, destabilised by some unknown, out-of-control internal factor.

'There's something wrong with my hormones, they aren't right, I can just *feel* it,' the patient says. We are sitting in a large, tired-looking consulting room. The last of the daylight is gathering at windows that are too high to see out of and which were painted shut years ago. So many stories have been told in this room – '*There's something wrong with my hormones . . .*' – which one has just unfolded? Is rapid weight gain the cause of the patient's distress? Maybe they are suffering the pain of infertility? Or perhaps they're feeling so anxious that they have also been referred to a psychiatrist?

Any of these stories and many more besides could be this patient's. Any of these accounts of a life upended could have brought them to this London teaching hospital today – in from the squally February weather, through the main entrance revolving door and up to the first floor, then straight ahead to Outpatients, following the signs and arrows that lead to the endocrinology clinic.

The clinic's waiting room has begun to thin out for the day. At two o'clock, all but three of the interlocked plastic chairs were

filled. Now there is space for the remaining patients to occupy their seats without the self-conscious drawing-in of arms and legs that comes from sitting too close to a stranger. Some rest their coats, bags and umbrellas on the empty chair next to them. In the third row is an exceptionally tall young man, still wearing his postman's uniform. Ten minutes ago, he stooped to pass through the doorway into the waiting room, his considerable height driven by a childhood pituitary gland tumour that produced too much growth hormone. In the paediatric clinic, he was diagnosed with 'gigantism', but the other patients look medically unremarkable, nothing about them suggesting that something in their internal signalling system is broken.

Just over a hundred years ago, these patients' conditions could not be explained. They were considered to have strange physical afflictions or weak mental attitudes, and some people with endocrine diseases were even dismissed as 'freaks' and heckled in circuses or locked away in institutions. The breakthrough came in 1902, when one of our body's messages, a dispatch sent from the gut to the pancreas, was discovered by the University College London physiologist Ernest Starling and his brother-in-law, William Bayliss. But what to call these internal communications? Starling had been considering the matter when he was invited to Cambridge to dine at Caius College, and the question came up over dinner. The classicist William Vesey was seated nearby. '*Ormao*,' suggested Vesey – from the Greek meaning 'to excite or arouse'. '*Ormao*,' Starling jotted down in his notebook, and in that chance conversation, the body's signals known ever since as our 'hormones' were named.

Three years later, before a packed lecture theatre at the Royal College of Physicians, Starling laid out his discovery of the 'Chemical messengers which, speeding from cell to cell along the bloodstream, may coordinate the activities . . . of different parts of the body.' His insight would prove to be the very essence of

endocrinology. A hormone signal produced by an endocrine gland is carried away in the blood to deliver a message to distant cells. This could be the postprandial transmission of the gut hormone glucagon-like peptide-1, or GLP-1, which signals fullness to the brain, or oestrogen from the ovaries, which is sent to pubertal breast tissue, stimulating it to grow.

The diversity of hormone function, from milk to mood, hunger to height, does not occur through the action of any single part of our anatomy. Instead, hormone signals and the glands that produce them are part of a communication system that organises *every* cell, turning collections of independently functioning cells, tissues and organs into an interconnected human body.