

# So Perfect, So Vulnerable

Carlos Santillana Castillos knows his migraines inside out. His physical symptoms include visual disturbances and severe headaches. But the brain is an enigma. During an attack, he also experiences something that resists classification.

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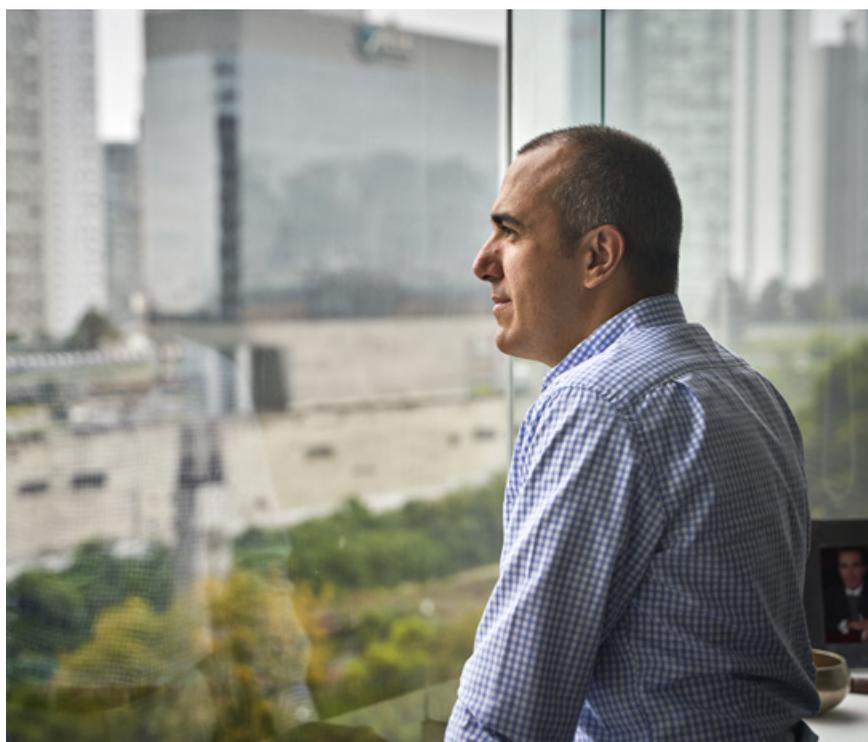
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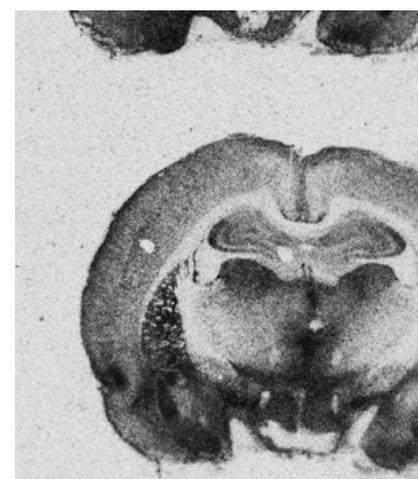
“  
We are leaders in climate action, and we measure everything we do with the most ambitious reduction targets set by science.”

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**As Diverse as the  
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Visit the Lundbeck website  
[www.lundbeck.com](http://www.lundbeck.com)

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# Lundbeck in Brief

We are a global pharmaceutical company specialized in discovering and developing innovative treatments for brain diseases.

## PURPOSE

**Tirelessly  
Dedicated to  
Restoring  
Brain Health**



## OUR AMBITION

**To be #1  
in Brain  
Health**

## HISTORY

Lundbeck was founded by Hans Lundbeck in Copenhagen more than 100 years ago, in 1915.

  
**1915**

## OUR BELIEFS

We are

**Patient-Driven  
Courageous  
Ambitious  
Passionate  
Responsible**

## REVENUE

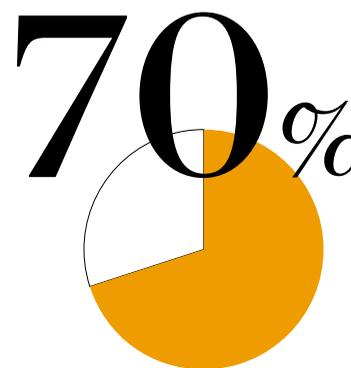
Our 2020 revenue reached DKK 17,672 million.

**17.7bn**



## OWNERSHIP

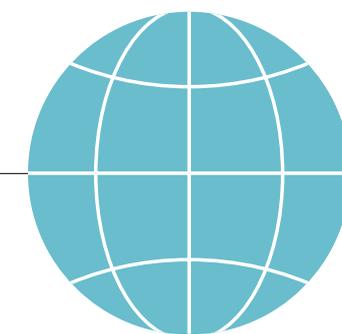
Our largest shareholder is the Lundbeck Foundation, which holds approximately 70% of the shares. The Foundation annually grants around DKK 500 million to support medical research and educational and communication activities.



## EMPLOYEES

We are approximately 5,600 employees across the entire pharmaceutical value chain.

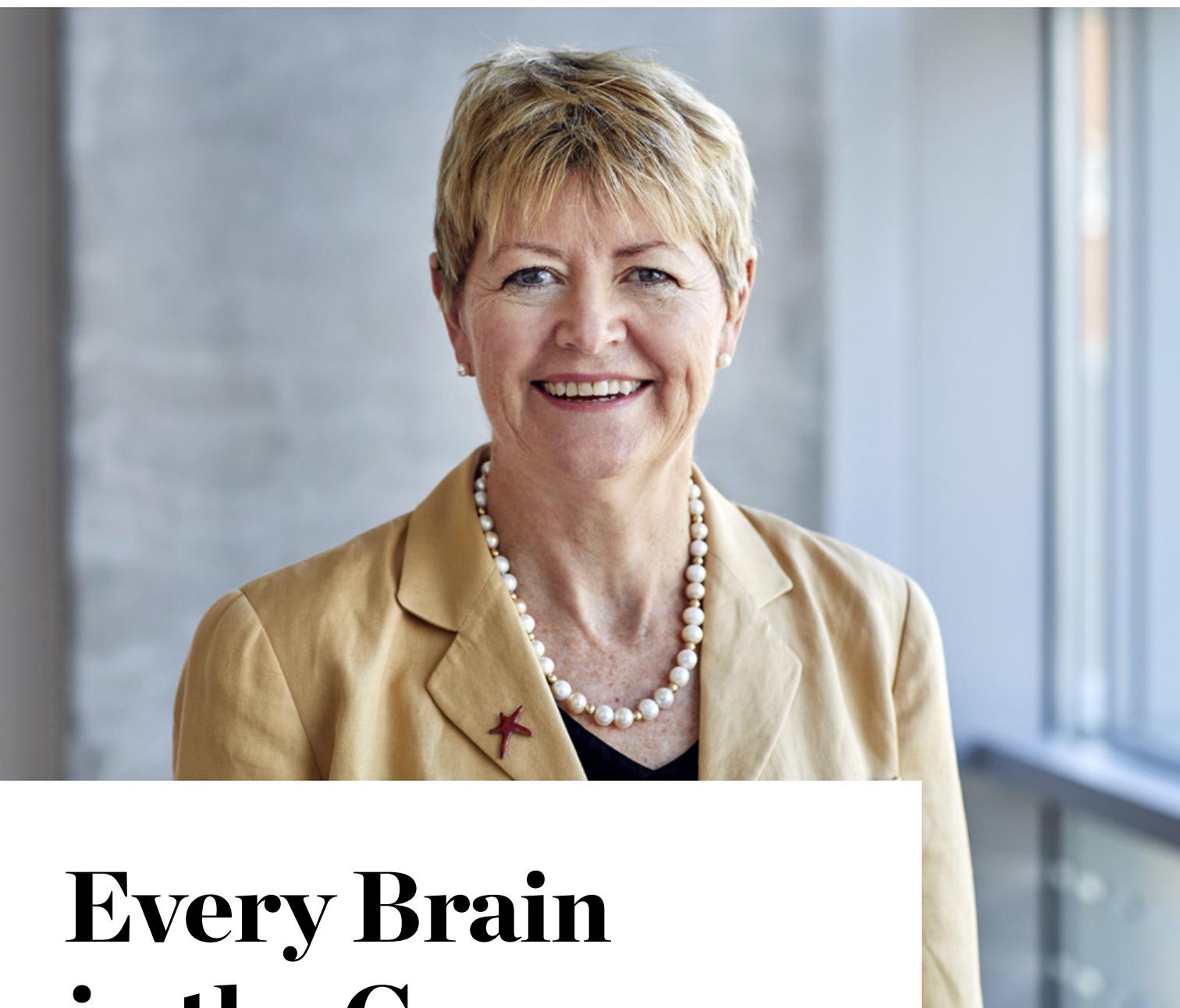
**5,600**



## GLOBAL PRESENCE

Our portfolio of products are registered in over 100 countries globally, and reaches more than 50 million people yearly.

**+100**



# Every Brain in the Game

I have a saying I like to use which is, “we need every brain in the game.” What I mean by this is that we need diversity of thought and perspectives across everything that we do, because in the end that is what will make Lundbeck a better company and make us even more relevant for patients.

Brain disease knows no boundaries and no color, and we are working hard to create a diverse organization and approaches to how we do business, which also reflects the patients we serve. Even those who work for Lundbeck are not exempt from brain diseases and in this issue, you will hear from our colleagues, Carlos and Johan who are living with Migraine and Parkinson’s Disease, respectively. We also take on the topic of racial disparity in being diagnosed and receiving treatment for brain diseases that African Americans and other minorities face. In Lundbeck, we recently pledged to have more diversity in our clinical trials to better reflect the diversity of patient populations.

### Drug Hunger to Find the Next Life-Changing Treatment for Brain Disease

With Lundbeck’s long history in neuroscience, our R&D organization was tasked to rethink its approach towards building a pipeline of premiere neuroscience, focused on rare and niche neurology and psychiatry diseases. Our R&D mindset is based on a concept of “drug hunger,” which compels us to stay at the forefront of innovation and progress a strong portfolio of industry-leading medicines. The team is continuously improving the way it works to reflect the ever-changing neuroscience landscape, integrate patient insights and leverage new technologies. We are delighted to be able to share more about the approach in this issue.

### Adapting to a New Normal

2020 and 2021 are years that will not be soon forgotten, marked by a global pandemic. We have all had to learn, adapt and reframe what we consider to be normal. The pandemic has had a disproportionate effect on brain health as people struggle to cope with long term isolation and changes to routines. As a global pharmaceutical company focused on brain health, we see it as our responsibility to initiate the dialogue around the pandemic and brain health so we can help healthcare organizations be better prepared for the brain health effects to come.

“Our world is changing, our business is changing and as we evolve, we need to ensure we are doing it in a sustainable way and in the best interest of our patients and the people that care for them.”

Throughout the pandemic, we have been fully dedicated to ensuring we can deliver our medicines to the people that need it most and to maintain steady participation of our clinical trials and research activities to produce the scientific data we need to develop new medicines. We have had a lot of learnings over the course of the pandemic, and we have used these to adapt towards new ways of working that will benefit Lundbeck longer term. Using technology, we have adapted how we do clinical trials, how we engage with one another and how we work with healthcare providers. We will continue to leverage our learnings from the pandemic to further brain health and better serve patients.

### Looking Towards the Future

Our world is changing, our business is changing and as we evolve, we need to ensure we are doing it in a sustainable way and in the best interest of our patients and the people that care for them. The United Nations Sustainable Development Goals are the blueprint for achieving a better and more sustainable future for all. Addressing the world’s global challenges is a shared responsibility and we do our part where we can and use our influence where we can make the most significant impact- brain health, ethics, transparency and compliance, and pursuing a zero emissions future. We will continue to promote change when it comes to diversity, gender equality, and responsible business. This is our commitment and at the core of our purpose, tirelessly dedicated to restoring brain health, so every person can be their best.

Deborah Dunsire  
President and CEO of Lundbeck

# OUR COMMITMENT

# Restoring Brain Health

Knowing the brain and advocating for brain health is at the very heart of Lundbeck's purpose. We have a long heritage of working to understand the brain and discovering medicines that make a difference to the quality of life for the people we treat.



**Our ambition?** To become number #1 in Brain Health by 2030, so that we are well positioned to continue serving people with brain health conditions for years to come.

Looking ahead, our ambition is to become #1 in Brain Health. We believe that to restore brain health we need to work in partnership in a multisectoral and multi-stakeholder approach. We will continue to focus on efforts in three priority areas:

**Research and Medical Education**

Fostered by a mindset of "drug hunger", Lundbeck invests 415M EUR<sup>1</sup> (close to 20% of our revenue) in brain research annually, we partner with leading research experts and centers and we invest in medical education.

**People with Lived Experience and Their Families**

We ensure that we listen and integrate patient insights throughout Lundbeck's value-chain, we provide patient education programs, as well as innovative treatments alongside support programs.

**Community and Society**

We seek to empower the brain health advocacy community, we co-create and publish evidence that fights stigma, and we advocate for systemic change to improve the lives of people with brain health conditions. As an employer of 5,600 people worldwide, we have a responsibility to promote wellbeing, train our employees and ensure a diverse and inclusive workplace, including of people impacted by brain health conditions.

1. Lundbeck's corporate release, pg 21, 6 Feb 2020



*Patient Story*

# So Perfect, So Vulnerable

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Carlos Santillana Castillos knows his migraines inside out. His physical symptoms include visual disturbances and severe headaches. But the brain is an enigma. During an attack, he also experiences something that resists classification.





A headache is not something you're supposed to pay attention to, Carlos explains, sweeping all headaches away with a dismissive gesture. His instinct is to hide his condition. Pain is ... private.

A dot?  
Suddenly, Carlos sees a dot of light in the visual field of his left eye. It shines brightly, but not so much that it hurts. He closes his eyes and it's still there. Then a shower of streaking light. When he opens his eyes, he can no longer see out of the left one.

He thinks: *I'm going blind.*

Carlos has come to Mexico City from his hometown in the Valley of Puebla. A 17-year-old boy on the big city subway, petrified stiff. And he's still there when the headache arrives. The pain is alien and it throbs. He doesn't ask anyone for help, because he can't find words to describe what's happening to him.

He thinks: *My eye is broken.*

### If He Could Trade

Since that day on the subway, Carlos has seen the glowing dot a couple of times a month. The dot is a sign. Carlos suffers from a form of migraine in which visual disturbances – known collectively as the aura – precede the headache. Sometimes the dot might skip a month between visits, other times it comes more often. But when it does appear, he knows, he should cancel meetings and social gatherings for the next 48 hours. He shouldn't go running, he should avoid bright lights. The laughter and clamour of his children will make him flinch.

He can never predict when it'll happen. Recently, the dot showed up while he was shopping at a local mall with his two small boys.

Or the attack can occur at work. He still remembers one project that he'd worked



on enthusiastically for months. And he remembers how he felt when the glowing dot appeared right before he was about to present it for the first time. But you'd have to know him well, he says, to notice when he's not feeling good. In Mexico – or anywhere in Latin America, for that matter – a headache is not something you're supposed to pay attention to, he explains, sweeping all headaches away with a dismissive gesture. His instinct is to hide his condition. Pain is ... private.

It's also profound, intense.

Yet there's another aspect of his migraine that makes him suffer more. If he were able to exchange this aspect for more physical pain, he would say yes to the trade.

### Maybe It Helps

Migraine means physical pain. But it means more than that. It confronts patients with its unpredictability and their lack of control. Many sufferers can attest to how their dread of the next episode has taken over their lives.

Carlos starts almost every day with a train-

ing run through empty morning streets. He trains himself not to tense up when it starts to hurt. He trains himself to breathe deeply throughout. Carlos is preparing himself to accept the physical pain involved in running marathons. He's betting that migraine pain and marathon pain will remain separate. But that isn't up to him. Once he ran a qualifying race in Las Vegas with a migraine, and it's a marathon he won't forget any time soon. While physical pain doesn't dismay him, the blindness that comes with his aura does. That's what he wishes he could trade away.

## CARLOS SANTILLANA CASTILLO

**Age** 42

**Residence** A suburb of Mexico City, Mexico.

**Family** Carlos lives with his wife Katia and their two young boys.

**Diagnosis** Soon after his first attack, while still a teenager, Carlos received a diagnosis of migraine with aura. In his case, it means that he experiences visual disturbances for about a half hour before the headache commences. The headache is severe for half a day, after which the pain subsides to a moderate level and disappears after a couple of days.

There are a variety of triggers that can provoke a migraine. Carlos has two: stress and bright lights.

**Employment** Carlos is a certified public accountant and has an MBA. He is also licensed as a private pilot. He's worked for a number of pharmaceutical companies and is currently Access & Business Support Director for Lundbeck Mexico.

**Interests** Carlos usually runs one or two marathons a year, most recently the 2019 Boston Marathon. Although the COVID-19 pandemic has resulted in widespread cancellations, he continues to train almost every day.



“  
Migraine means physical pain. But more than that, it confronts patients with their lack of control.  
”

The acrid smell shortens the half hour of disturbed vision – maybe.

Carlos shrugs his shoulders with a half smile. Or maybe it's just the fact of doing something that helps.

### The Doors of Perception

Years ago, migraines took Carlos by surprise. Today he knows the condition intimately, and when he talks about it, it comes across as a sort of a force. It wants to get in touch with him. And it brings him a gift.

The neurological activity of a brain during a migraine hasn't been fully mapped yet. But in certain rare instances, a patient may experience euphoric elation during the course of an attack. It's been hypothesized that this shift in perception is due to a sudden surge of dopamine in the brain. Carlos describes his own experience of the phenomenon in this way: during the transition from aura to headache, it feels as though the migraine flings open the doors of his perception. Hearing, sight, smell – all his senses dilate. The filter between him and his surroundings is gone, and he feels impressions from other people cascading directly into him.

Visual disturbances associated with migraine are a neurological symptom that lies outside human control. Carlos is completely unable to affect the blindness that strikes his one eye in any way. Experience tells him that it'll pass after about 10 minutes.

His body is not so sure.

And even if it only lasts 10 minutes, in those minutes he's vulnerable. What if the boys had got lost that day in the mall? They're so high-spirited – he can't let them out of his sight for a minute. What if they had run out in front of a car?

So he has developed a little ritual that helps him deal with his aura.

The ritual is inspired by an event in his early childhood, he explains. An event that still stands out in his memory. He had had a major operation, and when he emerged from the anaesthesia, he was feeling wretched. A doctor moistened a piece of gauze with isopropyl alcohol and handed it to him. “Breathe in, it'll help!” Now as an adult, Carlos mimics the surgeon's movements when the bright dot appears: he takes some cotton wool, moistens it with alcohol, holds it to his nose.

Are they sad, happy, scared? He can't tell. The experience lasts about five minutes – and those minutes are bliss. He summarizes these intense sensations in a single conclusion, a single conviction:

“We are all so perfect, and so vulnerable.”

The euphoria is a recurring event that has left a mark on him. It's shaped his view of human nature, as well as his relationship to his condition. Carlos explains that his migraine reminds him that he's created of flesh and blood. He's not invulnerable. Nobody, regardless of success or status, is above anybody else. We are all vulnerable.

Migraine reminds him that his life – and everyone's life – means much more than simply getting through the day's tasks. A migraine attack interrupts his daily existence, and at the same time it reconnects him with his purpose – with the compass he needs to steer his life.

And migraine makes him grateful.

### A Sunrise

Grateful?

Grateful for the headaches, for the cancellations and delays, for all the times his wife Katia has shushed the boys to give him some quiet? For the frustrating result of that qualifying race in Las Vegas?

Yes, Carlos answers. He's grateful. He has a couple of attacks a month. Other people have chronic migraine – meaning that their attacks take up more than half of each month. He's very aware that for these people, the condition is a different beast than it is for him. He's not better at managing his migraine, just luckier. Chronic migraine is disabling, and he feels compassion for the people who suffer from it.

The conversation turns back again to that qualifying marathon.

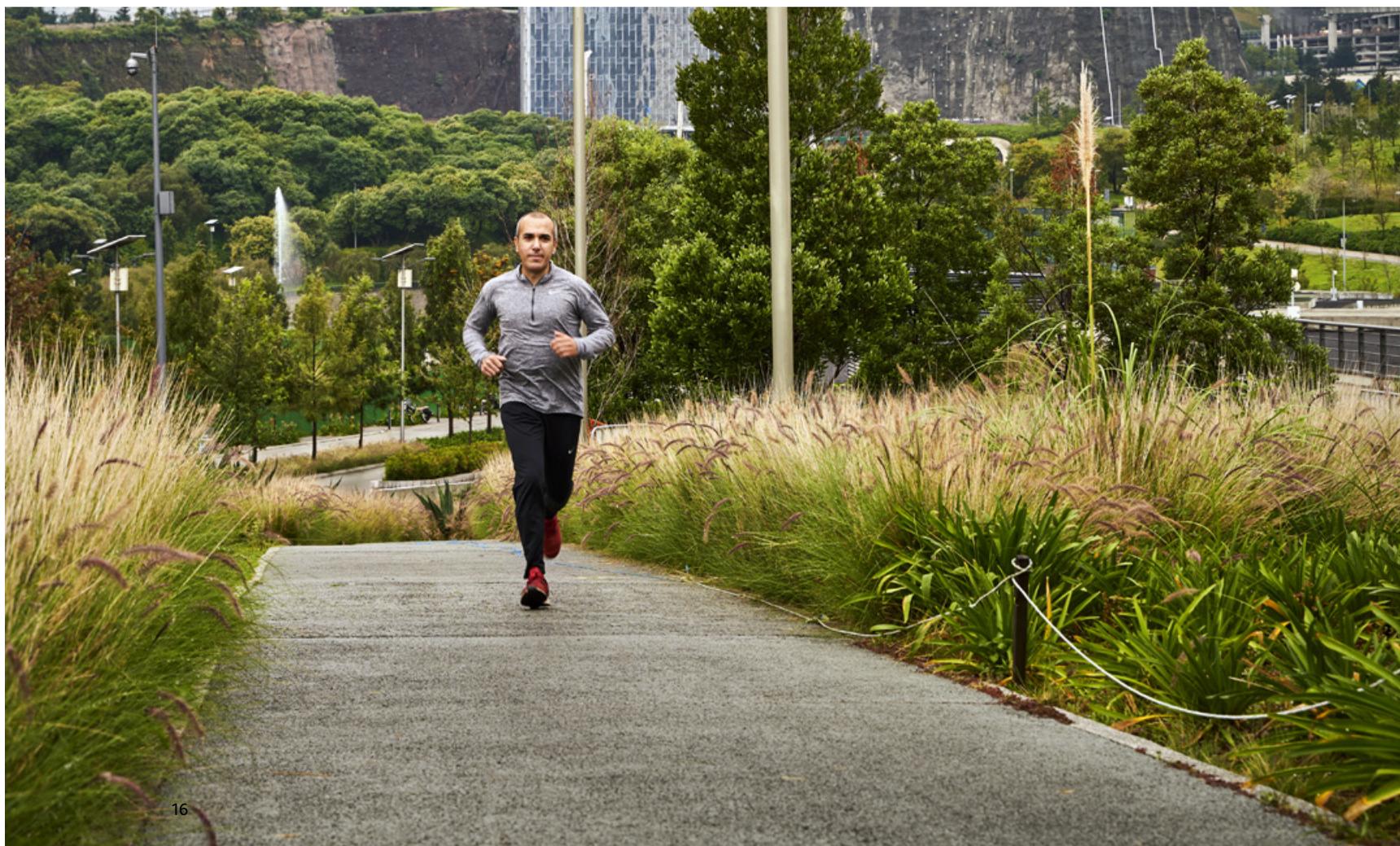


Visual disturbances associated with migraine are a neurological symptom that lies outside human control. Experience tells Carlos that it'll pass after about 10 minutes. *His body is not so sure.*



It's a fact that it turned into a harrowing race for Carlos – and that he didn't qualify. It's a fact that his many months of preparation ended in disappointment. Yet then there was the experience: during the race, the sun rose in the desert and blinded him. The light made his headache worse, and the marathon pain and the migraine pain merged into one. He poured water over his head to provide some relief. That was real. The sunrise was blindingly beautiful.

That was real too. ●



## MIGRAINE FACTS

A migraine attack is a severe headache that stops a person from going about their daily life. Some people also experience symptoms known as 'aura' – temporary disturbances of vision or other senses, such as seeing flashes of light, having blind spots, or feeling pins and needles.<sup>1,2</sup>

Worldwide, 1.3 billion people live with migraine.<sup>3</sup>

The most likely age group to have migraine is the one from 35–39 years.<sup>4</sup>

People with migraine miss an average of seven days of work or activities per year due to their condition.<sup>5</sup>

Migraine headaches are made worse by normal activity such as walking or climbing stairs. A person with a migraine attack may feel nauseous and may be extremely sensitive to light and sound.<sup>1</sup>

Only around 40% of people with migraine have consulted a doctor.<sup>6</sup>

1. Headache Classification Committee of the International Headache Society (IHS). The International Classification of Headache Disorders, 3rd edition. Cephalalgia. 2018;38(1):1–211.

2. Weatherall MW. The diagnosis and treatment of chronic migraine. Ther Adv Chronic Dis. 2015;6(3):115–123.

3. GBD 2017 Disease and Injury Incidence and Prevalence Collaborators. Global, regional, and national incidence, prevalence, and years lived with disability for 354 diseases and injuries for 195 countries and territories, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017. Lancet. 2018;392(10159):1789–1858.

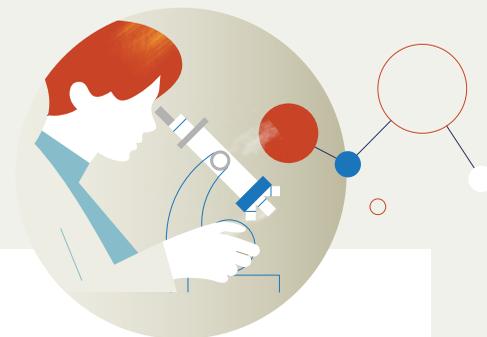
4. GBD 2016 Headache Collaborators. Global, regional, and national burden of migraine and tension-type headache, 1990–2016: a systematic analysis for the Global Burden of Disease Study 2016. Lancet Neurol. 2018;17(11):954–976.

5. Alonso J, Petukhova M, Vilagut G, Chatterji S, Heeringa S, Üstün TB, et al. Days out of role due to common physical and mental conditions: results from the WHO World Mental Health surveys. Mol Psychiatry. 2011;16(12):1234–1246.

6. Merikangas KR, Cui L, Richardson AK, Isler H, Khoromi S, Nakamura E, et al. Magnitude, impact, and stability of primary headache subtypes: 30 year prospective Swiss cohort study. BMJ. 2011;343:d5076.

# Premier Neuroscience at the Heart of R&D

At Lundbeck, we have a strong heritage within neuroscience, and we already have a solid track record of delivering innovative treatments to people living with brain diseases. Our R&D mindset is based on a concept of “drug hunger,” which compels us to stay at the forefront of innovation and progress a strong portfolio of industry-leading medicines. We continuously improve the way we work to reflect the ever-changing neuroscience landscape, integrate patient insights and leverage new technologies.



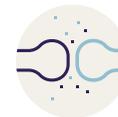
## Let the Molecule Speak

After our technically highly optimized drug candidates have completed the necessary preclinical vetting, we “let the molecule speak,” by employing a biomarker supported experimental medicine approach to delineate the potential of the drug candidates to influence human biology, disease processes and symptomatology in healthy volunteers and carefully selected patient groups. Only the most promising drug candidates are allowed to progress further into larger clinical studies, and only if they promise to deliver impactful medicines.



## Let the Biology Speak

Over the past year, we have focused our efforts and expertise on four promising “clusters” of biology. We believe this will allow us to fully explore our expanded operating space and deliver impactful medicines for niche and rare brain diseases.



**CIRCUIT / NEURONAL BIOLOGY**  
Targeting neurotransmission / synaptic dysfunction to restore brain circuits and reduce neurological, psychiatric, and pain symptoms



**PROTEIN AGGREGATION, FOLDING, AND CLEARANCE**  
Targeting neurodegenerative proteinopathies involved in a range of neurodegenerative diseases, e.g., Alzheimer's and Parkinson's as well as rare diseases



**HORMONAL / NEUROPEPTIDE SIGNALING**  
Targeting selected pathways of pain signals and stress response



**NEUROINFLAMMATION / NEUROIMMUNOLOGY**  
Targeting brain function through the innate and adaptive immune system relevant across most neurological disorders

Each of these clusters contain exciting and broad opportunities to identify innovative drug targets with strong link to disease biologies of high relevance for our therapeutic focus. Many drug targets in those clusters offer robust technical feasibilities to identify high quality drug candidates, with associated biomarkers, that facilitate further drug development.



## Let the Patient Speak

The most important part of our drug development programs is to ensure that we deliver impactful medicines that address patients' needs. To do this, we need deep insight into what patients and caregivers see as most critical, guiding us to bring to them treatment solutions that meaningfully improve quality of life. We take that to heart and have our patients at the core of everything we do. By letting the patient speak is also about developing meaningful labels – ultimately in service to patients – reducing burdens in peoples' lives and on healthcare systems.

## Where Science and Addressing Patient Needs Meet

After we have ‘let the molecule speak,’ it then enters the proof of concept phase. This is a pivotal moment in drug development; no longer are we trying to understand what the molecule is capable of, but we make a choice, based on patient insights, potential efficacy, safety and tolerability, whether it should be moved further into the pipeline and take the steps needed to make it available to patients.

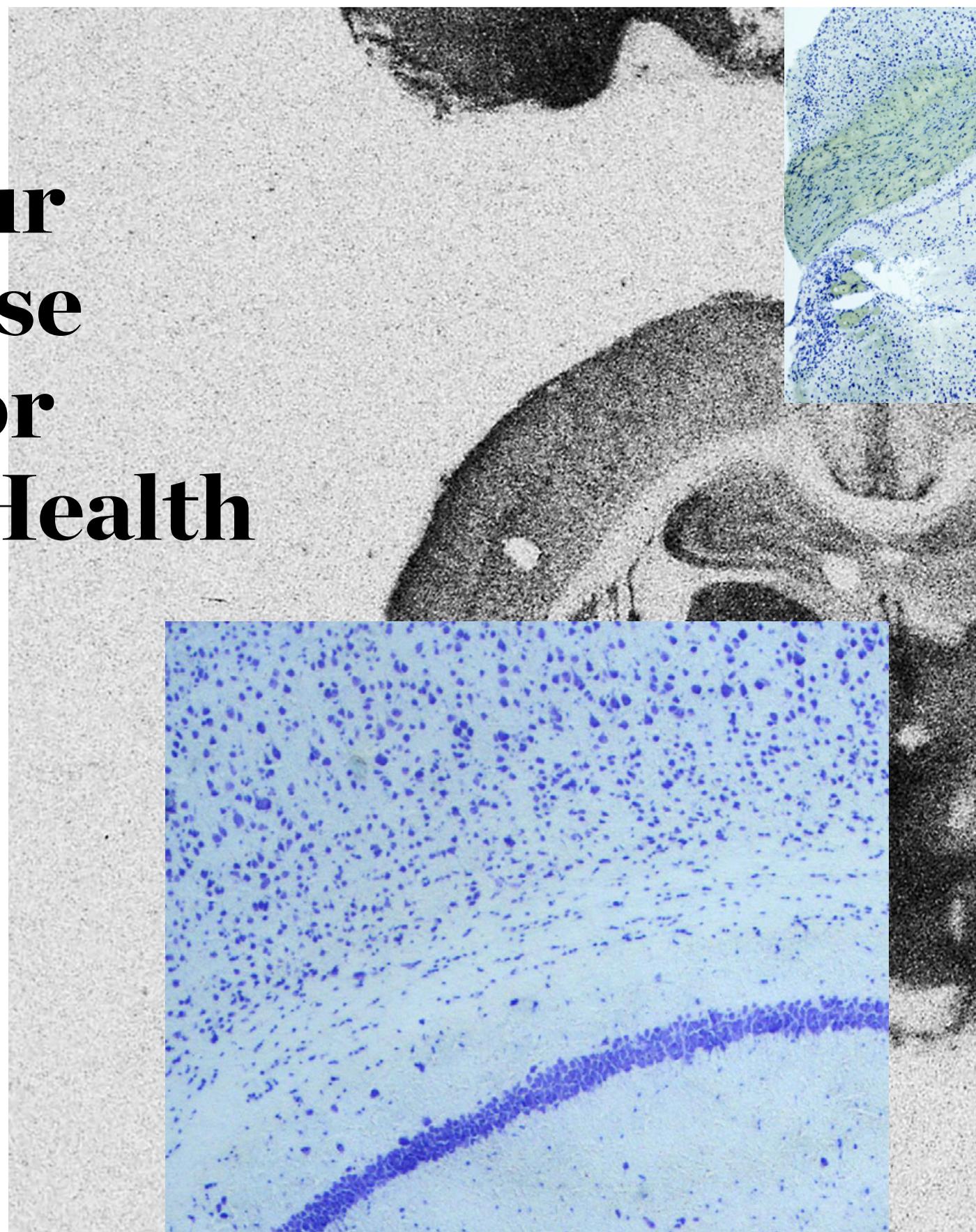
At this stage, we commit significant time and resources towards full development. We seek to find the most efficient clinical pathways, powered by groundbreaking study designs and operational excellence, to speedily advance the most promising candidates further into our pipeline. The large phase III studies needed for regulatory approval and marketing authorization are initiated, we evaluate the drug candidates to larger number of patients, to evaluate the safety profile, and we collect additional data needed for payer value proposition and formulary negotiations.

By combining new approaches with existing scientific and innovative competencies of the R&D organization, we have a great potential for bringing improvements that can help us better address patients' high unmet needs and move Lundbeck towards being #1 in Brain Health.

## BRAIN BASICS

# Leveraging Our Brain Expertise to Advocate for Better Brain Health

The brain is one of the largest and most complex organs in the human body which is responsible for directing all actions in the body<sup>1</sup> (think, do, feel).<sup>2</sup> It is made of billions of nerve fibers (white matter),<sup>3</sup> more than 85 Bn neurons (gray matter), which transmit information and communicate with various parts of the body in trillions of connections (synapses).<sup>4,5</sup>



### DID YOU KNOW?

## 2%

The brain is a soft mass of supportive tissues and nerves<sup>6</sup> which measures circa 15 cm<sup>7</sup>, making up 2% of a human's body weight.<sup>8</sup>

## 75%

It is composed 75% of water, protein and fat<sup>9</sup>, and its average weight varies between 1.1-1.3 Kg (compared to the human heart which weights 700gr, the skin which weights 4.5 Kg and like the liver which weights 1.5Kg)<sup>10</sup>. There is no correlation between brain's size and intelligence.<sup>11</sup>

## 20%

The brain requires about 20% of the body's oxygen and 25% of the body's glucose to function<sup>12</sup>, compared to the heart which requires 11% of oxygen.<sup>13</sup>

## 20 watts

The brain runs on only about 20 watts of energy, the same wattage as an energy-saving light bulb.<sup>14</sup>

\*

There are more synapses in the human brain than stars in the Milky Way galaxy.<sup>15</sup>

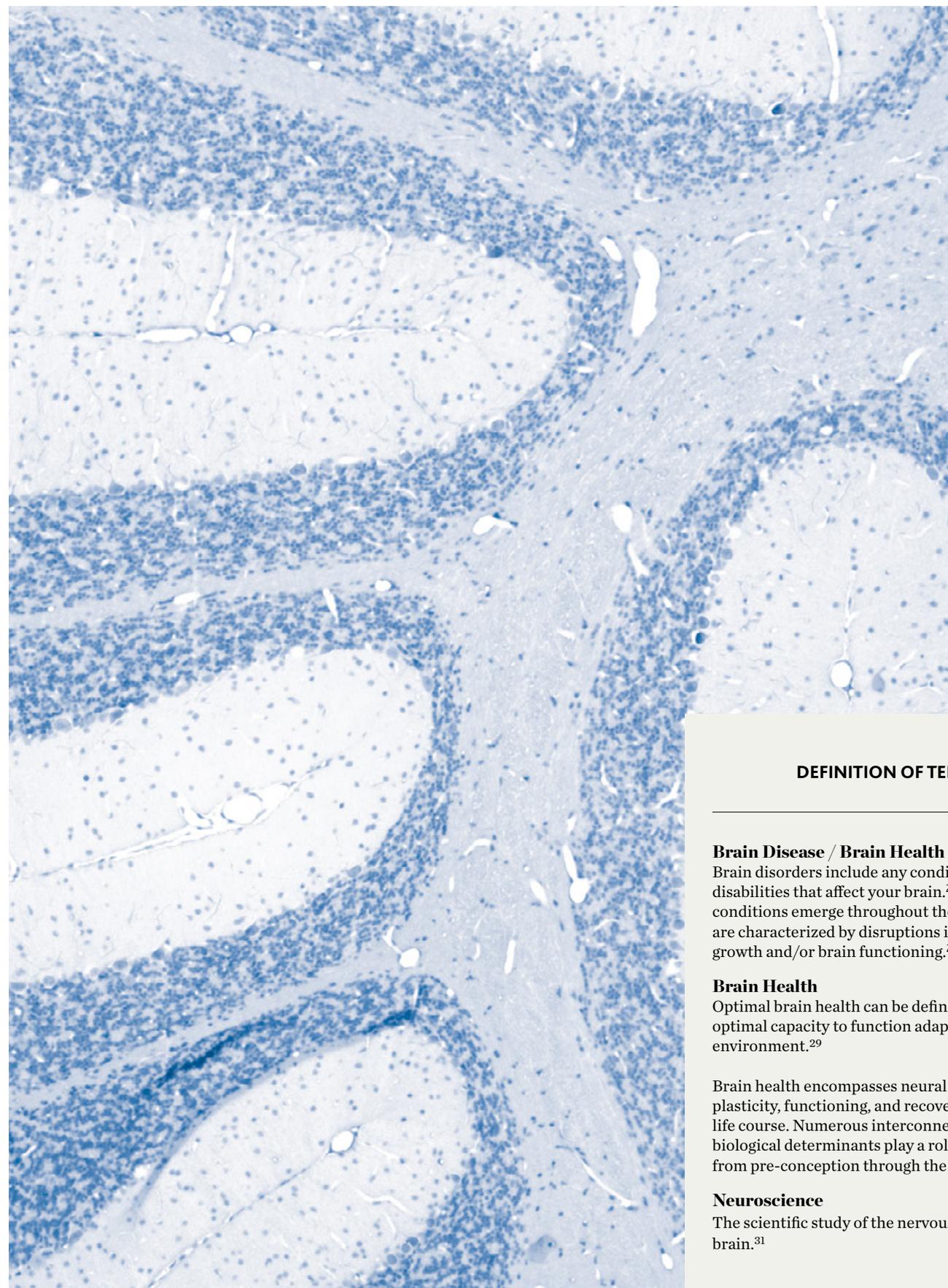
## 85 Bn

The brain is made of more than 85 Bn neurons, while a fruit fly has 100,000 neurons, a chimpanzee has 7 Bn neurons and an elephant has 23 Bn neurons.<sup>16</sup> Because of the folds in the human brain, humans have more neurons per unit volume than other animals.<sup>17</sup>

## 5

There are five brain health protective factors: healthy eating, regular exercise, keeping your brain active, getting enough sleep, and social connections.<sup>18</sup>

“  
Brain health conditions are heterogeneous with more than 600 brain diseases<sup>20</sup> and impacting close to half of the world's population<sup>i</sup>  
”



There are five risk factors of brain health conditions: accidents, alcohol intake, smoking, the improper use of medicines (e.g. medication overuse), health conditions (e.g. diabetes, heart disease, sleep problems).<sup>19</sup>

Brain health conditions impacts almost 3 Bn people worldwide.<sup>21</sup> This is close to half of the world's population.<sup>ii</sup> From these 3Bn, 2.659 Bn<sup>22</sup> people are impacted by neurological conditions (e.g. migraine, Alzheimer's disease, Parkinson's disease, etc), 970.1M people are impacted by mental health conditions (e.g. depression, anxiety, schizophrenia, psychoses) and 161.5M by substance abuse.

Brain disorders cost 10% of the world's GDP<sup>23</sup>. In the US, 3 out of 5 Americans will develop a brain disease in their lifetime.<sup>24</sup> Costing almost €800 Bn annually<sup>25</sup> in Europe, brain diseases are the most prevalent, disabling and account for 80% of the Non-Communicable Diseases' burden.<sup>26</sup>

## DEFINITION OF TERMS

### Brain Disease / Brain Health Conditions

Brain disorders include any conditions or disabilities that affect your brain.<sup>27</sup> Brain health conditions emerge throughout the life course and are characterized by disruptions in normal brain growth and/or brain functioning.<sup>28</sup>

### Brain Health

Optimal brain health can be defined as an optimal capacity to function adaptively in the environment.<sup>29</sup>

Brain health encompasses neural development, plasticity, functioning, and recovery across the life course. Numerous interconnected social and biological determinants play a role in brain health from pre-conception through the end of life.<sup>30</sup>

### Neuroscience

The scientific study of the nervous system and the brain.<sup>31</sup>

<sup>i</sup> Taken into account that approximately 25% of people accounted to be impacted by more than one type of brain health condition, we have adjusted the total prevalence of brain disorders for estimated co-morbidity between neurological, mental health and substance abuse disorders based on analysis of the Truven Marketscan U.S. Claims database (2019).

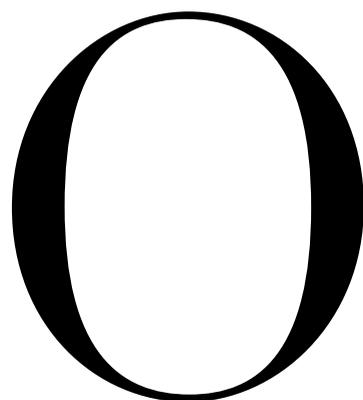
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1. Matthew Hoffman, Picture of the Brain, Human Anatomy, 2014 WebMD, accessed 30 December 2019
2. The Dana Alliance for Brain Initiatives, Answering Your Questions About The Brain, 2016, accessed Nov 2020
3. T.Lewis, Human Brain: Facts, Functions & Anatomy, Live Science, September 28, 2018
4. T.Lewis, Human Brain: Facts, Functions & Anatomy, Live Science, September 28, 2018
5. K.Cherry, The Size of the Human Brain: The size of the brain may not always indicate a measure of intelligence, VeryWellMind.com, Updated on October 2019, accessed in December 2019
6. How the Brain Works, Neurology and Neurosurgery, Brain Tumor Center, John Hopkins Medicine, accessed December 2019
7. K.Cherry, The Size of the Human Brain: The size of the brain may not always indicate a measure of intelligence, VeryWellMind.com, updated on October 2019, accessed in December 2019
8. T.Lewis, Human Brain: Facts, Functions & Anatomy, Live Science, September 28, 2018
9. K.Cherry, 9 Quick Facts About the Brain, VeryWellMind.com, updated on June 2019, accessed in December 2019
10. Top 10: What are the heaviest organs in the human body?, Science Focus, Accessed January 2020
11. T.Lewis, Human Brain: Facts, Functions & Anatomy, Live Science, September 28, 2018
12. K.Cherry, 9 Quick Facts About the Brain, VeryWellMind.com, updated on June 2019, accessed in December 2019
13. Study.com, Which organ of the body uses the most oxygen?, accessed January 2020
14. James L. Olds, National Science Foundation, Exploring the unknown frontier of the brain, April 2015, Accessed December 2020
15. The Dana Alliance for Brain Initiatives, Answering Your Questions About The Brain, 2016, accessed Nov 2020
16. K.Cherry and C.Chaves, How Many Neurons Are in the Brain?, VeryWellMind.com, Updated on June 11, 2019, accessed in December 2019
17. T.Lewis, Human Brain: Facts, Functions & Anatomy, Live Science, September 28, 2018
18. Administration for Community Living (ACL); the Centers for Disease Control and Prevention (CDC); and the National Institutes of Health (NIH), Talking about Brain Health and Ageing: the basics, , 2014 and updated in 2018
19. Administration for Community Living (ACL); the Centers for Disease Control and Prevention (CDC); and the National Institutes of Health (NIH), Talking about Brain Health and Ageing: the basics, 2014 and updated in 2018
20. L. Reed-Guy and Seunggu Han, Brain Disorders, HealthLine, 2017, Accessed January 2020
21. GBD 2019 Diseases and Injuries Collaborators, Global burden of 369 diseases and injuries in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019, Lancet 2020; Oct 17;396(10258):1204-1222. doi: 10.1016/S0140-6736(20)30925-9, accessed March 2021
22. GBD 2019 Diseases and Injuries Collaborators, Global burden of 369 diseases and injuries in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019, Lancet 2020; Oct 17;396(10258):1204-1222. doi: 10.1016/S0140-6736(20)30925-9, accessed March 2021
23. Henry Markram, Seven challenges for neuroscience, Funct Neurol. 2013 Jul-Sep; 28(3): 145 – 151 . Accessed December 2020
24. American Heart Association, Health Topics à Brain Health accessed in December 2019, <https://www.heart.org/en/health-topics/brain-health>
25. Olesen J et al. The economic cost of brain disorders in Europe. Eur J Neurol.2012; 19(1):155-62 (ISSN: 1468-1331) Economic burden of cancer across the European Union: a population-based cost analysis (2009)
26. A.Raggi, M.Leonardi Burden of brain disorders in Europe in 2017 and comparison with other non-communicable disease groups, British Medical Journal, Journal of Neurology, Neurosurgery and Psychiatry, January 2020 – Vol 91 – 1
27. L. Reed-Guy and Seunggu Han, Brain Disorders, HealthLine, 2017, Accessed January 2020
28. WHO, Health Topics, Brain Health, Accessed December 2020
29. AHA/ASA Presidential Advisory, Defining Optimal Brain Health in Adults A Presidential Advisory from the American Heart Association/ American Stroke Association, Stroke DOI: 10.1161/STR.0000000000000148, 2017, Accessed January 2020
30. WHO, Health Topics, Brain Health, Accessed December 2020
31. Cambridge Dictionary, definition of Neuroscience, accessed in March 2021

# A STRANGE DREAM

In Parkinson's disease, the brain's dopamine-producing neurons die at a steady pace. At 51, Johan Hellsten could choose to pursue spectacular experiences – while he still can. Yet he's opted for the exact opposite.





On a late summer day in 2020, Johan and his youngest teenage son bike down to the harbour. Their family lives in a Swedish suburb close to the sound, a narrow strait that separates southern Sweden from Denmark. They cast their fishing lines out and catch some perch, which they either throw back or give away. A little later, Johan's wife, Rebecka, shows up to take a swim.



Johan is sitting close to his son's side. When one of them gets a bite the other comments, if the size of the fish merits the catch.

The water sparkles in the August sun. Rebecka joins them after her swim.

#### How It Should Be

Five years earlier, Johan googled the terms *PD* and *honeymoon*. He has a PhD in molecular psychiatry, but it wasn't in his capacity as a neuroscientist that he was refreshing his knowledge of Parkinson's disease. A few days before his forty-seventh birthday, a neurologist had provided him and Rebecka with an explanation for why Johan was having difficulty moving his right wrist. Why his fingers tingled. Why he'd been using his left hand to help his right in controlling his mouse.

In a certain small area of a healthy brain, neurons produce dopamine, a neurotransmitter. Dopamine regulates a variety of functions, including movement, motivation and reward. In a brain with Parkinson's, these neurons start dying off.

They die quietly and painlessly. As a rule, the patient's dopamine producing cells will already have decreased by 60 to 80% at the time of diagnosis. For a period, drugs can compensate for the dopamine that the brain can no longer make. This time is known as the disease's "honeymoon".

As a researcher, Johan has studied the role of dopamine in numerous contexts. He tells of how he now can observe – in his own body – what a powerful substance it is. How seamlessly it integrates him with his sense of self. In the absence of drugs he starts feeling "low, slow and clumsy" he explains. He illustrates by becoming a rag doll, drooping in its chair. The medication makes him "himself" again, and the feeling is immediate. "Ah," he says, "this is how it should be." And the rag doll shakes and straightens up in its seat.

Increasingly, Johan has started to experience dips, the so-called OFF-periods, when the medication temporarily stops working. He describes how he deals with these dips: whenever he feels like someone's turned off a switch inside him, he takes an extra dose of dopamine – and waits.

Then he is switched on again.

Medication isn't the only thing that helps. One way that Johan strengthens his constitution is with an exercise bike. And his physiotherapist has shown him how to counter the effects of muscle stiffness by exaggerating his movements. And by e-nun-ci-a-ting his words. Johan flings his arms wide and demonstrates how a Johan who's adjusting for Parkinson's might comport himself. Then a wry smile lights his face. "Though I was always somewhat of a mumbler."

“As a neuroscientist, Johan has studied the role of dopamine. He tells of how he now can observe – in his own body – what a powerful substance it is. How seamlessly it integrates him with his sense of self.”





## JOHAN HELLSTEN

**Age** 51

**Family** Johan lives with his wife, Rebecka, and their two teenage boys.

**Residence** Malmö, a city on the southern coast of Sweden

**Diagnosis** Johan was diagnosed with Parkinson's disease in 2016.

**Employment** Johan studied to be a biologist, earning his PhD in molecular psychiatry. Since 2009, he's worked in the research & development (R&D) organization at Lundbeck. In spring 2020 he became a senior specialist in Patient Insights, a new R&D department that was established to integrate patient and caregiver perspectives into the firm's drug development and disease activities.

**Pastimes** In the '90s, Johan was a guitarist in several bands, that played throughout Sweden. He still plays guitar every day.



Johan has never followed a hard-and-fast plan for his life, and he thinks that makes it a bit easier for him to adjust to living with a chronic illness.

“

It was on the guitar that he noticed the first sign of his P.D. His fingers became strangers to him, weaker, faltering.

”

### Fingers Became Strangers

Johan has never followed a hard-and-fast plan for his life, and he thinks that makes it a bit easier for him to adjust to living with a chronic illness. In the mid-'90s, he gigged around Sweden with several rock bands and pop groups. At the end of that decade, he left the musician's life behind and took the first steps in what would become his research career. But he never left behind the guitar.

It was on the guitar that he noticed the first sign of his condition. His fingers became strangers to him, weaker, faltering. He was unable to play with the fine motor skills he had cultivated over the years.

According to Johan, the traditional image of Parkinson's patients as elderly people with trembling bodies and limbs doesn't capture the full range of patient experiences. Each neuron is connected to 10 000 others, multiplying into a vast neural network. The course of the disease varies with the individual, and it's impossible to

foresee how quickly it'll progress. With some people, the facial muscles stiffen into a mask. Others start to fall frequently. A person with Parkinson's can experience intense muscle cramps. They can lose their sense of perspective, their ability to concentrate. Their initiative. And more.

Patient reactions to the illness are equally unpredictable. Some of them dread the torrent of loss that lies in wait. Johan tells of a lecture by a patient in his thirties who described Parkinson's as "a slow, torturous death sentence". Others – especially the ones younger than Johan – defy the disease by driving their bodies to perform feats of extreme physical exertion.

Johan wants to avoid these responses.

### A Comic Strip

At Johan's house, the past and present interweave. There's a record player and walls of vinyl LPs. A red Fender Jazzmaster in the corner of the dining room and countless other guitars in the cellar. Shelf after shelf of essays, Scandinavian novels,

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When healthy people talk about their plans and worries for the future, Johan tends to keep silent. Instead he just says, “*So far, so good.*”  
”



photography books. Travel guides, graphic novels. A large David Bowie poster over the stairs.

And on the door of the guest bathroom, Johan has taped up a comic strip.

First frame: a diminutive male figure dreams that he enters a bathroom. Next: he brushes his teeth vigorously, spattering toothpaste everywhere. Then: he rinses out his mouth and flashes a big toothy grin at the mirror. And finally: the little man wakes up. He wakes to a world of palm trees and ocean, and he's riding a hippo and waving a flag as the hippo swims off into the horizon.

Johan has held onto this little tale for thirty years. The paper is yellowed and brittle.

There's a lot of his past that he's been able to carry with him into the present. But what about his future?

#### Ramones haircut

When healthy people talk about their plans and worries for the future, Johan tends to keep silent. His own future is something he prefers not to think about. Instead he just says, “So far, so good.”

He sums up his situation like this: when he was young, he wore his hair long and with a fringe, like the Ramones. There's little trace of that full head of hair these days. A glimmer of a smile crosses Johan's face. If he'd lost his hair overnight, he says, it would have been traumatic. He'd feel the same way if his Parkinson's symptoms all showed up at the same time. But they appear gradually, and he adjusts.

What he has is the present – but how is he going to fill it? A couple of years ago, he and Rebecka saw a one-man show by a Swedish performer who also has Parkinson's. The performer addressed that exact question. He said that he wasn't going to climb Mount Kilimanjaro. He'd rather ask his wife if they could make some grilled cheese sandwiches and sit together on the couch to watch a few episodes of a TV series.

That answer moved Johan deeply.

As long as he can, he wants to keep living life as usual: working, playing music, cooking weekend dinners. Trying to persuade his boys to hang out with their parents, and amused that they'd prefer to hit the town. For the time being, he manages to function as before, albeit a bit



As long as he can, Johan wants to keep living life as usual: working, playing music, cooking weekend dinners.

more slowly now and then. And his limbs haven't started to twitch and writhe – those involuntary movements that often are a side effect of taking dopamine medication for an extended period.

Every day, he encounters the comic strip on the bathroom door. It's entitled “A strange dream.” He has no idea what reality he might one day wake up to, but when healthy people say, “So far, so good,” the words signify something different than when Johan says them.

For his fiftieth birthday, he had the face of the little comic-strip man tattooed on his arm. ●



## PARKINSON'S DISEASE FACTS

Parkinson's disease is the second most common neurodegenerative disorder and the fastest growing neurological disorder.<sup>1</sup>

The number of people with Parkinson's disease (PwP) worldwide is projected to double from 6 million in 2015 to over 12 million by 2040.<sup>2</sup>

Parkinson's disease is most commonly affecting people in their mid-60s and above. However, 5-10% of cases start earlier, before the age of 40, so called young onset PD.<sup>3</sup>

Parkinson's disease is characterized by a complex variety of motor symptoms (e.g. shakiness, slowness and stiffness) and non-motor symptoms requiring a personalized care management approach.<sup>4</sup>

Non-motor symptoms like sleep disturbances, fatigue, depression, anxiety and cognitive impairment are common and can have a large impact on the quality of life of PwPs and their care partners.<sup>5</sup>

There's currently no cure for Parkinson's disease that can stop or slow the disease.

1 GBD 2015 Neurological Disorders Collaborator Group (2017) Global, regional, and national burden of neurological disorders during 1990-2015: a systematic analysis for the Global Burden of Disease Study 2015. *Lancet Neurol* 16, 877–897.

2 Dorsey ER, Sherer T, Okun MS, Bloem BR. The Emerging Evidence of the Parkinson Pandemic. *J Parkinsons Dis*. 2018;8(s1):S3-S8. doi: 10.3233/JPD-181474. PMID: 30584159; PMCID: PMC6311367.

3 Golbe LI (1991) Young-onset Parkinson's disease: A clinical review. *Neurology* 41, 168–173.

4 van Halteren AD, Munneke M, Smit E, Thomas S, Bloem BR, Darweesh SKL. Personalized Care Management for Persons with Parkinson's Disease. *J Parkinsons Dis*. 2020;10(s1):S11-S20. doi: 10.3233/JPD-202126. PMID: 32925110; PMCID: PMC7592650.

5 Hermanowicz N, Jones SA, Hauser RA. Impact of non-motor symptoms in Parkinson's disease: a PMDAAlliance survey. *Neuropsychiatr Dis Treat*. 2019 Aug 5;15:2205-2212. doi: 10.2147/NDT.S213917. PMID: 31496703; PMCID: PMC6689087.

# Our Approach to Sustainability

The United Nations Sustainable Development Goals are the blueprint for achieving a better and more sustainable future for all. Addressing the world’s global challenges is a shared responsibility. Together with our partners, we focus our efforts where we can make the most significant impact.

## Contributing to Society

At Lundbeck, our most important contribution to society is easing the global burden of the millions of people living with brain diseases. And we are one of the few companies in the world that focus exclusively on this unmet need.

## Brain Health

As part of our commitment to sustainability, we have launched our *Access to Brain Health* strategy. The strategy builds on four long-term aspirations to make innovative treatment available through R&D, promote accessibility, enhance cultural acceptability and provide safe and efficacious medical products.

Our aspiration is to enhance access to brain health for the most vulnerable. We aim to accelerate our efforts through strategic partnerships and collaboration with leading experts.

In many parts of the world, brain disease comes with a high degree of social stigma. To

advance a more inclusive world, we work with international and local advocacy groups to promote disease awareness, combat stigma and empower people living with brain diseases.

## Climate Action

Science and innovation are at the heart of what we do. It enables us to foster groundbreaking discoveries within neuroscience. But it also plays a pivotal role in helping us, as a company, prioritize climate action.

We are leaders in climate action, and we measure everything we do with the most ambitious reduction targets set by science. Throughout our value chain, we continue to reduce our carbon footprint, becoming more circular and increasing recycling.

## Ethics, Trust and Transparency

Trust is essential. To us, and to our industry. And as a business partner, we promote integrity in the pharmaceutical industry. We take prudent actions to remain responsible. We require our employees and

business partners to act with respect and integrity in everything they do, to maintain trust and safeguard our license to operate. At the same time, we are actively promoting inclusion, equality and a safe working environment for Lundbeck employees worldwide.

## Life-Changing Innovation

Globally, the number of people living with brain diseases is growing. We will remain steadfast in our commitment to chase the scientific breakthroughs that enable us to deliver hope. We will advance innovation in balance and not at the cost of nature – and we will continue to set ambitious sustainability targets while delivering life-changing innovation to the people who need it.

The model below illustrates our contribution to the Sustainable Development Goals.

Read our Sustainability Report 2020 on [www.lundbeck.com/global/sustainability](http://www.lundbeck.com/global/sustainability).



“  
We are leaders in climate action, and we measure everything we do with the most ambitious reduction targets set by science.  
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Tirelessly dedicated to restoring brain health, so every person can be their best

**PARTNERING FOR IMPACT**



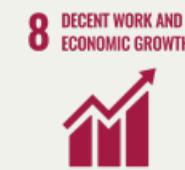
**DEDICATED TO RESTORING BRAIN HEALTH**



**PURSUING A ZERO-EMISSIONS FUTURE**



**USING OUR INFLUENCE TO PROMOTE CHANGE**



# Ensuring Brain Health in Unprecedented Times

2020 marked the beginning of a period of uncertainty as the world coped with a global pandemic. At Lundbeck, our priority has been to safeguard the research, production and distribution of our medicines for the people that need it most and to protect our employees.

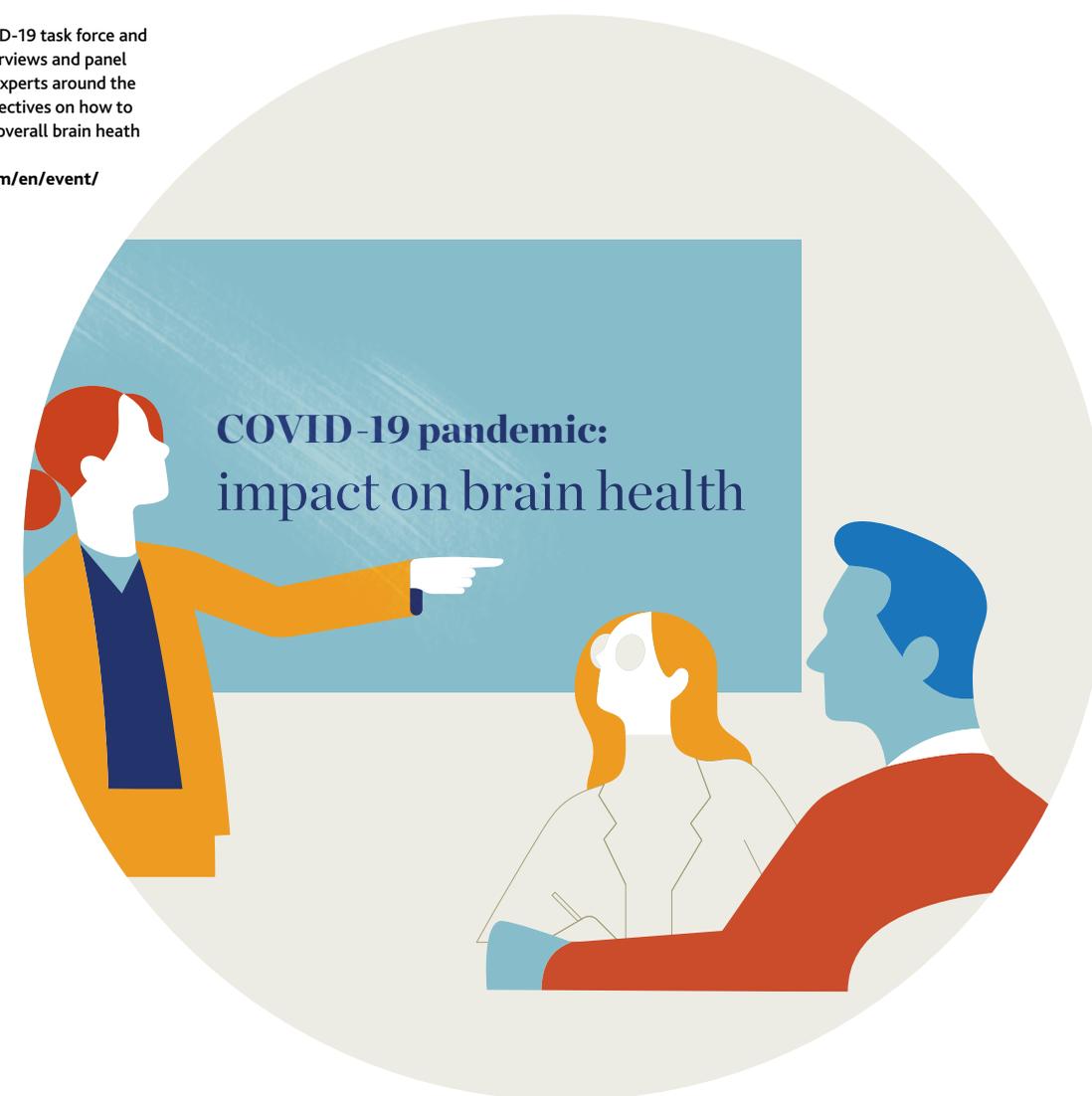
The pandemic has had a disproportionate effect on brain health as people struggle to cope with the pandemic and its effects. Throughout the pandemic, we have been fully dedicated to ensuring we can deliver our medicines to the people that need it most, and to maintain steady participation of our clinical trials and research activities to produce the scientific data we need to develop new medicines. Furthermore, we continue to work hard to raise awareness of the importance of brain health to society at large.

As one of the only companies fully focused on treating brain disorders, we see advocating for brain health as a responsibility, especially during a time like this when mental health stressors are at their peak. We also see it as a must to take advantage of our learnings and adapt our approaches, so we can be even better prepared for the future.

**Impact of the Pandemic on Brain Health**  
The COVID-19 pandemic has significant consequences on brain health, both in terms of direct effects of the disease, such as

neurological symptoms like loss of smell, extreme fatigue and memory and concentration difficulties. Some of these direct effects may persist long-term, and trigger indirect effects, such as depression or anxiety. These indirect effects can also be triggered by long-term isolation and lockdowns. While it is natural to want to draw learnings from past experience, but there is no parallel in recent history in terms of the scale and complexity of the current pandemic.

We created an R&D COVID-19 task force and conducted a series of interviews and panel discussions with leading experts around the world, sharing their perspectives on how to best manage mental and overall brain health during the pandemic.  
Learn more at [progress.im/en/event/covid-19-content](https://progress.im/en/event/covid-19-content)



**As one of the only companies fully focused on treating brain disorders, we see advocating for brain health as a responsibility, especially during a time like this when mental health stressors are at their peak.**

Understanding the impact of COVID-19 on brain health is essential for planning and executing a response to this and future health crises, and for designing resilient brain health services able to support patients during pandemics. We created an R&D COVID-19 task force and conducted a series of interviews and panel discussions with leading experts around the world, sharing their perspectives on how to best manage mental and overall brain health during the pandemic<sup>1</sup>. We want to do our part towards building even more resilient brain healthcare services for the future.

In response to the unforeseeable nature of the pandemic and its impact on society, we are pursuing more flexible approaches our clinical trial operations.



**Adapting Our Approach to Clinical Trials**

In response to the unforeseeable nature of the pandemic and its impact on society, we are pursuing more flexible approaches our clinical trial operations. We make use of additional trial participating backup countries and sites as well as virtual resources, covering meetings and consultations where possible. We are including data from wearables, covering patient data and log keeping during trials. Using technology, we have also enabled remote assessments and visits during trials

and digitalized the operational monitoring of trials, constantly keeping track of trails, participation rates, delays and completions of studies and trials globally. This enables us to act quickly if unforeseen challenges impact trial operating countries or sites.

We have also established a temporary and agile cross-functional R&D taskforce in order to implement actions across trials and projects and give guidance on COVID-19 vaccinations before and during studies.

**Safeguarding Product Supply**

At one of Lundbeck's production sites in Padova, Italy, the COVID-19 pandemic hit early, and it hit hard. Padova, alongside the rest of northern Italy, became the first part of Europe with a registered case of the new coronavirus. When the news broke that the virus had come to Italy, two key priorities guided Lundbeck's response: keep our employees safe and maintain product supply to our patients.



We have also established a temporary and agile cross-functional R&D taskforce in order to implement actions across trials and projects and give guidance on COVID-19 vaccinations before and during studies.



In order to keep doing what we do best, our number one priority has been, and continues to be, to keeping our employees safe and healthy.



The Lundbeck team in Padova quickly implemented a number of measures to mitigate the spread of the virus. With a significant amount of active ingredients being produced at the site annually, situational adaptability became crucial. Protective gear to for employees was quickly procured and a plan for maintaining distance between employees was put in place. We even started to produce our own hand sanitizer to make



sure shortages did not become an issue. Furthermore, last minute shipments of raw materials, solvents and chemicals were secured, and while shipping of products became more complex and difficult to plan, Lundbeck did not miss a single shipment or agreed delivery.

**An Organization That is Dedicated to Restoring Brain Health**

Lundbeck is a global organization with operations all over the world. More than 5,600 dedicated people work in our more than 50 affiliates worldwide, and more than 7 million patients rely on our medicines every day. In order to keep doing what we do best, our number one priority has been, and continues to be, to keeping our employees safe and healthy. If we cannot keep our employees safe, we cannot produce the medicines that the millions of people rely on.

As a company focusing on diseases of the brain, we take our own people's physical and mental well-being very seriously, and as a response to the pandemic, we have enforced our efforts in this area, and offer webinars, tutorials, courses and amplified management support. We have developed a new framework for flexible work, offering employees the foundation to plan and structure their work on an even more individualized basis, making sure that the needs at home and at work can be even better balanced.

1. Learn more at [progress.im/en/event/covid-19-content](https://progress.im/en/event/covid-19-content)

# As Diverse as the Patients We Serve

Lundbeck has always had diversity as part of its DNA. Since our very beginnings, a diverse set of people, products and partners have come together to make progress for the patients we serve.



By our very nature, we embrace different perspectives and ways of thinking. As such, diversity is part of who we are. But today demands more from us and we strive to build an even more inclusive organization.

### Diversity Matters, and Inclusion Creates Powerful Organizations

To ensure that we reflect the diversity of our patients and their needs, we are focused on creating the context, culture, and systems where all Lundbeck employees - no matter who and where they are - can be their authentic self and perform at their best. In practice, this means that individuals feel empowered not despite their differences but *because* of them.

In simple terms, diversity is the mix. Inclusion is making the mix work. Equity is making sure we are fair and impartial in that process.

We know that people are sometimes put into boxes - some of these boxes are of our own choosing and some are chosen for us. For this reason, Lundbeck is taking a systematic, business-led approach to diversity and inclusion that looks into and breaks down these boxes. Our bold action on inclusion includes an ambitious two-year plan that enables equality of opportunity through fairness and transparency, promotes openness, tackles bias and discrimination, and fosters belonging through our unique Lundbeck culture. From the highest levels of Lundbeck to the shop floor, we are working to ensure diversity and inclusion is an integrated practice and mindset.

# 5,600

employees as diverse as the patients we serve. A community of specialists fiercely dedicated to restoring brain health, drawing on the uniqueness of every employee.

### Doing Better Business

Today, "to do better business" means empowering all team members by respecting and appreciating what makes us different regardless of age, gender, ability, sexuality, ethnicity, religion, parental status, management status, work location, etc. We are constantly looking to evolve our Lundbeck culture. Diversity and inclusion allow us to accommodate differences that expand innovation and strengthen decision-making, which is why we are committed to creating an even more inclusive culture, where everybody benefits, and for which we all have a shared responsibility.

We are only at the beginning of this journey and we hope you will join us.

Learn more on [www.lundbeck.com/global/about-us/our-commitment/diversity-and-inclusion](http://www.lundbeck.com/global/about-us/our-commitment/diversity-and-inclusion)



We win together. We strive to make Lundbeck a place where you can grow and thrive – personally and professionally. We need to embrace the uniqueness of individuals, knowing we are stronger when every brain is in the game.



DEBORAH DUNSIRE, CEO

# Combating Racial Disparity in Migraine

Jaime Sanders is tired—weary, yes, but also resolute. She has lived with debilitating migraine since she was a young girl. As a Black woman in the United States, she faces the additional burden of navigating her migraine journey amidst racial disparities.

Migraine affects an estimated 38 million Americans, and one in four U.S. households includes someone with migraine.<sup>1</sup> Despite its wide prevalence, migraine is underdiagnosed and undertreated. This is especially true for Black people living with migraine disease, as research shows that in comparison to Caucasian counterparts, Black patients are more likely to have their headaches underdiagnosed and/or undertreated.<sup>2</sup>



"It is a very real issue and experience that many people of color have to deal with. Having to prove my pain over and over again, it's exhausting," Jaime says.

Jaime may be exhausted, but she is also fed up. Through her public speaking, blogging and activism, she is part of a growing movement to fight the unconscious bias, racial disparities and underrepresentation that prevents some Black migraine patients from receiving the care they deserve. "Without voices speaking truth to that and shedding light on the racial disparities that so many deal with, we won't have equity in headache care," she says.

**"I'm still here because there is a bigger purpose to my pain."**

Jaime was diagnosed with migraine at age 8. The fact that she received a diagnosis at all was unusual, she says. Her family was attuned to Jaime's early symptoms, which included pain and light sensitivity but also signs of abdominal migraine, because her mother lived with migraine. And her father, who worked in healthcare administration, was persistent in his pursuit of appropriate

care for his young daughter. "Because of his tenacity, I was able to see a neurologist in New York in 1986, which definitely was not the norm for a brown girl growing up during that time," she recalls.

Jaime managed episodic migraine throughout her youth. By the time she was 25, she had transitioned to chronic migraine, defined as headache occurring on 15 or more days per month for three or more months, with at least 8 headache days per month having the features of migraine headache.<sup>3</sup> Her symptoms include extreme light and sound sensitivity, nausea and severe pain, typically behind her left eye. At its worst: "It feels like getting hit on the head with a hammer and I just want to pull my eyeball out," she says.

Unfortunately, Jaime's transition to chronic migraine is not unique: According to the American Migraine Foundation, about 2.5 percent of people with episodic migraine transition to chronic migraine each year.<sup>4</sup>

Research shows that Black women with migraine also are more likely than their white counterparts to experience depression,<sup>5</sup> and

“  
A review of  
headache clinical  
trials found that  
non-whites  
are vastly  
underrepresented,  
with white  
participants  
accounting for more  
than 80 percent of  
trial participants.”  
”

Jaime knows this truth well. The constant-ness of migraine can eat away at a person, and one's sense of self can become lost in the disease, she explains. "I tried to check out. I attempted suicide. Twice," she says. "But I'm still here because I believe there is a bigger purpose to my pain."

With medication, therapy and a self-care regimen that includes mindfulness, she says she has learned to love her life again, and she wants others to experience that joy, too. "This might not be the life you thought it was going to be, but there is still beauty and value in the life you have," she says. "I've come through the darkness and found my voice to speak up for myself, and now for others, too."

**"We all have biases. We need to check them at the door."**

Jaime is particularly passionate about spreading her message to Black people living with migraine, who may feel unheard or undervalued in their interactions with healthcare providers. In fact, research studies indicate that implicit bias – negative unconscious or automatic feelings and beliefs about others – against Black and dark-skinned individuals is still held by many healthcare providers.<sup>6</sup> And this bias may impact health outcomes. Studies show that Black Americans are less likely to receive a migraine diagnosis or be prescribed migraine medication.<sup>5</sup> Even today, in 2021, healthcare providers may not be as "woke" as they would like to think, Jaime says.

"I'm constantly aware of the skin I'm in, and rather than rejoicing in the beauty of it, I am cognizant that it will dictate how I am treated. Regardless of where you come from, we all have biases. You need to check them at the door and focus on 'what can I do to help you?'" she says to the headache medicine community.

Bias may also be stalling the scientific community's understanding of the origins and impact of migraine on people of color. A

review of headache clinical trials found that non-whites are vastly underrepresented, with white participants accounting for more than 80 percent of trial participants.<sup>7</sup> Studies also did not analyze safety or efficacy of potential treatments by race.<sup>7</sup>

This underrepresentation in research, the headache medical and patient community is what Jaime is dedicated to reversing. Among her efforts, she is a member of the Disparities in Headache Advisory Council, a collaborative effort comprised of patient-advocacy organization leaders, headache patients and healthcare providers working to identify and determine solutions to racial disparities in headache medicine. The group will also be making recommendations for diversifying the headache patient community. Lundbeck is a founding sponsor of the group.

"This is about having uncomfortable conversations and asking people to check their privilege and do the work so our progress in migraine can encompass all communities of people," she says.

1. American Migraine Foundation. The Facts About Migraine. <https://americanmigrainefoundation.org/resource-library/migraine-facts/>
2. Nicholson RA, Rooney M, Vo K, O'Laughlin E, Gordon M. Migraine care among different ethnicities: Do disparities exist? *Headache*. 2006; 46(5):754-765
3. International Classification of Headache Disorders 3rd edition. <https://ichd-3.org/1-migraine/1-3-chronic-migraine/>
4. American Migraine Foundation. "Chronic Migraine." <https://americanmigrainefoundation.org/resource-library/chronic-migraine/>
5. Heckman BD, Britton AJ. Headache in African Americans: An Overlooked Disparity. *Journal of the National Medical Association*. 2015; 107(2):39-44.
6. Hall WJ, Chapman MV, Lee KM, et al. Implicit Racial/Ethnic Bias Among Health Care Professionals and Its Influence on Health Care Outcomes: A Systematic Review. *Am J Public Health*. 2015;105(12):e60-e76. doi:10.2105/AJPH.2015.302903
7. Robbins, NM, Bernat, JL. Minority Representation in Migraine Treatment Trials. *Headache*. 2017; 57(3):525-533.

# From Idea to Patient

Inventing and developing efficacious and innovative treatments is complex. It takes approximately 10-15 years for a new drug to move through the pharmaceutical value chain from when an idea is conceived until an approved treatment is made available to patients.



## 1 Research

In Research, we identify new disease targets and establish and confirm an understanding of the mechanism of action for new, safe drug candidates. Researching new treatments requires deep insight into the disease and into the unmet medical needs of patients. Researchers work to understand the underlying disease biology and identify new targets in the brain. New substances are then selected based on efficacy and are tested for safety and tolerability, before being selected for drug development.

## 2

### Drug Development

In Drug Development, we conduct clinical studies globally to establish evidence for new drug candidates, we engage healthcare specialists in scientific discussions to enhance the understanding of our clinical results, and we work to develop safe, reliable and efficient manufacturing processes. Safeguarding the rights, safety and wellbeing of study participants is of the greatest importance.

## 3

### Manufacturing

The manufacturing process has three major stages: Chemical Production, where the Active Pharmaceutical Ingredient (API) is made; Pharmaceutical Bulk Production, where the product is produced; and Finished Goods Production, where the products are packed. We strive to create the best supply chain in the pharmaceutical industry through continuous improvement of reliability, quality and cost. Every year, more than 100 million finished goods are sent to distributors, wholesalers and hospitals through close collaboration with our sales affiliates globally.

## 4

### Marketing

Our products are registered globally in more than 100 countries. We produce and conduct scientific and promotional events to educate healthcare professionals about the safe and effective use of our products. We engage decision-makers in activities to help them prioritize psychiatric and neurological disorders and argue the societal value of our products based on thorough assessments.

## 5

### Sales

In Sales, we inform and educate the key stakeholders who are responsible for managing treatment with prescription drugs. We have sales representatives in more than 50 countries. Our activities towards healthcare professionals aim to ensure a correct understanding of our products and their use. We also engage experts and leading specialists as speakers for educational events, where information is exchanged with the purpose of enhancing patient care.



Visual disturbances associated with migraine are a neurological symptom that lies outside human control. Experience tells Carlos that it'll pass after about 10 minutes. *His body is not so sure.*



CARLOS SANTILLANA CASTILLO, LIVING WITH MIGRAINE

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