A researcher at the Montreal Neurological Institute and Hospital, which is making all its data public.

OWEN EGAN/MNI

DATA SHARING

Access all areas

Advocates say that open science will be good for innovation. One neuroscience institute plans to put that to the test.

BY BRIAN OWENS

In the cut-throat world of early-stage clinical development, where aggressive defence of data and intellectual property is thought to be key to amassing profits, one academic institute is opting out.

Over the next five years, McGill University's Montreal Neurological Institute and Hospital (the Neuro) in Canada will conduct a radical experiment in open science. It will make all results, data and publications from its research free to access, will require collaborators to do the same, and, perhaps most surprisingly, will not pursue patents on any of its discoveries.

The primary motivation for the move is to increase the pace of discovery in neuroscience — a field in which clinical progress has so far been slow. "We think that by sharing data quickly, we'll be able to accelerate the discovery of mechanisms and eventually new medicines," says Neuro director Guy Rouleau.

But Rouleau acknowledges that there is also a moral argument for opening up scientific data. "We're funded mostly by public money, so it makes sense that it be freely available."

The Neuro's open policy, expected to come into effect this summer, is based on five principles developed through a series of consultations with the institute's faculty and staff. The first is that Neuro researchers will make all information about a study publicly available by the time the research is published. This requirement will apply to all of the results — positive and negative — as well as models, algorithms, reagents and software.

Second, all data and resources generated through new research partnerships — whether they be with companies, institutes or other universities — must follow the same rules. Third, the institute's biobank, which contains tissue samples and brain-scan data, will be opened up (although the institute may charge users a small fee to cover operating costs).

The fourth principle is that the institute will not pursue any intellectual-property protections for research discoveries. And the fifth is a commitment that, although the institute will not support activities that undermine these open-science principles, it will respect its researchers' autonomy. In practice, this means that a researcher could pursue a patent on their work, but the Neuro would not pay any of the fees or help with the paperwork.

By sharing data and results early and often, scientists should get a better idea of what is going on elsewhere in their field, and avoid exploring blind alleys that others have already rejected. This is particularly important in neuroscience, says Rouleau, where progress is slowed by both the vast complexity of the brain and the heterogeneity of neurological diseases.

Having a solid understanding of brain mechanisms is important for pharmaceutical companies working to develop new treatments, says Viviane Poupon, the institute's director of partnerships and strategic initiatives. "Without mechanisms, they're just fishing randomly," she says. "We're trying to help diminish the 95% failure rate of drug candidates targeting the central nervous system."

How much the principles of open science really can speed up innovation is a question that the Neuro hopes to help answer. Richard Gold, a researcher at McGill who studies the use of intellectual property in the life sciences and helped the Neuro to design its open principles, will be monitoring the institute's performance. He will then compare it with that of similar institutions that are not pursuing openness to see whether the Neuro's decision leads to better scientific outcomes.

The specific metrics he will use are yet to be decided, but he suggests that he will be looking at how closely the institute follows its own principles, whether it inspires others to follow suit, whether people make use of its open resources, and how successful it is at attracting funding and staff.

Open-science advocates hope that greater access to information will also help to solve a larger problem facing science than the slow translation of research into products: the fact that many high-profile results have proved impossible to replicate. "We're facing a credibility problem. Not a month goes by without some field of science being rocked by scandal," says Björn Brembs, a neurobiologist and open-science advocate at the University of Regensberg

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Guy Rouleau, director of the Neuro, favours open science.

in Germany. "Of the five or six large-scale replication studies that I know of, none of them confirm more than 50% of results."

It's no wonder, then, that the pipeline of new treatments has slowed to a trickle. "If the pre-clinical work is not replicable, then you can't make a drug out of it," says Brembs. Mike Ehlers, the chief scientific officer of Pfizer's Neuroscience and Pain Research Unit in Cambridge, Massachusetts, agrees. "The number of key findings that we are able to robustly reproduce is not what I would want to see."

Christof Koch, president of the Allen Institute for Brain Science in Seattle, Washington, thinks that having all the data from every experiment freely available will go a long way towards alleviating this problem. "If science wants to overcome this crisis, this lack of reproducibility, we have to practice what we preach, and practice open science," he says.

GROWING FAMILY

The Neuro is joining a growing movement towards the free sharing of scientific data and results. Some large-scale projects, such as the international Human Genome Project, have freely shared all of their data, and many charitable funders, such as the Bill & Melinda Gates Foundation, require the researchers they support to make their data and published results freely available.

The Allen Institute, launched in 2003 by Microsoft co-founder Paul Allen, has followed an open-science model "from the get-go", says Koch. The institute offers free access to its huge gene-expression maps for mice, humans and other animals, and posts data from its research online as soon as it is ready, rather than keep it hidden from researchers at other institutions until they are ready to publish a complete paper. "All our biggest papers have been published two to three years after the data was put online," says Koch. "The idea that you need to hold on to your data until after you publish is not true."

Drug companies are also embracing the idea that there are advantages to sharing in the early stages of research. "In the past 10 years or so we've seen greater movement towards multi-party collaborations," says Gold. "Generally in areas of science that are expensive, and considered pre-competitive and high risk."

The big pharmaceutical companies can see the value of working more openly with academic neuroscientists and with each other to mitigate those expenses and risks. "It's a very complex field," says Hans Lindner, head of global external innovation and alliances at the pharmaceutical company Bayer in Berlin. "Combining efforts is essential to deal with complex matters."

Much of the work is done in large groups involving multiple companies, universities and public agencies, all combining their cash, expertise and equipment, and sharing the results. "They realized that they're all spending money doing the same thing, and they could leverage that money through partnerships to do more risky work," says Gold. This provides universities with a new source of funding and allows government agencies to steer work towards their priorities. It also benefits the companies, which see more efficient discovery of potential drug targets.

Rouleau says that his inspiration for the Neuro's open-science project came from one such large-scale collaboration, the Structural Genomics Consortium (SGC). The SGC is a collaboration between six universities and eight pharmaceutical companies from around the world. It receives funding from government agencies in Brazil and Canada, and the UK Wellcome Trust, and generates protein structures, chemical probes and antibodies to speed up the development of new drugs. "When you can get academics to share, and get industry to share, you get a hell of a lot more and better data out of that collaboration," says Aled Edwards, the SGC's director. "It's a fantastic way to do science."

Lindner says that open innovation is "an essential part of our R&D strategy". In addition to taking part in the SGC and the European Union's Innovative Medicines Initiative, a public–private project to boost pharmaceutical innovation, Bayer has several crowdsourcing initiatives that provide access to Bayer compounds, and an 'incubator' laboratory that provides start-ups with lab space and access to its facilities. "The benefit of the open source is it may ease up the early testing of concepts, and increase the chance of an interesting concept being further developed," Lindner says. "Ultimately, we have more shots on goal."

NO PATENTS PLEASE

Although open science is a growing trend, at least one aspect of the Neuro's plan seems to be unique — the vow to eschew all intellectual-property protections on its work. It's a move that is proving popular in the open-science community, where most feel that the drive to protect every discovery has gone too far and is stifling progress. "Patents don't help drive innovation," says Edwards. "They just get in the way most of the time."

Ehlers is even more blunt: "Universities tend to slather IP on every finding, regardless of its potential value."

Lindner, meanwhile, is intrigued by the 'no patents' approach, and sees some potential benefits. "It may ease up the initial interaction between the institute and other parties," he says, when legal niceties such as intellectual property rights and licensing fees are usually decided. "Otherwise you have to negotiate this at the beginning, which can be lengthy and frustrating."

"Institutions waste a lot of time patenting, and most patents don't generate any money."

However, Ehlers does foresee complications for companies that want to develop products that are based on the Neuro's work. Companies often prefer to work with protected ideas, because it gives them a way to recoup their investment. "There has to be a well-calibrated use of patents," Ehlers says. "If there's too little protection, there's no way to capture the value."

Rouleau says that the institute is not completely opposed to the idea of patents. If a Neuro discovery shows commercial promise, a pharmaceutical company will be welcome to take it in house and use it to develop a patentable medicine. Rouleau acknowledges that this means that the institute and McGill would then lose out if one of the Neuro's ideas became a blockbuster drug, but he thinks that risk is low. "We're working at such early stages, anything we discover will need to be taken and worked on for years — our share of any profits would likely be small," he says.

And any loss should be more than made up for by new investments from philanthropic organizations and companies, from whom the Neuro's open concept is already attracting serious interest.

Gold agrees that passing up patents will be no great loss for the Neuro. "Institutions waste a lot of time patenting, and most patents don't generate any money," he says. "This gets the university out of the business of business, and back into knowledge generation."

Besides, the institute's top priority should be to do its best for the people relying on it to help cure their illnesses, not to make money, says Rouleau. "Blocking other people from working with our findings is not in the best interest of patients," he says. ■

Brian Owens *is a freelance science writer based in St. Stephen, New Brunswick.*