

# EPIGENETICS: CHANGING THE WAY WE VIEW PHYSICAL AND MENTAL DISEASE

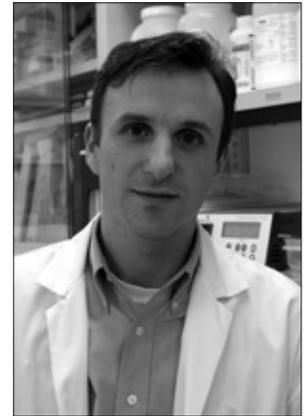
**If you put experts in psychology, neuroscience, suicide and epigenetics together in one room, what would they do? If the team of Patrick McGowan, Moshe Szyf and Gustavo Turecki is any example, they would not only help explain the neurobiology of despair but also create the foundation for understanding the mechanisms by which the environment can shape our genes and brains both physically and measurably.**



Patrick McGowan



Moshe Szyf



Gustavo Turecki

Working as a post-doctoral fellow under Michael Meaney, whose seminal animal studies on the effect of early life experience on behaviour set the stage for work in humans, Patrick McGowan wanted to understand more about the environment and the brain.

*"We know a lot about the effects of early life experience on behaviours and something about how early life experience can have a lasting impact on how the brain works,"* says Dr. McGowan, who is currently on faculty at the University of Toronto. *"But we don't know the connection between the two."*

## FORMING A SYNERGISTIC TEAM

To help bridge this gap, Dr. McGowan teamed up with Dr. Turecki, an expert in the neurobiology of suicide at Montreal's Douglas Hospital, and Dr. Szyf, a McGill-based expert in epigenetics.

*"Everything we think and feel is ultimately coded in the brain,"* says Dr. Turecki. But how? One explanation may be a process known as "methylation." According to Dr. Szyf, *"methylation is a grand mechanism of adaptation of the genome, and all human disease may be related to a misadaptation."* That is, a mismatch between the world your brain has been 'methylated' to live in and the world that you actually find yourself in.

Dr. McGowan and his scientific partners have shown that individuals who died by suicide and who had a history of abuse and/or neglect early in life had signs of methylation in

a gene known as GR, essentially turning it off. This was not seen in suicide victims without an early history of abuse and neglect or among individuals who died from other causes. Since the GR gene is responsible for regulation of the stress hormone glucocorticoid, those whose GR genes are shut down may be less able to handle stress.

## VAST IMPLICATIONS FOR MENTAL AND PHYSICAL DISEASE

The implications for this research, which links environmental triggers with biological effects on genes that, in turn, are linked with particular diseases and mental states, are astounding. It means biomarkers – that is, changes in a person's biology that can be directly measured – can be used to predict who is vulnerable to certain diseases (or negative mental states such as suicidality). Biomarkers can also be used to determine whether interventions and treatment (including drugs, psychotherapy, and other medical and social approaches) are actually working. They also suggest new roads to explore in terms of the development of novel treatments. Who knows? Maybe one day there will be a drug that can "unmethylate" targeted genes.

*"We hope that one day we and our colleagues will have many, many methylation signatures that could predict all kinds of pathologies very early in life,"* says Dr. Szyf. *"I think that will revolutionize medicine."* 🦋

BY ALISON PALKHIVALA

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