



Early Brain and Biological Development and Addiction, UME

Podcast Series:

INTRODUCTION

- 1 The Neuro-
Developmental Pathway
Origins of Addiction

CORE CONCEPTS OF EARLY CHILD DEVELOPMENT

- 2 Brain Architecture and
Development
- 3 **Early Experiences and
Gene Expression**
- 4 Building Cognitive
Emotional and Social
Capacities
- 5 Positive, Tolerable and
Toxic Stress
- 6 Brain Plasticity and
Behavioural Change
- 7 Intervention and
Treatment in Children's
Mental Health

ADDICTION

- 8 Different Kinds of
Addiction
- 9 Prevention, Intervention
and Treatment of
Addiction
- 10 Early Trauma in
Addiction
- 11 Chronic Disease
Management Model of
Addiction Treatment: A
Healthcare System
Response
- 12 Quality Improvement
Strategies and Evaluation
for Addiction Treatment
Programs
- 13 Process Improvements in
Healthcare Programs to
Support Addiction
Treatment

Listen to this Podcast
on AFMC.ca



PODCAST 3:

Early Experiences and Gene Expression

STUDY GUIDE | Run time 16:20, Released September 2012

Podcast 3, *Early Experiences and Gene Expression*, highlights the concept of epigenetics and how genes are expressed through interaction with different environments. The podcast describes the long-term effects of epigenetics, and looks at how early negative experiences harm brain architecture whereas positive interactive relationships (or serve and return experiences) build resilience over time. The podcast series has been designed to offer a quick introduction to the subject of early brain and biological development and its connection to addiction. In 10 to 15 minutes, each podcast links specific medical learning objectives with emerging research. Several podcasts also follow the story of Dr. Ray Baker, a physician who has struggled with addiction, to help illustrate the key concepts addressed.

The Association of Faculties of Medicine of Canada (AFMC) created the podcast series based on lectures from the Alberta Family Wellness Initiative, a knowledge mobilization initiative designed to translate scientific research into policy and practice. The lectures have been repurposed, with permission, for undergraduate medical education. Supplementary resources, including virtual patients and a Primer on the Neurobiology of Addiction, are also available on www.afmc.ca.

Learning Objectives:

Once you have listened to this podcast, you should be able to:

- Understand that each individual has a set of genes that provides cells with a basic blueprint for development and operations, but that these genes do not dictate the individual's fate
- Define epigenetics and how genes are expressed (or "turned on or off") through their interaction with different environments
- Describe the long-term effects of epigenetics
- Recognize that brain architecture is vulnerable to early negative experiences
- Explain how positive serve and return environments can increase stress tolerance, promote positive social interaction and maximize physical and emotional health

Featured Subject Matter Experts:

This podcast features excerpts from the following lectures:

- [Biological Embedding of Stress Early in Development](#)
Dr. Michael J. Meaney, James McGill Professor, Department of Psychiatry, McGill University, Douglas Hospital Research Centre
- [Factors Influencing Brain Development](#)
Dr. Bryan Kolb, Professor, University of Lethbridge
- [Early Genetic and Environmental Factors Impacting the Reward and Motivation System](#)
Dr. Pat Levitt, Director of Zilkha Neurogenetic Institute, University of Southern California, Keck School of Medicine
- [Eight \(Failed\) Assumptions: What We Thought We Knew About Early Child Development](#)
Dr. W. Thomas Boyce, Sunny Hill Health Centre/BC Leadership Chair in Childhood Development, University of British Columbia
- [Brain Development and Early Behaviours](#)
Dr. Judy Cameron, Scientific Research Council, University of Pittsburgh

Listeners are encouraged to learn more about the subject matter through their interactions with patients, research and by checking out the AFWI lecture series available at www.albertafamilywellness.org.



Key Learning Points:

- Each individual has a set of genes that provides cells with a basic blueprint for development and operations
- The epigenetic process, whereby genes are expressed (or “turned on or off”) through interaction with different environments, can alter this blueprint
- Environmental experiences, such as caregiver–child relationships, are biologically embedded in the brain and the body in a way that influences an individual’s behaviour and the behaviour of his or her children across a lifespan
- If these experiences are positive, they can promote resilience in the individual, whereas early negative experiences can result in a myriad of social, emotional and cognitive problems later in life

Reflective Questions:

1. In your role as a medical student or practising physician, how would you integrate and apply what you have learned about early experiences and gene expression?
2. With a view to engaging and empowering young parents, how could you pass on what you have learned about the benefits of positive parent–child interaction?
3. How could you integrate what you have learned about epigenetics when obtaining the personal history and identifying important relationships of a patient with an addiction?

Acknowledgements

DEVELOPED BY:

The Association of Faculties of
Medicine of Canada

PRODUCED BY:

Hugh Kellam, PhD Candidate,
Instructional Designer,
University of Ottawa

Colla MacDonald, PhD,
Project Manager & Education
Expert, University of Ottawa

SPONSORED BY:

The Norlien Foundation

ADVISORY COMMITTEE:

Niloofer Baria, MD, CCFP,
Addiction Medicine Program
Committee, College of Family
Physicians of Canada

Nancy Brager, MD, FRCPC,
Associate Professor, University
of Calgary

Peter Butt, MD, CCFP, FCFP,
Addiction Medicine Program
Committee, College of Family
Physicians of Canada

Gary Hnatko, MD, FRCPC,
FCPA, Professor,
University of Alberta

Lucie Rochefort, MD, MSc.,
CCMF, FCMF, Addiction
Medicine Program Committee,
College of Family
Physicians of Canada

Nicole Sherren, PhD,
Scientific Director & Program
Officer, Norlien Foundation

Pamela Weatherbee
Medical Student, University of
Calgary

Jonathan White, MD, PhD,
FRCSC, MSc, Assistant
Professor, University of Alberta

Preparing for your exams...

Medical Council of Canada (MCC) Objectives for the Qualifying Examination (excerpt):

36 GENETIC CONCERNS Rationale: An individual’s genetic make-up has an impact on their development, as well as their predisposition to disease. Genetic variation and mutation may cause disease directly, or interact with various experiential and environmental factors to influence development and medical conditions. **Key objectives:** The candidate will recognize situations where a person or a population is at risk of a genetic or epigenetic condition. Given a patient with evidence of, or a family history consistent with, a genetic or congenital condition, the candidate will diagnose the cause, severity and complications, and will initiate an appropriate management plan. (Source: [MCC Objectives for the Qualifying Examination: 36 Genetic Conditions](#))

Other relevant objectives:

[74 PERIODIC HEALTH EXAMINATION \(PHE\)](#)

[103 ADDICTIONS/SUBSTANCE ABUSE](#)

CanMEDS-FMU Undergraduate Competencies from a Family Medicine Perspective (excerpt):

3. THE FAMILY MEDICINE COLLABORATOR

3.3. The learner will demonstrate an understanding of how to engage patients or specific groups of patients (population) as active participants in their care (empowerment). (Source: *CanMEDS-FMU Undergraduate Competencies from a Family Medicine Perspective: 3. The Family Medicine Collaborator*)

GENETICS, toxic stress, Cognitive Skills, GENE, epigenetics, social skills, Addiction, EMOTIONAL SKILLS, Serve and return interactions, ADVERSE CHILDHOOD EXPERIENCES