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PODCAST 6:
Brain Plasticity and Behavioural Change

STUDY GUIDE | Run time 16:00, Released September 2012

Podcast 6, *Brain Plasticity and Behavioural Change*, describes brain plasticity; its importance in the development of brain structure and processes; and its influence on behaviours. It highlights pre- and postnatal factors that influence the pruning process and brain plasticity during the early developmental years, and how the ability to change brain architecture and behaviours decreases 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:

- Describe brain plasticity and its importance in the development of brain structure and processes
- Understand that behaviours emerge in development as the brain structure's underlying specific capacities mature over time
- Recognize that if brain architecture is changed, especially in the frontal regions, the brain will function differently and respond to future experiences in an altered manner
- Identify pre- and postnatal factors that influence the pruning process and brain plasticity during the early developmental years
- Understand that the ability to change brain architecture and behaviours decreases over time

Featured Subject Matter Experts:

This podcast features excerpts from the following lectures:

- Embryonic and Neural Development: Setting the Stage for the Lifespan
  Dr. Charles A. Nelson, Research Director of the Division of Developmental Medicine, Children's Hospital Boston
- Brain Plasticity and Behavioural Development
  Dr. Bryan Kolb, Professor, University of Lethbridge
- 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.

BRAIN PLASTICITY, pruning process, Brain Architecture, PRENATAL, postnatal, epigenetics, Addiction, BEHAVIOUR, Childhood Development, Stress, BRAIN

Key Learning Points:

- Early brain development involves a complex dance of genetic and environmental events that interact to adapt the brain to fit a particular environmental context
- A wide range of pre- and postnatal factors influence this pruning process and brain plasticity during the early developmental years
- If brain architecture is changed, especially in the frontal regions, the brain will function differently and respond to future experiences in an altered manner
- The ability to change brain architecture and behaviours decreases over time, so early interventions are important to minimize the damage from toxic stress

Reflective Questions:

1. In your role as a medical student or practising physician, how would you integrate and apply what you have learned about brain plasticity and behavioural change? Does it give you hope for ongoing growth and development, even if the level of plasticity diminishes over time? What are the implications for recovery from addiction? Do you think brain rehab principles would be applicable to addiction recovery?
2. How do you think children who have been subjected to early toxic stress might present?
3. How would you assist or advocate for children who have been subjected to early toxic stress? What support do you think children, adolescents and adults might require to mitigate the impacts?

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:

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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):

74 PERIODIC HEALTH EXAMINATION (PHE) **Rationale:** The periodic health examination (PHE) represents an opportunity for the prevention or early detection of health-related problems. The nature of the examination will vary depending on the age, sex, occupation, and cultural background of the patient. **Conditions to consider based on patient age:** 2. Infant and child: a. Nutrition, growth, development, b. Abuse/neglect, c. Other (e.g., hearing, amblyopia) **Key objectives:** Given a patient presenting for a PHE, the candidate will determine the risks for age and sex-specific conditions to guide the history, physical examination, and laboratory screening. (Source: *MCC Objectives for the Qualifying Examination: 74 Periodic Health Examination (PHE)*)

CanMEDS-FMU Undergraduate Competencies from a Family Medicine Perspective

(excerpt):

1. THE FAMILY MEDICINE EXPERT

1.1. The learner will be able to describe how illness presents differently in the family medicine setting compared to other specialist settings and demonstrate an approach to the diagnosis and management of undifferentiated patient problems that present to family physicians. (Source: *CanMEDS-FMU Undergraduate Competencies from a Family Medicine Perspective: 1. The Family Medicine Expert*)

6. THE FAMILY MEDICINE SCHOLAR

6.5. [and] [I]ntegrate the new knowledge in family medicine settings. (Source: *CanMEDS-FMU Undergraduate Competencies from a Family Medicine Perspective: 6. The Family Medicine Scholar*)