

ONTOGENY OF THE CORTEX

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NEURO-COG

<http://www.neuro-cog.com>

Herencia filogenética y desarrollo ontogenético ontogenia y socializacion

■ HERENCIA FILOGENÉTICA

- Memoria de la especie. Estructura (Barbizet)

■ DESARROLLO ONTOGENÉTICO

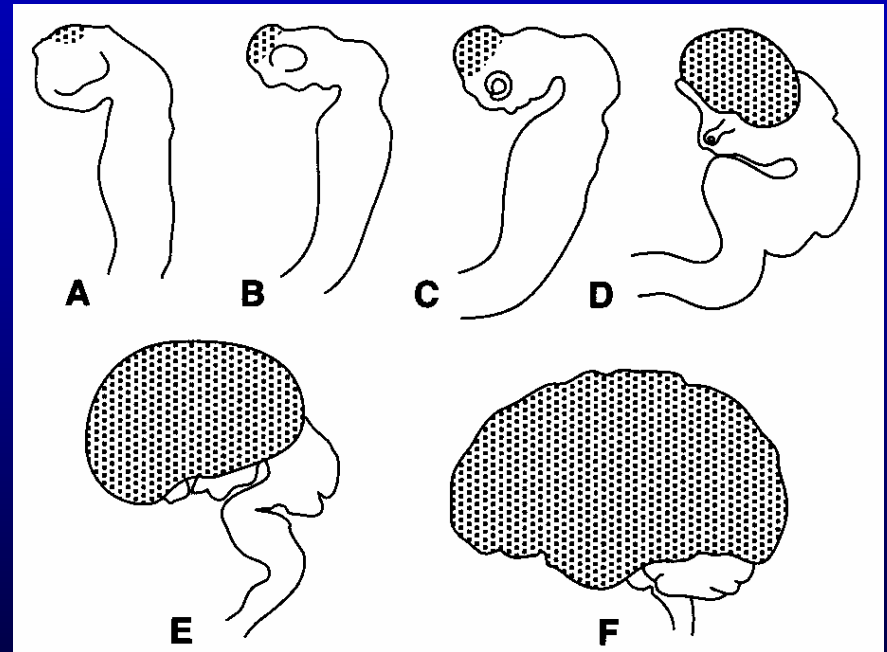
- Memoria del individuo
- Metaestructura - Metacircuitos (Barbizet)
 - » Lengua, cultura, escalas de valores (Conocimiento: Memoria semántica)
 - » Experiencias personales (Eventos: Memoria Episódica)
- Etapas de desarrollo: (neuro)psicología genética

Ontogenia de la corteza cerebral

- **MIGRACIÓN NEURONAL (Pasko Rakic)**
 - Las neuronas migran desde su lugar de “nacimiento” (la última mitosis) hacia su posición final.
 - Zonas proliferativas: superficie de los ventrículos.
 - Guiadas por un tipo especial de células: la glia radial
- **MADURACION NEURONAL**
 - Las neuronas de proyección maduran antes
 - seguidas por las pequeñas interneuronas (local)
- **MADURACIÓN DE LAS SINAPSIS**
 - Programa genético e INFLUENCIA DEL MEDIO

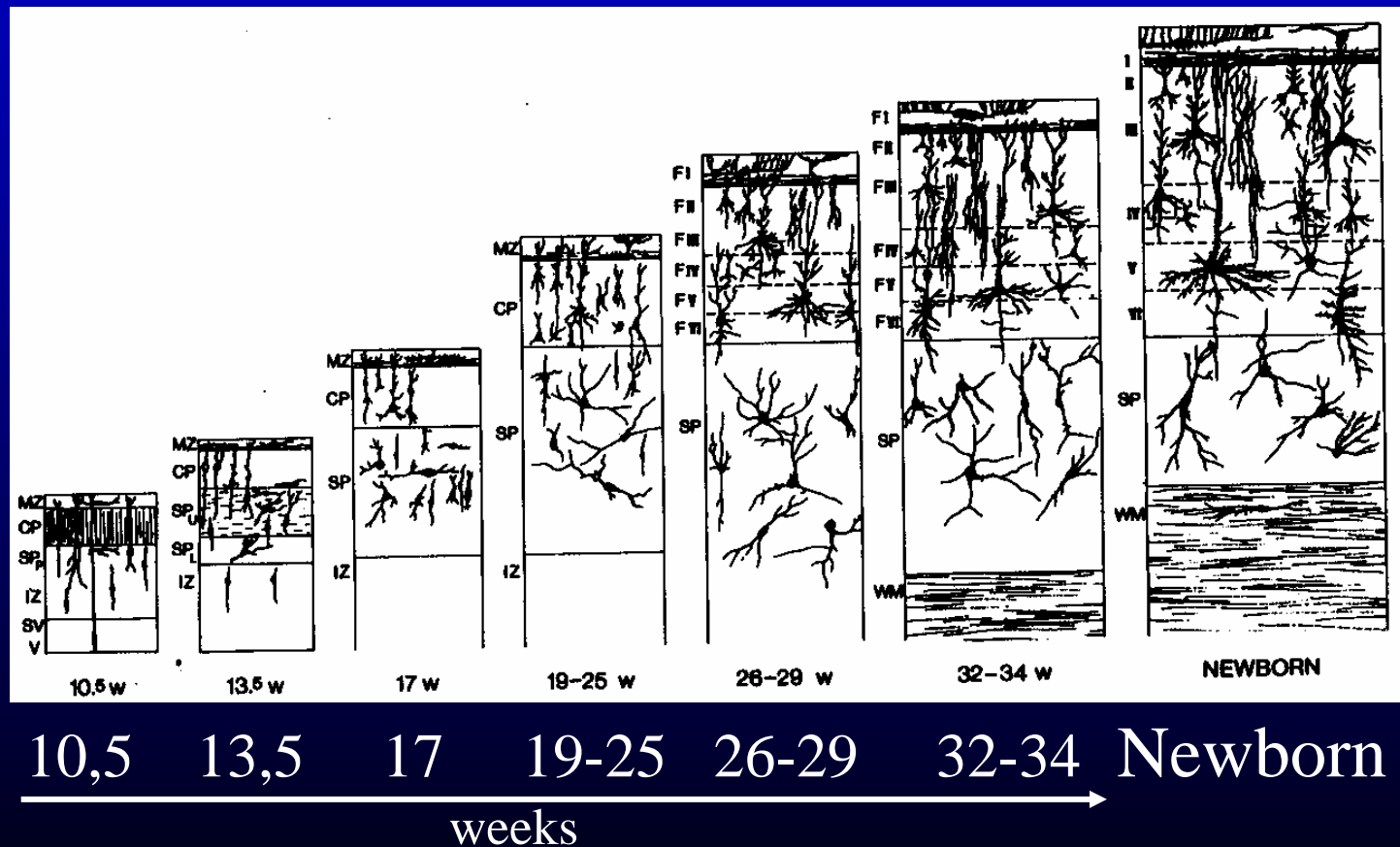
Relative growth of the cortex at various developmental stages

- A. Prenatal
- B. 2 weeks
- C. 3 weeks
- D. 4 weeks
- E. 6 month
- F. Adult



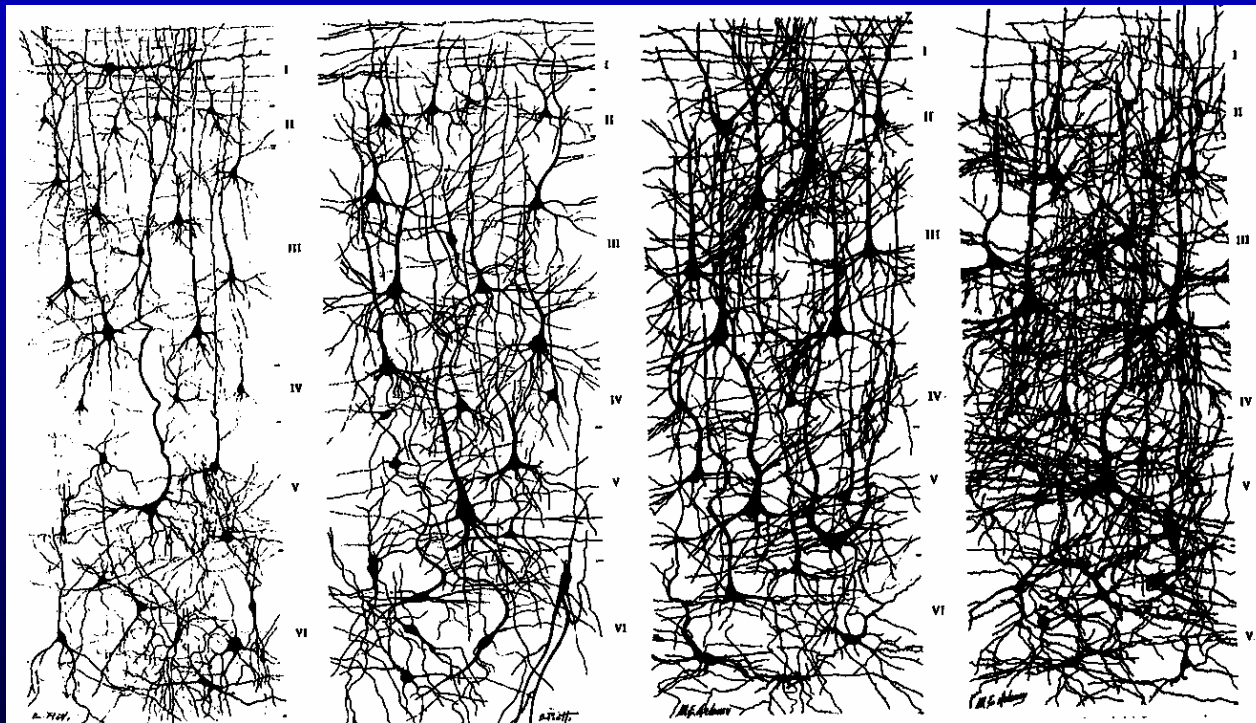
Development of neurons in the human cortex

Prenatal period



Development of neurons in the human cortex

Postnatal period



3 mo.

6 mo.

15 mo.

24 month

El desarrollo y el medio

- El incremento de las sinapsis corticales durante el desarrollo está ampliamente relacionado con el desarrollo de espinas
- Fetal - Recien nacido - Niño
- Sobreproducción... eliminación
- Las sinapsis corticales son extraordinariamente sensibles a una serie de influencias del entorno...
 - Medios enriquecidos (Greenough, 1984)

Genetic disorders

A note from a lecture

Barcelona 2005

Genetic disorders

- (2003) unique opportunity to investigate the neuromolecular basis of complex cognitive behaviour, and develop integrated approaches to study gene function and genotype-phenotype correlations. *Tassabehji. Hum Mol Genet. 2003*
- (2002) Mutated genes - syndromes of mental retardation or cognitive defects - placing gene products within signaling networks - how learning occurs and how memories are formed and sustained. *Weeber, Levenson, Sweatt. Mol Interv. 2002, 2:376-391*

Williams syndrome

- *Characteristic cardiac defect*
- *Typical facial appearance*
- **Cognitive profile**
 - Severe visuospatial cognitive deficits
 - » Deficient visuoconstructive abilities
 - Relative sparing of language, face recognition
 - Emotional affinity for music
 - Attentional deficits and hyperactivity

Deletion on chromosome 7

Williams syndrome. Neuropsychology, 1

■ Cognitive heterogeneity

- Porter et al 2005: Not all individuals show the profile of strength in verbal abilities and weakness in spatial functions

■ Evolution

- Vicari et al, 2004: The profile of younger children is different in respect to those of the older children (Lexical, grammatical, semantic, phonologic, visuospatial..)

■ Object perception and naming

- Landau et al, 2005: Selective sparing of basic mechanisms of object recognition. Delay or arrest in recognition of objects from unusual views (selective impairment of parietal areas)

■ Neural basis of visuospatial construction deficits

- Meyer-Lindenberg et al, 2004: Hypoactivation in the parietal portion of the dorsal stream. Parietal gray matter volume reduction

■ Interaction between domains (spatial – language)

- Phillips et al, 2004: Comprehension of spatial language terms

Williams syndrome. Neuropsychology, 2

■ Characterization of the musical phenotypes

- Levitin et al 2004: Great emotional responses to music, interest in music at an earlier age, more hours per week listening music
- Derouelle et al 2005: Global and local music perception

■ Emotion and face processing. Hipersociality...

- Reis et al 2004: Volumetric analysis: disproportionate increases in volume & density in several areas known to participate in emotion & face procession: amigdala, anterior cingulate, orbital-medial prefrontal...
- Meyer-Linderberger et al 2005: Hipersociality combined with increased non-social anxiety. Reduced amygdale activation for threatening faces vs increased activation for threatening scenes
 - Suggest a genetically controlled neural circuitry regulating human social beahvior.

Basic neurobiological principles

Neurodevelopmental Disorders = Neurodegenerative Disorders

1. **Selective loss** of specific populations of neurones
2. The neuronal loss **involves nuclei that are anatomically related to functional systems** such as...
Extrapyramidal, pyramidal, limbic, cognitive
3. The **particular population/s** of neurones that are vulnerable in each disorder determines the clinical presentation.
4. **The distribution of the pathology is more predicative of the clinical presentation than the molecular nature of the pathology**

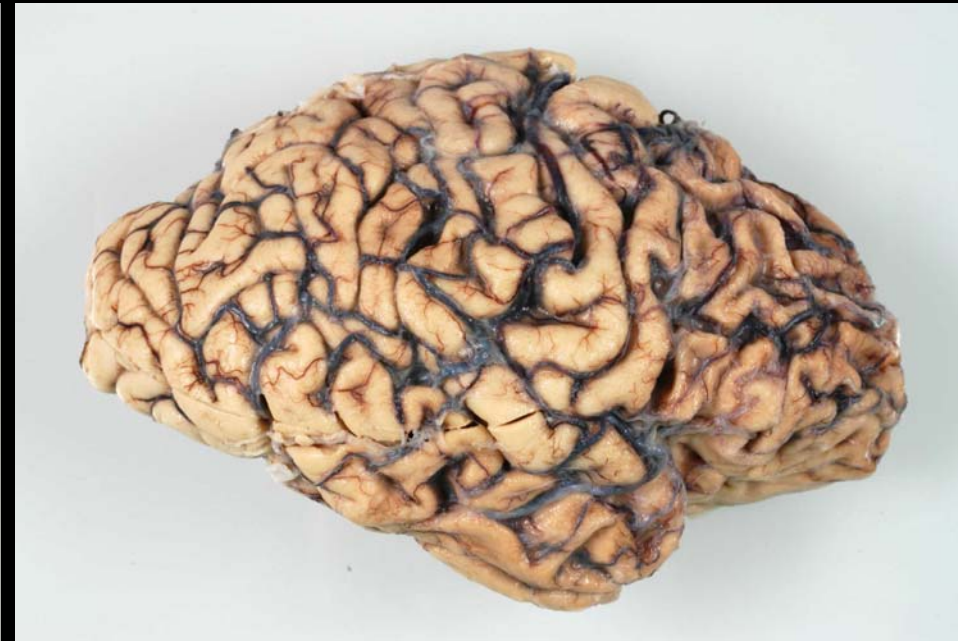
Classification of neurodevelopmental & neurodegenerative diseases

- Clinical syndromes or anatomical distribution of pathology
 - **CLINICAL PATTERN** = Clinical Terms
- Basic mechanisms of neuronal loss & the basis for the selective vulnerability.
 - **MOLECULAR PATTERN** = Molecular terms
 - » Molecular genetics
 - » Biochemical and immunochemical studies
 - » Major molecules

Alzheimer's Disease



Pick's Disease



Fronto-temporal Dementia