

Dudek transcript

Now starting then at the beginning. Brain development can take place generally in two processes. And first would be the generation of the gross structure that we can all see. And this includes cell division and migration, axon growth and axon myelination. And most of this takes place prior to birth in humans. But there's a second and I think equally important process in development and that's the refinement of the microscopic structures.

And I'm really talking here about synapses. These are the connections between neurons. Now upon synapse formation, they can either be strengthened and maintained. And this is an activity-dependent, neuronally activity-dependent process, and I'm depicting the neuronal activity here with little starbursts. And there's also a process I think again that is an equally important process that you might have heard about and that would be synapse weakening and elimination or the pruning of synapses. And this is critically important for determining the neuronal circuitry in the brain.

And both of these processes, as I mentioned, depend on normal activity and that comes from experience. The animal is -- this allows the animal to shape the brain circuitry by interacting with the environment. Now learning, luckily, occurs throughout life for some of us, I think. But for other brain areas there is a developmental down regulation of these processes or rather there are critical periods for this plasticity. And that actually is advantageous, as I mentioned. It allows for shaping the brain's circuitry according to experience, but it also can provide a vulnerable period during which time the brain is susceptible to environmental toxicants.

Therefore, a third interest in my lab is the regulation of plasticity across different brain regions and at different stages of development. And I'll be talking about this aspect today, the regulation of the plasticity. So sorry, David, it's not LTP or strengthening and weakening, it's the regulation of strengthening and weakening. So, this is particularly relevant then to certain diseases of development.

And I have always been talking about autism and schizophrenia in this context. That's because these two diseases have different developmental onsets — autism typically in the first year or two of life, and schizophrenia we think of mostly as being an adult disorder but really this frontal cortex and prefrontal cortex is still developing well into the early 20s -- so right when schizophrenia most typically manifests. So really I think schizophrenia can also be considered a disorder of the development of the brain.