**Arlotta Clip 1 Transcript**

PAOLA ARLOTTA: OK, so we are going to get started. Yes, wow. All right, so far in the course we have learned that the central nervous system, and in particular the central nervous system of mammals, must be developed during embryonic development. By the time the organism is born, all of the constituents of the brain are made. A lot of, of course, postnatal development still occurs. But that postnatal development is basically expansion, additional connectivity, interaction among the different cell types, maturation of the circuits, and so on and so forth. And a lot of learning, of course.

But the building blocks, everything is built during development. And we know that as that nervous system and the organisms continue to develop postnatally, the capacity to integrate new cells within the CNS and especially new neurons is much reduced. To the point that in an adult brain the capacity to regenerate its almost zero if you exclude the two neurogenic regions that we were talking about.

And we also touched upon the idea that this evolutionary choice of not regenerating the brain may, and I say may, go hand-in-hand with the choice of having a brain that is very plastic. So we as mammals, and human beings especially, have this brain that is able to learn a lot. We spend years, and years, and years when we're kids learning all the things that we need when we are adults. Now, if we chose to regenerate our brain, well, of course we would lose a lot of that learning simply because we remove a piece of the brain that then we have to remake.

So this leaves us in a very interesting situation when we think about neurodegenerative diseases where specific parts of the brains are affected and eliminated. Is there anything that we can do, since our brain does not regenerate to make new brain? And so what I wanted to do today is to talk about stem cell based approaches, models to see what these stem cell based approaches can do to help us understand neurological

diseases of the human brain, to help us understand how the human brain develops and forms. And ultimately, maybe, to identify targets that could be targeted by drugs to solve some of these main diseases.

So I'm going to use our markers and write here three things. And I'd like you to think about how stem cell based approaches can help us understand these three things. So the first is human brain-- and I mean brain, but I mean really central nervous system more broadly-- development. The second is human-- again, and I'll explain what I mean here. Why do I keep saying human?-- neurodegenerative disease. And the third is, again, human mental illness.

OK, here come the questions. How can stem cell based models and work help us understand human brain development? What powers do stem cells have from this point of view? What can we make in the dish starting from stem cells?