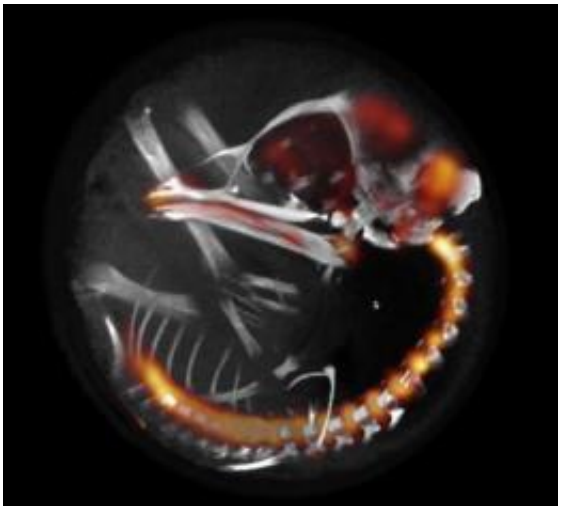
Spanish researchers monitor a chicken's brain

May 14 2012



This is an X-ray computed tomography scan of a chicken embryo skeleton inside its egg (in grayscale), together with the functional image of positrons representing, in color, the capture of glucose in the spinal cord, in the brain stem and in the embryo's brain. This image was created live. Credit: UC3M

Researchers from Carlos III University in Madrid are part of a team that, for the first time ever, has been able to monitor the brain activity of a chicken embryo and to confirm that superior brain activity (carrying out complex tasks) begins long before the chick hatches.

This is one of the principle conclusions of a study that has been published in the scientific journal Current Biology. Participants in the study included Evan Balaban (McGill University, Montreal), Manuel

Desco (Gregorio Marañón General University Hospital of Madrid and UC3M) and Juan José Vaquero (UC3M). The researchers managed to arouse a chicken embryo by exposing it to a sound that would have meaning after its birth (for example, the sound of a chicken warning others of danger). However, their study has demonstrated that the animal does not have the same reaction when it is exposed to a sound that is similar, but that has no special meaning for the chick.

These findings have important implications with regard to understanding both the development of chickens' brains and that of human fetuses, according to the study's authors. According to the researchers, this is so because pediatricians still question the effects that external stimuli, such as music, might have on brains that are still being formed. According to the scientists, this demonstration, which shows that the brain alternates between states of wakefulness and sleep (which is the normal cycle of an adult brain) long before it was previously thought and that it is able to recognize an external stimulus and wake up, indicates that circuits that are capable of monitoring the surroundings in the same way as in an adult brain are already developing in the embryo's brain. All of these characteristics begin to appear in the last quarter of development during the embryo's incubation period.

In order to carry out this study, a technique in which "Spain is a pioneer", according to the scientists, was adapted. This technique combines sub millimeter-resolution brain positron emission tomography (PET) and structural X-ray computed tomography (CT), creating a non-invasive technique that provides three-dimensional images of brain function in animal models, with sub-millimetric resolution. "For the first time, we have designed a procedure which allows us to observe and measure the changes in the embryo's brain activity as it vacillates between sleep and awake phases, without interfering in its normal development," comments Juan José Vaquero, of UC3M's Bioengineering Department.

The researchers were able to study the process in "great detail", according to Manuel Desco, who nevertheless points out that a much more needs to be done with other mammals before arriving at the human model. Desco has also noted that we still do not know exactly when the human brain begins to carry out complex tasks. "The fact that there is certain electrical brain activity in the fetus does not indicate superior activity", according to this scientist, who hopes that this study can contribute to clarifying this issue. For Evan Balaban, these findings may help us understand complex learning processes in fetuses and newborns.

Provided by Carlos III University of Madrid