

Condic-Oral Testimony:

Dear Members of the House of Parliament [Please provide appropriate language to address my audience], I am Dr. Maureen Condic, Associate Professor of Neurobiology and Adjunct Professor of Pediatrics at the University of Utah School of Medicine. Thank you for this opportunity to testify.

(Slide 1) 0:15

The experience of pain is clearly complex. Here, I have summarized the important events of brain development relevant to pain perception. The three points I would like to emphasize are, first, brain development begins very early, by *four weeks* post fertilization. Second, the neural circuitry underlying the most basic response to pain is in place by 8 weeks. *This is the earliest point at which the fetus experiences pain in any capacity*. And finally, circuitry in the thalamus that is primarily responsible for both fetal and adult pain perception develops between 12-18 weeks post fertilization.

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During this period, a fetus is well developed. All of the organs and structures are fully formed. She has a face. Fingerprints. And, based on my own experience with pregnancy, a definite personality.

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The debate over fetal pain is not *whether* pain is detected by a 20 wk fetus; there is essentially *universal* agreement on this point. Rather, the debate concerns *how* pain is experienced by the fetus; i.e., whether a fetus has the *same* pain experience as a newborn or an adult.

The Royal College of Obstetricians and Gynaecologists (RCOG), the American College of Obstetricians and Gynecologists (or ACOG) and a review in the Journal of the American Medical Association (JAMA) have addressed this question. Yet these reports have received serious scientific criticism. Surprisingly, they assumed *without evidence* that for a fetus to have a "conscious" experience of pain, certain, late-developing cortical brain structures must exist. Yet many conclusive, modern lines of scientific evidence contradict this view. I will present just two of them.

First, it is clear that children born without cortical brain structures are capable of conscious behaviors, including smiling when pleased, having preferences for particular kinds of music and having an adverse reaction to pain.

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Here is a picture of such a patient, recognizing her physician. Yet she does not possess the brain structures that RCOG and others erroneously insist are *required* for such conscious recognition. This is a scan of the little girl's brain. The red star indicates the limited cortical structures she has, and the yellow stars indicate *empty space* in the location of the cortical brain structures ACOG and others claim are required for "conscious pain perception." The blue star indicates the thalamus—the region of the brain that is *in fact* responsible for pain perception in this patient and in all human beings. **As I have noted, the pain-perception circuitry in this region of the**

brain is in place by 18 weeks.

Similar results are seen for animals that have had the regions of the brain RCOG insists are “required” for a conscious experience of pain experimentally removed; these animals remain conscious and continue to show a vigorous response to painful experiences.

Surprisingly, even the evidence cited by RCOG itself does not support the conclusion that cortical circuitry is required for conscious awareness of pain.

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For example, RCOG cites a study of pain sensitivity published in PNAS in support of the key conclusion that cortical activity is required for conscious pain perception, and therefore the fetus cannot experience pain prior to the development of this circuitry in the third trimester. Yet the paper RCOG invokes as evidence clearly demonstrates that thalamic activity is associated with the psychological experience of pain in all study participants, while cortical activation is only seen in subjects who report high sensitivity to pain. Thus how we think about our painful experiences may require cortical circuitry, but being consciously aware of pain does not.

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In addition to the neurobiological information I have just presented, what we directly *observe* about a fetus' response to pain is also very clear. Fetuses delivered prematurely exhibit pain-related behaviors, such as those shown here. Pain response observations are very precise and based on objective criteria. Strikingly, the earlier fetuses are delivered, the stronger their response to pain, due to the absence of later-arising brain circuits that inhibit pain responses in older infants and adults.

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Similarly, fetuses at 20 weeks post fertilization have an increase in stress hormones in response to painful experiences that can be eliminated by appropriate anesthesia, just as for an adult.

These and many other direct observations of fetal behavior and physiology have resulted in a clear consensus among professional anesthesiologists that the use of anesthesia is warranted in cases of fetal surgery, not based on pragmatic reasons (like suppressing fetal movement), but rather, based primarily on the fetus' experience of *pain*.

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In conclusion, the RCOG 2010 review cites limited evidence in support of its central assertion that pain cannot be consciously experienced until the third trimester, and ignores nine lines of established evidence that contradict this assertion.

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