

Three sections of additional material from Dr Page:

### **1.Extract from Dr Page's Testimony for Maryland and Texas Legislators**

Pain Perception: Neuronatomy, Physiology, and Biodynamics of Human Development  
Sheila Page, DO

The human fetus is in a very advanced state of neurological development at 8 weeks gestation. While science can never tell us whether it is wrong to take someone's life, an abundance of information is available to allow us to make a judgement on the potential suffering caused by dismemberment or other form of induced death for the pre-born baby.

The biodynamics of development from the moment of conception involve a flurry of motion and a fascinating interplay of forces acting on the developing human. By studying the biokinetics of the human fetus, it becomes very clear that a tiny person with an elegantly developed nervous system is present by 8 weeks. Over the next few weeks, these babies will be responding to sounds and pressures around them and developing very coordinated behaviors. All sensory receptors are denser in a baby than in an older child. They are very sensitive to their environment and they are able to feel pain.

The abortion of pre-born children after 20 weeks is considered unacceptable by most countries in the world. Research by Charlotte Lozier Institute has revealed that the United States is one of only seven countries that permit elective abortion past 20 weeks. The permissive nature of the abortion laws in the United States makes it an outlier in the international community. A critical study of the advanced physiological nature of the child at 20 weeks or earlier should give us cause to consider the ethical dilemma of intentionally ending the life of that child.

The concepts listed below help clarify the scientific observations of many researchers over several decades. The cumulative body of research available to us reinforces our intuitive understanding that inflicting damage on the human body results in suffering and pain.

1. Pain perception, as well as consciousness, is a function of the lower brain centers. The cortex elaborates consciousness, but is not the seat of it.
2. There are two definitions of pain, a subjective, psychological one, and an objective basic science definition. The basic science definition states that pain is a defense mechanism for the body that is directly correlated to tissue damage. It causes the individual to move away from a painful stimulus. Repeated studies have shown that people feel pain at precisely the time that cell damage occurs.
3. Almost all pain fibers terminate in the lower brain centers (the reticular activating system and the thalamus). Type C fibers, responsible for burning pain, terminate almost exclusively in the reticular formation. A very small percentage of Type A fibers will connect in the thalamus to neurons that travel to the cortex for the purpose of localizing pain.
4. The beginning of the nervous system implies the beginning of function. The idea that the function of the nervous system is added at some time after the development of its shape and structure is inconsistent with the observable order of development of all the other organ systems in the human. The internal organs and the nervous system are functional at the beginning of their formation.
5. The fundamental unit of pain, the peripheral nerves, spinal cord, and reticular activating system are complete as a unit between 7 and 8 weeks. By 10 weeks, the motion of breathing begins and continues until birth, shaping and developing the respiratory system. The nervous system and the other organ systems are highly developed and functional.

6. It is important to realize that human development is not a series of switches being turned on or an assembly of pieces. It is a dynamic continuum of differentiation and movement.

7. If we let the embryo itself present the evidence, we would see a remarkable symphony of movement of metabolic fields and gradients, fluid movement, cell differentiation and division. Cell lines are stretched, pulled, or compressed in a continual shaping process involving fluid pressures and growth differentials. Blood vessels are pulled structures, and nerves are drawn into the limbs like clay in a potter's hands. The branching vessels and nerves become the framework of the bones.

8. The function of the cells shapes the structure. One area in which this is visible is in the development of the kidney, in which clusters of cells begin to secrete fluid, which pools in the middle of the cells, and the cells begin to move away from the center to form a lumen. The lymph nodes form in places where there is a bend in the fetus and lymph fluid is congested.

9. The hands, as they are developing before 10 weeks, begin to bend and move in response to differentials between the rate of growth of the skeletal components and fascial components. As the skeletal parts of the fingers outpace the palmar fascia, the fingers bend forward, then straighten again as the palmar fascia lengthens and the dorsal elements begin to pull. A fluid line forms along the line of motion and tension that provides direction for the formation of the ligaments. The shaping of the joints follows as this motion continues.

10. All of the activity that we are able to observe, hand gestures and behaviors such as thumb-sucking, facial expressions like smiling and grimacing, all begin as awkward movements, but are rehearsed and become more elegant and coordinated over time. It is this movement that shapes the growing brain, not the brain directing the motion.

11. We may be incapable of relating to the humanity of the little babies developing in their mother's wombs, and incapable of comprehending the potential they have for suffering, but the basic science demonstrates that developing humans are capable of pain perception as early as 7.5 weeks. It is intellectually dishonest to deny this essential element of humanity of the pre-born child. Refusing to recognize the capacity for pain perception of the pre-born has a crippling effect on our understanding of human anatomy and physiology, and especially of our own humanity.

References:

1. Page S, DO. "The neuroanatomy and physiology of pain perception in the developing human," Issues in Law and Medicine, Fall 2015
2. The Textbook of Medical Physiology, Guyton 1986, 2010
3. Blechschmidt E, MD, Gasser RF, PhD. Biokinetics and Biodynamics of Human Differentiation, 1978, 2012.
4. <http://lozierinstitute.org/internationalabortionnorms/>
5. [https://www.washingtonpost.com/news/fact-checker/wp/2017/10/09/is-the-united-states-one-of-some-even-countries-that-allow-elective-abortions-after-20-weeks-of-pregnancy/?utm\\_term=.2bbb06cac5](https://www.washingtonpost.com/news/fact-checker/wp/2017/10/09/is-the-united-states-one-of-some-even-countries-that-allow-elective-abortions-after-20-weeks-of-pregnancy/?utm_term=.2bbb06cac5)

## **2.Simplified Outline of Pain Perception and Common Errors**

## Building a Foundation of Truths

These represent the counter to specific errors repeated frequently in medical journals.

1. There is no phase in which a non-human exists after fertilization of a human ovum.
2. There are no pain perception centers in the cortex. Pain perception occurs in the lower brain centers, where the vast majority of the pain fibers terminate. These include the thalamus within the reticular activating system.
3. The seat of consciousness is in the lower brain centers. The cortex elaborates consciousness. There are multiple examples of individuals without a detectable cortex that exhibit conscious behavior, thereby presenting a counter example to the hypothesis that the cortex is the seat of consciousness.
4. The definition of pain determines the direction of the study. Psychological definitions are inherently subjective. The basic science definition of pain is centered on the observable fact that people reliably report feeling pain at precisely the time that cell damage occurs. Cell damage is directly related to pain perception. The message is received in the reticular activating center of the brain.
5. The only pain fibers that reach the cortex are the few Type A fibers that connect to the somatic sensory cortex. These connections serve the purpose of localization of pain.
6. The human embryo develops as a whole and a continuum of biodynamic activity. There is no process of piecing together parts.
7. The organs and nervous system are functioning at the time they are formed. There is no later time at which the function of the nervous system is “turned on”.
8. The essential components of the human system for pain perception are formed by 7.5 weeks gestation.

Sheila Page, DO

### **3. 2015 Testimony by Dr G. George**

Chairwoman Jones, Ranking member Tavares, and members of the committee, thank you for allowing me to provide sponsor testimony today on Senate Bill 127, the Pain Capable Unborn Child Protection Act.

Gary L. George, MD Qualifications

My name is Gary L. George, MD. I graduated from Northwestern University with a BA in Biology. I graduated from the Uniformed Services University of the Health Sciences with my MD degree. I trained at the University of Washington in Seattle for my radiology residency and am certified by the American Board of Radiology in Diagnostic Radiology. I served 24 years in the United States Air Force where I was the Consultant to the Surgeon General in Radiology during my final 2 years. I am currently a radiologist at Miami Valley Hospital in Dayton, Ohio where I served as Chairman of the Medical Imaging Department for 4 years.

Background Information

My testimony is based upon my personal experience and professional expertise.

Growing up and attending high school, college, and medical school, I didn't really have an opinion on abortion. I just didn't think about it. During college, I even accompanied a relative to procure an abortion. My thoughts or lack thereof, changed abruptly during my radiology training. While doing my first ultrasound rotation, I observed my first “selective reduction”

procedure. A woman had undergone IVF treatment for infertility. She was pregnant with triplets. She and her husband decided that they could only handle having twins and wanted to undergo a “selective reduction” of one of the triplets at 18 weeks. I observed while the ultrasonographer scanned the three babies and provided live images so that the obstetrician could aim a long needle through the chest and in to one of the baby’s hearts in order to make a lethal injection. As the sharp needle touched the baby’s chest, the baby immediately withdrew and started to rapidly move his arms and legs. The needle was unable to penetrate the chest. The mother started crying when she saw the horrific live images on the screen. Her husband told her not to look and the obstetrician told our tech to turn the screen away from the mothers view to soften the reality of what was happening. The obstetrician made a second and third attempt on the same baby with the same immediate withdrawal and flailing about by the baby, but was again unsuccessful. At that point, the obstetrician decided to try and target another one of the triplets. At that point, I felt physically sick and thought I was going to vomit and left the room. I know from talking to the ultrasonographer that the obstetrician was eventually “successful” in penetrating the chest and heart of one of the triplets. I also know that from that point on, I was no longer ambivalent about abortion. The baby that I saw that day felt pain and suffering. This was not just some automatic reflex. That mother also suffered tremendously that day and likely every day since then. I can only imagine the pain of looking into the faces of her two living twins and knowing that there was another baby just like them that was “selectively reduced”.

The Geneva Convention and International laws outlaw torture and inhumane treatment. The most serious crimes are termed “grave breaches” and include willful killing, torture or inhumane treatment as well as willfully causing great suffering or serious injury to body or health. Death row inmates in Ohio and elsewhere are protected against cruel and unusual punishment. Animals are protected against cruelty. Our preborn children should have the same protections. The United States is one of only seven countries in the world that allow abortion after 20 weeks. Allowing abortions after 20 weeks puts us in the same category with countries like China and North Korea which are notorious violators of human rights.

The Dilation and Evacuation method of abortion is used in most second-trimester abortions which includes 20-24 week babies. The abortionist inserts a long-toothed metal clamp through the cervix into the mother’s womb. Each of the 4 limbs of the baby are grabbed and torn off the body in succession and placed on a surgical tray. The baby’s head is then clamped and crushed in order to remove it from the womb. The body parts are then reassembled on the surgical tray in order to ensure that all parts were removed and no body parts were left in the womb. It whole procedure takes about 30 minutes from beginning to end. Just like Partial-Birth Abortion, which was exposed in court as painful, this is incredible violence against helpless children.

#### Science Supporting Pain Capability in the 20 Week Unborn Fetus

My primary goal is to present scientific data demonstrating that 20 week and older human fetuses can feel pain and should be protected from painful procedures such as abortion. Important considerations in our discussion of this topic include: (1) The use of analgesia by fetal surgeons, (2) The current understanding of pain in unconscious and comatose states, and (3) The efficacy of perinatal hospice care.

Dr. Kanwaljeet S. Anand is one of the world’s foremost authorities on pain in the fetus and

newborn. It is important to understand his qualifications and the fact that his research was done in a purely scientific environment long before any utilization of his data in the abortion debate. Dr. Anand is a brilliant physician who received a Rhodes scholarship to study at the University of Oxford where he received his Doctorate from the Faculty of Medicine. He did additional post-doctorate training at Children's Hospital in Boston and at Massachusetts General Hospital. He has held academic appointments at the University of Oxford, Harvard Medical School, and several other institutions. He is a highly published researcher with a multitude of articles in reputable journals. When opponents of Pain Capable Unborn Child Protection legislation attempt to discount Dr. Anand's research, they are simply wrong.

Dr. Anand's research has shown that the human fetus possesses the ability to experience pain from 20 weeks of gestation, if not earlier, and the pain perceived by a fetus is possibly more intense than that perceived by term newborns or older children. Anesthetic agents that are routinely administered to the mother during an abortion are insufficient to ensure that the fetus does not feel pain, and higher doses of anesthetic drugs, enough to produce fetal anesthesia, would seriously compromise the health of the mother.

Since the human fetus is incapable of verbal expression, the evidence for fetal pain must be based on anatomical, functional, physiological and behavioral indicators that are correlated with pain. Multiple lines of scientific evidence converge to support the conclusion that the human fetus can experience pain from 20 weeks of gestation, and possibly as early as 16 weeks.

The neural pathways for pain include sensory receptors in the skin connected to nerve fibers, which lead to pain processing in the dorsal horn of the spinal cord. Nerve tracts from these spinal cord areas transmit the signals of pain to supraspinal centers located primarily in the brainstem, thalamus, and cerebral cortex of the brain. Fully functioning sensory receptors appear in the skin around the mouth of the fetus at 7 weeks and spread to all skin and mucosal surfaces before 20 weeks. Dorsal horn neurons in the spinal cord begin to develop before 13 weeks. The cerebral cortex starts to form at about 8-10 weeks. Massive increases in dendritic arborization and synaptogenesis begin at 18-20 weeks of gestation. The fetal neocortex is penetrated by the fibers from sensory thalamic nuclei by 20 weeks.

Let me recap: The pain pathways are present in the 20 week old fetus

Fetuses have been observed to exhibit hormonal stress responses to painful stimuli from as early as 16 weeks. Stress hormones such as plasma cortisol, catecholamines, and beta-endorphin increase significantly in fetuses given blood transfusions through a needle piercing the abdominal wall to get to the hepatic vein whereas no consistent response occurred in fetuses transfused by piercing the umbilical cord which is not innervated. The stress hormone response to piercing the abdominal wall was decreased when fentanyl analgesia was administered to the fetus. Other studies ("Fetal and Maternal Analgesia/Anesthesia for Fetal Procedures", *Fetal Diagnostic and Therapeutic Journal* 2012:31:201-209) of invasive procedures in the fetus have shown similar results.

Let me recap: There is a scientifically proven stress response in the 20 week fetus

The fetus at 20-32 weeks gestation experiences much more intense pain because the pain inhibitory mechanisms which dampen the pain experience do not begin to develop until after 32 weeks.

Other researchers have further investigated responsiveness of children with hydranencephaly. These are kids without cerebral hemispheres, but with functioning or partially functioning brain stem. When exposed to noxious stimuli, these kids have been found to react. A Swedish neuroscientist, Bjorn Merker in the journal "Behavioral and Brain Sciences" wrote that, "The tacit consensus concerning the cerebral cortex as the organ of consciousness may have been reached prematurely, and may in fact be seriously in error." Dr. Vivette Glover, a psychobiologist at the Imperial College in London, concludes that, "If hydranencephalic children can respond to stimuli in the absence of functioning cortex, the human fetus may be aware, conscious, and capable of pain once the brain's lower structures have taken shape at approximately 11 weeks."

Our understanding of pain in the unconscious patient is evolving. In research (Markl, "Brain and Behavior") on people with unresponsive wakefulness syndrome (UWS), also known as vegetative state, Dr. Markl's team gave moderately painful electric shocks to 30 people with UWS while scanning their brains using functional MRI. 16 of these patients had some kind of brain activation, 7 in the sensory network only, but 9 in the affective or emotional network also. Let me recap: Scientists continue to discover more evidence of neural and sensory responses in patients previously thought to be unresponsive.

I would also like to highlight the ever increasing role of perinatal hospice and palliative care to support families who have received the terrible news that their unborn child has a potentially lethal fetal anomaly. The perinatal hospice has been offered as an alternative to pregnancy termination for a non-viable fetus. In this model, time and support are offered after birth for a dignified life and death. Dr. Byron Calhoun (Calhoun, "The Perinatal Hospice: Allowing Parents to be Parents") and Dr. C. Wool ("Systematic Review of the Literature", Advances in Neonatal Care, June 2011) have documented positive patient feedback and no increased maternal morbidity or mortality for women who choose to carry their child to term.

A recently published article in the New England Journal of Medicine, "Causes and Timing of Death in Extremely Premature Infants from 2000 through 2011, January 22, 2015) documented that newborns as early as 22 weeks gestation are surviving due to continued advancements in neonatal care.

Marist Poll, January 2015 "Abortion in America"

When asked directly to take sides on the issue of abortion, either pro-life or pro-choice, Americans divide almost equally.

However, Americans' views on abortion are complex. When offered additional options to define their sentiment on the issue, a good deal of common ground is revealed.

Most Americans, 84%, agree there should be significant restrictions and safe guards associated with the procedure including limits to within the first three months of pregnancy, allowed only in cases of rape, incest, or to save the life of the mother, or never permitted.

More than two-thirds of pro-choice supporters believe access should be available, at most, during the first three months of pregnancy, allowed only in cases of rape, incest, or to save the life of the mother,

Most Americans, 84%, think laws can exist which protect, both, the health and well-being of a

woman and the rights of the unborn.

59% of Americans think abortion does more harm than good to a woman in the long-run

Clearly, there is some common ground on both sides of the abortion debate. We need to work to build consensus on this issue that fractures our country. There is compelling scientific evidence that the fetus experiences pain at 20 weeks and beyond. The most in-depth purely scientific and objective research on this was done long before the data was being utilized in the abortion debate. For those who are uncertain, we would do well to err on the side of caution. If there is a strong possibility that a 20 week old fetus experiences pain, justice and compassion compel us to act as if that capacity is present. The fetus should be given the benefit of the doubt. The Pain Capable Unborn Child Protection Act is well thought out and reasonable legislation to accomplish this goal.

Dated: June 15, 2015

Gary L. George, MD