HUMAN REPRODUCTION

More complicated than we thought

Babies absorb, and use, their mother's DNA

Robert Carter

THE DEVELOPMENT of a baby from a fertilized egg is an amazing process. The subtle interplay between mother and child is full of complex twists and turns. It involves the immune, hormonal, digestive, and excretory systems of both mother and child. The science of embryology includes a myriad of scientific words for the many functional parts and developmental stages of the embryo and fetus. When faced with such intricate beauty and marvellous engineering, all one can do is sit back in awe as we ponder our amazing and intelligent Creator.

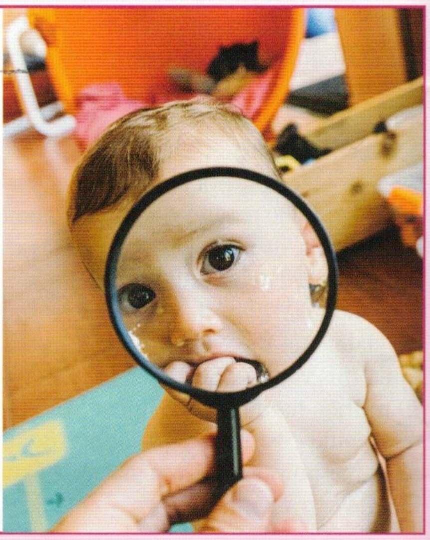
Sadly, embryology has also been used to foist deliberate evolutionary frauds on our culture. One of the worst was the blatantly false claim that babies go through the stages of evolution as they develop. And the assertion that they have gills, a tail, and are covered in hair at different times. These pernicious falsehoods were invented by an aggressive 19th-century evolutionist named Ernst Haeckel, whom we labelled the 'Apostle of Deceit' nearly 30 years ago.[1] Sadly, these misconceptions still circulate today, despite decades of effort by multiple writers and speakers at CMI.[2]

Mother and baby 'signal' each other

Yet, as science advances, we keep learning more and more interesting details about human development. One recent paper documented something truly amazing: the mother releases huge amounts of DNA into the uterus (womb) which is then absorbed by the embryo.[3] That DNA affects viability, implantation, and energy usage in the early, pre-implantation embryo.

The researchers were looking for DNA that had been secreted by the human endometrium, the lining of the uterus. Using the latest scientific procedures, they documented the presence

A note of caution: any time a scientist studies human development, Christian readers must wade through a morass of moral issues. This case is no different. It required reading the Materials and Methods sections of this new study looking for places where morality impinged upon their science. Specifically, what was the source of their samples? Was it from aborted babies? Perhaps leftover embryos from a fertility clinic? Neither of those was true in this case. Maternal DNA samples were obtained from women undergoing standard gynaecological examinations. Some of those women were undergoing hormonal replacement therapy. Thus, the abortion question is off the table.



and the DNA content of three different types of extracellular vesicles (EVs):

- ***Exosomes*** (EXOs): Extracellular vesicles that are released from the cell and which are involved in long-distance cell-to-cell communication, among other things. They are much smaller than a cell and can contain DNA, proteins, fats, and/or metabolites. The outer coat of their cell membrane can carry many different signalling factors.
- ***Microvesicles*** (MVs): Similar to, but generally smaller than, EXOs.
- ***Apoptotic bodies*** (ABs): Carry out apoptosis, the process of programmed cell 'death',[4] which is critically important for multicellular organisms. One byproduct of apoptosis is the production of ABs. These were once thought to be nothing more than garbage bags, but we now know they often contain important signalling molecules that can be passed to other cells.

The study isolated the different EV types at different stages of the menstrual cycle and sequenced the DNA they contained. Quite interestingly, the amount of DNA changed considerably over time. For example, the amount of mitochondrial DNA (mtDNA) was highest during the receptive period, when fertilization and implantation can occur.

"The mother sends DNA signals to the developing embryo that aid in implantation, and the embryo 'talks' back."

Both mother and baby release all three EV types into the endometrial fluid of the womb. What the EVs *do*, however, is a matter of enquiry. Prior studies have determined that EVs affect the development of the embryo, the process of adhesion and implantation, the migration of trophoblast (early skin) cells, and *angiogenesis* (the formation of new blood vessels). Both mother and baby release many microRNAs that have the characteristics of transcriptional and epigenetic modifiers. That is, they modify the way DNA is read and whether a particular gene is expressed or not. EVs are heavily involved in two-way communication between mother and child. The mother sends DNA signals to the developing embryo that aid in its implantation into the womb, and the embryo 'talks' back.

Breaking the Weismann Barrier

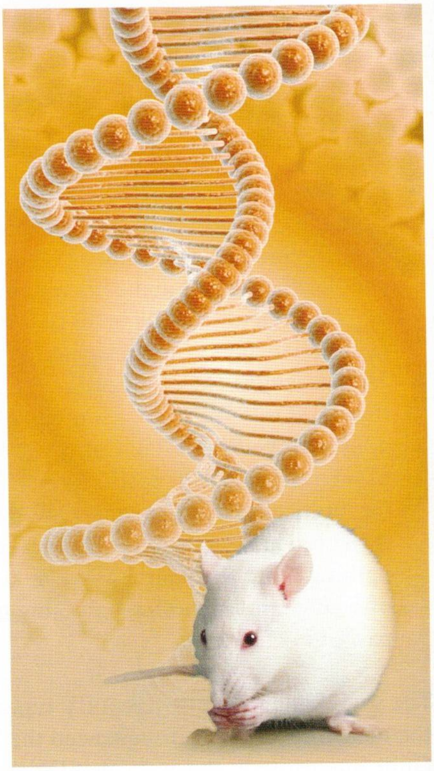
Wait a minute! DNA is not supposed to be passed that way. 'Vertical transmission' is not allowed. According to long-accepted biological 'knowledge', there is a wall of separation between the body (somatic) cells and the reproductive (germline) cells. This was established in the late 1800s by evolutionary theorist August Weismann. The Weismann Barrier is one of the foundational aspects of the modern genetic revolution. During development, the

reproductive cells go through a process called *meiosis*, whereby their genetic content is rearranged and divided in half. No genetic input from the body cells is supposed to happen.

Except that we already know the Weismann Barrier has been breached.[5] In males, sperm actively absorb somatic (body) RNAs while they develop in the male epididymis, the coiled tube that carries sperm from the testes. This means that the body produces RNAs in response to environmental factors, which brings us right back to Lamarckian inheritance (e.g., 'the inheritance of acquired characteristics'), a long-discredited theory to which Charles Darwin was an adherent.[6] Now we know that females pass DNA to their babies. This might not get incorporated into the genome but it absolutely does affect the development of the embryo (i.e., Lamarckian inheritance is still possible).

Once again, moral issues crop up. However, at least they did not use DNA from living people. Instead, they isolated EV DNA from the Ishikawa cell line. These cells could have been obtained by various immoral means, but they came from an endometrial adenocarcinoma (cancer that formed in glandular tissue within the uterine lining) in a 39-yr-old (anonymous) Japanese woman who may or may not have died from this cancer. The cell line is sold through Sigma Aldrich and has been available since 2012.[7] Since it is receptive to multiple human hormones, it has become an important tool for studying human endocrinology.

From an animal welfare perspective, the authors carefully spelled out how the female mice were euthanized before obtaining their hormonally forced embryos. From a transgenic perspective, we must deal with the fact that these researchers directly caused mouse cells to absorb human DNA. No, this is not the same thing as creating chimeras, for the human DNA did not get into the mouse nuclei and merge with the mouse genomes. Also, the mouse cells were not allowed to grow to full term (indeed, they could not have done so in a culture dish).



Human DNA mixed with mouse embryos

Clearly, standard biological theory is complicated. This new study on human reproduction is right in the middle of this muddle of terms and ideas. However, things are about to get hairy, for a huge issue arises when you find out what they did next. After documenting the type (and amount) of DNA carried by the different EVs, they mixed human EV DNA with mouse embryos (see box at right).

The mouse embryos displayed multiple evidences of having absorbed human EVs. First, they could be seen under a microscope. ABs were large enough that they could even tell they 'co-localized' with the mouse nucleus. In addition, "a considerable amount of AB-derived DNA accumulated in large deposits in discrete zones in the embryo." The trophoectoderm (outer cell layer of the blastocyte stage of the embryo, or 'early skin') also showed turnover of ATP after absorption. In other words, human mitochondria or mtDNA in the EVs were powering energy production in the mouse cells.

What does this mean?

As science has delved into human reproduction, we have learned that everything is much more complicated than most people anticipated. The baby is neither accident nor parasite. It was formed by a deliberate and beautiful process that involved initial contributions of both DNA *and* RNA from both father and mother.

The process is then influenced by a continuing conversation between mother and child that begins several days before implantation even occurs. The mother's body knows the baby is there long before the mother has any evidence of swelling, morning sickness, or the skipping of the menstrual cycle.

This casts fresh light on that classic passage, Psalm 139:13–14:

> "For you formed my inward parts; you knitted me together in my mother's womb. I praise you, for I am fearfully and wonderfully made. Wonderful are your works; my soul knows it very well."

References and notes

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