

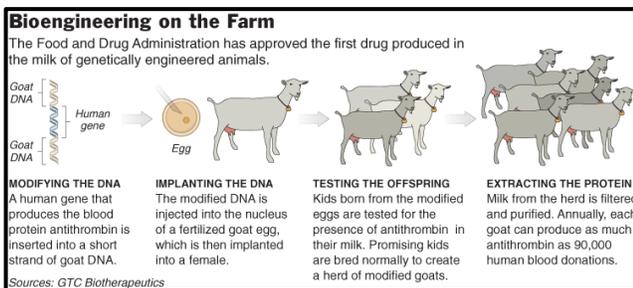


Goat Pharm: Goats in Human Medicine



As goat producers, we know the many benefits that goats provide to our lives. One of the lesser known, but important uses of goats in today's society is in modern medicine. Goats have been utilized in human medicine for their milk production, reproductive rate, ease of management, and cost efficiency. They have been instrumental in many gene therapeutic technologies and more recent discoveries include harvesting antithrombin III, spider silk proteins, monoclonal antibodies, and lysozyme for human medical use.

Goats can be used to produce antithrombin III which is a blood clotting factor that prevents clotting during surgery. People that are deficient in antithrombin, can't regulate clotting and need supplementation. The process starts with producing transgenic goats. A transgenic goat is one that has a modified genome to carry the genes of another species. In this case, antithrombin III DNA sequence is implanted into goat eggs. These eggs are then transplanted into female goats to make transgenic offspring. Antithrombin is then harvested from the milk of these transgenic offspring. Producing pharmaceuticals in this manner is easier on the goats because blood draws are not necessary, and it generates larger quantities of the drug at a lower cost than current methods.



Silk is another product that can be made from the milk of transgenic goats. Silk genes from spiders can be transferred to goats to allow them to produce silk proteins in their milk. Using goats for this technology eliminates the need for large numbers of spiders that are hard to manage. The silk can then be extracted from the milk to form a tough, light, flexible thread to be used in the production of military uniforms, artificial ligaments and tendons, and medical sutures.

Monoclonal antibodies are important in the treatment of autoimmune disorders, cancer, and tumor suppression. Monoclonal antibodies target specific disease-causing substances called antigens. The benefits of using monoclonal antibodies are that they can zero in on the disease cause while not damaging healthy tissue. They accomplish this by mimicking antibodies naturally produced in the immune

system, but only attach to defective cells. Goats offer more affordable and easier to manufacture monoclonal antibodies because they produce a high number of antibodies that are important in battling a multitude of human diseases.

Lysozyme is an enzyme naturally found in human breast milk and saliva and is important in the protection against bacteria that causes intestinal diseases in children. Goats can be engineered to produce higher levels of lysozyme in their milk. This offers a more gentle treatment than broad spectrum antibiotics because it inhibits growth of harmful bacteria rather than wiping out all bacteria in the gut. Transgenic goat milk containing lysozyme has not been approved in the United States for human consumption, but is still being researched at UC Davis. The future of this technology offers the possibility to save the lives of the over half a million children that die each year in developing nations where bacterial diseases are rampant in water, and vaccines and antibiotics are challenging to obtain.



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While not all of the research and technologies are currently widely accepted at this time, it is clear that there is a bright future in animal biotechnology. Goats provide a safer alternative to human derived pharmaceutical methods and provide an easy to manage and cost effective source. The future implications of these biotechnologies could be a great promotion to the goat industry and offer many benefits to human medicine.

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