

ANIMAL BIOTECHNOLOGY: ADVANCEMENT IN DEVELOPING COUNTRIES

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INTRODUCTION

The creating scene is horribly not ready for the new innovative and financial open doors, difficulties and dangers that lie not too far off. Despite the fact that it is trusted that biotechnology will work on the existence of each and every individual on the planet and permit more maintainable living, pivotal choices might be directed by business contemplations and the financial objectives that society views as the most significant. Around the world, domesticated animals creation is becoming quicker than some other area, and by 2020 animals is anticipated to turn into the main farming area regarding added esteem. The utilization of biotechnology will prompt a particular change in the monetary gets back from domesticated animals. Domesticated animals creation at present records for around 43% of the gross worth of farming creation. In created nations animals represents the greater part of horticultural creation, while in emerging nations the offer is around 33%. This last option share, notwithstanding, is rising rapidly a direct result of fast expansions in domesticated animals creation coming about because of populace development, urbanization, changes in ways of life and dietary propensities and expanding dispensable salaries.

WHAT IS ANIMAL BIOTECHNOLOGY?

Animal biotechnology is any innovative application that uses animals to make or adjust items. The act of Animal biotechnology started over quite a while back when people started taming and specifically reproducing animals. The cutting edge time of Animal biotechnology showed up following the revelation of the hereditary code during the 1950s.

Today new devices including expanded figuring power, genomic sequencing, cloning, regenerative medication and direct quality inclusion, and control have given individuals the possibility to decisively modify animals for a wide scope of purposes, including food

creation, clinical, and logical examination. Present day biotechnology addresses the crossing point of man's control of the climate and the rise of atomic and registering innovations. These advances, as well as the US High Court deciding that planned life could be protected, have brought forth better approaches for speeding up the utilization of animals in serving society.

EARLIEST ANIMAL BIOTECHNOLOGY

Ancient people were initially tracker finders who supported themselves by following the relocation of animals and aging of food varieties like wild products of the soil. Huntergatherer people group couldn't uphold high populace densities to some extent, since food assets were not consistent or unsurprising. It is accepted that the finish of the ice age roughly 10 000 BC made conditions reasonable for the progress from an agrarian way of life to cultivating networks. This change, known as the Neolithic Unrest, denoted the start of early horticulture. The Neolithic Upset is accepted to have happened autonomously in seven to nine significant focuses, including Mesopotamia, China, Mesoamerica, and East and West Africa (Von Baeyer, 2010). Most records distinguish Mesopotamia, otherwise called the Ripe Bow, as the beginning of early farming. Attributable to its effect on civilization, the change from agrarian to rancher has been depicted as the most significant mechanical development ever to happen in mankind's set of experiences. By becoming ranchers, people had the option to assemble in more noteworthy numbers, have better and more predictable nourishment and foster innovation controlling wild animals and plants for food creation, transportation, security, creation of important products (cotton, silk, or fleece), fighting, and friendship. Trained animals that we normally use today, including canines, felines, sheep, geese, camels, cows, pigs, and ponies began as wild animals however were changed after some time through taming rehearses (Zeder et al., 2006; Andersson, 2011).

Training is definitely not a prompt occasion. It is a total cycle described by changes in which accomplice populaces become related after some time (Zeder et al., 2006). This interaction is likewise formed by the specific ecological, natural, and conduct profiles of the objective species, as well as the social setting of the human social orders included. The common changes brought about by the training system can be outside or inside morphological changes, for example, alterations in body size, diminished cerebrum size, physiological

changes, formative changes, and social changes, like decreased dread (Jensen, 2006). In spite of the fact that training at first impacted the economies of human social orders, which were initially founded on hunting and assembling, it empowered these social orders to fill in size and to venture into new and more-testing conditions.

THE CURRENT STATE OF ANIMAL BIOTECHNOLOGY

Assisted Reproductive Technology

Since animals were first trained, numerous advancements have been created to choose for advantageous characteristics, make reproducing simpler, and make animals produce really posterity. Large numbers of those advances, including managed impregnation, in vitro treatment (IVF), undeveloped organism flushing, and cloning, include the control of Animal propagation.

Transgenics

An unmistakable area of contemporary Animal biotechnology research is the improvement of transgenic animals through hereditary designing (GE) innovation. Transgenic animals are delivered by bringing a secluded DNA section into an undeveloped organism with the goal that the subsequent Animal will communicate an ideal quality. Transgenic animals might be produced by the presentation of unfamiliar DNA got through animals of similar species, animals of various species, microorganisms, people, cells, and in vitro nucleic corrosive amalgamation. The main presently routine utilization of transgenic animals, principally mice, is in the space of human illness research. The counter thickening specialist in goat milk is the main such application to be supported by FDA (Walk 2009). As verified over, a crowd of GE dairy steers has been made that produces human bosom milk proteins in the cow's milk. That development could be 10 years or all the more away from any commercialization endeavors. Expected horticultural applications from hereditarily designing animals could incorporate superior feed use and quicker development; more protection from infection; meat that is less fatty or that has a greater amount of another helpful quality; and potentially even Animal squander that is all the more ecologically harmless.

In Vitro Fertilization

With in vitro treatment (IVF), an expert eliminates unfertilized eggs (oocytes) from the benefactor cow's ovaries, typically recuperating 6-8 useable oocytes. The oocytes mature in a hatchery and are prepared with sperm. The subsequent zygotes hatch and foster in the research facility prior to being put into the beneficiary cow. While IVF can deliver many treated undeveloped organisms, the additional cost of ET makes the strategy restrictive much of the time.

Sexing Embryos

The dairy business inclines toward calves and the meat business favors bulls. Undeveloped organism sexing techniques in dairy cattle have been created utilizing a cow-like Y-chromosome test. Specialists eliminate a couple of cells from the undeveloped organism and survey the DNA in these cells for the presence of a Y-chromosome. Presence of a Y-chromosome decides the incipient organism is male. Research is additionally creating in sperm sexing innovation.

Embryo Flushing

Rather than treating oocytes and refined the undeveloped organisms in vitro (as in IVF), undeveloped organisms are frequently delivered in vivo and afterward 'flushed' out of the uterus. As a matter of fact, undeveloped organism flushing is significantly more common and cost-proficient than IVF for the development of incipient organisms. Albeit the primary fruitful undeveloped organism flush and move was acted in bunnies in 1890, the technique is principally finished with steers today. More cows go through incipient organism flushing every year than any remaining species joined. Incipient organism flushing is fundamentally achieved by falsely inseminating a superovulated female contributor with spermatozoa from a hereditarily prevalent male. The incipient organisms are gathered from the giver after treatment happens, normally inside 6-8 days. Ox-like incipient organism assortment regularly utilizes a Foley catheter, flushing medium, and an assortment vessel. The Foley catheter is embedded into the uterus and the flushing medium is gone through the catheter. The catheter regularly contains a little inflatable that seals off the uterus and forestalls the discharge of the flushing medium. The flushing medium is permitted to stream back out of the catheter and is gathered in a vessel. Contingent upon the progress of superovulation and preparation, the

flushing medium might contain 1-30 incipient organisms. The run of the mill yield for steers that go through superovulation and planned impregnation is 5-7 reasonable incipient organisms (Senger, 2003). The incipient organisms can be inspected by a magnifying instrument for suitability and moved to a beneficiary or cryopres.

Cloning

Cloning, examined at more noteworthy length beneath, is a biotechnology strategy growing quickly and with huge public contention. The vast majority consider cloning the making of a life form that is hereditarily indistinguishable from another. Nonetheless, researchers utilize the term all the more extensively, to allude to creation of such animals as well as of hereditarily indistinguishable cells, and to replication of DNA and different particles. It likewise alludes to a type of propagation found normally in many single-celled life forms, as well as plants and animals. These distinctions in importance and utilization have created some turmoil in broad daylight banter about cloning, where the primary area of discussion connects with counterfeit cloning including higher life forms, including people.

Gene Knockout

Here specialists inactivate, or "take out," a quality by supplanting it or upsetting it with a fake piece of DNA to figure out what that specific quality does — for instance, cause or safeguard against some infection, change digestion, etc. A knockout mouse is a research facility mouse exposed to this innovation.

Food and Drug Administration (FDA)

Within the Department of Health and Human Services (HHS), FDA directs food, Animal feed fixings, and human and Animal drugs, fundamentally under the Government Food, Medication, and Restorative Demonstration (FFDCA; 21 U.S.C. §301 et seq.). FDA has expressed that most — albeit presumably not all — quality based alterations of animals for creation or helpful cases fall inside the domain of the office's Middle for Veterinary Medication (CVM), which directs them under the FFDCA as new Animal drugs. Another Animal drug (NAD) should be supported by the organization after it is shown to be protected to man and animals, as well as being successful. Guideline of transgenic animals as NADs,

nonetheless, proposes to certain eyewitnesses (e.g., the Middle for Food handling, Association of Concerned Researchers) the inborn shortcoming of existing administrative designs to answer enough to the intricacies that emerge with Animal biotechnology innovations.⁹ The NAD audit process is at the focal point of worry over FDA's expected endorsement of GE salmon for commercialization.

ETHICAL CHALLENGES

Various types of advances have been worked on in the space of biotechnology. These innovations have offered an incredible chance to the people. Biotechnologies have made it conceivable to create more nutritious food and medication and furthermore to foster a way for developing more food in saline water, almost draft land, and in focused conditions. In spite of these commitments of Animal biotechnology, various contentions have been brought up in such manner. These deliver different moral difficulties. What is the ecological effect of this innovation? One more moral test is connected with Animal's government assistance and human's wellbeing. During the most recent couple of many years, there have been various sorts of contentions are talked about in such manner. In this part, every one of the contentions and debate is introduced in short to make a last determination and propose reasonableness of the moral lattice toward the end.

PROS & CONS

The inquiry in regards to Animal biotechnology is a critical one. While explaining the solution to the inquiry, the vast majority of the favorable to Animal biotechnology defenders contend that this innovation can satisfactorily eliminate hunger from the world overwhelmingly of food inside sensible costs and furthermore ready to wipe out the greater part of the basic deadly sicknesses. The moral guideline of usefulness likewise requests such an activity as biotechnology requests, which is empower to decrease (eliminate) worldwide appetite and basic sicknesses. Gregory Pence (2002), a defender of biotechnology, maintains the view that as an innovation it stresses end of craving. The subsequent significant focal point of Animal biotechnology is connected with wellbeing, especially, with the field of present day drug advancement, antibodies, determination, and other clinical worries. As to issue of worldwide yearning, different global bodies guarantee that the total populace and our

interest have expanded quickly in the new times. Yet, our normal assets and, especially, agro-land has not expanded appropriately. In a report made by FAO (2009), it has been referenced that: "By 2050 the total populace will arrive at 9.1 billion, 34 percent higher than today. Yearly cereal creation should ascend to around 3 billion tons from 2.1 billion today and yearly meat creation should ascend by more than 200 million tons to arrive at 470 million tons" (FAO, 2009 : 2)

This multitude of information give us the message that to take care of the always expanding populace on the planet, food creation should be multiplied by 2050. How would we answer what is happening? In light of this present circumstance, the new leftist R. Shapiro states that to accomplish the necessary food we want to give more prominent need to agrarian examination like food biotechnology (Shapiro, 1999: 28-29). The examination likewise guarantees that we want to expect to become worried about food security of the ongoing expanding worldwide populace.

Biotechnology in animal cultivating has the probability to create super-useful animals, which are as to give the important measure of nutritious milk, Animal protein, and fat-less meat. It assists us with delivering crops in the profoundly saline and almost dry spell soils. This is the reason, Shapiro contends that biotechnology can assist with meeting the essential privileges of worldwide populace by adding to food security.

In regard of Shapiro's safeguard of biotechnology, we can now bring up the accompanying issue: is biotechnology the best way to meet the push of world food security? While answering this inquiry, we can investigate the data that in each year 100 tons of corn is transformed into bio-powers and 756 million tons of grains were taken care of to the animals just in 2007 (Artist, 2009: 121-122). This information suggests that we are not delivering too little food and that we don't eat the food we develop. Thus, professing to meet the food shortage it isn't vital for produce a gigantic measure of food by applying biotechnology. We have sufficient food, as a matter of fact. Notwithstanding, what we really want to do is that we ought to guarantee equivalent circulation and humankind's fair admittance to the creation.

Environmental Issues

Ecological worries emerging from arising Animal biotechnologies are generally theoretical as of now since few items have been marketed. For instance, albeit the EFSA draft logical assessment anticipated no ecological effect, it likewise noticed that restricted information were accessible on this part of Animal cloning.

Modern designers of farming biotechnology could contend that more proficient creation of animal-based feeds could decrease the assets important to deliver food and, consequently, diminish the natural weight of animal creation. Should the turn of events and boundless reception of the "EnviroPig" (tm), which creates less phosphorus in its waste, happen, it very well may be viewed as by some to be a positive ecological advantage of farming biotechnology.

The 2002 NRC Animal biotechnology report noted likely bad ecological effects of hereditarily changed animals. Departure, endurance, and quality stream into wild populaces were distinguished as main issues. Of most worry to the NRC board was the departure into the climate of GE salmon that have been hereditarily adjusted for quick development, and the probability that they could then raise with wild populaces in the climate. FDA is right now talking about this and other natural issues as they think about supporting GE salmon. Other hereditarily modified animals like fish, bugs, and shellfish could likewise possibly escape into common habitats and become wild, disturb environments, or present novel qualities in a characteristic populace.

The FDA direction on GE animals takes note of that the organization will consent to prerequisites of the Public Ecological Arrangement Act (NEPA). Ecological dangers are probably going to vary contingent on the Animal and application. For instance, the kinds of ecological worries emerging from a GE cow reared for protection from mastitis will contrast significantly from the worries raised by a GE new water fish designed to develop all the more quickly. Material to go with FDA's last direction takes note of that "albeit the office has broad involvement with ecological evaluation, including for fish, other government and state organizations have covering or integral power and skill" that FDA plans to tap. It additionally vowed to disclose the aftereffects of natural audits.

Food Safety

Startling and accidental compositional changes emerge with all types of plant and Animal hereditary adjustment, including GE, finished up the IOM-NRC report on hereditarily designed food varieties. That's what the report added, up until this point, no GE-related unfriendly human wellbeing impacts have been archived. Nonetheless, the report's creators referred to "sizeable holes" in the capacity to distinguish compositional changes brought about by all types of hereditary adjustment — whether GE or customary — and their significance for human wellbeing, and they suggested new methodologies for evaluating the security of new food varieties both when they enter the market.

Past exploration and involvement in commercializing transgenic plants proposed that adverse consequences on human wellbeing were practically nonexistent. While not declaring that hereditarily adjusted animals fundamentally produce medical conditions, all the more as of late revealed research in peer-checked on logical diaries has recommended that GMOs might raise sanitation concerns:

Australian scientists have distributed an article making sense of that the exchange from a bean for a pea quality that communicates an insect poison protein has brought about immune response creation in mice took care of the transgenic pea. The immunizer response is a marker of unfavorably susceptible response.

Italian scientists at the College of Urbino had recently shown that retention of transgenic soy by mice actuated changes in the cores of their liver cells. Late exploration showed that a re-visitation of non-transgenic soy made the noticed contrasts vanish.

Norwegian researchers at the College of Tromso exhibited that the impetus 35S CaMV, a component of the hereditary designs used to change a plant, can incite quality articulation in refined human cells. This impetus was recently accepted to work in this manner just in plants.

In the NRC Animal biotechnology report, specialists saw that the logical standards for evaluating the security of GE animals are "subjectively the equivalent" concerning non-GE animals. In any case, since GE can bring new proteins into food varieties, the potential for allergenicity, bioactivity, and additionally harmfulness reactions ought to be thought of, they said. Others have commented that animals hereditarily designed for nonfood items like drugs

or substitution organs may be of concern assuming such animals entered or impacted the food supply.

Consumer and Social Acceptance

Standards for choosing helpful attributes to be created through transgenic animals will probably be founded on the interest for explicit business qualities. Regardless of whether logical proof is persuading that GE and cloned Animal items are protected and useful for human utilization or financially significant to makers, different worries might restrict commercial center and buyer acknowledgment.

Animal Welfare

A few parts of quality exchange, and of cloning, can possibly make irresistible illness dangers as well as impeded generation. Posing a potential threat in the moral discussion are inquiries concerning whether hereditary changes, cloning, and different innovations stress animals superfluously, subject them to higher paces of illness and injury, and hurry demise. The NRC Animal agribusiness report noted, for instance, that ruminants delivered by in vitro culture or atomic cell move techniques will generally have higher birth loads and longer growth periods than those created by planned impregnation, making potential calving issues. Atomic exchange strategies to spread hereditary changes might expand dangers to the regenerative wellbeing and government assistance of both the substitute female animals and their transgenic posterity. The report referred to other proof of issues like physical, physiological, or conduct anomalies in numerous transgenic animals. A few researchers have countered that Animal government assistance issues have been overstated and will more often than not retreat, especially as the innovations are culminated. Most seem to concur, nonetheless, that animals beginning from certain types of hereditary alteration or from cloning might require nearer perception and care.

Genetic Diversity

Could the presentation of a couple hereditarily changed or cloned "superspecies" carry a lot of hereditary consistency to crowds? As hereditary variety declines, groups could be more vulnerable to illnesses, prompting enormous creation misfortunes and additionally a lot

heavier utilization of anti-toxins and other Animal medications to treat them, some have contended. A connected concern is that an overall modest bunch of "first class" makers or raisers could hold the exclusive privileges to these species, to the burden of numerous ranchers and farmers. Some Animal biotechnology specialists have highlighted the possible significance of protecting unaltered germlines in homegrown animals since they could end up being an important "quality bank" if novel irresistible sicknesses or inheritable hereditary deformities were unintentionally brought into changed subpopulations as an outcome of hereditary adjustment.

Trade Issues

In the event that the US were to be the principal country to support food items from cloned animals, how should the choice influence U.S. sends out? Any commodities of the results of Animal biotechnology would probably experience a wide range of unfamiliar administrative systems, some more prohibitive than the U.S. framework. For instance, the ongoing European Association limitation on new biotechnology items is probably going to envelop different limitations on Animal biotechnology as it really does on establish biotechnology. Then again, specialists in various different nations, including some EU individuals, have been creating clones, and one — France — has distributed its own gamble appraisal on clones that, FDA has noticed, by and large concurs with the U.S. evaluation.

Worldwide rules relating to commodities of Animal items got from biotechnology are being thought of. The Codex Impromptu Intergovernmental Team on Food sources Got from Biotechnology held an underlying gathering in September 2005 in Chiba, Japan, to decide the new work projects. Pretty much every nation, aside from the US, proposed aAnimal biotechnology project. The team consented to push ahead with a recombinant DNA (r-DNA) Animal project, explicitly to foster rules for how nations would survey the security of food sources got from r-DNA animals.⁶⁵ At a gathering in November-December 2006 in Chiba, the team, in addition to other things, checked on the creating rules, consenting to restrict their extension to food handling and dietary issues (while perceiving the significance of others like Animal government assistance, natural, and moral worries).

CONCLUSIONS

Progresses in biotechnology have developed at such a quick rate in the earlier ten years that even experts have been shocked. Beside that, leap forwards in livestock genome sequencing, atomic marker innovation progressions, and other biotechnology applications will give additional opportunities to research to improve and modernize the animals business. Later on, Animal hereditary sythesis will be accessible, taking into consideration the expectation of aAnimal's creation limit before birth, or even as an embryo, as well as the determination of animals the most ideal to a specific creation setting. For animals to live, it is important that the essential information is given over through the ages. In the event that a populace's hereditary data has sufficient variety, it is bound to change effectively to ecological changes.

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- Genetic engineering (GE) here refers to the use of molecular biology to alter cells by inserting or removing genes. GE is a form of genetic modification (GM), which refers more broadly to the practices of altering an organism's genetic composition by both GE and non-GE methods.
- NRC, *Animal Biotechnology*, p. 14.
- See Center for Food Safety website, at <http://www.centerforfoodsafety.org/geneticall7.cfm>; and the Union of Concerned Scientists website, at http://www.ucsusa.org/food_and_agriculture/. Also see discussion of FDA's guidance for industry, later in this section.
- FDA has not granted approval for any human foods from transgenic (or cloned) animals, although a "very limited number have been approved for rendering into animal feed components." The only FDA-approved product of biotechnology in wide commercial use is bovine somatotropin (bST), and there is a currently pending application for a GE salmon. (Questions and Answers about Transgenic Fish, at <http://www.fda.gov/cvm/transgen.htm>). Also see CRS Report RL34247, *Federal Regulation of Substances Generally Recognized As Safe (GRAS) and the Use of Carbon Monoxide in Packaging for Meat and Fish*, by [author name scrubbed] and Cynthia Brougher.
- For information on the deregulatory process for GE sugar beets, see CRS Report R41395, *Deregulating Genetically Engineered Alfalfa and Sugar Beets: Legal and Administrative Responses*.
- NRC, *Animal Biotechnology*, p. 163. At a January 9, 2009, meeting, the FDA Blood Products Advisory Committee ruled that a new drug to prevent clots in humans, recombinant human antithrombin III produced in the milk of GE goats, is safe and

effective. FDA could make a final regulatory decision to approve the license application of its developer, GTC Biotherapeutics, soon. Source: "FDA issues final guidance to industry on transgenic animals," Food Chemical News, January 19, 2009.

- Guidance for Industry: Regulation of Genetically Engineered Animals Containing Heritable rDNA Constructs. FDA noted that much of the new guidance will be relevant also to non-heritable rDNA constructs (such as modifications intended for gene therapy); a separate guidance for non-heritable constructs might come later.
- The agency states at the outset: "This guidance represents the Food and Drug Administration's (FDA's) current thinking on this topic. It does not create or confer any rights for or on any person and does not operate to bind FDA or the public. You can use an alternative approach if the approach satisfies the requirements of the applicable statutes and regulations."
- Federal Register, Vol. 75, No. 165, August 26, 2010. Accessible at <http://edocket.access.gpo.gov/2010/pdf/2010-21245.pdf>.
- A summary of the California bill can be found at <http://www.environmentcalifornia.org/uploads/e7/64/e764a13989bd42c8c10ffc20bc8b1db8/Fact-Sheet-GE-Salmon-Labeling-AB-88.pdf>.
- Research published in the Proceedings of the National Academy of Sciences notes that a release of just 60 GE salmon into a wild population of 60,000 would lead to the extinction of the wild population in less than 40 generations. W. M. Muir and R. D. Howard, "Possible ecological risks of transgenic organism release when transgenes affect mating success: Sexual selection and the Trojan gene hypothesis." Proceedings of the National Academy of Sciences, 96: 13853-13856 (1999).