DOWNLOAD PDF GENETIC MODIFICATION OF ANIMALS

Chapter 1 : Is it ethical to genetically modify farm animals for agriculture? | Debates | racedaydvl.com

Although genetic engineering may provide substantial benefits in areas such as biomedical science and food production, the creation and use of genetically engineered animals not only challenge the Three Rs principles, but may also raise ethical issues that go beyond considerations of animal health, animal welfare, and the Three Rs, opening up issues relating to animal integrity and/or dignity.

After paying with a dime or a quarter, perhaps, they gained entry into a world of the most bizarre animals, like a two-headed calf. Here are some of the more recent examples of bizarre genetic engineering in animals. Rather than paying your money at the circus, you might be doing so at your local grocery store to buy low-lactose milk, for example. That algae grows profusely in the presence of phosphorous. So, we work backward to the streams that feed the pond high-phosphorous hog manure. From there, we work our way back to the pigs that cause the problem in the first place. Well, engineer the pig to produce less phosphorous. Researchers found that injecting both mouse DNA and E. Coli bacteria into a pig embryo does the trick. How they came up with the idea for this creative genetic cocktail is unknown. But, it apparently works. It turns out that a bacteria arises from injecting cellulose, and that bacteria just loves to produce methane. Undeterred by this gaseous gastric challenge, researchers at the University of Alberta have engineered cows to produce fewer of these bacteria, and therefore less methane â€" 25 percent less, in fact. In case you missed out before your first birthday Dairy Cow Wikipedia Within the past couple of years, Chinese scientists have set out to infuse dairy cows with certain human genes so that they could basically start producing milk with the same advantageous qualities as human breast milk. Milk, even when not from the source in 6 above, offers a wealth of protein and vital nutrients. But alas, some ethnicities are especially burdened with this problem. Among certain groups in Asia and Africa, as many as 90 percent of individuals are lactose intolerant. So, the geneticists have arrived to address this challenge. They injected genes from organisms called archaea, that are quite talented at limiting lactose production, into cow embryos. Three actually carried the low-lactose gene. She is a genetically modified Holstein that will be eagerly tested when she starts lactating to see just how much the lactose content in her milk has been reduced. Lactation generally starts in dairy cattle at 25 months of age, so stay tuned. There is a hope that, if this research proves successful herds of low-lactose cows could be benefiting broad swaths of the population in just years. So far, this does not sound too appetizing. However, this effort expanded omega-3 fatty acids in the milk by over percent. Hey skeeter, just drop dead male-mosquito Leszek. This may disappoint the females, but not the researchers. The hope was that this material could be produced on a large enough scale to be used in everything from parachute cords to artificial ligaments. John Sperling parlayed his marriage of the internet and education into a net worth exceeding a billion dollars. However, perhaps because researchers thought that the cat was a little lower on the evolutionary ladder, they went forward with efforts to clone a cat. So, these are ten of the more interesting genetically modified GE animals. Such efforts generate more than a minor amount of controversy. She suggested that this was a morally irresponsible direction in which to head, and that unintended consequences of such alterations in GE animals often appear, like deformities. Helen Wallace also expressed concern, citing food safety issues. One only needs to ponder that E. Coli and the pig embryo to imagine that she may have a point. The whole effort is nonetheless more than fascinating, and scientists are unlikely to show much constraint in the name of scientific progress, dangers notwithstanding.

Chapter 2 : Genetically modified animals | racedaydvl.com

Genetic modification of animals involves altering genetic material by adding, changing or removing certain DNA sequences in a way that does not occur naturally. The purpose is to modify a characteristic of an animal or introduce a new trait, such as disease resistance or enhanced growth.

Print Introduction Genetic modification of an animal involves altering its genetic material by adding, changing or removing certain DNA sequences in a way that does not occur naturally. It aims to modify specific characteristics of an animal or introduce a new trait, such as disease resistance or enhanced growth. DNA is the genetic material of an organism and carries the instructions for all the characteristics that an organism inherits. While this technology has so far been used in plants for agriculture and in micro-organisms to produce enzymes, the potential application of genetic modification techniques to animals is also being researched. The EU has established a legal framework regulating GM food and feed derived products as well as the release of living GMOs into the environment in order to ensure a high level of protection of human and animal health, and the environment. While it acknowledges the broader societal, political and economic concerns over GM animals, EFSA does not consider these aspects when carrying out its scientific assessments. However, scientific developments suggest submissions may be made in future across a range of species. Therefore, as a proactive measure, the European Commission has asked EFSA to develop comprehensive risk assessment guidelines that would be used by companies and risk assessment bodies to evaluate the possible risks for food and feed safety, the environment as well as related animal health and welfare aspects. These will help possible future applicants when submitting their applications to EFSA. Food, feed and animal welfare risk assessment This guidance document, published in January , outlines specific data requirements and the methodology to be followed for risk assessment should applications for food and feed derived from GM animals be submitted for market authorisation in the EU. The risk assessment approach compares GM animals and derived food and feed with their respective conventional counterparts, integrating food and feed safety as well as animal health and welfare aspects. The basic assumption of this type of comparative assessment, which is required under current EU legislation for all GMOs submitted for market authorisation, is that food and feed from conventionally-bred animals have a history of safe use and therefore can serve as a baseline for the risk assessment of food and feed derived from GM animals. The guidance gives recommendations for the post-market monitoring and surveillance PMM of GM animals and derived food and feed. PMM seeks to identify any potential unintended effects related to the genetic modification which might arise after the product has been authorised for placement on the market. Guidance on the risk assessment of food and feed from genetically modified animals and on animal health and welfare aspects Environmental risk assessment of GM animals In May , EFSA published its guidance on the environmental risk assessment ERA of GM animals. This guidance document also includes health and welfare aspects of the GM animals. Based on the wide range of GM research thought to be currently underway related to several different animal species, the European Commission requested that EFSA develop environmental risk assessment guidance for GM fish, insects, mammals and birds. Firstly, a six-stage assessment procedure should be completed. This step-by-step process, laid down in EU legislation, should begin with identifying potential hazards and the extent of human, animal and environmental exposure to them. The next three stages are characterising the hazard, exposure and risk. Finally applicants must outline risk management strategies and provide an overall risk evaluation. Secondly, applicants must address seven areas of potential risk for GM fish, insects, mammals or birds: Thirdly, the guidance highlights a number of cross-cutting considerations that should be factored into the full ERA process. These include which non-GM animals to use as comparators, the use of appropriate surrogates if necessary, and recommendations on identifying environments into which GM animals are likely to be released. Separate public consultations were launched on the guidance documents to ensure that the broadest possible range of comments and opinions from consumers, Member States, and stakeholders were taken into account before being finalised. Hundreds of comments made during these consultations by interested parties and stakeholders were assessed by EFSA and, where appropriate, incorporated into the final guidance documents. What are genetically modified GM animals? A genetically modified animal is one whose genetic material has been altered by adding, changing or removing certain DNA sequences in a way that does not occur naturally. This process is carried out to introduce a new trait or change a characteristic such as the disease resistance of an animal. Acting on a request from the European Commission, EFSA developed comprehensive guidance for the risk assessment of food and feed derived from GM animals, including an evaluation of animal health and welfare and environmental safety. The Authority has also developed a guidance document on the environmental risk assessment ERA of GM animals, which covers GM fish, insects, mammals and birds. No GM animals, or food or feed from GM animals, have been authorised for placement on the market in the EU, nor have any applications been made by industry for approval. If no such applications have been made, why have these guidance documents been developed? Scientific developments suggest future submissions for GM animals may be made for a number of species. In some countries outside the EU, regulators are already assessing the safety of GM animal products developed for food and feed purposes. Based on these considerations, and as a proactive measure to assure consumer safety, the European Commission requested that EFSA develop comprehensive risk assessment guidance for GM animals. They provide clear guidance to risk assessors and biotech companies. In the event of making any future application for market approval, applicants would be obliged to use. EFSA has developed two guidance documents that outline specific data requirements and the methodology for the risk assessment of GM animals. The first relates to the safety assessment of food and feed derived from GM animals and includes considerations on animal health and welfare aspects. The second document provides guidance on how to conduct an environmental risk assessment ERA of living GM animals to be placed on the EU market and includes health and welfare aspects. This guidance document, published in January , relates to the safety assessment of food and feed derived from genetically modified animals and on animal health and welfare aspects. The document outlines specific data requirements and the methodology to be followed for risk assessment should applications for food and feed derived from GM animals be submitted for market authorisation in the EU. The guidance document outlines a risk assessment approach to compare GM animals and derived food and feed with their respective conventional counterparts. The basic assumption of this type of comparative assessment is that food and feed from conventionally-bred animals have a history of safe use and therefore can serve as a baseline for the risk assessment of food and feed derived from GM animals. Important components of the risk assessment include molecular characterisation, compositional analysis and assessment of toxicity, nutritional aspects and potential allergenicity. For example, experts will assess whether food and feed from GM animals are as nutritious to humans and animals as those from conventionally-bred animals. The guidance document also outlines the methodology required for the comparative assessment of health and welfare aspects of GM animals. This assessment is applied in two ways: For further information on animal health and welfare aspects, see question The guidance also includes recommendations for the post-market monitoring and surveillance of food and feed derived from GM animals on a case-by case basis. The next three stages are characterising the hazard and exposure and - from the combination of both - the potential risk. The guidance also highlights a number of cross-cutting considerations that should be factored into the full ERA process. These include which non-GM animals to use as comparators, the use of appropriate surrogates if this is considered necessary, and recommendations for the assessment of potential long-term effects of GM animals as well as for the uncertainty analysis. EFSA recognises that there are concerns about animal health and welfare related to the development of GM animals for food and feed purposes. Requirements for the assessment of animal health and welfare are integrated in both its guidance documents on GM animals. The guidance of food and feed derived from GM animals highlights the need for extensive comparative analysis of the characteristics and traits of GM animals, including physiological parameters, with those of their conventional counterparts. It also proposes that health and welfare should be assessed at all stages of development of the GM animal. The recommended assessment strategy covers the laboratory setting where the GM animal is initially developed, experimental field trials outside the laboratory involving a higher number of animals and trials with large numbers of animals carried out in a commercial setting prior to authorisation. In these cases, the document provides guidance on data requirements and outlines the obligation for applicants to show the health and welfare of the animals are not significantly affected compared to an appropriate comparator â€” a non-GM counterpart that is used as a baseline against which to assess the GM animal. Where no comparator can be identified, the health and welfare of the GM animal itself should be considered. If experiments need to be carried out to generate data, these should comply with EU legislation regarding the use of animals for scientific purposes. Post-market monitoring and surveillance is also considered necessary to identify unintended effects of the genetic modification on the health and welfare of the GM animal arising after it has been authorised for placement on the market. What about the ethical concerns surrounding GM animals? EFSA is only responsible for evaluating the food and feed safety, environmental safety and health and welfare aspects of GM animals. While EFSA acknowledges the broader societal, political and economic debates about GMOs and GM animals, these considerations are not taken into account in the scientific process of risk assessment. What is the difference between GM animals and cloned animals? Genetic modification involves the altering of the genetic material of an animal. In a genetically modified animal, DNA sequences have been inserted, removed or modified in order to introduce a new trait or change a characteristic such as the disease resistance of an animal. The technology used is known as recombinant-DNA technology and was first applied in the s. Animal cloning results in the production of an animal that is a genetically identical copy of the original.

Chapter 3 : Is the world ready for GM animals? - BBC News

Genetic modification involves the altering of the genetic material of an animal. In a genetically modified animal, DNA sequences have been inserted, removed or modified in order to introduce a new trait or change a characteristic such as the disease resistance of an animal.

The two are similar, but not identical. Scientists and the biotechnology companies who sponsor them use genetic engineering GE on farm animals in an attempt to achieve higher productivity e. Nevertheless, many of the animals presently cloned are genetically modified stock. Seamark, So, what is wrong with that? Stated simply, two things set GE and cloning technologies apart from traditional breeding. Poole, Sheep, cattle, pigs, chickens and 35 species of fish have already been genetically modified in attempts to increase their production of milk and meat beyond the limits their bodies can bear without damage. Apart from the immense suffering they cause to animals not that that can be so easily pushed aside , these technologies are unrivalled, ridiculously costly and inefficient, and, most importantly, unsafe to both animals and humans. That is because genetic engineering is a hit-or-miss process. In fact, between 85 and 99 percent of genetically altered embryos die before they are born. Speaking of the media, the real results from these cruelest of animal experiments are kept from the public eye. Pictures of GE animals are extremely difficult to find. Research projects dealing with the development of transgenic livestock are granted much subsidy from both industry and state. Nor is it today, and therefore there is a great knowledge deficiency concerning the risks. The effects of this cannot be predicted in advance, for example, researchers may assume that removing a receptor gene for thrombin a blood-clotting enzyme in mice will affect their control of blood coagulation, but only by creating the animals can they discover that such a deletion causes half of the altered embryos to bleed from multiple sites so that they die in the womb. Griffin et al, Other mice have been produced with no legs, with only one eye or with grossly deformed organs. These GE animal experiments are without question among the cruelest and most sadistic forms of animal exploitation existing today. They must be stopped. That is of course, a false premise. The mice, in contrast, suffer principally from bowel disorders and are clearly not a very helpful model of the disease. In fact, that is usually the exception, not the rule. Yes, genetics do play a role to our susceptibility to many diseases, but factors such as diet, lifestyle and environmental pollution are far more important in determining whether or not we will succumb to a particular disease at a particular time. Most of us in fact, are carrying the genes for a variety of serious diseases right now, but we are not suffering from these diseases. The gene will perform in a completely different way in the mouse from the way it is expressed in its natural human environment. There is one more issue. Research clearly shows that the brains of animals housed in standard barren laboratory cages are severely abnormal. Garner, The sheer boredom of cage life literally drives them insane, causing brain damage, which must surely render much accepted research invalid. Thousands of chips can be processed in a matter of hours. The results are more accurate and sensitive than animal tests and when human DNA is used are directly relevant to humans. Lovett, Confined to the lab? Rabbits can escape relatively easy from enclosures and possess a very high reproduction potential. In Australia wild rabbit that had developed a resistance to myxomatosis could explosively propagate at the end of the eighties of the last century. The consequences for the affected ecosystems were very severe. Fish are farmed in the direct surroundings of its wild co-specifics. Reports of escapes from aquaculture systems where fish is kept in cages are quite common. Farmed salmons from aquaculture endanger the declining populations of wild Atlantic salmon by spreading of parasites and diseases. Additionally populations of Atlantic salmon that are well adapted to their habitat are endangered by a contamination of their gene pool with genes from farmed salmon. This means that genes that are unfavourable for the survival of the species may enter into wild populations of Atlantic salmon. Gathering Force Worldwide, literally billions of dollars are spent on research and development of genetically modified plants, approximately in a 2: When one considers that, it is not surprising that the mass media globally tends to promote GE technologies. Even when scientists achieve their objectives, the animals suffer. But we are told none of these things. Furthermore, the technology is no longer only confined to the laboratory. But it does not have to be like this. You, as an individual, can help to put an end to this madness. Below are some ideas to get you started: Do not buy meat from animals that have been genetically modified or cloned. If you hear of a company selling meat, fish or milk from genetically modified animals, write to them highlighting the cruelty mentioned above. If the Chief Executive of the company refuses to take action, petitions can be very useful. Write letters to your local press, telling them of the welfare implications of genetic modification and asking the public to boycott animal products from genetically modified species and animal testing in general. The last point is particularly important. If people were aware of the facts, demand for GE animal products would be very small indeed! Hence, companies would not produce them as it would not be profitable to do so. Public outrage has been significant in reducing conventional animal testing over the past decades. It can be so again. Spreading the truth will help to end this needless suffering. We cannot treat animals like this. We do not have that right. Please do not stand by and let it happen. Biotechnological advances in goat reproduction. Journal of Animal Sciences, Animals with novel genes. Regulatory sequences from the avian skeletal a-actin gene directs high level expression of human insulin-like growth factor-I cDNA in skeletal muscle of transgenic pigs. Journal of Animal Science, The generation of transgenic sheep by pronuclear mikroinjection. Genetic transformation of mouse embryos by microinjection of purified DNA.

Chapter 4 : Genetically modified animals | European Food Safety Authority

Another medical application of genetic modification aims to improve the suitability of animal organs for xenotransplantation, e.g. in pigs (Luo, Lin, Bolund, Jensen, & Sorensen,). Lastly, animals have also been modified to improve, or rather, add 'aesthetic' qualities (Gong et al., , Wan et al.,).

Pictures Thu Jul 25, The breed is the largest fluorescent fish in the world which are able to mate and reproduce, said Yu-Ho Lin, Chairman of Jy Lin. Dolly, who born on July 5 Dolly, who born on July 5 after her creation by the Roslin Institute research centre, died in February after the decision was taken to "euthanase" her when it was discovered she had a progressive lung disease. She has now been preserved for public display at the Museum. Israeli scientists at the Agriculture department of the university have genetically engineered bare-skinned chickens as part of a research project to Israeli scientists at the Agriculture department of the university have genetically engineered bare-skinned chickens as part of a research project to develop succulent, low fat poultry that is environmentally friendly. The naked chicken, as the bird has been dubbed, would also save poultry farmers large amounts of money on ventilation to prevent their chickens from overheating. The team -- at Framingham, Massachusetts -based Genzyme Transgenics Corporation, Tufts University and Louisiana State University -- said their three female goats, shown in this undated photograph, were born last fall. The female camel calf was born on April 8, created from cells harvested from the ovary of an adult she-camel which were grown in culture The female camel calf was born on April 8, created from cells harvested from the ovary of an adult she-camel which were grown in culture before being frozen in liquid nitrogen. Pieraz-Cryozootech-Stallion was born February 25, from the genes of castrated endurance champion Pieraz, an Arab Pieraz-Cryozootech-Stallion was born February 25, from the genes of castrated endurance champion Pieraz, an Arab stallion. The genetics companies LTR-CIZ and Cryzootech say that it is the first clone reproduced for the purposes of making a breeding animal from a sterile animal. The mice may help researchers find treatments for muscular dystrophy or the muscle wasting that accompanies cancer or AIDS. They took a fluorescent protein, much like that produced by some sea anenomes, and inserted it into the cell of a beagle. The name "Ruppy" is a combination of the words "Ruby" and "Puppy", and the offsprings of such dogs will possess the same fluorescent gene as their mothers. Scientists are genetically modifying a bizarre looking Mexican salamander, which according to ancient mythology is a Scientists are genetically modifying a bizarre looking Mexican salamander, which according to ancient mythology is a transformed Aztec god, in the hope its ability to regenerate body parts will one day help human amputees. Also known as "water monsters," the half-foot-long cm-long axolotl is nearly extinct in its only remaining habitat: Italian scientists, working with colleagues in the United States, have created a genetically modified breed of super-muscle mice Italian scientists, working with colleagues in the United States, have created a genetically modified breed of super-muscle mice which do not succumb to as much muscle wasting that occurs during ageing, and are trying to apply the discovery to fight muscular dystrophy. The baby rhesus monkey is named ANDi, backward for ANDi who was born on October 2, is seen in this undated handout photo released on January Many of those used in the research at the biotechnological centre are clones of genetically-modified rabbits, which have Many of those used in the research at the biotechnological centre are clones of genetically-modified rabbits, which have had human genes added to their genomes. Scientists say milk from the resulting rabbits contains protein that helps treat cancer in humans. The center, just outside Moscow, keeps dozens of these transgenic rabbits for research purposes. R holds "Flequillo" bangs , a year-old genetically engineered donkey, touted as the "smallest in the world," at the Buenos Aires Zoo April 12,

Chapter 5 : 10 Genetically Modified Animals You Can Buy - Listverse

Genetic modification is always a controversial topic. However, before you hold a view, it's better to know some animals genetically modified like enviropig and sudden-death mosquito.

Perzigian Scientists are now capable of creating new species of animals by taking genetic material from one, or more, plants or animals, and genetically engineering them into the genes of another animal. This allows scientists to create animals that are on one hand completely foreign to the earth and on the other, specifically tailored to possess only the traits that humans desire in animals. This means that science can engineer farm animals to grow faster, have healthier meat and flesh, and be less able to feel the pain and suffering often associated with the conditions present in modern factory farms. Genetically engineered animals are also created to help medical researchers in their quest to find cures for genetic disease, like breast cancer. This use of modern technology is not without its drawbacks or its critics. By genetically engineering farm and research animals, critics argue, we may be undoing what nature has worked to create over millions of years. Natural animals are specifically adapted to a given environment and when science manipulates the genes of a few species in the ecosystem, the entire balance of the ecosystem might fall completely apart causing an unknown number of natural animal species to grow ever extinct. Others argue that animals should possess, at a bare minimum, the right to be free of genetic manipulation or a reduction in their natural abilities. Despite this debate, the law in both the United States and in Europe, tends to support genetic engineering research and development by allowing genetically engineered animals to be patented. Patents give scientists a monopoly over their genetically engineered animal species, something before unheard of in modern economic systems. Typically, animals could be owned, but never entire species. Regardless, we must not wait and see what the effects genetic engineering animals will have on the earth. We must form educated opinions, lobby for government regulation, and hope that whatever direction that bioengineering takes us, is a positive step towards decreased animal suffering, increased environmental sustainability, and an overall compassionate regard for the earth and its precious life. Genetic Engineering and Animals: Perzigian With the advent and rapid development of genetic engineering technology, the animal rights movement is currently facing one of its greatest challenges and dilemmas. Critics believe that bioengineering poses greater risks than it does benefits. A Review of the Technology Transgenic animals are animals that have, through genetic engineering, genes from other plants and animals. Unlike controlled breeding, which is confined to the genetic material contained in a single species, modern genetic engineering permits an almost limitless scope of modification and introduction of otherwise foreign genetic material. This permits specific traits, and not the host of other traits common from crossbreeding, to be effectively introduced into new, transgenic animal species. Genetic engineering is able to create whole organisms that are not natural to the planet, and whose specific genetic make-up is as much a result of human manipulation as it is natural selection. For further information on the basics of genetic engineering, see Detailed Discussion. Pros of Genetic Engineering With regard to the agricultural industry, transgenic farm animals can be created, that are better able to resist disease, grow faster, and more efficiently reproduce than current species of animals. Transgenic sheep can be created to produce better wool and cows can be engineered to more efficiently convert grain into higher quality milk and meat. Transgenic salmon, salmon that grow larger and at a faster rate than natural varieties, have already been created and farmed. One of the more controversial uses of this technology is found in recent proposals to engineer farm animals to be non-sentient, without the "stress" genes that cause them great suffering during their lives on industrial factory farms. Since sentience, the ability to feel pain and experience suffering, is the basis upon which much animal rights ideology is based, some argue that these types of transgenic farm animals would help to solve many of the animal welfare issues posed by industrial factory farms. For more information on the risks, see Detailed Discussion. The bio-medical research industry has been equally influenced by genetic engineering technology. Instead of relying on numerous test animals to research modern diseases and appropriate drug therapies, the bio-medical community can now rely on specifically engineered animal research models. Such animals are bred to have an increase susceptibility to modern diseases, like hereditary breast cancer. Transgenic animals have made research of such diseases more accurate, less expensive and faster, while at the same time permitting accurate results with the use of fewer individual animals in any given study. Also, transgenic animals, like goats, sheep, and cattle, have been engineered to produce large amounts of complex human proteins in their milk, something very useful in the creation of therapeutic drugs. By engineering these animals to release these and other proteins in their milk, the mass production of high quality therapeutic drugs is made less costly, easier to manufacture, and at the expense of fewer animal lives than what was formerly the case. Biotechnology breakthroughs in whole animal cloning have led to many suggestions that such technology could be used to clone endangered species. Cloning provides a great support blanket for the modern extinction crisis and can help to ensure that critical numbers of endangered species will exist for generations to come. Cons of Genetic Engineering In general, opponents of genetic engineering assert that such technology creates a huge diminution in the standing of animals, leaving them as nothing more than "test tubes with tails," only of benefit for the exploitive practices of factory farming, and drug and organ manufacturing. Creating more efficient agricultural animals threatens weaken the genetic diversity of the herd and thereby make them more susceptible to new strains of infectious disease. Also, if transgenic farm animals ever escape into wild populations, they can have profoundly disturbing effects on the natural environment, including a complete elimination of natural populations and the processes of natural selection. Animal rights advocates also argue that each species should enjoy an inherent, natural right to be free of genetic manipulation in any form. This is especially the case when genetic engineering is used as a means of depriving animals of their sentience, of exacerbating the cruel, horrific conditions of the modern factory farm and biomedical lab. Although the sheer numbers may decline, the actual suffering experienced by agricultural and research animals may increase. Cloning endangered species, although useful as a last resort, may unwisely shift our efforts away from protecting the critical habitat necessary to sustain viable endangered species populations. Habitat protection is as important to saving endangered species as is the specific renewal and maintenance of viable numbers within a population. Since limited funds exist, habitat protection, and not expensive cloning technology, should be the focus of our endangered species protection efforts. For more information on the inherent dangers, see Detailed Discussion. In the United States, most research and farm animals are excluded from federal protection. This provides a huge incentive for the biotechnology industry to continually research and develop novel transgenic animal creations. With patents, researchers can now own and monopolize entire animal species, something unheard of prior to modern genetic engineering. The Supreme Court has upheld transgenic animal patents without any review of the potential ethical and environmental risks associated with the technology involved. Most modern legislation regarding genetic engineering and cloning technology ensued following the birth of Dolly the sheep, the first multi-cellular organism cloned from adult cells. The primary objectives of the subsequent United States and EU legislation was to ban human cloning while at the same time ensuring that genetic engineering research continued unimpeded by such legislation. Patent protection effectively promotes genetic engineering research and helps to ensure its speedy development. For more information on U. Conclusion There is no doubt that genetic engineering of animals will continue well into the future. One thing is for sure, we must not sit complacently by as this technology rapidly changes the fabric of our existence from the inside out. We must not wait and see what the effects are. We must form educated opinions, inspire legislative regulation, and hope that whatever direction that bioengineering takes us, is a positive step towards decreased animal suffering, increased environmental sustainability, and an overall compassionate regard for the earth and its precious life. Johnson, 15 Animal L. Related cases Diamond v. Chakrabarty , U. Supreme Court held that genetically engineered animals are patentable subject matter.

Chapter 6 : Advancements in Genetic Engineering- Open Access Journals

Genetically modified (genetically engineered) animals are becoming more vital to the discovery and development of cures and treatments for many serious diseases. By altering the DNA or transferring DNA to an animal, we can develop certain proteins that may be used in medical treatment.

References Things like glow-in-the-dark cats may seem to be the stuff of science fiction, but they were actually created several years ago. Today you can find animals that are genetically modified who have had their DNA combined with that of other animals or altered in order to create a new group of genes. So it can process and digest phosphorus better, and then it is unnecessary to feed them with additional phosphorus. This kind of pig is created for the current issue that normal pig manure contains high levels of phosphorus, so if it is used as fertilizer, this chemical gets into the water, leading to algae blooms and oxygen depletion as well as death of marine life. If we were able to make it on a larger scale, it would be useful for parachute cords, artificial ligaments, and everything in between. Nexia Biotechnologies announced in the creation of one of the genetically engineered animals to fix this problem. To do this, they inserted a dragline silk gene from spiders into goats. You can use the silk milk produced by the goats to create Biosteel, a web-like material. This fish is actually able to grow twice as fast as typical fish, despite having the same odor, color, texture, and flavor of standard salmon. These Atlantic salmon were genetically engineered to add the growth hormone of Chinook salmon so they can produce the necessary growth hormone throughout the entire year. The hormone stays activated thanks to a gene of ocean pout, a fish that is eel-like. There are still debates, however, as to whether this fish is safe to eat. If the FDA approves them, they would not need a label indicating that these are genetically modified. Cows naturally produce methane due to their digestion process, specifically a bacterium that results from the cow diet of grass and hay, both of which are high in cellulose. Agriculture research scientists from the University of Alberta worked to identify this bacterium that is responsible for methane. Afterwards, they created cattle with 25 percent less production of methane compared to average cows. This disease causes a million deaths annually as well as infecting additional million people. These malaria fighting mosquitoes are able to resist the plasmodium parasite, which means that it is almost impossible for them to become infected with the disease. The thing, however, is that plasmodium parasites can evolve quickly, leading to some people wondering if we would be better off by killing mosquitoes. To deal with this option, some scientists created sudden-death mosquitos which pass the relevant gene to their offspring. This gene means that the baby mosquitoes would die naturally of old age before reaching sexual maturity. The issue, however, is that without mosquitoes, the entire ecosystem would be affected with facing extinction of bats and other predators. Vietnamese scientists created this, the first of genetically modified animals originating from Vietnam. Scientists used the gene shooting method to insert a mixture of jellyfish proteins and gold dust into the eggs of a seahorse. While gold seahorses are pretty, gene shooting has many other implications, such as treating diabetes and other incurable diseases by replacement of problematic DNA within the body. Tilapia farmers, however, want to take this a step further and make male tilapia more common than female ones. This is because females "mouthbrood", which means they hold their eggs in their mouths over an extended period of time. Because of mouthbrooding, tilapia farmers rather have males on their farms. The scientists say they bred a species which has naked neck with a standard broiler chicken. There are, however, some drawbacks. The feathers on chickens help protect them from harsh weather, parasites, and even overzealous cocks during mating. Eduard Kac uses genetic engineering for creating works of art that are alive. In May , he introduced Alba, an albino rabbit that will glow fluorescent when in blue light, known as his "GFP bunny. He then took Alba home to be his pet. To create Alba, a French research institute injected fluorescent jellyfish protein in a rabbit egg which was fertilized. They never agreed for Kac to take Alba home and there were animal rights debates, but Alba died before the issue could be resolved. American and Japanese scientists in inserted genes in cats to help resist FIV. In order to mark the cells more easily, they also inserted a green fluorescent protein and both genes transferred to feline eggs. This let the scientists examine how this resistant gene developed within the cats by examination under a microscope. The cats are always normal during the day, but sometimes glow at night.

Chapter 7 : Genetically modified organism - Wikipedia

BIO's Guidance for Genetically Engineered Animal Stewardship provides information for the development and implementation of stewardship programs for product developers in industry and academia that plan to engage in research, development and commercialization of GE animals.

Is it ethical to genetically modify farm animals for agriculture? Researchers have genetically engineered a number of mammals, from laboratory animals to farm animals, as well as birds, fish and insects. However, farm animals, such as sheep, goats and cows, can also be genetically modified to enhance specific characteristics. These can include milk production and disease resistance, as well as improving the nutritional value of the products they are farmed for. For example, cows, goats and sheep have been genetically engineered to express specific proteins in their milk. Do the benefits of genetically modified farm animals outweigh the risks? Yes Genetic engineering holds great potential in many fields, including agriculture, medicine and industry. Genetically modified farm animals are being used to produce important medicinal products, such as antibodies , in large quantities. These products can be used for the treatment of many different human conditions. The current production system for such products is donated human blood, which is in limited supply due to a lack of donors. No The transfer of genetic material from one species to another raises potentially serious health issues for animals and humans. There is a risk that new diseases from genetically engineered animals could be spread to non-genetically engineered animals, and even humans. Is genetic modification of farm animals ethical? Genetic engineering of animals is strictly controlled by animal cruelty legislations in many countries and is always carefully scrutinised by teams of experts before being approved for wider use. No Many of the embryos that undergo genetic engineering procedures do not survive. Genetic modification can put animals at risk of harm. Yes Not all genetic engineering directly benefits humans. It can also be used to remove characteristics that cause injury, for example, selecting for cattle without horns. Animals have been used to help humans for millennia. The percentage of genetically modified farm animals is tiny compared to the number of animals slaughtered for humans to eat. This practice is widely seen as morally acceptable. No Research could use other organisms such as plants and bacteria to mass produce therapies for human medicine. For example, genetically engineered cereal grains to produce human proteins. The cost to the animal always outweighs the benefits as, by carrying out genetic engineering, we are violating their rights. Genetic engineering often involves modifying animals for reasons that have no benefit for that species, and could potentially cause them pain and discomfort. Life should not be regarded as a product that can be altered and played with for economic benefit. Is there a thorough regulatory process for genetic modification of farm animals? Yes It has been suggested that, as a rule, genetically engineered animals should be no worse off than the equivalent stock would be if they were not genetically engineered. The Animal Welfare Act, a federal law passed in the UK in , requires all entities looking to carry out research with animals to have their programme reviewed before they go ahead, have veterinary care programmes in place and staff that are qualified to care for live animals. It helps monitor and maintain certain standards, including input from the public, when it comes to genetically engineering animals. No Genetic engineering of animals is a relatively new practice and is mainly used in research. As a result regulations for its use in farming are minimal. For regulations that have been put in place for the use of animals in research, it is often unclear how they would be applied to genetic engineering of farm animals and few guidelines refer to it directly. This page was last updated on Related Content:

Chapter 8 : 8 Bizarre Examples of Genetic Engineering in Animals

Transgenic animals are animals that have, through genetic engineering, genes from other plants and animals. Unlike controlled breeding, which is confined to the genetic material contained in a single species, modern genetic engineering permits an almost limitless scope of modification and introduction of otherwise foreign genetic material.

Advancements in Genetic Engineering journal provide an opportunity to share the information on Genetic engineering techniques and its application to numerous fields of research, biotechnology, and medicine among scientists and researchers. The journal includes a wide range of fields in its discipline to create a platform for the authors to make their contribution towards the journal and the editorial office promises a peer review process for the submitted manuscripts for the quality of publishing. Genetically engineering foods Genetic engineering modifies the DNA of crops to display specific traits, such as a resistance to pesticides and herbicides. Genetically engineered GE crops are often also referred to as genetically modified organisms GMOs or biotech crops. In recent years, the Food and Drug Administration began paving the way for approval of GM animals, such as salmon. The first genetically modified animal approved for human consumption, supporters of GM salmon claim it grows at twice the normal rate. The probe thereby hybridizes to single-stranded nucleic acid DNA or RNA whose base sequence allows probe-target base pairing due to complementarity between the probe and target. Gene cloning Gene cloning is the process in which a gene of interest is located and copied cloned out of DNA extracted from an organism? When DNA is extracted from an organism, all of its genes are extracted at one time. This DNA, which contains thousands of different genes. A gene library can be defined as a collection of living bacteria colonies that have been transformed with different pieces of DNA from the organism that is the source of the gene of interest. If a library is to have a colony of bacteria for every gene, it will consist of tens of thousands of colonies or clones. RFLPs can be used in many different settings to accomplish different objectives. Each organism inherits its DNA from its parents. Since DNA is replicated with each generation, any given sequence can be passed on to the next generation. A target sequence is any segment of DNA that bind to a probe by forming complementary base pairs. A probe is a sequence of single-stranded DNA that has been tagged with radioactivity or an enzyme so that the probe can be detected. When a probe base pairs to its target, the investigator can detect this binding and know where the target sequence is since the probe is detectable. RFLP produces a series of bands when a Southern blot is performed with a particular combination of restriction enzyme and probe sequence. Trans-Genesis Transgenes is the process of introducing an exogenous gene â€” called a transgene â€” into a living organism so that the organism will exhibit a new property and transmit that property to its offspring. Transgenes can be facilitated by liposomes, plasmid vectors, viral vectors, pronuclear injection, protoplast fusion, and ballistic DNA injection. Transgenesis is the process of introducing an exogenous gene â€" called a transgene â€" into a living organism so that the organism will exhibit a new property and transmit that property to its offspring. Insulin genetics The Insulin genetics provides instructions for producing the hormone insulin, which is necessary for the control of glucose levels in the blood. Glucose is a simple sugar and the primary energy source for most cells in the body. Insulin is produced in a precursor form called proinsulin, which consists of a single chain of protein building blocks amino acids. The proinsulin chain is cut cleaved to form individual pieces called the A and B chains, which are joined together by connections called disulfide bonds to form insulin. This biological process occurs in all living organisms and is the basis for biological inheritance. This is carried out by an enzyme? The two separated strands will act as templates for making the new strands of DNA. Ethics in genetic engineering Ethical issues, including concerns for animal welfare, can arise at all stages in the generation and life span of an individual genetically engineered animal. The following sections detail some of the issues that have arisen during the peer-driven guidelines development process and associated impact analysis consultations carried out by the CCAC. The CCAC works to an accepted ethic of animal use in science. However, despite the steps taken to minimize pain and distress, there is evidence of public concerns that go beyond the Three Rs and animal welfare regarding the creation and use of genetically engineered animals. Recombinant DNA Recombinant DNA rDNA molecules are DNAmolecules formed by laboratory methods of genetic recombination such as molecular cloning to bring together genetic material from multiple sources, creating sequences that would not otherwise be found in biological organisms. A series of procedures that are used to join together recombine DNA segments. Under certain conditions, a recombinant DNA molecule can enter a cell and replicate there, either on its own or after it has been integrated into a chromosome. For nuclear encoded genes, splicing takes place within the nucleus after or concurrently with transcription. Green genetic engineering Green genetic engineering as it is used in agriculture and the food industry is all about creating new species of plants that are highly resistant to pests and pesticides or contain higher levels of nutrients than traditional plants. The idea is not new; in fact, farmers have been doing this for thousands of years, crossing and breeding plants to produce new and stronger species. Which benefits and risks would be linked to the cultivation of genetically modified crops in Switzerland? How should research and cultivation be regulated? Which ethical questions have to be considered? The Forum for Genetic Research promotes fact-based dialogue based on science. Genetic engineering crops Genetically engineering crops , biotech crops are plants used in agriculture, the DNA of which has been modified using genetic Engineering techniques In most cases the aim is to introduce a new trait to the plant which does not occur naturally in the species. Examples in food crops include resistance to certain pests, diseases, or environmental conditions, reduction of spoilage, or resistance to chemical treatments e. Examples in non-food crops include production of pharmaceutical agents, biofuels, and other industrially useful goods, as well as for bioremediation. Related Journals of Genetic engineering crops Cell Biology: Functional Genomics Functional genomics is a field of molecular biology that attempts to make use of the vast wealth of data produced by genomic and transcriptomic projects such as genome sequencing projects and RNA-seq to describe gene and protein functions and interactions. The aim of functional genomics studies is to understand the complex relationship between genotype and phenotype on a global genome-wide scale. Studies investigate a range of processes such as transcription, translation and epigenetic regulation. We encourage articles involving genome-wide DNA methylation mapping and gene expression including histone replacement, messenger RNA interference miRNA as well any other epigenetic studies.

Chapter 9 : Genetic Modification - The Environmental Literacy Council

Frankenstein may be a work of fiction, but these experiments are real. For decades, scientists have been tweaking the genes of animals to give them desirable (and sometimes just plain bizarre) traits.

Genetic engineering techniques A gene gun uses biolistics to insert DNA into plant tissue. Creating a genetically modified organism GMO is a multi-step process. Genetic engineers must isolated the gene they wish to insert into the host organism. This can be taken from a cell containing the gene [3] or artificially synthesised. The gene is then combined with other genetic elements, including a promoter and terminator region and a selectable marker. Bacteria can be induced to take up foreign DNA by being exposed to certain stresses e. As only a single cell is transformed with genetic material, the organism must be regenerated from that single cell. In plants this is accomplished through tissue c ulture. Gene targeting techniques, which creates double-stranded breaks and takes advantage on the cells natural homologous recombination repair systems, have been developed to target insertion to exact locations. Genome editing uses artificially engineered nucleases that create breaks at specific points. There are four families of engineered nucleases: History of genetic engineering Herbert Boyer pictured and Stanley Cohen created the first genetically modified organism in Humans have domesticated plants and animals since around 12, BCE, using selective breeding or artificial selection as contrasted with natural selection. They took a gene from a bacterium that provided resistance to the antibiotic kanamycin , inserted it into a plasmid and then induced another bacteria to incorporate the plasmid. The bacteria was then able to survive in the presence of kanamycin. This included genes from the toad Xenopus laevis in , creating the first GMO expressing a gene from an organism from different kingdom. The first transgenic livestock were produced in [35] and the first animal to synthesise transgenic proteins in their milk were mice, [36] engineered to produce human tissue plasminogen activator in Bevan , Richard B. Flavell and Mary-Dell Chilton. They infected tobacco with Agrobacterium transformed with an antibiotic resistance gene and through tissue culture techniques were able to grow a new plant containing the resistance gene. Genentech announced the production of genetically engineered human insulin in Craig Venter Institute , announced that they had created the first synthetic bacterial genome. Genes have been transferred within the same species , across species and even across kingdoms. New genes can be introduced, or endogenous genes can be enhanced, altered or knocked out. GMOs have been used in biological and medical research, production of pharmaceutical drugs , [57] experimental medicine e. Genetically modified bacteria Bacteria were the first organisms to be genetically modified in the laboratory, due to the relative ease of modifying their chromosomes. Genes and other genetic information from a wide range of organisms can be added to a plasmid and inserted into bacteria for storage and modification. Once a gene is isolated it can be stored inside the bacteria, providing an unlimited supply for research. They can be used to produce enzymes , amino acids , flavourings , and other compounds used in food production. With the advent of genetic engineering, new genetic changes can easily be introduced into these bacteria. Most food-producing bacteria are lactic acid bacteria , and this is where the majority of research into genetically engineering food-producing bacteria has gone. The bacteria can be modified to operate more efficiently, reduce toxic byproduct production, increase output, create improved compounds, and remove unnecessary pathways. Generally the bacteria are grown to a large volume before the gene encoding the protein is activated. The bacteria are then harvested and the desired protein purified from them. Ideas include altering gut bacteria so they destroy harmful bacteria, or using bacteria to replace or increase deficient enzymes or proteins. One research focus is to modify Lactobacillus , bacteria that naturally provide some protection against HIV , with genes that will further enhance this protection. If the bacteria do not form colonies inside the patient, the person must repeatedly ingest the modified bacteria in order to get the required doses. Enabling the bacteria to form a colony could provide a more long-term solution, but could also raise safety concerns as interactions between bacteria and the human body are less well understood than with traditional drugs. There are concerns that horizontal gene transfer to other bacteria could have unknown effects. As of there are clinical trials underway testing the efficacy and safety of these treatments. Crops have been inoculated with Rhizobia and more recently Azospirillum to increase their production or to allow them to be grown outside their original habitat. Application of Bacillus thuringiensis Bt and other bacteria can help protect crops from insect infestation and plant diseases. With advances in genetic engineering, these bacteria have been manipulated for increased efficiency and expanded host range. Markers have also been added to aid in tracing the spread of the bacteria. The bacteria that naturally colonise certain crops have also been modified, in some cases to express the Bt genes responsible for pest resistance. Pseudomonas strains of bacteria cause frost damage by nucleating water into ice crystals around themselves. This led to the development of ice-minus bacteria , that have the ice-forming genes removed. When applied to crops they can compete with the ice-plus bacteria and confer some frost resistance. Other uses for genetically modified bacteria include bioremediation , where the bacteria are used to convert pollutants into a less toxic form. Genetic engineering can increase the levels of the enzymes used to degrade a toxin or to make the bacteria more stable under environmental conditions. Genetically modified virus Viruses are often modified so they can be used as vectors for inserting genetic information into other organisms. In researchers genetically modified a virus to express spinach defensin proteins. One has increased malolactic fermentation efficiency, while the other prevents the production of dangerous ethyl carbamate compounds during fermentation. Genetically modified plant Kenyans examining insect-resistant transgenic Bt corn Transgenic plants have been engineered for scientific research, to create new colours in plants, and to create different crops. In research, plants are engineered to help discover the functions of certain genes. One way to do this is to knock out the gene of interest and see what phenotype develops. Another strategy is to attach the gene to a strong promoter and see what happens when it is over expressed. A common technique used to find out where the gene is expressed is to attach it to GUS or a similar reporter gene that allows visualisation of the location. One of the added genes was for the blue plant pigment delphinidin cloned from the pansy. Work has been done with duckweed Lemna minor , [87] the algae Chlamydomonas reinhardtii [88] and the moss Physcomitrella patens. Genetically modified crops Genetically modified crops GM crops, or biotech crops are plants used in agriculture , the DNA of which has been modified using genetic engineering techniques. In most cases the aim is to introduce a new trait to the plant which does not occur naturally in the species. Examples in food crops include resistance to certain pests, diseases, or environmental conditions, reduction of spoilage, or resistance to chemical treatments e. Examples in non-food crops include production of pharmaceutical agents , biofuels , and other industrially useful goods, as well as for bioremediation. A variety of classification schemes have been proposed [96] that order genetically modified organisms based on the nature of introduced genotypical changes rather than the process of genetic engineering. While some genetically modified plants are developed by the introduction of a gene originating from distant, sexually incompatible species into the host genome, cisgenic plants contain genes that have been isolated either directly from the host species or from sexually compatible species. The new genes are introduced using recombinant DNA methods and gene transfer. Some scientists hope that the approval process of cisgenic plants might be simpler than that of proper transgenics, [97] but it remains to be seen. Many trees face the threat of invasive plants and diseases, such as the emerald ash borer in North American and the fungal disease, Ceratocystis platani , in European plane trees. A suggested solution to increase the resilience of threatened tree species is to genetically modify individuals by transferring resistant genes. The papaya ringspot virus PRSV devastated papaya trees in Hawaii in the twentieth century until transgenic papaya plants were given pathogen-derived resistance. A main concern with using genetic modification for conservation purposes is that a transgenic species may no longer bear enough resemblance to the original species to truly claim that the original species is being conserved. Instead, the transgenic species may be genetically different enough to be considered a new species, thus diminishing the conservation worth of genetic modification. Genetically modified mammals Some chimeras , like the blotched mouse shown, are created through genetic modification techniques like gene targeting. Genetically modified mammals are an important category of genetically modified organisms. Brinster and Richard Palmiter developed the techniques responsible for transgenic mice, rats, rabbits, sheep, and pigs in the early s, and established many of the first transgenic models of human disease, including the first carcinoma caused by a transgene. The process of genetically engineering animals is a slow, tedious, and expensive process. However, new technologies are making genetic modifications easier and more precise.

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Transgenic animals are used as experimental models to perform phenotypic and for testing in biomedical research. By altering the DNA or transferring DNA to an animal, we can develop certain proteins that may be used in medical treatment. Stable expressions of human proteins have been developed in many animals, including sheep, pigs, and rats. Human-alphaantitrypsin, [] which has been tested in sheep and is used in treating humans with this deficiency and transgenic pigs with human-histo-compatibility have been studied in the hopes that the organs will be suitable for transplant with less chances of rejection. Scientists have genetically engineered several organisms, including some mammals, to include green fluorescent protein GFP , first observed in the jellyfish, Aequorea victoria in , for medical research purposes Chalfie , Shimoura , and Tsien were awarded the Nobel prize in Chemistry in for the discovery and development of GFP []. For example, fluorescent pigs have been bred to study human organ transplants xenotransplantation , regenerating ocular photoreceptor cells , and other topics. Food and Drug Administration approved the first human biological drug produced from such an animal, a goat. The drug, ATryn , is an anticoagulant which reduces the probability of blood clots during surgery or childbirth. An example are pigs that are genetically modified so that their organs can no longer carry retroviruses which can pose a danger to humans, when transplanted into them. Such animals, which are hence composed of a mixture of cells from more than one species, are called " chimeras " [] [] One project, undertaken by Pablo Ross of the University of California, involves the growing of a human pancreas inside a pig. The project ended in The enzyme was introduced into the pig chromosome by pronuclear microinjection. With this enzyme, the animal is able to digest cereal grain phosphorus. In , Chinese scientists generated dairy cows genetically engineered with genes from human beings to produce milk that would be the same as human breast milk. Aside from milk production, the researchers claim these transgenic cows to be identical to regular cows. Although gene therapy is still relatively new, it has had some successes. In both cases, the genetically modified organism used was a myxoma virus , but for opposite purposes: In the Iberian peninsula, the European wild rabbit population has experienced a sharp decline from viral diseases and overhunting. The European wild rabbit population in Australia faces the opposite problem: The same myxoma virus was genetically modified to lower fertility in the Australian rabbit population. Genetically modified fish Genetically modified fish are used for scientific research and as pets, and are being considered for use as food and as aquatic pollution sensors.