DOWNLOAD PDF MOLECULAR FARMING OF PLANTS AND ANIMALS FOR HUMAN AND VETERINARY MEDICINE

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History[edit] The first recombinant plant-derived protein PDP was human serum albumin , initially produced in in transgenic tobacco and potato plants. While the United States Department of Agriculture has approved planting of pharma crops in every state, most testing has taken place in Hawaii, Nebraska, Iowa, and Wisconsin. Proof of concept has been established for the production of many therapeutic proteins , including antibodies , blood products , cytokines , growth factors , hormones , recombinant enzymes and human and veterinary vaccines. However, in late , just as ProdiGene was ramping up production of trypsin for commercial launch [11] it was discovered that volunteer plants left over from the prior harvest of one of their GM corn products were harvested with the conventional soybean crop later planted in that field. This raised a furor and set the pharming field back, dramatically. A compromise was reached, but Ventria withdrew its permit to plant in Missouri due to unrelated circumstances. The industry has slowly recovered, by focusing on pharming in simple plants grown in bioreactors and on growing GM crops in greenhouses. In Dow AgroSciences received USDA approval to market a vaccine for poultry against Newcastle disease , produced in plant cell culture â€" the first plant-produced vaccine approved in the U. Blood, egg white, seminal plasma , and urine are other theoretically possible systems, but all have drawbacks. Blood, for instance, as of cannot store high levels of stable recombinant proteins, and biologically active proteins in blood may alter the health of the animals. Hamsters and rabbits have also been used in preliminary studies because of their faster breeding. One approach to this technology is the creation of a transgenic mammal that can produce the biopharmaceutical in its milk or blood or urine. Once an animal is produced, typically using the pronuclear microinjection method, it becomes efficacious to use cloning technology to create additional offspring that carry the favorable modified genome. Marketing permission was granted by the European Medicines Agency in August The patentability of such biopharmaceuticals and their process of manufacture is uncertain. Probably, the biopharmaceuticals themselves so made are unpatentable, assuming that they are chemically identical to the preexisting drugs that they imitate. Several 19th century United States Supreme Court decisions hold that a previously known natural product manufactured by artificial means cannot be patented. This issue has not yet been decided in the courts. In plants[edit] Plant-made pharmaceuticals PMPs , also referred to as pharming, is a sub-sector of the biotechnology industry that involves the process of genetically engineering plants so that they can produce certain types of therapeutically important proteins and associated molecules such as peptides and secondary metabolites. The proteins and molecules can then be harvested and used to produce pharmaceuticals. Recently, several non-crop plants such as the duckweed Lemna minor or the moss Physcomitrella patens have shown to be useful for the production of biopharmaceuticals. These frugal organisms can be cultivated in bioreactors as opposed to being grown in fields , secrete the transformed proteins into the growth medium and, thus, substantially reduce the burden of protein purification in preparing recombinant proteins for medical use. Additionally, an Israeli company, Protalix, has developed a method to produce therapeutics in cultured transgenic carrot or tobacco cells. The advantage of rice and flax is that they are self-pollinating, and thus gene flow issues see below are avoided. However, human error could still result in pharm crops entering the food supply. Using a minor crop such as safflower or tobacco, avoids the greater political pressures and risk to the food supply involved with using staple crops such as beans or rice. Regulation of the release of genetic modified organisms The regulation of genetic engineering concerns the approaches taken by governments to assess and manage the risks associated with the development and release of genetically modified crops. There are differences in the regulation of GM crops â€" including those used for pharming â€" between countries, with some of the most marked differences occurring between the USA and Europe. Regulation varies in a given country depending on the intended use of the products of the genetic engineering. For example, a crop not intended for food use is generally not reviewed by authorities responsible for food safety. There are also specific controversies around pharming. Advantages[edit] Plants do not carry pathogens that might be dangerous to human health. Additionally, on the level of pharmacologically active proteins , there are no proteins in plants that are similar to human proteins. On the other hand, plants are still sufficiently closely related to animals and humans that they are able to correctly process and configure both animal and human proteins. Their seeds and fruits also provide sterile packaging containers for the valuable therapeutics and guarantee a certain storage life. Expanding the existing microbial systems, although feasible for some therapeutic products, is not a satisfactory option on several grounds. For these reasons, science has been exploring other options for producing proteins of therapeutic value. The World Health Organization estimates that nearly 3 million people die each year from vaccine preventable disease, mostly in Africa. Diseases such as measles and hepatitis lead to deaths in countries where the people cannot afford the high costs of vaccines, but pharm crops could help solve this problem. In the case of genetically modified GM foods, concerns focus on the safety of the food for human consumption. In response, it has been argued that the genes that enhance a crop in some way, such as drought resistance or pesticide resistance , are not believed to affect the food itself. Other GM foods in development, such as fruits designed to ripen faster or grow larger, are believed not to affect humans any differently from non-GM varieties. Considerable attention is focused, therefore, on the restraint and caution necessary to protect both consumer health and environmental biodiversity. They worry that once production begins, the altered plants might find their way into the food supply or cross-pollinate with conventional, non-GM crops. Activists also are concerned about the power of business. Was in process of launching trypsin product in [11] when later that year its field test crops contaminated conventional crops. Stine, [60] who owns one of the biggest soybeans genetics companies in the US.

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Chapter 2 : Agriculture and Aquaculture Journal Impact Factor | Scholarly Journals

Read "Molecular Farming of Plants and Animals for Human and Veterinary Medicine" by with Rakuten Kobo. Molecular farming has been hailed as the "third wave" of genetically-modified organisms produced through biote.

Micro- and nano-electronic components and devices have increasingly been combined with biological systems [2] like medical implants , biosensors , lab-on-a-chip devices etc. Biomaterials â€" any matter, surface, or construct that interacts with biological systems. As a science, biomaterials is about fifty years old. The study of biomaterials is called biomaterials science. It has experienced steady and strong growth over its history, with many companies investing large amounts of money into the development of new products. Biomaterials science encompasses elements of medicine , biology , chemistry , tissue engineering and materials science. Biomedical science â€" healthcare science, also known as biomedical science, is a set of applied sciences applying portions of natural science or formal science , or both, to develop knowledge, interventions, or technology of use in healthcare or public health. Explaining physiological mechanisms operating in pathological processes , however, pathophysiology can be regarded as basic science. Biomonitoring â€" measurement of the body burden [4] of toxic chemical compounds , elements , or their metabolites , in biological substances. Since they are polymers , biopolymers contain monomeric units that are covalently bonded to form larger structures. There are three main classes of biopolymers, classified according to the monomeric units used and the structure of the biopolymer formed: Food science â€" applied science devoted to the study of food. Activities of food scientists include the development of new food products, design of processes to produce and conserve these foods, choice of packaging materials, shelf-life studies, study of the effects of food on the human body, sensory evaluation of products using panels or potential consumers, as well as microbiological, physical texture and rheology and chemical testing. The field also includes studies of intragenomic phenomena such as heterosis , epistasis , pleiotropy and other interactions between loci and alleles within the genome. Kinesiology â€" Kinesiology, also known as human kinetics, is the scientific study of human movement. Kinesiology addresses physiological, mechanical, and psychological mechanisms. Applications of kinesiology to human health include: Play media Parasagittal MRI of the head, with aliasing artifacts nose and forehead appear at the back of the head Medical imaging is the technique and process used to create images of the human body or parts and function thereof for clinical or physiological research purposes Optogenetics â€" Optogenetics is a neuromodulation technique employed in neuroscience that uses a combination of techniques from optics and genetics to control and monitor the activities of individual neurons in living tissue â€"even within freely-moving animalsâ€"and to precisely measure the effects of those manipulations in real-time. Spatially-precise neuronal control is achieved using optogenetic actuators like channelrhodopsin , halorhodopsin , and archaerhodopsin , while temporally-precise recordings can be made with the help of optogenetic sensors like Clomeleon, Mermaid, and SuperClomeleon. More specifically, it is the study of the interactions that occur between a living organism and chemicals that affect normal or abnormal biochemical function. If substances have medicinal properties, they are considered pharmaceuticals. Population dynamics â€" Population dynamics is the study of short-term and long-term changes in the size and age composition of populations , and the biological and environmental processes influencing those changes. Population dynamics deals with the way populations are affected by birth and death rates , and by immigration and emigration , and studies topics such as ageing populations or population decline. Proteomics â€" Proteomics is the large-scale study of proteins , particularly their structures and functions. The proteome is the entire set of proteins, [34] produced or modified by an organism or system. This varies with time and distinct requirements, or stresses, that a cell or organism undergoes. University of California Press.

Chapter 3 : List of life sciences - Wikipedia

Molecular Farming of Plants and Animals for Human and Veterinary Medicine Edited by L. Erickson University of Guelph, Department (~f Plant Agriculture, Geulph, Ontario, Canada.

This paper will address the transmission of antibiotic-resistant microorganisms between animals and humans in a One Health perspective. Overview The epidemiology of antimicrobial-resistant microorganisms at the humanâ€”animal interface involves complex and largely unpredictable systems that include transmission routes of resistant bacteria as well as resistance genes and the impact of antimicrobial selective pressures in several reservoirs animals, humans, and the environment Figure A It involves a multitude of potential transmission routes and vehicles, antimicrobial selective pressures and other ecological drivers, as well as more Thus the One Health approach is useful when it comes to addressing zoonotic transmission of pathogens that are resistant to antimicrobials, because we need to engage a wide range of stakeholders including farmers, veterinarians, food safety professionals, medical doctors, as well as environment and wildlife experts in monitoring and control activities. The feature that particularly differentiates antimicrobial resistance from other food safetyâ€"related problems is the role of the chemical driver, the antimicrobials, which selects for the resistant bacteria that subsequently can spread between animals and humans. Antimicrobials are used widely to prevent or treat disease in food animals. It is estimated that the volumes of antimicrobials used in food animals exceeds the use in humans worldwide, and nearly all the classes of antimicrobials that are used for humans are also being used in food animals, including the newest classes of drugs such as third- and fourth-generation cephalosporins, fluoroquinolones, glycopeptides, and streptogramins Aarestrup et al. The massive use of antimicrobial agents in agriculture has supported the intensification of modern food-animal production since the early s by facilitating earlier weaning, higher animal densities, and the use of cheaper feed sources, among others, and has most likely contributed to increased outputs and lower prices of meat. However, the gains have come at a cost, which is being borne, in part, by other stakeholders, in particular public health. Furthermore, the production gains achieved by indiscriminate antimicrobial usage in the s production systems may to a large extent be achievable by other means in modern and more environmentally sustainable food-animal production systems, where higher emphasis is placed on animal welfare, a smaller environmental footprint, and disease prevention through hygiene and intelligent herd management. The amounts and patterns of antimicrobials used in food animals is the major determinant for the propagation of resistant bacteria in the animal reservoir. Thus, the levels and patterns of resistance observed in food animals to a wide extent reflect the patterns of drug usage; however, other determinants also play a part, such as spread of bacterial clones between animals, in particular vertical spread between the generations e. Bacteria as well as antibiotic residues from food-animal production are spread widely in the environment, mainly with manure, where it affects bacteria in the environment as well as in wild fauna. Thus, the environment and wild fauna can become reservoirs of resistance and a source of reintroduction of resistant bacteria into the food-animal and human reservoirs. The public health consequences of zoonotic antibiotic resistance are invariably difficult to assess for a number of reasons: In the most comprehensive assessment of the problem to date, an expert group gathered by the World Health Organization WHO , the Food and Agriculture Organization FAO , and the World Animal Health Organization OIE in concluded there is clear evidence of adverse human health consequences due to resistant organ isms resulting from non-human usage of antimicrobials. These consequences include infections that would not have otherwise occurred, increased frequency of treatment failures in some cases death and increased severity of infections, as documented for instance by fluoroquinolone resistant human Salmonella infections. Evidence shows that the amount and pattern of non-human usage of antimicrobials impact on the occurrence of resistant bacteria in animals and on food commodities and thereby human exposure to these resistant bacteria. The foodborne route is the major transmission pathway for resistant bacteria and resistance genes from food animals to humans, but other routes of transmission exist. There is much less data available on the public health impact of antimicrobial usage in aquaculture, horticulture and companion animals. For the purpose of intervention, there are multiple potential points of control that may be used, depending on the specific nature of the problem. Identifying and intervening at the most efficient points of control requires a comprehensive assessment of the risk based on integrated monitoring, as well as good collaboration between all the stakeholders involved. Already in the early s, findings of resistant Salmonella in food animals and humans, and studies that showed that they could pass their resistance traits on to other enteric bacteria, gave rise to major concern in the United Kingdom. The United States and the rest of the world, however, did not follow the same path. In the mids the detection of vancomycin-resistant Enterococcus f aecium as well as quinolone-resistant Salmonella and Campylobacter in food animals and evidence of their spread to humans elevated the scientific and public concerns to new levels. Recently a number of antimicrobial-resistant pathogens have emerged in the food-production chain: These emergences can all be associated with the use of antimicrobial agents in food animals, and they have led to renewed attention to the use of certain types of antimicrobials in food animals that are considered critically important for human health Aarestrup et al. Residues of antimicrobial agents that may occur in animal-derived products appear to be of a lesser concern for public health than the resistant bacteria. A WHO expert committee concluded in that residues of antimicrobials in foods, under present regulatory regimes, represent a significantly less important human health risk than the risk related to antimicrobial-resistant bacteria in food FAO et al. Use of antibiotic resistance genes as marker genes in genetically modified plants, which may serve as feed for animals or food for humans, has also raised concerns in this context. Increased overlap between humans and wildlife populations may increase the risk for novel disease emergence in wildlife in a recent study by Wheeler et al. Antibiotic-resistant bacteria were found in reptile feces from tourism sites, whereas no resistance was detected at protected beaches on more isolated islands, indicating that human contact may be the source of resistant enteric bacteria E. Recognizing the continued emergence of new bacterial pathogens, in animals, that are resistant to antimicrobials considered critically important for human therapy, there is good reason to further strengthen global efforts to prevent and control the emergence and spread of resistance from animals to humans. The One Health concept and its focus on the interdependencies and links between the three health systems of animals, humans, and the environment, respectively, are extremely well suited for this purpose. National and International Attempts to Monitor and Control Transmission of Antimicrobial Resistance Between Animals and Humans A large number of national and international rules and regulations are involved in the regulation and control of food-borne antimicrobial resistance. This code of practice gives recommendation for the responsibilities of regulatory authorities, the veterinary pharmaceutical industry, veterinarians, and wholesale and retail distributors and producers. As examples, regulatory authorities should ensure that antimicrobial agents are prescription only thus, not used for growth promotion , only drugs that are efficacious and with well-established dosages should be approved, surveillance programmes for monitoring drug use and resistance should be established, research should be encouraged, and all unused drug should be collected and destroyed. It is stated that veterinarians should only prescribe drugs for animals under their care and ensure that the drugs used are aimed at clinical disease. In addition, the professional organization should develop clinical practice guidelines on responsible use. In addition to these international recommendations a large number of different national legislation regulates the use of antimicrobial agents and the control of antimicrobial-resistant bacteria. Below are some examples of control options and their effect on resistance. Possible Risk Management Options Currently from a practical and legal point of view, control options are usually divided into pre-harvest e. Thus, the control of antimicrobial resistance can be controlled either through management of the selective pressure leading to resistance or through interventions aimed at limiting the spread of the selected resistance. Continuous and updated information is essential to guide risk management and to determine the effect of possible interventions. Thus, continuous monitoring of the occurrence of food-borne pathogens, antimicrobial resistance, and drug use as well as research studies determining the effects of interventions and the associations between different reservoirs, the spread of bacterial clones and genes, and risk factors for the development and spread of resistance are essential for efficient risk management. Monitoring of Antimicrobial Resistance Information on the occurrence of antimicrobial resistance is needed at the local, national, and international levels to guide policy and detect changes that require intervention strategies. Such monitoring programmes should be continuous and standardized, enabling comparison between countries as well as over time. The main aspects to be considered in establishing a monitoring system include animal or food groups to be sampled, the number of samples to take and the strategy for collection, bacterial species to be included, methods for susceptibility testing, antimicrobials to test, break points to use, quality control, data to be reported, analysis and interpretation of data, and reporting Bager et al. Recently a proposal for a common protocol for antimicrobial resistance monitoring was proposed for Europe EFSA, It can be hoped that this can form the basis for a future establishment of a common global standard. Monitoring of Antimicrobial Drug Use Data on drug usage is essential for the development of national and international policies for containment of antimicrobial resistance. In Denmark, a programme called Vetstat was implemented in August and has since collected data from veterinarians, pharmacies, and feed mills. The programme monitors the use of all prescription medicine in production animals, including sera and vaccines, as well as the use of coccidiostatics Stege et al. Today Vetstat enables the authorities to assess usage patterns at the level of the individual herd and individual prescriber. Furthermore, many veterinarians use Vetstat daily as a tool in relation to their service for their clients farmers. Because all data are converted to defined animal daily doses ADDs it is possible to compare the use of antibiotics on one farm with a similar average for the whole country. Each year, DVFA will issue threshold limits for antimicrobial consumption in pigs other animal species may follow later. The limits for pigs in were as follows: Young pigs, including young females over 30 kg , excluding sows, gilts, and boars: Sows, gilts, and boars: If the average antimicrobial consumption in a holding within a 9-month period exceeds one or more of the threshold limits, DVFA may issue an order or injunction the yellow card compelling the owner of the holding, in collaboration with the veterinary practitioner, to reduce the antimicrobial consumption in the holding below the threshold limits within 9 months. The total use of antimicrobials in swine has been reduced by 21 percent in Denmark, following the introduction of the Yellow Card Initiative, when comparing national data on usage for the years and , respectively DVFA, Recently a first attempt to collect comparable veterinary antibiotic usage data for the European countries was carried out Figure A Grave et al. The rather large differences between the different countries can be explained by differences in types of animal production systems, different veterinary antibiotic policies and practices, or differences in disease occurrence. Comparison of the sales of veterinary antibacterial agents between 10 European countries mg per kg meat produced. Limiting the Selective Pressure Prescription One of the basic principles in the Codex Alimentarius codes of practice to minimize and contain antimicrobial resistance is that all antimicrobial agents should be on prescription, and the right to prescribe drugs should rest with the veterinarians or other animal health professionals with an appropriate education. Prescribing and dispensing should be separated to avoid conflicts of interest. Drug Approval All drugs intended for human or animal use undergo an approval process before licensing, which differs somewhat between countries even though some general guidelines are used. The traditional risks that are considered in the approval process include proof of efficacy against the target pathogen, target animal safety, environmental safety, and human health safety with a focus on toxicological effects residues. Human hazards related to the transfer of antimicrobial resistance are of more recent concern and have so far only had limited focus in the approval process. In the U. Food and Drug Administration FDA published a guidance document for a qualitative risk assessment to be performed prior to the approval of an antimicrobial agent for animal use FDA, This guideline outlines an evidence-based approach to preventing antimicrobial resistance from emerging in humans as a consequence of using antimicrobial agents in animals. This guidance requires a ranking into high, medium, and low of the following factors: These three factors are then joined together in an overall risk estimate ranked as high, medium, or low. In combining the three factors, the most value is put on the consequence estimate. Thus, already in the approval process consideration as to whether antimicrobials are of critical importance for human health can be taken into account. As an example, in Australia fluoroquinolone use was never approved for use in food animals. Fluoroquinolone-resistant strains are either at very low levels or nonexistent in food animals. The rates of resistance are also very low in human isolates in comparison to other countries e. It is also possible in the approval process to implement certain restrictions. Thus, it could be possible to approve drugs for a limited number of indications, without accepted extralabel or off-label usage or for some modes of administration only e. This has recently been done by FDA in the United States, which in July issued an order coming into effect by October prohibiting the extralabel use of cephalosporin antimicrobial drugs in food-producing animals FDA, Treatment formularies and prescriber guidelines In Denmark a veterinary treatment formulary was published by the National Food Institute in Pedersen et al. This formulary was mainly targeted toward concerns for human health, but it also took into account the prevalence of antimicrobial resistance among bacteria causing infections in animals. In the formulary, antimicrobials for every disease and associated pathogen s are listed and scored within the following four categories: It is difficult to evaluate the specific effects of the guidelines. However, considering that one of the main recommendations in Denmark has been to limit the use of macrolides and cephalosporins and that the use of these classes of antimicrobials for pigs, which constitutes 80 percent of the usage for animals in Denmark, has increased by 30 and 33 percent, respectively, between and DANMAP, , the effect seems to be minor. Restrictions on the use of certain antimicrobial classes It is also possible to implement national or international restrictions on certain antimicrobial classes. As mentioned, in Australia fluoroquinolones are not registered for use in food animals. In Denmark fluoroquinolones were approved for use in production animals in , and in the following years an emergence of resistance was observed. Thus, fluoroquinolones can only be used in food-producing animals if a current laboratory test of resistance patterns shows that no other antimicrobial will be effective in treatment of the disease in question and this has been reported to the regional veterinary officer. Furthermore, fluoroquinolones can only be administered by injection and by the veterinarian only. This reduced the total usage of fluoroquinolones in animals in Denmark from kg in to 49 kg in Figure A FIGURE A The total consumption of fluoroquinolones in Danish food-animal production, following voluntary and regulatory efforts to reduce the amounts used in and , respectively. This could tempt some veterinarians to overprescribe antibiotics because of the financial benefit. An example from Denmark showed that limiting the possibility of veterinarians to profit from the sale of drugs led to a reduction in total usage. Furthermore, a veterinarian can only sell antibiotics to a farmer during a visit and for a maximum of 5 days of use. The rest has to be bought at a pharmacy.

Chapter 4 : Show all Jobs | Theater Jobs in Higher Education

Fifteen years on, the first technical proteins produced in transgenic plants are on the market, and proof of concept has been established for the production of many therapeutic proteins, including antibodies, blood products, cytokines, growth factors, hormones, recombinant enzymes and human and veterinary vaccines (Twyman et al,).

General considerations Historical background Historical evidence, like that from currently developing nations, indicates that veterinary medicine originally developed in response to the needs of pastoral and agricultural man along with human medicine. It seems likely that a veterinary profession existed throughout a large area of Africa and Asia from at least bce. Ancient Egyptian literature includes monographs on both animal and human diseases. Evidence of the parallel development of human and veterinary medicine is found in the writings of Hippocrates on medicine and of Aristotle , who described the symptomatology and therapy of the diseases of animals, including man. Early Greek scholars, noting the similarities of medical problems among the many animal species, taught both human and veterinary medicine. In the late 4th century bce, Alexander the Great designed programs involving the study of animals, and medical writings of the Romans show that some of the most important early observations on the natural history of disease were made by men who wrote chiefly about agriculture, particularly the aspect involving domesticated animals. Most of the earliest suggestions of relationships between human health and animal diseases were part of folklore, magic, or religious practice. From the pre-Christian Era to about , the distinctions between the practices of human and veterinary medicine were not clear-cut; this was especially true in the fields of obstetrics and orthopedics, in which animal doctors in rural areas often delivered babies and set human-bone fractures. It was realized, however, that training in one field was inadequate for practicing in the other, and the two fields were separated. Rinderpest cattle plague was the most important livestock disease from the 5th century until control methods were developed. Many aspects of animal diseases are best understood in terms of population or herd phenomena; for example, herds of livestock, rather than individual animals, are vaccinated against specific diseases, and housing, nutrition, and breeding practices are related to the likelihood of illness in the herd. The work of Pasteur was of fundamental significance to general medicine and to agriculture. Veterinarians became concerned with foods of animal origin after the discovery of microorganisms and their identification with diseases in man and other animals. Efforts were directed toward protecting humans from diseases of animal origin, primarily those transmitted through meat or dairy products. Modern principles of food hygiene, first established for the dairy and meat-packing industries in the 19th and early 20th centuries, have been generally applied to other food-related industries. The veterinary profession, especially in Europe, assumed a major role in early food-hygiene programs. Inadequate diet claims many thousands of lives each day. When the lack of adequate food to meet present needs for an estimated world population of more than 4,,, in the s is coupled with the prediction that the population may increase to 7,,, by the year , it becomes obvious that animal-food supplies must be increased. One way in which this might be accomplished is by learning to control the diseases that afflict animals throughout the world, especially in the developing nations of Asia and Africa, where the population is expanding most rapidly. Most of the information concerning animal diseases, however, applies to domesticated animals such as pigs, cattle, and sheep, which are relatively unimportant as food sources in these nations. Remarkably little is known of the diseases of the goat , the water buffalo , the camel , the elephant , the yak , the llama , or the alpaca ; all are domesticated animals upon which the economies of many developing countries depend. It is in these countries that increased animal production resulting from the development of methods for the control and eradication of diseases affecting these animals is most urgently needed. Despite the development of various effective methods of disease control, substantial quantities of meat and milk are lost each year throughout the world. In countries in which animal-disease control is not yet adequately developed, the loss of animal protein from disease is about 30 to 40 percent of the quantity available in certain underdeveloped areas. In addition, such countries also suffer losses resulting from poor husbandry practices. Role in human disease Animals have long been recognized as agents of human disease. Man has probably been bitten, stung, kicked, and gored by animals for as long as he has been on earth; in addition, early man sometimes became ill or died after eating the flesh of dead animals. In more recent times, man has discovered that many invertebrate animals are capable of transmitting causative agents of disease from man to man or from other vertebrates to man. Such animals, which act as hosts, agents, and carriers of disease, are important in causing and perpetuating human illness. Because about three-fourths of the important known zoonoses are associated with domesticated animals, including pets, the term zoonosis was originally defined as a group of diseases that man is able to acquire from domesticated animals. But this definition has been modified to include all human diseases whether or not they manifest themselves in all hosts as apparent diseases that are acquired from or transmitted to any other vertebrate animal. Thus, zoonoses are naturally occurring infections and infestations shared by man and other vertebrates. Although the role of domesticated animals in many zoonoses is understood, the role of the numerous species of wild animals with which man is less intimately associated is not well understood. The discovery that diseases such as yellow fever , viral brain infections, plague, and numerous other important diseases involving man or his domesticated animals are fundamentally diseases of wildlife and exist independently of man and his civilization, however, has increased the significance of studying the nature of wildlife diseases. Of the more than 1,, species of animals thus far identified, only a few have been utilized in research, even though it is likely that, for every known human disease, an identical or similar disease exists in at least one other animal species. Veterinary medicine plays an ever-increasing role in the health of man through the use of animals as biomedical models with similar disease counterparts in man. This use of animals as models is important because research on many genetic and chronic diseases of man cannot be carried out using humans. Hundreds of thousands of mice and monkeys are utilized each year in research laboratories in the U. Animal studies are used in the development of new surgical techniques e. Animals are especially valuable in research involving chronic degenerative diseases, because such diseases can be induced in animals experimentally with relative ease. The importance of chronic degenerative diseases, such as cancer and cardiovascular diseases, has increased in parallel with the growing number of communicable diseases that have been brought under control. Examples of animal diseases that are quite similar to commonly occurring human diseases include chronic emphysema in the horse; leukemia in cats and cattle; muscular dystrophies in chickens and mice; atherosclerosis in pigs and pigeons; blood-coagulation disorders and nephritis in dogs; gastric ulcers in swine; vascular aneurysms permanent and abnormal blood-filled area of a blood vessel in turkeys; diabetes mellitus in Chinese hamsters; milk allergy and gallstones in rabbits; hepatitis in dogs and horses; hydrocephalus fluid in the head and skin allergies in many species; epilepsy in dogs and gerbils; hereditary deafness in many small animals; cataracts in the eyes of dogs and mice; and urinary stones in dogs and cattle. The study of animals with diseases similar to those that affect man has increased knowledge of the diseases in man; knowledge of nutrition, for example, based largely on the results of animal studies, has improved the health of animals, including man. Animal investigations have been used extensively in the treatment of shock, in open-heart surgery , in organ transplantations, and in the testing of new drugs. Other important contributions to human health undoubtedly will result from new research discoveries involving the study of animal diseases. Role of ecology Epidemiology , the study of epidemics , is sometimes defined as the medical aspect of ecology, for it is the study of diseases in animal populations. Hence the epidemiologist is concerned with the interactions of organisms and their environments as related to the presence of disease. The multiple-causality concept of disease embraced by epidemiology involves combinations of environmental factors and host factors, in addition to the determination of the specific causative agent of a given disease. Environmental factors include geographical features, climate, and concentration of certain elements in soil and water. Host factors include age, breed, sex, and the physiological state of an animal as well as the general immunity of a herd resulting from previous contact with a disease. Epidemiology, therefore, is concerned with the determination of the individual animals that are affected by a disease, the environmental circumstances under which it may occur, the causative agents, and the ways in which transmission occurs in nature. The epidemiologist, who utilizes many scientific disciplines e. Diseases in animal populations are characterized by certain features. Some outbreaks are termed sporadic diseases because they appear only occasionally in individuals within an animal population. Diseases normally present in an area are referred to as endemic , or enzootic , diseases, and they usually reflect a relatively stable relationship between the causative agent and the animals affected by it. Diseases that occasionally occur at higher than normal rates in animal populations are referred to as epidemic , or epizootic , diseases, and they generally represent an unstable relationship between the causative agent and affected animals. The effect of diseases on a stable ecological system, which is the result of the dominance of some plants and animals and the subordination or extinction of others, depends on the degree to which the causative agents of diseases and their hosts are part of the system. Epidemic diseases result from an ecological imbalance; endemic diseases often represent a balanced state. Ecological imbalance and, hence, epidemic disease may be either naturally caused or induced by man. A breakdown in sanitation in a city, for example, offers conditions favourable for an increase in the rodent population, with the possibility that diseases such as plague may be introduced into and spread among the human population. In this case, an epidemic would result as much from an alteration in the environment as from the presence of the causative agent Pasteurella pestis, since, in relatively balanced ecological systems, the causative agent exists enzootically in the rodents i. Driven from their natural habitat of reeds and rushes, the wild birds, important natural hosts for the virus that causes the disease, are forced to feed near farms; mosquitoes transmit the virus from birds to cattle and man. Detection and diagnosis Reactions of tissue to disease As previously noted, disease may be defined as an injurious deviation from a normal physiological state of an organism sufficient to produce overt signs, or symptoms. The deviation may be either an obvious organic change in the tissue composing an organ or a functional disturbance whose organic changes are not obvious. The severity of the changes that occur in cells and tissues subjected to injurious agents is dependent upon both the sensitivity of the tissue concerned and the nature and time course of the agent. A mildly injurious agent that is present for short periods of time may either have little effect or stimulate cells to increased activity. Strongly injurious agents in prolonged contact with cells cause characteristic changes in them by interfering with normal cell processes. Most causative agents of disease fall into the latter category. Characteristics of cell and tissue changes Changes in cells and tissues as a result of disease include degenerative and infiltrative changes. Degenerative changes are characterized by the deterioration of cells or a tissue from a higher to a lower form, especially to a less functionally active form. When chemical changes occur in the tissue, the process is one of degeneration. When the changes involve the accumulation of materials within the cells comprising tissues, the process is called infiltration. Diseases such as pneumonia, metal poisoning, or septicemia the persistence of disease-causing bacteria in the bloodstream may cause the mildest type of degenerationâ€”parenchymatous changes, or cloudy swelling of the cells; the cells first affected are the specialized cells of the liver and the kidney. Serious cellular damage may cause the uptake of water by cells hydropic degeneration , which lose their structural features as they fill with water. The causes for the accumulation in cells of abnormal amounts of fats fatty infiltration and degeneration have not yet been established with certainty but probably involve fat metabolism. Poisons such as phosphorus may cause sudden increases in the accumulation of fats in the liver. An abnormal protein material may accumulate in connective-tissue components of small arteries as a result of chronic pneumonia, chronic bacterial infections, and prolonged antitoxin production in horses ; the condition is known as amyloid degeneration and infiltration. Hyaline degeneration, characterized by tissues that become clear and appear glasslike, usually occurs in connective-tissue components of small blood vessels as a result of conditions that may occur in kidney structures glomeruli of animals with nephritis or in lymph glands of animals with tuberculosis. Certain structures glomeruli of animals with nephritis result in degeneration. The condition in which mucus , a secretion of mucous membranes lining the inside surfaces of organs, is produced in excess and accumulates in greater than normal amounts is referred to as mucoid degeneration. Major causes of this condition include chronic irritation of mucous membranes and certain mucus-producing tumours. Abnormal amounts of glycogen , which is the principal storage carbohydrate of animals, may occur in the liver as a result of certain inherited diseases of animals; the condition is known as glycogen infiltration. The abnormal deposition of calcium salts, which is known as hypercalcification, may occur as a result of several diseases involving the blood vessels and the heart, the urinary system, the gallbladder, and the bonelike tissue called cartilage. Pigments coloured molecules from coal dust or asbestos dust may infiltrate the lungs of certain dogs in two types of lung disease: Abnormal amounts of iron-containing coloured molecules hemosiderin resulting from the breakdown of hemoglobin, the oxygen-carrying protein of red blood cells, are often deposited in the liver and the spleen after diseases that involve excessive breakdown of red blood cells. A dark-coloured molecule melanin occurs abnormally in the livers of certain sheep suffering from Dubinâ€”Johnson syndrome and in certain tumours called melanomas. Uric acid infiltration, which occurs in poultry, is characterized by the deposition of uric acid salts. Necrosis , the death of cells or tissues, takes place if the blood supply to tissues is restricted; poisons produced by microbes, chemical poisons, and extreme heat or electricity also may cause necrosis. The rotting of the dead tissue is known as gangrene. Atrophy of animal tissue involves a process of tissue wasting, in which a decrease occurs in the size or number of functional cellsâ€”e. Hypertrophyâ€”an increase in the size of the cells in a tissue or an organâ€”occurs in heart muscle during diseases involving the heart valves, in certain pneumonias, and in some diseases of the endocrine glands. Aplasia is the term used when an entire organ is missing from an animal; hypoplasia indicates arrested or incomplete development of an organ, and hyperplasia an increase in the production of the number of cellsâ€”e. Metaplasia is used to describe the change of one cell type into another; it may occur in chronic irritation of tissues and in certain cancerous tumours. Characteristics of inflammatory reactions When tissues are injured, they become inflamed. The inflammation may be acute , in which case the inflammatory processes are active, or chronic, in which case the processes occur slowly and new connective tissue is formed. The reaction of inflamed tissues is a combination of defensive and repair mechanisms. Acute inflammation is characterized by redness, heat, swelling, sensitivity, and impaired function. Several types of acute inflammation are known. Mild acute inflammations of mucous membranes resulting in the production of thin watery material exudate are called catarrhal inflammations; parenchymatous inflammations occur in organs undergoing degeneration.

Chapter 5 : Aquaculture & Veterinary Science Journals

New Molecular Farming Of Plants And Animals For Human And Veterinary Medicine. Molecular Farming Of Plants And Animals For Human And Veterinary Medicine By L.

Founded in , ASP members contribute to the development of parasitology as a discipline as well as to primary research in systematics, medicine, molecular biology, immunology, physiology, ecology and biochemistry. Parasitologists study parasites wherever they occur and whether they are viruses, bacteria, worms or insects. Parasites are organisms that use other species of plants and animals as hosts. The hosts provide the environment in which the parasite lives. In the history of life on earth, the parasitic lifestyle has been incredibly successful; in fact, the number of species of parasites exceeds the number of free-living species. It is no wonder that parasitology is a diverse field. Parasitology is a dynamic field because the relationships between parasites and their hosts constantly are changing. Unlike the environment of free-living plants and animals, the environment of the parasite can fight back. Parasites and hosts are locked into a continuous struggle for survival, and understanding the mechanisms that each side in this battle use to gain advantage challenges parasitologists to understand biological phenomena at the cutting edge of a wide variety of scientific disciplines. As a result, parasitologists contribute significantly to our basic understanding of the way our biological world functions. Career Opportunities Many different career options exist within the field of parasitology because parasites affect the world in so many ways. Rewarding careers await parasitologists with interests in medicine and public health. Veterinary parasitologists play vital roles in controlling diseases of domestic animals. Agriculture and aquaculture are dependent upon parasitologists to assist in providing plant and animal food for an increasing human population. The following are several of the broad areas in which parasitologists work: Medical Parasitology Perhaps the best-known aspect of the significance of parasites is the role they play in causing human disease. Insect parasites such as fleas and lice are, at best, annoyances to humans, and as vectors of diseases such as the bubonic plague and typhus they have been responsible for a great deal of human mortality. Mosquitoes not only transmit malaria but spread yellow fever, encephalitis and other viral diseases and also are responsible for introducing into humans several species of filarial worms that cause some of the most horrific diseases in medical literature. Emerging diseases such as Lyme disease, transmitted by ticks, increasingly are recognized as significant to human health. Medical parasitologists use many approaches to combat parasites. Among the areas of research used are epidemiology the scientific study of factors affecting the health and illness of individuals and populations , chemotherapy the use of chemical substances to treat disease , immunology a broad branch of biomedical science that covers the study of all aspects of the immune system in all organisms and pathology the study of the processes underlying disease and other forms of illness, harmful abnormality or dysfunction. Promising breakthroughs in the development of vaccines against disease-causing parasites exist because of technological and conceptual advances in these fields as well as in allied disciplines such as immunology and biochemistry. The field of public health is allied closely with medical parasitology. Public health practitioners are employed by national, state and local governments and can work for international agencies such as the World Health Organization. Private industry, philanthropic and charitable organizations, military organizations and a variety of other institutions also employ the services of public health workers. Agriculture, Aquaculture, and Veterinary Parasitology Human health not only is affected directly by parasites that can infect humans but also is affected indirectly by parasites that cause diseases in plants and animals that are used as food for humans. The use of parasites as biological control agents against crop insects holds much promise for increasing agricultural production. Veterinary parasitologists care for domesticated animals used for food and work; they also care for companion animals. Veterinarians play an indirect role in human health when they control parasites in nonhuman animals that are transmissible to humans. Animals used by humans for sport and recreation also require the services of veterinary parasitologists. Pharmaceutical companies are important sources of employment for parasitologists.

In this capacity, parasitologists might work on the development of chemotherapeutic drugs to eliminate animal parasites, which is of major economic significance. The discovery of these antiparasitic drugs for domesticated animals not only has benefited the agricultural industry but in some cases has aided humans when the same chemotherapeutic agents have been demonstrated to be effective in the treatment of disease-causing parasites. Wildlife and Fisheries Parasitology Career opportunities exist for parasitologists who can assist wildlife managers in developing programs designed to protect animals in their natural environment. Parasitologists working for government agencies, industry and universities survey wild animals for parasites and disease and develop strategies to reduce the negative impact of parasites on wildlife populations. Conservation biologists especially are interested in parasitic diseases of threatened and endangered species and use that information to formulate management plans for their protection. Monitoring parasites in wild animals that are capable of being transmitted to humans is another important function of parasitologists. Fisheries biologists need information on the role of parasites in causing fish disease and the fish parasites humans can acquire from eating fish. These scientists also might use parasite data to understand aspects of natural fish populations. Alterations of natural environments such as the damming of rivers, channelization of streams and cutting of timber can affect important game species by altering parasite abundance, and the advice of parasitologists often is sought before making such decisions. Ecological and Systematic Parasitology These exciting areas of parasitology are rooted in the study parasite evolution and their interactions with the environment through their hosts. These basic areas of inquiry often lead to breakthroughs in applied areas of parasitology with direct or indirect benefits to humans. The field of parasite taxonomy the science of classifying living things and systematics the study of the diversity of organism characteristics currently are experiencing a resurgence of activity because of new methods that recently have been incorporated into the discipline. Techniques developed by molecular biologists have been applied to questions regarding relationships among taxonomic groups of parasites and are providing powerful new insights. The study of ecological aspects of host-parasite relationships has benefited greatly from the use of computer technology, vastly increasing the ability of parasitologists to quantify and analyze the dynamics of parasite populations. The tools of molecular biology also are being assimilated into the field of ecological parasitology, and the promise of new discoveries regarding parasite life cycles, detection and identification of parasites, patterns of parasite transmission and colonization are extremely exciting. Applications of basic research in parasite systematics are likely to be forthcoming and will provide career opportunities for parasitologists. Ecological parasitologists can assist medical parasitologists in assessing the potential role of global warming on public health by evaluating changes in patterns of parasite distribution and colonization. Biochemistry and Molecular Biology of Parasites Powerful technological advances have revolutionized the study of biology at the subcellular level. The promise of advances in parasitology from the application of these tools is great and will lead to many new career opportunities. The genetics of parasites can be explained at levels never before possible using techniques such as polymerase chain reaction a molecular biology technique for enzymatically replicating DNA without using a living organism such as E. Many applications could come from enhanced knowledge of parasite genetics, including the development of diagnostic tools for the detection and specific diagnosis of parasites. Immunoparasitology Job opportunities for immunologists who desire to work with parasites are likely to increase because of new technical developments in the field and because of new practical applications of that technology. One important thrust in parasite research today is the development of vaccines against parasites of human and domestic animals. The benefits of lifelong immunity among individuals and the goal of imparting complete protection to entire populations is an important driving force in the effort to discover vaccines against parasites. In recent years, the development of specific diagnostic tests for parasites has been one of the major successful applications derived from basic research in immunoparasitology. Clearly, further advances in basic research are on the horizon and application of this new knowledge will benefit both medical and veterinary parasitology. Parasitology Educators Academic careers are intellectually rewarding, and parasitologists have played an important role in the education of university students. One reason for the success of parasitologists in the academic community is the fact that parasitologists are among the most broadly trained of all biologists. Because examples of parasites can be found throughout the plant and animal kingdom, most parasitologists have a good working knowledge of biological diversity. A university position offers individuals a challenging and rewarding career that combines both teaching and research. Research opportunities allow faculty to ask creative questions and design studies to answer these questions. Teaching has many rewards, including the satisfaction of seeing young people exposed to new knowledge and watching students apply that knowledge to their own scientific curiosity. Parasitology is a broad and diverse field with many career options. Most parasitologists are attracted to the field because of their scientific curiosity. Parasitology represents a great career for intelligent young people with inquisitive minds. Research opportunities are virtually unlimited. The variety of basic and applied research in fields from the molecular to the global level are unsurpassed in other fields of biology. Emphasis should be placed on attainment of a broad-based education in biology and chemistry. Overspecialization in one narrow field of the biological sciences will not lead to the range of knowledge required by most successful parasitologists. A good background in mathematics, computer science and statistics will provide the computational skills that are required in virtually all areas of parasitology. The development of good writing and speaking skills is fundamental because all scientists must be able to communicate their ideas and results to others. Job opportunities in parasitology exist for people who attain a B. Positions in clinical laboratories, environmental firms or universities might involve work with parasites. Thesis research might involve laboratory or field study of parasites. Although most parasitologists attaining an M. Examples of jobs include the fields of wildlife management, fisheries biology, aquaculture, animal husbandry and human health care. Most parasitology researchers hold either a Ph. Advantages of attaining a doctoral degree are numerous. Most tenure-track university faculty positions require a Ph. Salary The salary range for parasitologists is highly dependent on experience and the specific area of focus.

Chapter 6 : Plants & Animals News - Biology news

Boston University School of Medicine Summary: A new study has shed light on the mechanisms underlying the progression of prion diseases and identified a potential target for treatment.

Chapter 7 : Veterinary Medicine For Sale - Antique Shops Store

Agriculture involves rearing and cultivation of animals, plants, fungi and other edible items to suffice for the food requirements of animals and humans. On the other hand, aquaculture corresponds to the farming of fishes, crustaceans, aquatic plants and algae in controlled fresh water and marine water bodies.

Chapter 8 : College of Agriculture and Life Sciences

Humans are becoming masters in the art of manipulating genes, despite limited understanding of gene function and interaction, Klaus Rajewsky, MD, head of the immune regulation and cancer research team at the Max DelbrÃ¼ck Center for Molecular Medicine in Berlin, said during the summit.

Chapter 9 : Database Category Taxonomy Page | WSU Libraries

Agriculture and aquaculture are dependent upon parasitologists to assist in providing plant and animal food for an increasing human population. The following are several of the broad areas in which parasitologists work.