ANIMAL MICROBIOLOGY pdf

1: Veterinary Microbiology Jobs, Employment | www.enganchecubano.com

Veterinary Microbiology is concerned with microbial (bacterial, fungal, viral) diseases of domesticated vertebrate animals (livestock, companion animals, fur-bearing animals, game, poultry, but excluding fish) that supply food, other useful products or companionship.

This increase is possible because the wavelengths of the electron beams are so much shorter than the wavelengths of light. Objects as small as 0. Specimens are observed by either transmission electron microscopy or scanning electron microscopy. In TEM the electron beam passes through the specimen and registers on a screen forming the image; in SEM the electron beam moves back and forth over the surface of microorganisms coated with a thin film of metal and registers a three-dimensional picture on the screen. Scanning electron micrograph of the spirochete Treponema pallidum attached to testicular cell membranes. Among these are confocal microscopy, the atomic force microscope, the scanning tunneling microscope , and immunoelectron microscopy. These are particularly significant for studies of microorganisms at the molecular level. Nutritional and physiological characteristics Microorganisms as a group exhibit great diversity in their nutritional requirements and in the environmental conditions that will support their growth. No other group of living organisms comes close to matching the versatility and diversity of microbes in this respect. Some species will grow in a solution composed only of inorganic salts one of the salts must be a compound of nitrogen and a source of carbon dioxide CO_2 ; these are called autotrophs. Many, but not all, of these microbes are autotrophic via photosynthesis. Organisms requiring any other carbon source are called heterotrophs. These microbes commonly make use of carbohydrates , lipids , and proteins , although many microbes can metabolize other organic compounds such as hydrocarbons. Others, particularly the fungi, are decomposers. Many species of bacteria also require specific additional nutrients such as minerals, amino acids , and vitamins. Various protozoans, fungi, and bacteria are parasites, either exclusively obligate parasites or with the ability to live independently facultative parasites. If the nutritional requirements of a microorganism are known, a chemically defined medium containing only those chemicals can be prepared. More complex media are also routinely used; these generally consist of peptone a partially digested protein , meat extract, and sometimes yeast extract. When a solid medium is desired, agar is added to the above ingredients. Agar is a complex polysaccharide extracted from marine algae. It has several properties that make it an ideal solidifying substance for microbiological media, particularly its resistance to microbial degradation. Microorganisms vary widely in terms of the physical conditions required for growth. For example, some are aerobes require oxygen , some are anaerobes grow only in the absence of oxygen , and some are facultative they grow in either condition. Eukaryotic microbes are generally aerobic. Those organisms which grow under optimally under one or more physical or chemical extremes, such as temperature, pressure, pH, or salinity, are referred to as extremophiles. Bacteria exhibit the widest range of temperature requirements. Whereas bacterial and fungal growth is commonly observed in food that has been refrigerated for a long period, some isolated archaea e. Other physical conditions that affect the growth of microorganisms are acidity or basicity pH , osmotic pressure, and hydrostatic pressure. The optimal pH for most bacteria associated with the human environment is in the neutral range near pH 7, though other species grow under extremely basic or acidic conditions. Most fungi are favoured by a slightly lower pH 5â€"6 ; protozoa require a range of pH 6. Reproduction and growth Bacteria reproduce primarily by binary fission , an asexual process whereby a single cell divides into two. Under ideal conditions some bacterial species may divide every 10â€"15 minutesâ€"a doubling of the population at these time intervals. Eukaryotic microorganisms reproduce by a variety of processes, both asexual and sexual. Some require multiple hosts or carriers vectors to complete their life cycles. Viruses, on the other hand, are produced by the host cell that they infect but are not capable of self-reproduction. The study of the growth and reproduction of microorganisms requires techniques for cultivating them in pure culture in the laboratory. Data collected on the microbial population over a period of time, under controlled laboratory conditions, allow a characteristic growth curve to be constructed for a species. Metabolism Collectively, microorganisms show remarkable diversity in their ability to produce complex substances from simple chemicals and to decompose complex materials to simple chemicals. An example of their synthetic ability is nitrogen fixation â€”the production of amino acids, proteins, and other organic nitrogen compounds from atmospheric nitrogen N2. Certain bacteria and blue-green algae cyanobacteria are the only organisms capable of this ecologically vital process. Laboratory procedures are available that make it possible to determine the biochemical capability of a species qualitatively and quantitatively. Routine techniques can identify which compounds or substances are degraded by a specific microbe and which products are synthesized. Through more elaborate experimentation it is possible to determine step-by-step how the microbe performs these biochemical changes. Certain biochemical tests are routinely used to identify microbesâ€”though more in the case of bacteria than algae, fungi, or protozoa. The adoption of routine sets of laboratory tests has allowed automated instrumentation to perform the tests. The apparatus automatically records the results and is frequently capable of calculating the degree of accuracy of the identification. Pathogenesis Some microorganisms cause diseases of humans, other animals, and plants. Such microbes are called pathogens. Pathogens are identified by the hosts they infect and the symptoms they cause; it is also important to identify the specific properties of the pathogen that contribute to its infectious capacityâ€”a characteristic known as virulence. The more virulent a pathogen, the fewer the number needed to establish an infection. Antigenic characteristics An antigen is a substance that, when introduced into an animal body, stimulates the production of specific substances antibodies that react or unite with the antigen. Microbial cells and viruses contain a variety of antigenic substances. A significant feature of antigen-antibody reactions is specificity; the antibodies formed as a result of inoculating an animal with one microbe will not react with the antibodies formed by inoculation with a different microbe. Antibodies appear in the blood serum of animals, and laboratory tests of antigen-antibody reactions are performed by using seraâ€”hence the term serological reactions. Thus, it is possible to characterize a microorganism by its antigenic makeup as well as to identify microorganisms by using one of many different serological tests. Antigens and antibodies are important aspects of immunity , and immunology is included in the science of microbiology. Genetic characterization Since the last quarter of the 20th century, researchers have accumulated a vast amount of information elucidating in precise detail the chemical composition, synthesis, and replication of the genetic material of cells. Much of this research has been done by using microorganisms, and techniques have been developed that permit experimentation at the molecular level. Test kits are available for the identification of microorganisms, particularly bacteria, by DNA probes. Since the invention of recombinant DNA technology in , techniques have been developed whereby genes from one cell can be transferred to an entirely different cell, as when a gene is transferred from an animal cell to a bacterium or from a bacterium to a plant cell. Recombinant DNA technology opened the door to many new medical and industrial applications of microbiology, and it plays a central role in genetic engineering. Applied microbiology Genetic engineering is an example of how the fields of basic and applied microbiology can overlap. Genetic engineering is primarily considered a field of applied microbiology that is, the exploitation of microorganisms for a specific product or use. The methods used in genetic engineering were developed in basic research of microbial genetics. Conversely, methods used and perfected for applied microbiology can become tools for basic microbiology. Applied microbiology can, however, be divided under the following headings. Dead vegetation, human and animal wastes, and dead animals are deposited in or on soil. In time they all decompose into substances that contribute to soil, and microbes are largely responsible for these transformations. Two great pioneer soil microbiologists were Martinus W. Beijerinck â€” , a Dutchman, and Sergey N. Winogradsky â€” , a Russian. These researchers isolated and identified new types of bacteria from soil, particularly autotrophic bacteria, that use inorganic chemicals as nutrients and as a source of energy. The relationship between legumes and bacteria in the nodules of legume roots was discovered by other scientists in The nodules contain large numbers of bacteria Rhizobium that are capable of fixing atmospheric nitrogen into compounds that can be used by plants. The ecology of fertile soil consists of plant roots, animals such as rodents, insects, and worms, and a menagerie of microorganismsâ€”viruses, bacteria, algae, fungi, and protozoa. In the nitrogen cycle , for example, microorganisms capture nitrogen gas from the atmosphere and convert it into a combined form of nitrogen that plants can use as a nutrient; the plant synthesizes organic nitrogen compounds that are consumed by humans and animals; the consumed nitrogen compounds eventually reach the soil; microorganisms complete the cycle by decomposing these compounds back to atmospheric nitrogen and simple inorganic molecules that can be used by plants. In similar cycles for other elements such as carbon, sulfur, and phosphorus, microbes play a role; this makes them essential to maintaining life on Earth. Microbiology of water supplies, wastewater , and other aquatic environments Long before the establishment of microbiology as a science, water was suspected of being a carrier of disease-producing organisms. But it was not until , when an epidemic of cholera was proved to have had its origin in polluted water, that contaminated water was considered more seriously as a source of disease. Since that time there has been continuous research on the microbiology of public water supplies, including the development of laboratory procedures to determine whether the water is potable, or safe for human consumption. At the same time, purification procedures for these supplies have emerged. A highly standardized and routine laboratory procedure to determine the potability of water is based upon detecting the presence or absence of the bacterium Escherichia coli. The principal operations employed in a municipal water-purification plant are sedimentation, filtration, and chlorination. Each of these operations removes or kills microorganisms, and the microbiological quality of the treated water is monitored at frequent intervals. The used water supply of a community , commonly referred to as sewage , is microbiologically significant in two ways. First, sewage is a potential carrier of pathogenic microorganisms, so measures such as chlorination must be implemented to prevent these microbes from contaminating drinking-water supplies. Second, sewage-treatment plants purify water by exploiting the biochemical abilities of microbes to metabolize contaminants. Raw sewage is processed through large tanks, first for anaerobic degradation of complex substrates and later for aerobic oxidation of soluble products. Another aspect of the microbiology of water pertains to natural bodies of water such as ponds, lakes, rivers, and oceans. Aquatic microbes perform a host of biochemical transformations and are an essential component of the food chain in these environments. For example, the microbial flora of the sea comprises bacteria, algae, fungi, and protozoa. The microorganisms inhabiting aquatic environments are collectively referred to as plankton ; phytoplankton refers to the photosynthetic microbes primarily algae , whereas protozoa, and other small animals, are zooplankton. Phytoplankton is responsible for converting solar energy into chemical energyâ€”the components of plankton cells that serve as food for higher aquatic life. The magnitude of this process can be appreciated by calculations indicating that it takes 1, tons of phytoplankton to support the growth of one ton of fish. Large populations of archaea live in volcanic ridges 2, metres 8, feet below the ocean surface in areas immediately surrounding hydrothermal vents deep-sea hot springs. Many bacteria concentrate in this region because of the availability of H_2S, which they can use for energy. The abundance of animal life that also inhabits this region is completely dependent on the microbes for food. There is a growing interest in other ecological aspects of aquatic microbiology, such as the role of microbes in global warming and oxygen production. Experimental approaches are being developed to study the complex biology and ecology of biofilms and microbial mats.

2: Plant and Animal Microbiology - PacBio

The Sir Howard Dalton Young Microbiologist of the Year Prize is awarded by the society each year. The prize recognises and rewards excellence in science communication by a Microbiology Society Member who is a postgraduate student or postdoctoral researcher, having .

The presence of a nuclear membrane in eukaryotes permits separation of the two phases of protein synthesis: Compared to the structure of the bacterial cell , this gives greater control over which proteins are produced. Such control permits specialization of cells, each with identical DNA but with the ability to control finely which genes successfully send copies into the cytoplasm. Tissues and organs can thus evolve. The semirigid cell walls found in plants and fungi, which constrain the shape and hence the diversity of possible cell types, are absent in animals. If they were present, nerve and muscle cells, the focal point of animal mobility, would not be possible. A definition of animals A characteristic of members of the animal kingdom is the presence of muscles and the mobility they afford. Mobility is an important influence on how an organism obtains nutrients for growth and reproduction. Animals typically move, in one way or another, to feed on other living organisms, but some consume dead organic matter or even photosynthesize by housing symbiotic algae. The type of nutrition is not as decisive as the type of mobility in distinguishing animals from the other two multicellular kingdoms. Some plants and fungi prey on animals by using movements based on changing turgor pressure in key cells, as compared with the myofilament-based mobility seen in animals. Mobility requires the development of vastly more elaborate senses and internal communication than are found in plants or fungi. It also requires a different mode of growth: Cytoplasm is contained within cells in the space between the cell membrane and the nuclear membrane. All phyla of the animal kingdom, including sponges, possess collagen , a triple helix of protein that binds cells into tissues. The walled cells of plants and fungi are held together by other molecules, such as pectin. Because collagen is not found among unicellular eukaryotes, even those forming colonies, it is one of the indications that animals arose once from a common unicellular ancestor. The muscles that distinguish animals from plants or fungi are specializations of the actin and myosin microfilaments common to all eukaryotic cells. Ancestral sponges, in fact, are in some ways not much more complex than aggregations of protozoans that feed in much the same way. Although the sensory and nervous system of animals is also made of modified cells of a type lacking in plants and fungi, the basic mechanism of communication is but a specialization of a chemical system that is found in protists, plants, and fungi. The lines that divide an evolutionary continuum are rarely sharp. Mobility constrains an animal to maintain more or less the same shape throughout its active life. With growth, each organ system tends to increase roughly proportionately. In contrast, plants and fungi grow by extension of their outer surfaces, and thus their shape is ever changing. This basic difference in growth patterns has some interesting consequences. For example, animals can rarely sacrifice parts of their bodies to satisfy the appetites of predators tails and limbs are occasionally exceptions , whereas plants and fungi do so almost universally. History of classification Except perhaps for the possession of collagen, the criteria used above to distinguish animals from other forms of life are not absolute. The first catalogs of animal diversity were based on overall form and similarity. Aristotle and other early biologists regarded all organisms as part of a great chain, divisions of which were more or less arbitrary. The 18th-century Swedish botanist Carolus Linnaeus divided all animals into six classes: In the early s the French zoologist Georges Cuvier recognized that vertebrates were substantially different from invertebrates, and he divided most animals on the basis of form and function into four branches: Homology is correspondence between features caused by continuity of information. Homologous structures need not resemble each other; for example, the three bones in the middle ear of humans are homologous to three bones in the jaw apparatus in fishes because the genetic and developmental information controlling them has been continuous through evolutionary change. Evolution provided a testable explanation for homologies. By carefully tracing selected homologies, it has been possible to show that previously proposed classifications established inappropriate relationships based solely on form or function, or both; for example, the radial symmetry of starfishes is not homologous to that of coelenterates such as jellyfish. Protozoans were once considered to be animals because they move and do not photosynthesize. Closer study has shown, though, that their movement is by means of nonmuscular structures cilia, flagella , or pseudopods and that photosynthesis in them has often been lost and gained. Protozoans do not, therefore, form a natural group but with algae form a eukaryotic kingdom separate from plants and animals, called Protista. Like plants and animals, fungi arose from protists and are now accorded a kingdom of their own. Animal diversity The diverse appearance of animals is mostly superficial; the bewildering variety of known forms, some truly bizarre, can be assorted among a mere half-dozen basic body plans. These plans are established during the embryonic stages of development and limit the size and complexity of the animals. Symmetry, number and relative development of tissue layers, presence and nature of body cavities, and several aspects of early development define these fundamental modes of organization. Their simplicity has been adaptive, and sponges have remained important in benthic marine habitats since their origin. The sessile, filter-feeding way of life shown by sponges has favoured a body plan of radial symmetry, although some members have become asymmetrical. The shape of the creeping, flattened placozoans is irregular and changeable. For example, coelenterates have well-defined nerve nets, and their contractile fibres, although only specialized parts of more generalized cells, are organized into discrete muscle units. Because discrete cells of different types do not carry out the internal functions of the animals, coelenterates are considered to be organized at only a tissue level. Lobed comb jelly Lobata A jellyfish contracting its body. The integration of cells into tissues, particularly those of nerve and muscle, permits a significantly larger individual body size than is possible with other modes of body movement. Flagella and cilia become ineffective at rather small size, and amoeboid movement is limited to the size a single cell can attain. Muscles contract by a cellular mechanism basically like that used in amoeboid locomotionâ€”interaction of actin and myosin filaments. Through coordinated contraction of many cells, movement of large individuals becomes possible. Coelenterates, like parazoans, have only two body layers, an inner endoderm primarily for feeding and an outer ectoderm for protection. Between the endoderm and the ectoderm of coelenterates is the mesoglea , a gelatinous mass that contains connective fibres of collagen and usually some cells. Both layers contain muscle fibres and a two-dimensional web of nerve cells at the base; the endoderm surrounds a central cavity, which ranges from simple to complex in shape and serves as a gut, circulatory system , and sometimes even a skeleton. The cavity is also used for gamete dispersal and waste elimination. Cleavage of a fertilized egg produces a hollow sphere of flagellated cells the blastula. Invagination of cells at one or both poles creates a mouthless, solid gastrula; the gastrula is called the planula larva in species in which this stage of development is free-living. The inner, endoderm cells subsequently differentiate to form the lining of the central cavity. The mouth forms once the planula larva has settled. Although the details of early development are different for parazoans and coelenterates, most share a stage in which external flagellated cells invaginate to form the inner layer, which lines the cavity, of these diploblastic two-layered animals. This is characteristic of invagination during the development of all animals. All coelenterates are more or less radially symmetrical. A radial form is equally advantageous for filtering, predatory, or photosynthetic modes of feeding. Tentacles around the circumference can intercept food in all directions. The body plans that are generally recognized are acoelomate, pseudocoelomate, and coelomate. Acoelomates have no internal fluid-filled body cavity coelom. Pseudocoelomates have a cavity between the inner endoderm and the middle mesoderm body layers. Coelomates have a cavity within the mesoderm , which can show one of two types of development: Most protostomes show schizocoelous development, in which the mesoderm proliferates from a single cell and divides to form a mass on each side of the body; the coelom arises from a split within each mass. Deuterostomes show enterocoelic pouching, in which the endoderm evaginates and pinches off discrete pouches, the cavities of which become the coelom and the wall the mesoderm. The animals in these major divisions of the Bilateria differ in other fundamental ways, which are detailed below. Unlike sessile sponges or floating jellyfish , the Bilateria typically move actively in pursuit of food, although many members have further evolved into sessile or radial forms. Directed movement is most efficient if sensory organs are located at the head or forward-moving end of the animal. Organs of locomotion are most efficiently arranged along both sides, a fact that defines the bilateral symmetry; many internal organs are not in fact paired, whereas muscle layers, limbs, and sensory organs almost invariably are. The diffuse nerve net of coelenterates coalesces into definite tracts or bundles, which run posteriorly from the anterior brain to innervate the structures of locomotion. Acoelomates Flatworms phyla Platyhelminthes , Nemertea , and Mesozoa lack a coelom, although nemerteans have a fluid-filled cavity at their anterior, or head, end, which is used to eject the proboscis rapidly. The lack of a fluid-filled cavity adjacent to the muscles reduces the extent to which the muscles can contract and the force they exert see below Support and movement. Because most also lack a circulatory system, supplying muscle tissues with fuel and oxygen can be no faster than the rate at which these substances diffuse through solid tissue. Flatworms are thus constrained to be relatively flat and comparatively small; parasitic worms, which do not locomote, can achieve immense lengths e. The larger of the free-living flatworms have extensively divided guts, which reach to within a few cells of the muscles, thus compensating for the lack of a circulatory system. Most flatworms have but one opening to the gut. Nemerteans, in addition to a coelom-like housing for their proboscis, have attained a one-way gut and a closed circulatory system. Both increase their ability to move food and oxygen to all parts of the body. Flatworms are considered to be the ancestors of all other Bilateria. Prostheceraeus, a flatworm of the class Turbellaria. Jacques Six Pseudocoelomates , or aschelminths The pseudocoelomates include the nematodes, rotifers, gastrotrichs, and introverts. Some members of some other phyla are also, strictly speaking, pseudocoelomate. These four phyla of tiny body size many species no larger than the bigger protozoans are placed together in part because they lack mesoderm on the inner side of the body cavity. Consequently, no tissue, muscular or connective, supports the gut within the coelomic fluid. For tiny organisms, this is advantageous for conservation of tissue: The inconspicuousness of most of these phyla has led to a slow advancement in understanding their phylogenetic position in the animal kingdom. Nematodes feed on bacteria, fungi, and small animal forms in the soil. Otherwise, in those animals with a body cavity used in locomotion, gravity would pull the gut down and severely curtail body size. Coelomates have attained vastly larger body sizes than has any other group of animals. Within the coelomates, the coelom has been of variable significance to the form and diversity of the various phyla. For example, it is essential for the burrowing abilities of annelids and related phyla. It has largely lost this significance in the arthropods, however, which have transferred locomotion to limbs supported by an exoskeleton rather than a coelomic hydroskeleton. Suspension is the main function of the coelom in vertebrates, which achieve the largest body sizes among animals by virtue of an endoskeleton that does not need to be shed during growth.

3: Microbiology: Definitions and Microorganisms

Animal Microbiology Journals comes under the main classification General Microbiology, biology, biochemistry, and immunology. The research papers publish the information of diseases caused by the microbes to the domestic and wild animals.

Archaebacteria , Chromista , and Archezoa Thomas Cavalier-Smith thought at first, as was almost the consensus at that time, that the difference between eubacteria and archaebacteria was so great particularly considering the genetic distance of ribosomal genes that they needed to be separated into two different kingdoms, hence splitting the empire Bacteria into two kingdoms. He then divided Eubacteria into two subkingdoms: Negibacteria Gram negative bacteria and Posibacteria Gram positive bacteria. Technological advances in electron microscopy allowed the separation of the Chromista from the Plantae kingdom. Indeed, the chloroplast of the chromists is located in the lumen of the endoplasmic reticulum instead of in the cytosol. Moreover, only chromists contain chlorophyll c. Since then, many non-photosynthetic phyla of protists, thought to have secondarily lost their chloroplasts, were integrated into the kingdom Chromista. Finally, some protists lacking mitochondria were discovered. As a result, these amitochondriate protists were separated from the protist kingdom, giving rise to the, at the same time, superkingdom and kingdom Archezoa. This was known as the Archezoa hypothesis. This superkingdom was opposed to the Metakaryota superkingdom, grouping together the five other eukaryotic kingdoms Animalia , Protozoa , Fungi , Plantae and Chromista. Six kingdoms[edit] In , Cavalier-Smith published a six-kingdom model, [4] which has been revised in subsequent papers. The version published in is shown below. The two subkingdoms Unibacteria and Negibacteria of kingdom Bacteria sole kingdom of empire Prokaryota are distinguished according to their membrane topologies. The bimembranous-unimembranous transition is thought to be far more fundamental than the long branch of genetic distance of Archaebacteria , viewed as having no particular biological significance. Cavalier-Smith does not accept the requirement for taxa to be monophyletic "holophyletic" in his terminology to be valid. He defines Prokaryota, Bacteria, Negibacteria, Unibacteria, and Posibacteria as valid paraphyla therefore "monophyletic" in the sense he uses this term taxa, marking important innovations of biological significance in regard of the concept of biological niche. In the same way, his paraphyletic kingdom Protozoa includes the ancestors of Animalia, Fungi, Plantae, and Chromista. The advances of phylogenetic studies allowed Cavalier-Smith to realize that all the phyla thought to be archezoans i. This means that all living eukaryotes are in fact metakaryotes , according to the significance of the term given by Cavalier-Smith. Some of the members of the defunct kingdom Archezoa , like the phylum Microsporidia , were reclassified into kingdom Fungi. Others were reclassified in kingdom Protozoa like Metamonada which is now part of infrakingdom Excavata.

4: Microbiologist | About Bioscience

About Animal Microbiology Veterinary microbiology deals with the various microbial (bacterial, fungal, viral) diseases in animals especially that supply food, other useful products or companionship. Studies of antimicrobial resistance are also included in the various studies of animal microbiology.

Microbiologists in this field play a large part in making sure the food supply is safe. There is a section devoted solely to how microbiologists fit into the FDA as well as into the rest of the world. Microbiologists can gain insight into new techniques and findings and learn about how to work in the field to better suit the changing world. Microbiology is the study of living organisms that are invisible to the naked eye, such as bacteria and fungi. Though not living organisms, viruses also are studied by microbiologists. Though many people tend to group them together, there are many different types of microbiology. Medical microbiology is perhaps the most well-known because it deals with the roles that microbes have in human illness. Other types include veterinary microbiology, environmental microbiology, food microbiology and pharmaceutical microbiology. All these deal with the way microbes or microorganisms affect animals, the environment, the food supply and the health care industry. This type of microbiologist can assist in preventing the spread of disease by containing and treating it. Food Industry This type of microbiologist works with the food supply that later is distributed to grocery stores and other vendors and also may work with organizations such as the Food and Drug Administration and the Department of Agriculture. These microbiologists ensure the food supply is free of pathogenic organisms that may be harmful to the health of those who consume it. Food microbiologists are very important and provide a way to guarantee the food is safe to distribute to the public. Environmental Microbiologists who work with the environment study how organisms such as bacteria function and react in the environment. This field deals not only with how organisms react to themselves but also with how they react to other processes in the environment, such as pollution, living things like plants and animals, simple seasonal changes and the changing and evolving world in general. Research Laboratories Many microbiologists work as research scientists. They study and test bacteria and other organisms in controlled environments to better understand their breakdown and how they react when put through different tests. The fundamental discoveries these microbiologists make have a great impact on the way medications are distributed, illnesses are treated and health care systems are run, and important breakthroughs are not uncommon. Research can be a very rewarding field for microbiologists because it is where the practice of microbiology begins. The information and insight that research microbiologists gain can change the ways in which those in many other fields behave. Teaching Instructional microbiology is another very common subset of the field. Community colleges and universities are popular places for microbiologists to lecture about the systems and advances of microbiology. It is an ever-changing field, so instructors need to be constantly learning in order to pass that information on to their students. A career as a microbiologist usually requires an education beyond the high school level. Typically, these degrees are given in areas such as microbiology, chemistry or biology. A doctoral degree, or Ph. Salary Because microbiologists can choose to enter numerous fields and can have varying degrees of education, their salaries range greatly. The highest salaries typically are awarded to those working in industries such as research, while those working in educational settings such as colleges or universities usually make less. The salaries for microbiologists usually increase quickly with time, but those with higher degrees have a better chance of earning a higher salary. The median salary for a beginning microbiologist with a Ph. Bureau of Labor Statistics.

5: Veterinary Microbiology - Journal - Elsevier

Veterinary microbiologists are veterinarians that specialize in the study of microorganisms that cause infectious disease in animal species. These disease-causing agents may include bacteria, viruses, toxins, and parasites.

Why should someone consider a career in industrial microbiology and biotechnology? Industrial microbiology or microbial biotechnology is the application of scientific and engineering principles to the processing of materials by microorganisms such as bacteria, fungi, algae, protozoa and viruses or plant and animal cells to create useful products or processes. The microorganisms utilized may be native isolates, laboratory-selected mutants or microbes that have been genetically modified using recombinant DNA methods. Metagenomics, the study of all of the genetic material in an environmental sample, is being used to screen for microbes with potentially useful industrial properties. In some cases the organisms have been developed using synthetic biology, the design of new biological systems or the re-design of existing systems.. Areas of industrial microbiology include discovery of new organisms and pathways, such as antimicrobial drugs. For instance, most antibiotics come from microbial fermentations involving a group of organisms called actinomycetes. Other organisms such as yeasts are used in baking, in the production of alcoholic beverages, and in biofuel production. For example, the sweetener aspartame is derived from microbially produced amino acids. Industrial microbiologists may also be responsible for the bioremediation of air, soil, and water contamination. Industrial microbiologists may also deal with products associated with the food, dairy, and consumer products industries, along with the prevention or deterioration of processed or manufactured goods, and with waste disposal systems. Quality assurance for the food, pharmaceutical, and chemical industries is a large area, along with the health of animals used in testing products. When choosing a career in industrial microbiology or biotechnology, you should be prepared to embrace a multidisciplinary science. Very rarely will challenges be limited to just one area, but rather will require investigation of several aspects of a process or production problem. In such circumstances, you will often need skills and expertise in additional fields such as molecular biology, biochemistry, immunology, and biostatistics. Synthetic biology is an excellent example of the need for a wide ranging background in many areas of science and engineering. Using traditional genetics or recombinant DNA techniques, the microorganisms can be modified to improve the yield or action of antibiotics and other antimicrobial agents. New research directions are aimed at discovering microbial metabolites with pharmacological activities useful in the treatment of hypertension, obesity, coronary heart disease, cancer, and inflammation. Recombinant DNA technology has allowed for the production of vaccines that offer protection without risk of infection e. Industrial microbiologists are actively involved in the development of these new vaccines. Microorganisms are also used to produce human or animal biologicals such as insulin, growth hormone, antibodies, and components for cosmetics. They may also take part in identifying the organisms involved in and maintaining proprietary culture collections. There is a great deal of microbiology in the food and beverage industries. Production of coffee, tea, cocoa, summer sausage, vanilla, cheese, olives, and tobacco all require microbial activity and a microbiologist to insure product quality. Food Flavoring Agents and Preservatives: Organic acids, such as citric, malic, and ascorbic acids, and monosodium glutamate are microbial products commonly used in foods. Mushrooms, truffles, and some red and green algae are consumed directly. Yeasts are used in food supplements for humans and animals. All of these require a microbiologist to insure product efficacy and quality. ENZYMES Industrial applications of enzymes include the production of cheese, the clarification of apple juice, the development of more efficient laundry detergents, pulp and paper production, and the treatment of sewage. These processes have been dramatically enhanced by the use of recombinant DNA techniques to design enzymes and increased activity, stability, and specificity. The latter are also used for secondary oil recovery in oil fields and as lubricants in drilling oil wells, gelling agents in foods, and thickeners in both paints and foods. The microbiologist is involved in research on improvements in the production and detection of new metabolic pathways. Microbiologists are also involved in the development of procedures for the control of deterioration in cosmetics, steel, rubber, textiles, paint, and petroleum products. The industrial microbiologist is directly involved in developing microbial strains to detoxify wastes of industrial, agricultural, or human origin. Extraction of minerals from low-grade ores is enhanced by some bacteria microbial leaching. In addition, selective binding of metals by biohydrometallurgical processes is important in recycling of metals such as silver and uranium. You may become a skilled technician through on-the-job training, but many organizations require that a technician take career-related college level courses in order to advance to higher paying technical positions. Your guidance counselor may also be helpful in identifying college, industry, and government-sponsored summer enrichment program for high school or undergraduate students. Students able to work on one or more research projects while an undergraduate student may have advantages when being considered for employment or graduate school. A person with a BS degree has several career options. One may begin a career in an industrial or clinical entry-level position. There may also be opportunities in sales of laboratory products or instruments. In many organizations, employees are encouraged to continue their educations. It may be possible in such an environment to obtain a higher degree while working full time. This means that the scientists will have the opportunity to advance to higher levels of responsibility either by staying in their chosen technical field or by assuming administrative responsibilities in technical management. As with most careers, an individual advances based on his or her unique approach to assigned tasks and contributions to achievements of his or her employer. These positions may be in industry, government or academic situations. With the advanced degrees comes greater expectations for not only knowledge but increasing experiences with project design, conduct, and management. Multidisciplinary experiences are essential. Experiences with both oral and written forms of scientific and technical communication are equally important. The ability to work well as part of group is important at all levels. These may include basic research, process development, production, technical services, quality control, compliance control, or technical sales. Some individual microbiologists may be considered genetic engineers utilizing recombinant DNA techniques while others are classified as bioprocess engineers optimizing enzymatic reaction systems for a desired product. If you are the kind of person who likes variety in work responsibilities and enjoys solving problems and making things work, you should seriously consider a career in this area. As products developed by applied research move into production, a much wider range of personnel will be needed by industry, government, and academia. Industry will require scientists who can discover new products and develop methods for producing those products in large quantities. Individuals who develop their skills and expertise will find mobility in the job marketplace since their basic background and training will be transferable to new opportunities.

6: microbiology | Definition, History, & Microorganisms | www.enganchecubano.com

Veterinary Microbiology jobs available on Receives and prepares samples for laboratory analyses and tests to diagnose various pet and other animal illnesses.

Here is a list of viruses that are found in animals: Papovaviruses are one of the four important dsDNA viruses e. The term papova is derived from the first two letters of the three prototypes, papilloma virus, polyoma virus and simian vacuolating virus SV The other important viruses of this group are JC virus associated with neurological degeneration , BX virus which suppresses immune system of humans , K virus of mice, etc. Capsid is of nm, naked, icosahedral; virion consists of dsDNA and protein. Capsid is made up of 72 capsomers which are built by subunits. Virus enters the cell and migrates to the nucleus where it replicates. The dsDNA encodes the early proteins and capsid proteins. S V40 is an oncogenic virus. It is naked and icosahedral in morphology with a diameter of 45 nm. Capsid consists of 72 capsomers. SV40 is similar to polyoma virus in size and structure. Polyoma is associated with tumour in mice. The dsDNA in its native form is supercoiled i. After breaking the phosphodiester bond, single stranded DNA helix is converted into a relaxed circular form. This form has the sedimentation coefficient of 16S. A linear form of 14S is formed after double stranded break in the supercoil. Virus enters the cell and directly migrates to the nucleus. Replication of the viral RNA takes place inside the nucleus. Before the replication begins, early proteins are synthesized in the nucleus of the infected cells. The mechanism of DNA replication can be divided into the following four stages: DNA replication begins at a site known as origin of replication as the ori genes are present at this site. Initiation requires a gene product A which is a globular protein. The ori region is rich in adenine and thymine. Replication in two direction starts from the point of ori region. The chain elongates discontinuously on both the strands and form short fragements of DNA which is known as Okazaki fragements. In turn the Okazaki fragements are covalently sealed to form a continuous strand. Until the two complementary strands reach the termination, chain elongation continues. Each duplex contains an original strand and a linear strand. During maturation the two ends of the linear strand is sealed by the ligase and two complete circular DNA molecules are formed. Within 12h of infection and before start of DNA replication, there begins early protein synthesis. The synthesis of antigen i. Late proteins are synthesized when DNA replication is over. Adenoviruses were first isolated in human adenoids tonsils from which its name is derived. The adenoviruses are common pathogens of humans and animals. More than serologically distinct types of adenovirus have been identified including 49 types that infect humans. Moreover, several strains have been the subject of intensive research and are used as tools in mammalian molecular biology. Several adenoviruses cause respiratory and conjunctival diseases such as pneumonia, acute follicular conjunctivitis, epidemic keratoconjunctivitis, cystitis and gastroenteritis. In infants, pharyngitis and pharyngeal-conjunctival fever are common. In addition, a few types of human adenoviruses induce undifferentiated sarcomas in newborn hamsters and other rodents and can transform certain rodent and human cell cultures. Adenoviruses are unusually stable to chemical or physical agents and adverse pH conditions. This ability helps in its prolonged survival outside of the body and water. Adenoviruses are primarily spread via respiratory droplets; however, they can also be spread by fecal routes as well. Adenoviruses are classified as group I under the Baltimore classification scheme. Adenoviruses are put iii the family Adenoviridae which is divided into two genera: However, more than antigenic types of adenoviruses e. Since adenoviruses readily infect human and other mammalian cells, their genomes have been developed into vectors in experimental therapy. Vector genomes carry deletions in the E1 and E3 regions; the gaps in the genome are used to take up foreign genes, e. Deletions in E1 minimize the potential of these vector genomes to elicit an infection cycle in human cells. The first clinical applications in patients suffering from the genetic disease cystic fibrosis have been reported but problems with adenovirus toxicity remain. Epidemiology of the common herpesvirus infections puzzled clinicians for many years. In , Burnet and Buddingh showed that herpes simplex virus HSV could become latent after a primary infection, becoming reactivated after later provocation. So far, about herpesviruses have been isolated from many animal species. Herpesviruses belong to the family Herpesviridae viruses with double stranded DNA genomes Class 1 , which have envelope with spikes on icosahedral virion. The family Poxviridae is a legacy of the original grouping of viruses associated with diseases that produced poxs in the skin. Modem viral classification is based on the shape and molecular features of viruses and the smallpox virus remains as the most notable member of the family. It has two sub-families: Some of the important genera are: Vaccinia virus; diseases-cowpox, vaccinia, smallpox , Para poxvirus, Avipoxvirus, Capri poxvirus, Leporipoxvirus, Suipoxvirus, Swinepox virus, Molluscipoxvirus type species: Poxviruses can infect both vertebrate and invertebrate animals. There are four genera of poxviruses that may infect humans e. The most common viruses are vaccinia found in Indian subcontinent and molluscum contagiousum but monkeypox infections are gradually increasing in west and central African rainforest countries. An example of such a group and the problems of complexity are shown by the members of the poxvirus family. These viruses have oval or brick-shaped nm long particles. These particles are so large that they were first observed using high resolution optical microscopes in A temple record of from Egypt B. Picornaviruses belong to the family Picornaviridae which is one of the largest of the viral families. There are five groups of picorna viruses: The most important pathogens from the genus entero-viruses include: Togaviruses belong to the family Togaviridae, which falls into the group IV of the Baltimore classification of viruses. Some examples Alphavirus type species- Sindbis virus, eastern equine encephalitis virus, western equine encephalitis virus, Venezuelan equine encephalitis virus, Ross River virus and Rubivirus type species Rubella virus. Only Alphaviruses are arthropod-borne. Rubella virus has one species, which is quite distinct from Alphaviruses. Togaviridae is classified as in Table Rubella was first recognized as a distinct disease in During , Venezuelan Equine Encephalitis was isolated. Rubella vaccine was licensed in Large epidemic of the chikungunya virus was reported on the island of La Reunion and the surrounding islands in the Indian Ocean. During in India, the major epidemic of the chikungunya virus was reported in over 1. It grows in both mammalian and insect cell lines. Transmission of virus takes place from salivary glands of the mosquito to the bloodstream of the vertebrate host. It is most commonly caused by a bite from an infected animal or by other contact. Rabies has been known for more than 20, years. The first description dates from the 23rd century BC in the Mesopotamia. During s, Pasteur carried out the serial passage of Rabies virus in rabbits, and eventually succeeded in isolating an attenuated preparation which was used to treat patients bitten by mad dogs. There are over Rhabdo-viruses known, which infect man, other mammals, fish, insects and plants. The family Rhabdoviridae includes the genera Lyssavirus, Ephemerovirus and Vesiculo-virus. The rabies virus is a member of the genus lyssavirus. Genetically, these viruses have non-segmented - sense RNA genome reminiscent of Paramyxoviruses. The family includes six genera. The family Orthomyxoviridae includes five genera: The first three genera contain viruses that cause influenza in vertebrates, including birds, humans, and other mammals. Isaviruses infect salmon; thogotoviruses infect vertebrates and invertebrates e. Orthomyxoviridae consists of 7 to 8 segments of linear negative-sense single stranded RNA. The total length of the genome is 12,, nucleotides nt. The sequence of genome has terminal repeats which are repeated at both ends. The nucleic acid is completely genomic in nature. However, each virion may contain defective interfering copies as well. It is a family of viruses that can affect the gastrointestinal system such as Rotavirus and respiratory tract.

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Our faculty promote the understanding of causes of infectious disease in animals and the mechanisms by which diseases develop at the organismal, cellular and molecular levels. Veterinary microbiology also includes research on the interaction of pathogenic and symbiotic microbes with their hosts and the host response to infection.

Takashi Matsumoto and Yoshio Yamaoka, Essential reading for everyone working with human microbiota, probiotics and prebiotics. Definition of Microbiology Microbiology is the study of microorganisms, which are unicellular or cell-cluster microscopic organisms. This includes eukaryotes such as fungi and protists and prokaryotes such as bacteria and certain algae. Viruses are also included. Microbiology subdivided into divisions including bacteriology, virology, mycology, parasitology and others. A scientist who specializes in the area of microbiology is called a microbiologist. Microbiology can be divided into several subdisciplines, including: The study of how the microbial cell functions biochemically. Includes the study of microbial growth, microbial metabolism and microbial cell structure. The study of how genes are organised and regulated in microbes in relation to their cellular functions. Closely related to the field of molecular biology. The study of the molecular biology and genomics of microorganisms. The study of the role of microbes in human illness. Includes the study of microbial pathogenesis and epidemiology and is related to the study of disease pathology and immunology. The study of the role in microbes in veterinary medicine or animal taxonomy. The study of the function and diversity of microbes in their natural environments. Includes the study of microbial ecology, microbially-mediated nutrient cycling, geomicrobiology, microbial diversity and bioremediation. Characterisation of key bacterial habitats such as the rhizosphere and phyllosphere. The study of the evolution of microbes. Includes the study of bacterial systematics and taxonomy. The exploitation of microbes for use in industrial processes. Examples include industrial fermentation and wastewater treatment. Closely linked to the biotechnology industry. This field also includes brewing, an important application of microbiology. The study of airborne microorganisms. The study of microorganisms causing food spoilage. General Microbiology Microbial Biodegradation, Bioremediation and Biotransformation Interest in the microbial biodegradation of pollutants has intensified in recent years as mankind strives to find sustainable ways to cleanup contaminated environments. These bioremediation and biotransformation methods endeavour to harness the astonishing, naturally occurring, microbial catabolic diversity to degrade, transform or accumulate a huge range of compounds. Environmental Microbiology The study of the composition and physiology of microbial communities in the environment i. Can also include the microorganisms living on or in the animals and plants that inhabit these areas. Oral Microbiology The study of the microorganisms that inhabit the mouth and in particular those involved in the two major dental diseases: Oral bacteria include streptococci, lactobacilli, staphylococci, corynebacteria, and various anaerobes in particular bacteroides. Plant Pathogenic Bacteria Bacteria pathogenic for plants are responsible for devastating losses in agriculture. Plant pathogenic bacteria impact innumerable and valuable agricultural crops, causing hundreds of millions of dollars in damage each year. The use of antibiotics to control such infections is restricted in many countries due to worries over the evolution and transmission of antibiotic resistance. Microbiology Societies A list of societies relevant to microbiology Bacteria Acinetobacter The genus Acinetobacter is a group of Gram-negative, non-motile and non-fermentative bacteria belonging to the family Moraxellaceae. They are important soil organisms where they contribute to the mineralisation of, for example, aromatic compounds. Acinetobacter are able to survive on various surfaces both moist and dry in the hospital environment, thereby being an important source of infection in debilitated patients. These bacteria are innately resistant to many classes of antibiotics. In addition, Acinetobacter is uniquely suited to exploitation for biotechnological purposes. Bacillus Bacillus subtilis is one of the best understood prokaryotes in terms of molecular biology and cell biology. Its superb genetic amenability and relatively large size have provided powerful tools to investigate a bacterium in all possible aspects. Recent improvements in technology have provided novel and amazing insights into the dynamic structure of this single cell organism. Clostridium The genus Clostridium comprises a heterogeneous group of anaerobic spore-forming bacteria, including prominent toxin-producing species, such as C. Clostridia produce a range of different clostridial toxins including two of the most potent biological toxins known to affect humans. Corynebacteria Corynebacteria are a diverse group Gram-positive bacteria found in a range of different ecological niches such as soil, vegetables, sewage, skin, and cheese smear. Some are important pathogens while others are of immense industrial importance. Cyanobacteria Cyanobacteria are a fascinating and versatile group of bacteria of immense biological importance. Thought to be amongst the first organisms to colonize the earth, these bacteria are the photosynthetic ancestors of chloroplasts in eukaryotes such as plants and algae. In addition they can fix nitrogen, survive in very hostile environments e. This makes them ideal model systems for studying fundamental processes such as nitrogen fixation and photosynthesis. Gram-positive Bacteria Gram-positive bacteria are generally divided into the Actinobacteria and the Firmicutes. The Actinobacteria include some of the most common soil bacteria and some pathogens, such as Mycobacterium , Corynebacterium. Helicobacter pylori Helicobacter pylori causes peptic ulcers, gastritis and gastric cancer. Lactobacillus Lactobacillus is a genus of Gram-positive facultative anaerobic or microaerophilic bacteria. In humans they are symbiotic and are found in the gut flora. Lactobacillus species are used for the production of yogurt, cheese, sauerkraut, pickles, beer, wine, cider, kimchi, chocolate and other fermented foods, as well as animal feeds such as silage. These bacteria are commonly found in aquatic habitats where they can survive and multiply in different protozoa enabling the bacterium to be transmissible and pathogenic to humans. Mycobacterium Mycobacterium is a genus of Actinobacteria, given its own family, the Mycobacteriaceae. The genus includes pathogens known to cause serious diseases in mammals, including tuberculosis and leprosy. Mycobacteria are aerobic and nonmotile bacteria except for the species Mycobacterium marinum which has been shown to be motile within macrophages that are characteristically acid-alcohol fast. Mycobacteria do not contain endospores or capsules and are usually considered to be Gram-positive bacteria. Pasteurellaceae The Pasteurellaceae family comprises a large and diverse family of Gram-negative bacteria with members ranging from important pathogens such as Haemophilus influenzae to commensals of the animal and human mucosa. Members of the family Pasteurellaceae cause a wide variety of diseases in humans and animals. Pseudomonas The bacterial genus Pseudomonas includes the opportunistic human pathogen P. Staphylococcus Species of Staphylococcus are important pathogens that cause a variety of diseases in humans and animals. In particular, they cause hospital acquired infections and antibiotic resistant strains MRSA cause major problems in hospitals. Treponema Treponema pallidum is a gram-negative spirochaete bacterium. There are at least four known subspecies: Vibrio cholerae Vibrio cholerae is the causative agent of cholera and belongs to a group of organisms whose natural habitats are the aquatic ecosystems. The strains that cause cholera epidemics have evolved from non-pathogenic progenitor strains by acquisition of virulence genes, and V. Fungi Candida Candida species are important human pathogens that are best known for causing opportunist infections in immunocompromised hosts eg transplant patients, AIDS sufferers, cancer patients. Infections are difficult to treat and can be very serious: The sequencing of the genome of C. These have provided a fascinating insight into the molecular and cellular biology of these fungi and these should pave the way for the development of more sensitive diagnostic strategies and novel antifungal therapies. Pathogenic Fungi Pathogenic fungi are fungi that cause disease in humans or other organisms. The study of pathogenic fungi is referred to as medical mycology. Although fungi are eukaryotic organisms many pathogenic fungi are also microorganisms. Viruses Animal Viruses The study of animal viruses is important from a veterinary viewpoint and many of these viruses causes diseases that are economically devastating. Many animal viruses are also important from a human medical perspective. Bluetongue Virus Bluetongue virus BTV , a member of Orbivirus genus within the Reoviridae family causes serious disease in livestock sheep, goat, cattle. Partly due to this BTV has been in the forefront of molecular studies for last three decades and now represents one of the best understood viruses at the molecular and structural levels. Coronavirus Coronaviruses are positive-strand, enveloped RNA viruses that are important pathogens of mammals and birds. This group of viruses cause enteric or respiratory tract infections in a variety of animals including humans, livestock and pets. Bacteriophage The New Phage Biology from genomics to applications. Bacterial viruses, or bacteriophages, are estimated to be the most widely distributed and diverse entities in the biosphere. With more recent advances in technology, most notably the ability to elucidate the genome sequences of phages and their bacterial hosts, there has been a resurgence of interest in phages as more information is generated regarding their biology, ecology and diverse nature. Phage research in more recent years has revealed not only their abundance and diversity of form, but also their dramatic impact on the ecology of our planet, their influence on the evolution of microbial populations, and their potential applications. This review focuses on this new post-genomic era of phage biology, from information emerging from genomics and metagenomics approaches through to applications in agriculture, human therapy and biotechnology. This picornavirus is the etiological agent of an acute systemic vesicular disease that affects cattle worldwide. Cytomegalovirus Cytomegaloviruses are members of the herpesvirus group and can infect humans and other primates. Infection causes problems in immunocompromised hosts including AIDS victims or patients undergoing organ and stem cell transplantation and congenital infection can cause birth defects in the child. Development of an effective vaccine has high priority. Epstein-Barr Virus Epstein-Barr virus EBV is a human gamma herpes virus that remains one of the most successful viral parasites known to man. It is the etiological agent of infectious mononucleosis and is the major biological cofactor contributing to a number of human cancers including B-cell neoplasms e. Papillomavirus Papillomaviruses are oncogenic DNA tumour viruses that infect humans and animals. Human papillomavirus is one of the most common causes of sexually transmitted infection in the world and can also cause cancer. Papillomavirus research has been revolutionised in recent years with the advent of new technologies such as organotypic raft cultures, virus-like particles and transgenic mice. Bacteriophage Phage Bacterial viruses, or bacteriophages, are estimated to be the most widely distributed and diverse entities in the biosphere.

8: Animal Microbiology | Microbe Post

Summary: The microbiology of animal bite wound infections in humans is often polymicrobial, with a broad mixture of aerobic and anaerobic microorganisms. Bacteria recovered from infected bite wounds are most often reflective of the oral flora of the biting animal, which can also be influenced by the.

9: Kingdom (biology) - Wikipedia

Nov. 5, â€" While microbial communities are the engines driving the breakdown of dead plants and animals, little is known about whether they are equipped to handle big changes in climate. In.

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