Microbiology and parasitology pdf

Genes determine our eye color, height, development throughout life and even our behavior. All living beings have a set of genes that, when expressed, manifest themselves in a more or less explicit way in their body, modeling it and giving it a wide variety of traits and functions. However, is it possible that the expression of certain genes has effects outside the body itself? Discover some basic ideas about advanced phenotype theory. Advanced Phenotype: Genetics Outside the Body First, let's talk about two basic, but no less important, concepts that will help you understand the advanced theory of phenotype: genotype and phenotype. The genotype of the genotype is a set of genes or genetic information possessed by a particular organism in the form of DNA. It can also refer to two alleles of the gene (or alternative forms of the gene) inherited by the body from its parents, one per parent. The genetic information that a particular organism has in the form of DNA is its genotype. An image of the public domain. It should not be confused with the genome: the genome is a set of genes corresponding to DNA that the species does without considering its diversity (polymorphisms) among humans, while the genotype does contemplate these changes. For example: the human genome (total species Homo sapiens sapiens) and the genotype of one person (collection or set of genes and their variations in humans). The genotype of the genotype, or at least part of it, expresses itself inside the body, thereby contributing to its observed traits. This expression occurs when information encoded in DNA traduces synthesize proteins or RNA molecules, a precursor to proteins. A set of observed traits expressed in the body through the expression of its genotype is called phenotype. Eye color (phenotype) is determined by the expression of a set of genes in the body (genotype). Drawing cocoparisienne on Pixabay (public domain). However, genes are not always all in determining the characteristics of the body: the environment can also influence its expression. Thus, a more complete definition of the phenotype will be a set of attributes that manifest in the body as the sum of its genes and pressure on the environment. Some genes express only a specific phenotype, taking into account certain environmental conditions. The Advanced Phenotype Theory Concept of Advanced Phenotype was coined by Richard Dawkins in his book Advanced Phenotype (1982). Dawkins rose to fame after the publication of his most controversial work, The Selfish Gene (1976), which was a precursor to his theory of advanced phenotype. According to Dawkins himself, the extended phenotype is not limited to the individual body in which the gene is located; that is, it includes all what the gene causes to the world. Thus, the gene can influence the environment in which the body lives through the behavior of this organism. Dawkins also believes that a phenotype that transcends the body itself can affect the behavior of other organisms around it, thereby benefiting all of them or just one... and not necessarily an organism that expresses a phenotype. This would lead to strange a priori scenarios, such as that the body's phenotype was beneficial to the parasite that attacks it, not for itself. This idea is summarized in what Dawkins calls the Central Theoreum of The Enhanced Phenotype: Animal behavior tends to maximize gene survival for such behavior, regardless of whether these genes are in a particular animal's body by performing it. It's a complicated idea, isn't it? However, it makes sense to take into account the basic premise with which Dawkins begins, which says in his work The Selfish Gene: the main units of evolution and the only elements on which natural selection operates, in addition to individuals and populations, are genes. Thus, the bodies of organisms are simple survival machines improved to ensure the perpetuation of genes. Examples of advanced phenotype May all seem very complex, but you'll understand them better with some examples. According to Dawkins, there are three main types of advanced phenotype. 1) Beaver architecture animals build dams and change their surroundings, just as the termite colony builds a termite mound and changes the ground as part of their way of life. A dam built by beavers. Figure Hugo.arg (CC 4.0) Termit Mounds in Outratalia. An image of the public domain. On the other hand, the protective cases that caddisfli build around them from the material available in the environment improve their survival. The Caddisfly larva inside the protective enclosure consists of a plant material. Illustration by Matt Reinbold (CC 2.0) These are all examples of the simplest type of extended phenotype: animal architecture. The phenotype, in this case, is a physical or material expression of animal behavior that improves the survival of the genes that express such behavior. 2) Parasite manipulation of host behavior In this type of extended phenotype, the parasite expresses genes that control the behavior of its host. In other words, the parasite's genotype manipulates the host's phenotype (in this case, behavior). A classic example is that crickets controlled by nematomorphs or gordiaceae, a group of parasitic worms commonly known as hair worms, as explained in this video: To sum up: hair larvae worms develop inside aquatic hosts such as fly larvae. As soon as the flies undergo metamorphosis and reach adulthood, they fly to dry land, where they die; and it was at this point that Enter the scene: Adult cricket feeds on the remnants of flies and acquires the worm hair larvae that develop inside the cricket, feeding on its fat. Adult worms must return to the aquatic environment to complete their life cycle, so they will monitor the cricket brain to get it to find the source of the water and fall. Once in the water, the worms leave the cricket body behind, which sinks. Other examples include female mosquitoes carrying the simplest, which causes malaria (Plasmodium), which causes female mosquitoes (Anopheles) to feel more attracted to human breathing than uninfected, and bile induced by several insects on various host plants such as cipids (micro-drains). 3) Action at a distance A recurring example of this type of extended phenotype is the manipulation of the behavior of the owner of cuckoo chicks (a group of birds of the Cuculidae family). Many cuckoo species, such as the usual cuckoo (Cuculus canorus), lay eggs in the nests of other birds so they can lift in their place; In addition, cuckoo chicks fight off the competition by getting rid of eggs of other species. Watch as the cuckoo chick gets rid of the cane reed eggs (Acrocephalus scirpaceus)! In this case, parasitism, the chicken is not physically related to the owner, but nevertheless affects the expression of its behavioral phenotype. Reed warbler feeding common cuckoo chicken. Illustration by Per Harald Olsen (CC 3.0). . . . There are still examples and studies on this concept. If you are very interested in this topic, I highly recommend that you read the Selfish Gene (always critically and from an open point of view). Also, if you have a good notion of biology, I encourage you to read Advanced Phenotype. Main picture: Alandmanson/Wikimedia Commons (CC BY-SA 4.0) Symbiotic relationships are an important engine of organism diversification and evolution. The relationships established by the insects with some endosymbiotic microorganisms (i.e. those inhabiting the inner part of their body) have provided them with many amazing physiological and environmental adaptations. The value of the relationship between insects and their endosymbione The main reason for the inquisitive and adaptive success of insects is their potential to stabilize useful relationships with other vital creatures and, especially, with those microorganisms inhabiting their insides: endosymbione. A few years ago, it was thought that the greatest contribution of endosymbiotic microorganisms to the physiology of insects played a role in eating habits, which explains, at least in part, the diversity of diets among insects. However, endosymbionics have been shown to affect many other physiological traits. Types of endosymbiosis in insects of endosymbiotic microorganisms can be found inside intestines, in the spaces between the cells and inside the cells. As a rule, the more internal endosymbiotic microorganisms are found in the host's body, the closer their connection with the insect. The four most common types of endosymbiosis in insects are explained below, from the most external and least close relationships with the most internal and closest. Gut microbial microbiota insects consist of both prokaryotes (single-celled, nucleus-free, like bacteria and archaea) and eukaryotes (single-celled or pluricellular, with a nucleus like the protozoa) that live outside bowel cells. They usually inhabit the back of the insect's intestines (hindgut), either moving freely in its lumen or remaining attached to its walls. In some phytophagic insects like termites and cockroaches, Hindgut is a camera without oxygen (anaerobic), where cellulose and other complex sugars are fermented. Worker termite of the intestine; The green part corresponds to the hindgut without oxygen. Illustration: Brune, A. (2014). Symbiotic digestion of lagnocellulose in the intestines of termites. Nature Microbiology Reviews, 12 (3), 168-180. In termites, this anaerobic chamber contains professor-teaching anaerobic prokaryotes (they can develop either with or without oxygen) and obliges anaerobic prokaryotes (they can only develop without oxygen), such as spirochetes and methanogens, which help digestion. Besides, in some worker termites, this camera also contains the simplest ones that play an important role in the digestion of wood pulp (have you ever seen a piece of furniture pierced by termites?). Unlike other endosymbiones, intestinal microbes are horizontally transmitted between insects; that is, insects do not inherit intestinal microbes from their parents, but they must acquire them throughout their lives. In termites, the acquisition of intestinal microbes occurs through a process called trophallaxis: workers who are the only ones able to feed on their own, digest food and transmit the resulting product mixed with intestinal microorganisms to the rest of the colony through the mouth parts. Trofollaksis. Illustration by Shutterstock. In addition, microorganisms are removed during molting processes, so termites (and other trophollaxis insects) can acquire them again through trophollaxis. Endorazites are parasites that live and/or develop inside the body known as endorazites. They are also horizontally transmitted between insects. Insects stabilize much more relationships with pluricellular endoparasites than with microorganisms, being pluricellal endoparasites most harmful to insects in general terms; these are cases of insect parasitoids (which we mentioned in this post) and nematodes (capable of transmitting deadly bacteria to insects). relevant endoparasity link between insects and microorganisms, and the only one, the only one explain here, are vectors: the insect (or vector) serve as a container for the parasite until it reaches the final host. The parasites carried by vectors are usually pathogenic protozoa, harmful to vertebrates such as trypanosoma (Chagas disease), Leishmania (leishmaniasis) or plasmodium (malaria). The mosquito of the genus Anopheles, the main vector of the simplest malaria-causing worldwide: Plasmodium. An image of the public domain. Extracellular and intracellular symbiosis Unlike intestinal microbes and endoparasites, extracellular and intracellular endosymbionts are vertically transmitted from generation to generation; that is, the insect inherits them from its parents Extracellular endosymbionics of extracellular endosymbios, which can be both prokaryotes and eukaryotes, can be found in various organs of the body (even in the intestines along with intestinal microbes). Either way, they never get inside the cells. However, some species can be found outside and inside cells. Since many extracellular microorganisms may also be intracellular, the possibility that they are in an evolutionary sense in the transitional stage between intestinal microbes and intracellular endosymbionts has been discussed. An interesting case of extracellular endosymbiosis occurs in some species of aphids of the Cerataphidini tribe. As a rule, aphids stabilizes a close relationship with intracellular bacteria endosymbiont (Buchnera), but in some species of the aforementioned tribe these bacteria are replaced by extracellular single-cell yeast fungi (YLS or 'yeast-like symbion'), which inhabit the cavities between the organs and inside different fat bodies. Like Buchner in the rest of the aphids, YLS will play a key role in aphid feeding habits by participating in the production of essential nutrients. Ceratovacuna nekoashi (Cerataphidini). Link (CC 2.5) Assumed that YLS would have evolved from an entomopathogenic fungus (i.e., harmful to insects) whose line would later be derived into beneficial endosymbiotic organisms. Intracellular endosymbiones are thought to have at least 70% of the insects endosymbiotic microorganisms inside their cells. There are two types of intracellular endoimbionts: mycetocytes or flea or mycetocytes are specialized fat cells containing endocimbionts that can be found in some groups of insects. These cells are vertically passed to offspring and come together, forming organs known as bacterioma mycetoms. Blochman's bodies, or simply endosymbionic bodies inside mycetoms, are associated with three groups of insects: Blattaria (cockroaches), some groups of heteropterans in Gomopter (cicadas, rust flies, aphids, etc.) and Curculionidae (curcumian beetles). Buchner afidikol inside the mycetoma apli acyrthosiphon pisum. Central to the core The cells, which are round, are arranged packed in mycetoma cytoplasm. Illustration by J. White and N. Moran, University of Arizona (CC 2.5). The most well-studied case is the link between Buchnera and aphids. This intracellular bacterium processes uric acid and some other nitrogen waste produced by aphids to produce the amino acid glutamine, which is then used by the same endosymbiont to produce other essential amino acids needed for the development of aphids. Buchnera is also believed to produce vitamin B2 (riboflavin). This may explain why aphids have such high reproductive rate and great evolutive success, despite the fact the diet is rich in carbohydrates (which they get from plant juice) and poor in nitrogen compounds. It has been confirmed that Buchner's cells decrease in quantity when nutrients are scarce. This suggests that aphids use Buchner cells as an alternative food source in difficult situations. Thus, aphids take more advantage from this relationship than Buchnera. Guest endosymbionts In this case, the guest (endosymbiont) changes some of the insect's physiological traits to gain some advantage. Guest endosymbiones usually affect the sex ratio of insects (the proportion of males and females in the population), as well as other reproductive traits. Guest endosymbionic, which alters the sex ratio, are known as sex-ratio seekers. Some guest microbes that inhabit the cytoplasm of insect cells are vertically passed to offspring through eggs, so they need a higher proportion of female insects to guarantee their own perpetuity. To change this proportion, they use a variety of methods: killing men, induction of parthenogenesis, feminization or incompatibility of cytoplasm, for which they usually cause changes at the genetic level. One of the most well-studied cases is Wolbachia, an intracellular bacterium capable of causing bias in the sex ratio through almost every one of the aforementioned methods. Phenotypes are the result of insects infected with Wolbachia. Illustration belonging to the following work: Verren, J. H., Baldo, L. and Clark, M. E. 2008. Wolbachia: a master manipulator of invertebrate biology. Nature Microbiology Reviews, 6 (10), 741-751. . . . Do you know of any other connection between germs and insects? Leave your comments below! Links Burcis K, Miller TA (2003). Insect symbiosis. CRC Press. Douglas, A.E. (1998). Food interactions in insect-microbial symbiosis: Apla and their symbiotic Buchner bacteria. Annual Entomology Review, 43: 17-38. Vega F.E., Blackwell M. (2005). Insect-fungal associations: Ecology and evolution. Oxford University Publishing House, USA. Cover image - a montage made by the author of two images: 1) vector of bacteria (flaticon www.flaticon.com) and 2) the termite vector (received www.allstatepest.com.au). During the time Mothers bring everything they need to develop the baby. Do you know what also implies for microorganisms? For the good maturation of our gut and immune system, we need a microbiological contribution from mom. Enter and discover the different types of bacteria that gives us our mother in the early days of life. A STERILE PREGNOSITY? For a long time it was believed that the uterus and amniotic sac containing the fetus were a sterile place without any microbiological presence. Moreover, the mere presence of microorganisms was associated with illness or risk to the baby. Thus, it was believed that the fetus was carried out in a completely sterile environment during 40 weeks of pregnancy and came into first contact with some type of bacteria during childbirth. Today, thanks to technological advances and genetic research, it has been noted that this dogma is not true. Fruits are in contact with bacteria throughout pregnancy. These are usually non-pathogenic bacteria that are transmitted by the mother during pregnancy and after childbirth. Placenta ultrasound. Bacterial communities are in red, while their veins are observed in blue. (Image by Wolfgang Moroder) This maternal microbiological transmission is widespread in many groups of the animal kingdom, such as Porifera, molluscs, arthropods and chordates. The presence of this phenomenon throughout the animal kingdom and the ease with which these organisms reach the fetus show that this transmission is a very old process and represents an evolutionary advantage for organisms. Different organisms that maternal transmission is observed. A) Pea aphid (Acyrothosiphon pisum). b) Ordinary chicken (Gallus gallus domesticus). c) Red salmon (Oncorhynchus nerka) and d) River tortoise Podocnemis expansa. (Image: Lisa Fankhauser). TRANSMISSION ROUTES There are different ways why a mother get a baby's first bacterial community. Thus, the child's contact with his future microbiome is given for the first time through the bacteria of the placenta. Then and during childbirth, some bacterial strains are transmitted through the birth canal, the skin and finally through breast milk. Different routes of transfer of microbiological communities. (Image: Lisa Fankhauser) MICROBIOME OF THE PLACENTA is relatively recent that the presence of bacterial communities in this body is known. However, it is noteworthy that it is a small microbiome in terms of abundance. These are usually non-pathogenic microorganisms, but their change may be due to common disorders during pregnancy, such as preterm birth. It was originally thought that these bacterial communities would be associated with the mother's vaginal microbiota, but it has been observed that placental bacteria are more similar to those of the mother's oral microbiota. According to from the mother's mouth to the fetus through the bloodstream. So good oral health is essential for the proper development of the baby. The following diagram shows the main bacterial species identified in the human placenta. The main bacterial fila is observed in the placenta. Your own image. TRANSMISSION DURING CHILDBIRTH As it is known, during childbirth there is a large transfer of bacteria. Most of these bacteria are associated with the vaginal and fecal microbiota of the progenitor. During pregnancy, the mother's vaginal microbiome changes and becomes less diverse, being a more predominant presence of bacteria such as Lactobacillus sp. However, it is noteworthy that this transmission will vary depending on the type of birth, i.e., babies born vaginally present the same microbiome as the mother's vagina microbiota (Very rich Lactobacillus sp., Prevotella sp., Bacteroids and Bifidobacterium sp.), while those born with a caesarean section represent a more similar microbiome to the microbiome of the skin. Staphylococcus sp., Propionibacterium sp. and Corynebacterium sp. The microbiome of the first child depends on the type of chibir. In this diagram we can observe the different bacterial communities that participate in each of them. (Own image) SKIN CONTACT As in other cases, skin with skin contact produces the transmission of microorganisms between two people. In this case, it can be through the type of birth (C-section), in contact with the outer area of the mother's vulva and in contact with the external skin of the mother. Some of the bacteria that are acquired at birth and are usually found in the skin of adults staphylococcus sp. Corynebacterium sp. and Propionibacterium sp. MILK WITH BACTERIA Another of the myths about pregnancy esteryl was breast milk. Until recently, it was thought that breast milk was sterile and the bacteria that were in the samples were due to cross-contamination through the mother's skin and baby's mouth. Today, thanks to the discovery of some anaerobic bacteria, it has come to the conclusion that the mother also provides certain bacterial communities with human milk. There are different microorganisms in milk and tend to vary depending on the type of feeding and the mother's origin (see the different abundances of microorganisms in different mothers in the picture below). However, it has been noted that in the first months of breastfeeding, breast milk is rich in staphylococcus sp., Streptococcus sp. and Lactococcus sp.; while with six months of lactation milk is rich in typical microorganisms of oral microbiota like Veillonella sp., Leptotri spchia. and Prevotella sp. Differences in abundance of bacterial species found in breast milk of 16 subjects analyzed. (Image: Katherine Hunt) and fecal microbiota than artificial insemination of infants. These bacteria favor the child against diarrhea, respiratory diseases and reduce the risk of obesity. Be careful! This does not mean that a child fed artificial milk is worse than breastfeeding, as many of these bacteria can also be acquired by other means. · All these bacterial transmissions on the part of the mother allow the child to begin maturing the immune system and the development of a good intestinal microbiota. Our mothers always give him the best to us! REFERENCES Imagine a bacterium. What image did it occur to you? You may have thought of being elongated like Bacillus, a type of E. coli bacteria or in a small bowl. For many years we have associated bacterial morphology with several basic forms, but there are many forms in the environment. Discover them in the second chapter of Basic Microbiology! BACTERIAL SHAPES Microorganisms are a very diverse group of organisms invisible to the naked eye. In the previous chapter of the previous chapter of this article we talk about the size of the microbe and in this second chapter of basic microbiology we will talk about the various morphologies or forms that exist in the group of bacteria and archaea group (extremophyl bacteria). Usually, when we started to travel to the bacterial world, we found that bacteria have a number of basic forms: digging (spherical or berry), bacilli (forms) and spirills (spiral), as well as its aggregation. They are formed by a union of cells after division. For example, there are species that are cocci pairs (known as diplococci), others form long chains of cocci (e.g. Streptococcus sp.), others are located in three-dimensional cubic groups (e.g. Sarcina sp.) and other formed structures such as grape clusters (Stalocphyoc spcus.). Cocci and its aggregation (Image: Aula Virtual). In the case of rod-like bacteria, we can also find different groups such as diplobacilli or streptobacillus (e.g. Bacillus cereus). In addition, we can find many variations of bacillus: there are shorter and more rounded (numerous coccobacillus, as would be the case with Yersinia pestis), there are Pleomorphic (which have one or more forms depending on the phase of the cell cycle), finished at the tip (such as Epulopiscium fishelsoni), curved or curved. The genus forms of bacteria and its aggregation (image: Aula Virtual) Finally, spiral forms appear, as would be the case with vibrios (in the form of commas like Vibrio cholerae), spirils (like Rodospilium rubrum) or spirochaeta stenostrepta. Spiral Bacteria (Image: Aula Virtual). But why is morphology generalized in these forms? It should be remembered that microbiology has always been a medical discipline, and these forms are more recurrent in pathogenic bacteria. Now, with the rise of microbiology, it was that in the environment there is a huge variety of different morphologies, some much more complex that is known until now. The following graph is the result of a thorough study by David T. Kisela and shows the true morphological diversity that exists in the bacterial world. The various bacterial morphology around the phylogenetic tree (Image: David T. Kysela) FEW EXAMPLES Some individual bacteria represent peculiar structures, such as a narrow stretching known as prostheca. This is the case of Caulobacter sp. and Hyphomicrobium sp. These sprains allow the bacterium to be fixed on a hard surface. There are bacteria that can also represent stems, spikes, or tips. Hyphomicrobium sp. With their prostheca (Image: Nils Hill) Other bacteria have unusual shapes. For example, halophyte bacteria (which support high salt concentrations) such as Stella sp. and Haloquadratum sp. Forming a very strange aggregation. The first has a star shape and a second rectangular shape. Chart of Stella's characteristic form of vacuolat (a) and Haloquadratum walsbyi (b). (Image: Aula Virtual). Haloarcula japonica is a separate halophytic bacteria, like previous ones, presenting a very striking morphology. As we can see in the first section of the image, at certain stages of the cell cycle has a triangular shape. On the other hand, Pyrodictium abyssi (b) represents one of the most striking morphologies, as it has the shape of the letter y. (a) Haloarcula japonica (Image: Nite) b) Pyrodictium abyssi (Image: Benjamin Cummings) There are also very characteristic bacterial associations, such as long chains of organisms that give an aspect to filious bacteria. This is a case of a bacterial filum known as chloroflexia, where green sulfur bacteria such as Chloroflexus sp are classified. Another very striking group is the palisades. They are characterized by bacterial rods with vertical connections. A well-known example is the case of Simonsiella Mullery (b). (a) Microphotography Chloroflexus sp. (Image: JGI Genome Portal). b) Simonsiella sp microphotographer. (Image: J. Pangborn) In some cases, there are bacteria that do not have a certain shape or this can vary throughout the cell cycle. In this case we are talking about technically known as pleomorphic bacteria. Corynebacterium sp. and Rhizobium sp. are good examples of this type of morphology. DETERMINED BY THE GENOME Form or morphology that represents a different bacteria is determined by its genome. This fact and the wide variety of morphologies in different environments show that this function has adaptive value and has been created by selective forces. As a rule, morphological features are explained by environmental phenomena, restriction of nutrients, reproduction, scattering, predator evasion or guest detection. In B Filamentous bacteria, they presented better buoyancy in liquid media and harder to digest protists. Helical bacteria move the easiest way in viscous media, while spherical bacteria or cocci is ideal for diffusion nutrients (because it increases surface/volume ratio). Thus, expect that the same morphology can appear by convergence in different lines (which do not have a common ancestor), i.e. that the form is an adaptation to a given environment. For example, earlier bacteria that have prostheca were grouped into a single genre known as Prosthecomicrobium, but thanks to genetic research, this genus was divided into three different genres. The surprise came when it was noted that each of these genera was more like a gender without prostheses that between them, i.e. were not related to phylogenetically. It's just that these species have developed the same system of adaptation to the environment. However, there are also remember that there are morphological characteristics that are inherited from the common ancestor and persist because it is beneficial for the life of the microbe. · Along with increasing knowledge in the microbial world and genetic methods, we learn more facts about these tiny organisms. Brock, microbe biology. Madigan. Ed Pearson. Microbiology Introduction. The tortor. Ed. Pan American. (Free access in Spanish here) David, T. Kisela. Diversity teaches: understanding the mechanistic and adaptable basis of bacterial morphology. OOP biology. (Free access) Kevin D. Young. The selective value of the bacterial form. Reviews of microbiology and molecular biology. (Free access) Kevin D. Young. Bacterial morphology: why have different shapes? Current opinion in microbiology. (Free access) Cover Photo: Escaela y Ciencia. In August 2016, all media outlets published news about the green pool at the Rio Olympics, but this phenomenon is more common in nature than in wethink, for example, in Lake Urmia (Iran), Lake Clichos (Lanzarote), Lake Hilier (Australia), etc. CONCEPT OF EUTROPHICATION We've heard so much talk about the amazing color change of the pool ones of the Olympics, but do you know the scientific explanation for this effect? Rio 2016 Olympic Games pool. The change in color was obvious and caused by the spread of microscopic algae. (Image: Vern. El Pais). This phenomenon of color change is very common in nature. It's water eutrophication. This concept refers to the spread of organisms due to increased concentrations of nutrients in water. So understand this easily: increased food occurs in water and leads to the growth of organisms that change the characteristics of water, such as color, turbulence, etc. organs, like lakes or pools, this phenomenon is more common, but in the sea also appear this flowering organisms (primarily phytoplaston). An example of eutrophication by algae in the lake. (Image: Radio wtcv) The main nutrients that affect the eutrophication of lakes are the limiting factors of nitrogen and phosphorus. In sweet water reservoirs, this latter is the determining factor, while in salted water nitrogen is usually a limiting factor. Increasing the concentration of these nutrients begins the process of eutrophication and the spread of photosynthetic organisms (mainly microalgae and photosynthetic bacteria such as cyanobacteria or archabatteria, like holobacteria). When the lake receives excessive nutrients, the entire trophic structure can change very quickly. Water is too fertilized and photosynthetic organisms multiply, causing the flowering of algae or microorganisms. The main diagram of eutrophication (image: Sachink Biology) Usually, we talk about microal aerials (phytoplankton) and cyanobacteria blooms, but in some cases, when the change in nutrients is more dramatic (which affects the composition or chemical characteristics of water) we can talk about the spread of bacteria and archaea. For example, in Lake Urmia (Iran) exponentially multiply halobacteria, which support large salt concentrations. Due to the small precipitation and continuous extraction of water for agriculture, water becomes more salty and hinder the life of most organisms and promotes flowering more specialized as Halobacteria. Red pigmentation occurs due to the presence of a pigment known as bacteriohodoxin. Satellite image of Lake Urmia (Iran). The color change is made by spreading bacteria from the Halobacteriaceae family. (Image: La Vanguardia) The Rio basin shows the initial stages of algal bloom. Some lakes, however, are in the later stages of eutrophication, as would be the case with Lake Clichos in Lanzarote. In this lake, the exponential algae Ruppia maritima breed. Photo Lake Clicquos in Lanzarote. (Image: National Geographic) NATURALANDANTHROPOGENIC EUTROPHICATION The natural eutrophification process is strictly regulated as it tends to balance input resources (precipitation, runoff, erosion...) and nutrient outputs. There are three trophic states in the lakes: oligophrogic, mesotrophic and eutrophic, depending on certain characteristics of water, such as the concentration of nutrients and oxygen, its turbulence, primary production, etc. These states mark the age of lakes, i.e. the young lake will be oligrotrophic, while one senior will tend to eutrophication. In the following table we find some differences between these three-trophic Table with some differences between different different States. Ecosystems naturally represent resilience, i.e. the ability to return to normal after a sudden disturbance. Despite this, over time, ancient lakes tend to accumulate sediments and organic remains, making finally a lake in the swamp. This process can last thousands of years. Anthropogenic eutrophication refers to one type of eutrophication caused by humans. Wastewater, water rich in fertilizers and other types of pollution are the main causes of this type of eutrophication. The ecosystem is unable to eliminate so many nutrients in a balanced way, and they tend to accumulate. In this case, the process lasts much less than naturally: once a few decades is enough. Comparison between two types of eutrophication. (Image: New Brunswick, Canada). THE END Eutrophication, however, marks the beginning of the death of the ecosystem. But how? Increased concentration of nutrients leads to an increase in the spread of aquatic plants and algae carried out by photosynthesis. Therefore, the body blooms and causes the formation of a barrier in the water. On the surface, the concentration of oxygen is maintained while in deep areas where light does not penetrate easily, produces an increase in aerobic breathing and reduces photosynthesis. This process of oxygen consumption causes that each time has a lower concentration of this gas and the environment is again anoxic. With enough oxygen, the species, before living peacefully in the lake, will now disappear. In the diagram you can see the barrier created by the spread of algae, leaving deeper areas in a dark environment without oxygen. (Changed image from SPE International) On the other hand, high biological activity implies a decrease in the dissolution of some nutrients in the water, causing a change in pH and salinity of this, conditioning is also seriously also inhabited by these waters and contributes to the spread of extremophiles. In addition, the presence of some algae suggest the production of toxins that negatively affect the local populations of lake Essential toxic cyanobacteria, which are usually easily reproduced are Anabaena sp, Cylindrospermopsis sp., Microcystis sp. and Oscillatoria sp. This means a heavy loss in the diversity of the area. Comparison of diversity in olygotrophic lake and eutrophic. (Image: Madrid) Finally, organic remnants of dead organisms accumulate at the bottom of the lake, thereby increasing the sedimentary layer. Over time, the volume of water has significantly decreased, turning the place into a swamp. · As in most cases, men's actions have serious consequences in the environment. We must avoid pollution or lose the great diversity that surrounds us. READ MORE Eutrophysacion. Mazzeo. (PDF, Spanish) Personal notes, biology degree at UIB. Eutrophication: causes, effects and control in aquatic ecosystems. Michael No. Available here. Cover photo: Aksna. If you ever thought you were alone in your home, you were wrong. In your house there are thousands and thousands of microorganisms germinate at ease. They are responsible for the smells and pollution from your home. Want to know more about your tenants? MICRO-SQUATTERS of our homes It is stimated that about 90% if our time is spent in enclosed places such as office, school or house. These places, like the rest of our planet, represent environmental conditions suitable for the spread of bacteria, fungi and arthropods. These communities are known as the microbiome of the house. Photomicrograph bristles used toothbrush, where many microbial communities multiply (Image: Scientific photobiography) Relationships that we are stable with these communities of microorganisms, can be caused directly in our health. They can find useful microorganisms, indifferent microorganisms (i.e. do not produce any effect) and pathogens (like staphylococcus aureus are resistant to antibiotics) or allergens as ticks. These pathogens, in most cases, simply represent a percentage of the lit and pose no risk to them by the occupants of the house. BACTERIA Bacterial communities are very abundant in our homes. We can find them in every corner and have a great variety. For example, dust is estimated to have 7,000 different types of bacteria. In the following graph, you can observe a wide variety of bacterial species that colonize certain regions of our home, such as a toilet cover, kitchen or our own beds. Various bacterial families that we can find arround our home (Image: G. E. Flores) FUNGI Under normal conditions, the house can present up to 2000 different types of fungi. We can also find them in all living conditions, such as food, kitchen, walls and even in forgotten places during cleaning, such as dust accumulated on door frames. Among them are the presence of aspergillus, penicillium and fusary (common surroundings of mushrooms). Also breed fungi responsible for wood degradation (e.g. Stereum, Tremetes, or Tremellosa) or fungi associated with humans like Candida. The shape of the walls that appear in the houses (picture: Mycleaningproduct.com) or the fruit mold Penicillium sp. (image: wisegeek). MITES These microorganisms represent for the arthropods of our homes. They usually live in dust, on rough surfaces such as fabrics, mattresses and pillows where they feed on dead human and animal skin. We can find Dermatophagoides pteronyssus and Dermatophagoides farinae species, commonly known as dust mites. Even so, and to a lesser extent, we can also find what another example of Demodex folliculorum. It's This. live in the hair follicles of our face and feed on dead skin. Usually it follows from the skin while we sleep. Dust mite D. pteronyssinus (image: Geran Malmberg) and Follicles of the Demodex folliculorum (Image: BBC) BIOGEOGRAPHY AND EMISSION SOURCES Geographical distribution of these microscopic communities and the factors that define it are little known. For this reason, during this decade, research on the Homa microbiome has increased and spread for real. The large microbial diversity varies in different places in our house, i.e. we will not find the same microorganisms in bed as in the toilet bowl. For example, in our kitchen, depending on the place we explore, we find a greater abundance of specific bacteria or other. At the bottom of the image, we show how in the oven of our kitchen to find more salmonella sp than Clostridium sp. Differences in the abundance of bacteria depending on the location (Image: G.E. Flores) Despite this, we can find a certain pater in this distribution, i.e. microorganisms that inhabit certain areas are more similar than the comminities that we found elsewhere. In the next dendogram, we can see that the microorganisms found in our pillowcase are very similar to those in the toilet, but completely different from what we can find in our kitchen cutting board. The dendrogram is similar between bacterial communities in different areas of our home. (Image: Robert, D. Dunn). But what is the reason for this geographical distribution? The reaction is found in different sources of emissions of these organisms. Depending on the source, we may find several species or other. It is obvious that the main source of microorganisms' emissions into the environment are people. We know that millions of bacteria and other microorganisms live in our bodies and they spread everywhere, either by respiratory activity, digestion waste or contact with the skin. Everyone leaves a certain microbial fingerprint in these places. The main sources of emissions depending on the area of the house to study. See that the biggest source of emissions are our own human. (Image: G. E. Flores) In the graph you can see that in some places there are microorganisms associated with our intestines, in particular those who throw away with litter. Don't wash you hans after going to maintenance, surely yo goes spreading fecal bacteria everywhere. Also, if you pull the string with a hard lid open, it causes the expansion of fecal bacteria as if it were a spray, reaching our toothbrushes or hand soap. On the other hand, microbial diversity is greatly influenced by the number and type of occupants of the house. We can't find the same microorganisms in a two-person house than in another with a family of seven. In addition, it has been observed that no microorganisms in homes where there are a larger number of women with more men. Generally, men released more microorganisms into the environment. Graphic the influence of the genre of occupiers on the diversity of microorganisms in our house (Image: Albert Barberon). Another important determinant of this geographical distribution and microbial diversity is the presence of pets. If we have animals in our homes, like cats or dogs, we will hiring more diverse microbial communities. In this case, these microorganisms are associated with the faeces, skin and heads of these animals. Differences in abundance are some types of bacteria based on the presence or absence of pets (Image: Albert Barberan). Although the main source of emissions are the occupants of these houses, microscopic komis, which colonize all angles closely related to which we can find from the outside. In the case of fungi, this link is narrower, which is the case for bacteria. Despite this, it has been observed that the species are more diverse in homes. Comparison of rich bacterial and fungal our homes and foreign. (Image: Albert Barberon) How many reasons there is a phrase like my home anywhere! Each house is really aunique and a specific universe of microscopic communities. There are no equals in the world! REFERENCES Mysteries of Human Evolution, their development and their history of movement continue to create great interest and expectations. There are still things to discover and understand about ancient societies, but thanks to the cooperation of science we are getting closer. Can the parasites of the past shed light on these communities? We'll find him in paleoparasitology. WHAT IS PALEOPARASITOLOGY? It is a branch of paleontology that studies parasitological evidence in archaeological records, i.e. the study of parasites or the remains of these found in ancient archaeological sites. The purpose of these studies is to shed light on the origin and evolution of parasitic diseases that exist, as well as to determine their phylogenetic relationships. The study of ancient parasites allows us to know the socio-cultural aspects of ancient societies, for example, their diet, their level of hygiene, if a person has a nomadic or sedentary lifestyle, their migration, etc. Materials studied by paleoparasitology are usually fossilized tissueremains, mummies, fossils, coprolites (feces mummified) or sediments that were able to be in contact with those who were the masters of these parasites. Mummified human coprolites. (Image: M. Beltram) It is difficult to find the remains of the parasite in some samples, as over time all the evidence is destroyed. Even so, usually eggs or Oocyst parasites are found (since they are forms of resistance that have managed to stay for millennia). Egg louse (Pediculus humanus) found in mummy of Brazil (12,000 years old B. Egg Trichuris sp. found in Cape Virgo, Argentina (6000 years old). (Image: Araujo). In some cases, manuscripts and drawings of ancient societies have provided information about the presence of certain parasites, such as ceramics, which we observe below, where the lesions are accurately represented, which represent a person who suffers from skin leishmaniasis. In the next image we see a fossilized skull, which represents very similar damage. A. Changed image of a ceramic mosh representing (red circle) lesions caused by leishmaniasis. (Image: Oscar Anton, Pinterest) B. is a mummified skull that shows very similar injuries. (Image: Carl Reinhard). ARRIVAL TO AMERICA: HUMAN MIGRATIONS AND PARASITES About 150,000 years ago there was a new species of hominids in Africa: Homo sapiens. It began to expand in a few waves to the rest of the continent, Europe and Asia, carrying with it some parasites that were inherited from their ancestors (known as a relic of parasites). At the same time, they are acquiring a number of parasites on their way due to interaction with other people and animals (souvenir parasites). After archaeological remains and parasitological evidence that ancient people left during migration, it is possible to determine the routes on which they follow. One such route was the arrival of a new world (America). We always believed that the first americans came across the Bering Strait (which at one point joined icy Siberia with Alaska) about 13,000 years ago. A view of the path followed by the first American settlers at the bridge across the Bering Strait. (Image: Siberian Times). Another parasitological fact that confirms this theory is the presence of Enterobius vermicularis, popularly known as pinworms. This parasite has been associated for the first time with the ancestors of Homo sapiens and throughout history, coevolved with them to lead to several different subspecies. In the Americas, the remains of two E.vermicularis lines were found, which may have been because hominids arrived from different places with different parasites. In this case, the parasite, if it could pass through the Bering Strait, because its life cycle is not so much dependent on environmental conditions. · Parasites suffer the same phenomena for evolution as humans and other organisms like selection, extinction and colonization. For this reason, these specific human parasites are excellent evidence that shed light on the movements of our ancestorsAuto Araujo, 2008. Some of the most commented images of landscapes are known as the Sea of Stars of Jervis Bay (Australia) or cave stars in New York. Places that glow in the dark. Is this a photo montage? In fact, it is a natural process in which organisms that have the ability to shine their own Fascinating sea of stars in Jervis Bay (image: maxres) B. Waitomo Glowworms Cave in New York (image: Forevergone). WHAT IS BIOLUMINESCENCE? Although it seems like a magical landscape of fairy tales, it is not a magical process. Bioluminescence is a type of chemiluminescence (a chemical process of light production) through which living organisms are able to produce light. It should not be confused with fluorescence. The latter is characterized by the intake of afoton medium, which is then sent, while bioluminescence is the production of lightby of the same body. Species of all kingdoms have such a possibility: bacteria, fungi, fish, insects, etc. It is estimated that 90% of species living in the deepest areas of the ocean are capable of producing light. Mark Arenas talks about these fascinating organisms in two articles Journey to the bottom of the sea wasps I and II. At ground level this number falls, but we all know thecase fireflies (the Lampyridae family) and bioluminescent fungi (genus Aillimara, Mycena ...). Firefly (Fam Lampyridae) and mycenae chlorophos fungus. (Image: National Geographic) Bioluminescence is an oxidation reaction that does not produce heat. Organisms represent a protein known as Luciferin, which oxidizes under the influence of the enzyme luciferase. In the next image, we see a simple representation of this reaction. Luciferase allows luciferin protein to attach to oxygen. The resulting energy of this oxidation is emitted as light. To accomplish this process, organisms must expend energy by consuming ATP (the energy molecule used to function cells). Bioluminescence Scheme (Image: HuffPostworks) There are two different types of bioluminescence: intracellular (chemical reaction occurs in specialized organs) and extracellular (molecules are synthesized in the body and then sent to the street where the reaction occurs). In the case of intracellular, we can find those organisms that synthesize the necessary molecules or those that have a symbiotic relationship with fluorescent bacteria. BIOLUMINESCENCE FUNCTIONS As we have said, most organisms that have the ability to synthesize their own light live in dark places (caves, deep ocean ...). These creatures had to adapt to these harsh conditions. Bioluminescence is used for a wide range of situations. Intra-specific communication. It is used to communicate between organisms of the same species, for example, for mating. In the article How do insects communicate? Irene talks about the various methods used, including bioluminescence used by fireflies. Defense. There are certain living organisms that are disturbed or attacked to produce light intracellularly or extracellularly to scare off the predator. A very interesting example is the vampire squid (Vampyrotethis infernalis), Spitting out spitting out mucus to deceive predators. Attracting loot. Some organisms have light-producing organs that attract their prey. As for example belonging to the genus Lophiiformes. Camouflage. In some cases, bioluminescence is used to camouflage in the shadow of the ocean, this will be a case of lantershashka. BIOLUMINESCENCE IN MICROORGANISMS Many microorganisms are able to produce their own light, and their intentions are not much different from higher organisms. In some cases, bioluminescence is used as a method of detoxifying oxygen, i.e. an easy way to remove excess oxygen. In others, it is used as a method of communication. The image of bioluminescence simplifies the genetic process regulated by quorum sensing. (Image: Cornell Institute of Biology Teachers). Recreating the illumination of the future by bioluminescent plants. (Image: Iluminet) This form of energy, in addition to reducing energy costs and pollution, is fast and easy to maintain. Only thanks to the nutrient-rich gel and the colony of Vibrio Fischeri can have brilliant and continuous lighting. Is this a new way of lighting in our cities? · Nature is majestic and continues to give us lessons, you just have to learn to observe. Brock, biology de los microorganisms. Michael T., Madigan. Ed Pearson. (Spanish) Ocean today. Noaa. Bioluminescence web page. Cover Photo: Andy Hutchinson 7 September 1674 Anton van Leeuwenhoek said after seeing several tiny animals in a drop of water. What did you mention about the concept of tiny animals? In many of our articles we refer to these organisms. Read on to begin your journey into the fascinating world of the invisible. MICROSIT WORLD They are invisible to the naked eye and abounded in such a way that the water seemed to be alive. From a simple sample of water Anton Leuvenhook came to the conclusion that there are tiny living organisms that can not be observed with the naked eye. Using an elementary microscope, he described the first microorganisms. The world of microscopic drawings of Leeuwenhoek over what he described as tiny animals. (Photo: Miguel Vicente, Madrimast). The concept of microorganisms refers to a heterogeneous group of organisms, which can be displayed only by microscopes, as they are smaller than the limits of human vision (approximately 0.1 mm). They can be prokaryotic (bacteria), eukaryotic (simple, algae, fungi...) and even acellular faces, as would be the case with the virus. These organisms are measured by the sub-multhipolipolises of the metro, or rather in micrometers (mkm, a thousandth of a millimeter) and nanometers (nm, a millionth of a millimeter). The armpits of the subway table (photo: Science Park). This small size has its advantages: a high surface-to-volume ratio. This factor has an important biological effect. For example cells tend to grow and multiply faster due to the rapid exchange of nutrients. Being reduced in size, on the other hand, contributes to faster evolution already that multiply faster significantly increases the frequency of mutations (remember that mutations are the raw material of evolution). In addition, microorganisms adapt to the environment more quickly. Let's look at the different sizes that can be found in this large group of microorganisms. In the picture below we can see a simple comparison between different organisms and cells. Different microorganisms and cell size scales. (Photo: Isabel Etayo). BACTERIA This group of prokaryote is characterized by a size that includes more than 700 microns and 0.2 microns. It should be noted that this group represents different morphologys and therefore some of them are measured by diameter (spherical bacteria or coconuts) or by thickness and height (extended bacteria or bacillus). The average size of a prokaryote is between 0.5 and 4 microns. The bacterium Escherichia coli is usually about 2 microns x 1 micron. In a small space like the diameter point that is there at the end of this sentence will fit about 500 E. coli. The size is a comparative chart of different bacteria. (Photo: University of Granada). The largest known bacterium is Thiomargarita namibiensis. This prokaryot was found in Namibia in 1999. It is 750 microns in diameter (0.75 mm), so they are almost visible to the naked eye. These microorganisms are usually present as large as some nutrient storage mechanism, in this case sulfur. Another great example is that of Epulopiscium fishelsoni measuring 600 microns. On the right side of the picture below we can see a comparison of the latter with E. coli. A. Image Thiomargarita namibiensis, about 750 micrometers. B. comparison of Epulopiscium fishelsoni and E. coli. (Photo: Scientific Policy) The presence of microscopic size is not all the advantage, obviously there should be no lower limit. The size of the bacterium of less than 0.15 microns would be virtually impossible. Mycoplasma pneumonia is the smallest bacterium, with a diameter of 0.2 microns. It is a bacterium without a cell wall, which can be purchased in different ways. Following the example of the endpoint, at a diameter of 1 mm will correspond to 5000 bacteria the size of mycoplasma pneumonia. VIRUSES in general, viruses are much smaller than bacteria. They usually have sizes from 20 to 300 nm. Thus, the virus can be a hundred times smaller than a bacterium like E. coli. Comparison of the size of different viruses and E. coli. (Photo: diversidad microbiana) The largest known virus is mimivirus. This represents 600 nm in diameter (more than Mycoplasma pneumonia). In the picture below, you can see a comparison between the size of these giant viruses and Rickettsia conorii that cause human Boutonneuse fever). Comparison Comparison Mimivirus and Rickettsia Conoria. (Photo: Byte Size Biology) The polio virus is one of the smallest viruses known to be, with a size of 20 nm (0.02 microns). If we could see how many polio viruses were placed at the end of the sentence, we would have found about 50,000 viral polio particles. MICROSCOPIC EUKARYOTES In Protozoa, the size remains varied. The average size is usually 250 microns in length. Despite this, small protozoa bacteria can be found (2 to 3 microns, such as Leishmania or Babesia) or large protozoa visible to the naked eye (from 16 mm in the case of Porospora gigantea). In the case of Leishmania, you can see how almost a hundred bodies (thin arrow) can live inside a 30 microphase (rough black arrow). Leishmania inside the macrophagi (black arrow). The bar represents about 20 micrometers. (Photo: Etavan Potirat). Microscopic mushrooms, such as yeast, include sizes of 6-20 microns. The most famous yeasts are Saccharomyces cerevisiae the size of a fluctuation between 6 and 12 microns depending on the stage of maturation. In the picture below we can see the example very clearly. The size of saccharomyces cerevisiae cells. (Photo: Easy Notes). · No species has reached my eye more pleasant than this so many living things within a small drop of water. Anton Leuvenhoek discovered an incredible invisible world in 1974. REFERENCES Brock, Biology de Los Microorganisms. Editing by Pearson. Ignacio Lopez-Goshi. Virus and pandemics. Editorial by Naukas. Cover Photo: Escaela y Ciencia. In recent years, the number of amphibians worldwide has declined significantly, and many of them have completely disappeared. Many researchers claim that the loss of these populations is due to several factors: climate change, habitat loss and the presence of a parasitic fungus. This article will announce a parasite known as killer fungus. BATRACHOCYTRIUM DENDROBATIDIS is the scientific name given to the fungus. It belongs to the class Chytridiomycetes, which collects fungal parasite plants and invertebrates. However, it is the only one of this species affecting vertebrate organisms. This is due to the disappearance of more than 200 species of amphibians, including the golden toads of Costa Rica. One of the last images that we have is a golden toad (Almirante periglenes). (Photo: Richard K.) It has a life cycle that consists of two stages: stationary (sporang) and one mobile (via zoospor). In the picture below we can see the outline of the structure of this type of fungi. Sporang has some subtle enlargements known as risoids or mycelium risoid, allowing you to anchor yourself in the inner layer of the skin. The zoospor comes out of sporangy when it matures and is a single apc flagellum. Bd. mushroom structure diagram (photo: trilobite glass factory) Batrachocytrium is a parasite and need a host that provide nutrients. In this case, the fungus feeds on the keratin of the skin of amphibians. The zoospores arrive in the host's skin by water and ensta in the areas with the highest amount of keratin. They lose the flag and become a sporange. They develop mycelium and again produce zoospores that appear in the water. In case there are no hosts around, the parasite becomes a saprophyte (eating organic matter when decomposed) in anticipation of the arrival of new amphibians. Life cycle of B. dendrobatidis. (Photo: Roseblum) Why does this process lead to disease for amphibians? CHYTRIDIOMYCOSIS In amphibian skin is one of the most important organs. It develops functions such as hydration, osmolestulation, thermoregulation and breathing (e.g., fox and gasps breathes only through the skin. The fungus feeds on the keratin of the skin, destroys the upper layers and spreads throughout the surface of the body, preventing this organ from performing an ion exchange. People die of cardiac arrest. An image of the microscopy of the skin of an amphibian affected by shitridyomycosis. The arrows point to a sporangy. (Photo: Che Weldon) Sporangia is attached to the orertinal area of the skin that receive their nutrients. After about 4-6 days after infection, they begin to develop zoospor (black areas in the interior sporangia image above). When these spores are ripe, release through the spout, which is initially closed. The cork (bottom image) dissolves shortly before the release of the zoospores. An image of the surface of the frog's skin using an electronic scanner. The disputed nipples are identified with the triangle. The black arrow points to a sporange with a dissolved plug. (Photo: Berger). This disease affects only adults. Despite this, tadpoles are reservoirs of the disease, so they can become infected but do not develop symptoms. The fungus infects the tadpole of keratinized areas (usually the mouth area), and when metamorphosis occurs, the fungus expands in other areas. GEOGRAPHIC EXPANSION: ARRIVAL TO SPAIN Mushroom is typical of the South African population Xenopus laevis (African nail toad used in research), but spreads around the world through traffic from infected people. The situation is so serious that the World Organization for Animal Health (OiE) has classified chytridiomycosis as a notable disease. In addition, B. dendrobatidis is included by the IUCN in the list of the 100 most invasive exotic species (if you want to know that they are an invasive species, please read the following article). World regions where positive cases of chitridomicose have been confirmed. (Photo: Bd-maps). Spain became the first European country to be affected by the outbreak of chytridiomycosis, especially in the natural de Penalara park in The average toad midwife (obstetricians-alita) suffered the most. Positive cases have also been reported in other Spanish regions, such as the Balearic Islands. There are many studies being done to address this problem, such as the project zero CSIC General Fund. Positive amphibians to shitridiomycosis in Spain (photo: Bd-maps) CASE OF THE BALEARIC MIDWIFE TOAD Balearic midwife toad (Alytes muletensis) is endemic for the Balearic Islands. IUCN classifies it as a vulnerable species (in this article we talk about this organization and its red list of species). He lives in ponds and ravines of difficult access in Serra de Tramuntana (Mallorca). Specimens can reach about 4 cm and night. Typically, this species is threatened by the destruction of their habitat or predators, but the last threat facing it is chytridiomycosis. Balearic midwife toad or ferreret (photo: Guillem Gutierrez). Researchers found that some populations experienced a significant decline in the number of samples, and they were found to be dead for no apparent reason. Studies have shown that these deaths were caused by the presence of the parasitic fungus B.dendrobatidis. The population that presented more problems belonged to an area known as Torrent del Ferre (the first case of chytridiomycosis was confirmed in 2004). The evolution of the population of Alites muletensis in Torrent del Ferrerec. There have been deaths of Bd since 2004 (photo: Joan Mayol) Research to put an end to this fungus has been a success. In late 2015, researchers from the Balearic Islands confirmed the first successful treatment of citridiomycosis. They disinfected in the natural environment (to eliminate any presence of zoospor) and combined it with antifungal treatment of tadpoles. They managed to completely eliminate the presence of the parasite and thus save the population. Despite this, efforts to put an end to this fungus should not stop. · Chytridiomycosis is still a major problem for global amphibian populations, but there is still hope. 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