INSTITUTE FOR APPLIED RESEARCH IN SUSTAINABLE ECONOMIC DEVELOPMENT – IPADES

HIGH SCIENCE AND TROPICAL DISEASES

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This theme has already received a topic link Highlights IPADES November 2011. By its importance, both for the health of the population as by scientific and economic insertion for emerging countries, in this case the Brazil deserves a more comprehensive approach, which is done in the development in focus January 2012.

Tropical diseases affect 20% of the population in the poorest regions of the planet. Diseases such as malaria, leishmaniasis and dengue are known as neglected tropical diseases. But in fact are associated with lack of economic resources, the precarious health and access to health care bad, since even in tropical regions, only exist where there is poverty; and also because, although understanding the biochemistry of the diseases has been immense advances in the second half of last century, these studies are still distant as relates to tropical diseases.

The impact of tropical diseases in the population is characterized because they blind, they disfigure, they mark and they kill. Currently around one billion people are infected with one or more of these diseases and other two billion live in areas of risk.

Combat these diseases, as well as public policies and financial resources targeted to combat, it is necessary to cross the boundaries of traditional disciplines. This is because the modern development of drugs is very different from trial and error that guided historical advances in medicine, as the discovery of penicillin. Today seeks to determine the structure of receivers and transmitters of the disease. And is there, with techniques that allow you to examine and build models of molecules, which physicists can contribute to the study of disease. From the basic understanding of organisms and proteins that cause the illnesses you can find the targets and find molecules to block receptors.

An example is Chagas disease, endemic in Latin America and growing problem of public health in the State of Pará. And there is no effective treatment. One approach is to seek, in the Brazilian biodiversity, molecules that can generate a new drug. With

models of the structure of target receptors in the membrane of the parasite or of host cells, researchers today know exactly the properties required in a compound that inactive this receiver. It's like a puzzle where if you are looking for a mountain of small pieces, one which has a hand, a rounded bulge and cutouts in the other three, for example. In chemistry, the properties searched in molecules are the ability to attract or repel water, or the tendency to bind to specific elements. This is the case to see how a plant molecule fits into the active site of *Trypanosoma cruzi* to combat Chagas disease.

There is an inconsistency in the State of Pará in relation to that disease. At the same time it propagates with greater intensity, the Amazonian State is the holder enormous biodiversity. However the biodiversity "*in natura*" will not, by itself, contribution to combating the disease. So she makes is necessary, firstly, investment in knowledge. Is what already has been doing the State of São Paulo, since 1999, with the Program in Characterization, Conservation, Restoration and Sustainable Use of Biodiversity in the State of São Paulo, better known as BIOTA-FAPESP. Is the first Brazilian scientific programme with regular investment in research in the natural sciences and ecology.

Another approach transcends the molecular analysis and considers also their biological context. In the case of malaria. A path to your fight can be in conjunction between Biochemistry and the molecular and cellular biology of the life cycle of the parasite that causes, the Plasmodium. Once injected into the blood by the mosquito anopheles, this microscopic organism settles in liver during one stage, before they invade erythrocytes (red blood cells in blood). In the search for discover how Plasmodium reproduces, researches are revealing an exchange "information" intense between parasite and host-indicator of the existence of very specific receptors in the membrane of cells. Search the code for this communication in the genetic material has been a challenge, since there were no clues to the role of 60% of the genome of *Plasmodium falciparum*, sequenced in 2002.

With the help of bioinformatics, the researchers found four genes that determine recipients – called serpentine – the membrane parasite that serves as "antenna" for communication with the host. More recently discovered which molecules bind to two of these receptors, a gigantic step for pharmaceutical research in an innovative way of trying to sabotage communication essential to the micro-organism attacker.

On the other hand, the relationship between the host and the parasite is essential to regulate the pace of disease. This relationship is mediated by ATP (substance that works as "fuel" cellular) and melatonin (hormone that has a peak release to midnight). There the Plasmodium perceives the environment within the erythrocytes and

synchronizes the cycle of life. Assuming this information, the chemistry has been testing synthetic molecules that block the action of melatonin on the parasite, which can improve the action of ant malarial drugs.

It turns out that High Science can contribute significantly to the fight against so called neglected tropical diseases. Open up windows about as biology, chemistry, physics, bioinformatics and biodiversity interact to understand and combat disease, while showing a complexity that leaves clues about the reasons for the slow development of cures.