

The background of the slide is a blue-tinted photograph of a tropical landscape. In the foreground, there is a body of water, possibly a lagoon or a bay, with some rocks or small islands. The middle ground shows a sandy beach with several palm trees and other tropical vegetation. In the background, there are more palm trees and a clear sky. The overall scene is peaceful and scenic.

## Ic. Transverse and Innovative Projects

# Malaria Immunobiology Project

## Summary of activities in 2006

The transverse programme on the immunobiology of malaria aimed primarily to strengthen research into malaria in Portugal, in particular its strands established in modern biomedical sciences. As well as launching a research programme looking at new perspectives on the parasite/host relationship with the aim of testing out new vaccine strategies, the project immediately sought to attract and set up in our country young people mid-career from around the world who had demonstrated their competence and competitiveness. This target was broadly met, and the malaria research programmes are today pursued by a number of groups in the Gulbenkian Institute of Science (IGC) and, more recently, in other high-calibre Portuguese biomedical research institutions, specifically through the transferring of some of these groups. It was thus possible to attract researchers of proven competence in this field to come from abroad, such as Dr Maria Mota and Dr Gabriela Gomes, as well as scientists with established reputations in other areas of biomedicine and now dedicated to malaria in the context of this programme in the IGC, such as Professor Dan Holmberg and Professor Miguel Seabra. The beginning of the set-up of Prof. Miguel Seabra's laboratory in the IGC, with everything that represented in the crusade to strengthen national competence in biomedicine, was one of the high points of 2006's activities. As a direct consequence of this programme, Portugal is today recognised internationally for its research into malaria, and a number of collaborations with experts in European and African countries have been established. The presence of these researchers in Portugal has also made it possible to attract foreign funding that has multiplied the Gulbenkian Foundation's investment in this transverse project. Meanwhile the establishment of these competences within the IGC has allowed doctors and researchers from Portuguese-speaking African countries (Angola and São Tomé e Príncipe) to come over to be trained here, in turn contributing technical support in the planning and eventual execution of other Calouste Gulbenkian Foundation projects in this area in their countries. Ultimately this project would enable the launch of "fieldwork" on Príncipe island (Republic of São Tomé e Príncipe).

From a scientific point of view, 2006 was marked by some significant advances, in particular those resulting from the collaboration between groups in the IGC. Dr Maria Mota (now at the Institute of Molecular Medicine) and Dr Miguel Soares discovered new molecular mechanisms involved in cerebral malaria, and promise not only to open up a whole line of investigation into the most serious clinical complications of acute malaria, but also to contribute towards new therapeutic perspectives. In collaboration with Dr Elsa Seixas (whose initial findings were described in the last report), Dr Miguel Soares's group made very relevant observations on molecular mechanisms of a different kind of fatal acute malaria, hepatic failure. This work has not yet been completed, but is already providing significant and innovatory perspectives on the analysis of this subject, which besides has massive implications for any pathogenesis of malaria. Earlier results for the deactivation of various genes of the parasite which are responsible for the production of "innate immunity activators" by "stress proteins" have been extended to other experimental systems in train in the IGC, contributing to alternative perspectives on the earlier observations. Work continued on the construction of a genetic, biological and clinical-epidemiological database for the population of Príncipe, the site of a new laboratory, along with training for local staff, and should be completed during the coming year.

The collaboration with the Luanda Paediatric Hospital continued, with a broadening of the results of genetic control of susceptibility to serious malaria in human beings. Ultimately, the international network of epidemiology, established thanks to Dr Gabriela Gomes, would bear important fruit. The network encompasses a number of other European and African centres dedicated to malaria, gathers epidemiological data and derives mathematical models that describe and attempt to explain the variability of the situation in areas where it is endemic making it possible to predict the results of different kinds of intervention in relation to populations. The first results, which have now been submitted for publication, make it possible to confirm that high-coverage anti-malarial treatment for six to eight months in the population of an area where it is endemic is enough to eradicate the affliction.

2006 was also dedicated to preparing for the completion phase of this programme for 2007, in particular through the search for professional possibilities for those associated with the project, and the preparation of the doctoral theses of those students involved in it.

## ■ The SAUDAR Project – Health and the Air We Breathe

### SAUDAR – Health and the Air We Breathe

[€83 428]

Established in 2004 with a planned duration of four years, this project seeks to analyse the relationship between the quality of air (exterior and interior) and human health in a given region and the predictable evolution of this relationship in that area based on existing development plans.

The project splits into four phases: the selection of the region for study; the characterising of the current situation in that region; predicting of the evolution of the situation; and the development of a programme of awareness and training.

The area chosen was the municipality of Viseu, with the characterisation of the current situation there being carried out by means of a pair of experimental campaigns measuring atmospheric pollutants, one during winter and one in summer.

Analysis of the results obtained suggests that – apart from in exceptional cases – the problems of atmospheric pollution identified in Viseu consist of increased concentrations of mobile particles both outside and in the classrooms. The increased concentration of particles at night-time which were measured outdoors in the winter campaign seem to be linked to residential fuel-burning. The high concentration of mobile particles within the schools are being studied, with the use of chalk being the probable cause. The upper limits to the average benzene and radon levels within homes are still being exceeded.

This study has identified the concentration of particles to which children are being exposed in schools as a serious problem, making it necessary to identify the sources of these particles and to develop methodologies for reducing these emissions.

On the whole the results obtained thus far make it possible to conclude that Viseu has a low level of pollution, allowing it to be considered a “clean” city.

The project was presented in public in June 2006, on the occasion of the publication of a brochure, *A Healthy City for a Better Life*.

The team went on to disseminate the scientific findings of the project at a national and international level, with presentations at international conferences and medical congresses, as well as publications in national scientific magazines and through the web-page.

The next year, the final phase of the project, will see an intensification of the search for a relationship between exposure to ozone and its effects on populations of sick people within the study area, since significant differences between the biomarkers in the winter and summer campaigns have already been found. The bronchial tubes of the people suffering from asthma were more inflamed during the month of June, reflecting a higher level of exposure to ozone, which is more intense in summer-time. Future development scenarios will also be modelled to

make it possible to evaluate future conditions of air quality in the city and possible effects on those with asthma.

The results obtained in the case study will subsequently be able to be used/adapted for other situations in the country.

The project is the responsibility of the Education and Scholarships department and the Health and Human Development department, and is being carried out by a research team comprising members of the Aveiro University and the New Lisbon University.