



## Marseilles' lazaretto for the 21st century

A new integrated infectious diseases facility opened in Marseilles last year. John McConnell paid a visit.



The opening in December, 2016, of the University Hospital Institute Méditerranée Infection (IHU-MI) in Marseilles, France, was the realisation of Didier Raoult, the institute's director, and his colleagues' vision more than a decade earlier for an integrated facility to study and treat infectious diseases. The purpose-built structure is located adjacent to the main hospital of Aix Marseilles University, known locally as La Timone Hospital. Raoult was inspired by the example of the Pasteur Institute, Paris, that existed until the 1960s, to create a setting where multidisciplinary research and diagnostic teams and a hospital exist on a single site, thus generating a creative environment to produce advances in the epidemiology, diagnosis, treatment, and prevention of infectious diseases.

Construction of the IHU-MI building began in 2013 with a budget of €56 million to build and maintain the structure for 6 years. Finance is largely provided by a state grant, but also includes contributions from city and regional governments, the European Union, and numerous educational, charitable, and commercial partners. The building occupies 27 000 m<sup>2</sup> spread over four floors plus a basement level, and is split over four joined blocks that together make a roughly wedge-shaped plan view. The windows of the building that look out onto the street are protected by permanent sunshades, which form a striking exterior view.

At the core of the building is the patient-care area, which includes a hospital of 75 beds over three floors. The 25 single-bed rooms on the third floor form a dedicated biosafety level 3 (BSL3) ward, with negative or positive pressure control. At the time of my visit, when all the hospital beds

were occupied, the rooms on the third floor were being used to manage immunocompromised patients and those with multidrug-resistant infections and *Clostridium difficile* colitis, but in the event of an outbreak of a highly pathogenic infection requiring BSL3 management, the ward can be converted into separate modules of seven, eight, and ten beds. Health-care personnel carry a microchip in their shoes, which records them entering and leaving a patient's room and sets off an alarm if they don't follow hand hygiene procedures.

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Another block is dedicated to diagnostics, and is full of the very latest technology for genomics, PCR, culture and susceptibility testing, serology, proteomics, and microscopy. There are also dedicated research laboratories, with the researchers able to share the diagnostics platforms during specified periods. A third block houses shared office space for the clinicians, scientists, engineers, and students working on the site. The final block is the site of the 150 seat lecture theatre and teaching and meeting rooms. Housed in the basement level in banks of freezers is the institute's biobank. The current collection of the biobank includes more than 100 000 serum samples, 750 viral strains including a comprehensive set of arboviruses, and the world's largest collection of isolates of intracellular bacteria. Administrative offices are on the fourth floor, where there is also space for start-up commercial collaborations.

The various departments are signposted based on a system that uses the sea creatures found locally in the Mediterranean. So, for example, to find the microscopy department, visitors follow the barracuda pictures. Access to departments is electronically controlled by microchips embedded in identity cards, so that staff can only enter parts of the building for which they have been given permission.

Raoult and his colleague Jean-Marc Rolain told me that with its comprehensive facilities to investigate infectious diseases problems the IHU-MI is a unique institution in France, and possibly worldwide. The range of skills on-site and wealth of observations generated create what Raoult described as a "permanent brainstorm". The research focus of the IHU-MI involves studies using all available techniques to improve understanding of the role of the microbiota, including investigating how the microbiota is involved in the therapy of cancer. 50% of the patients treated at the IHU-MI are involved in a clinical study of some sort. One current project is to look at whether well-established antibiotics that are no longer part of routine practice can be used to treat gonorrhoea. Another is investigating the antibiotic regimen used to treat leprosy to shorten the course of tuberculosis treatment.

Marseilles was once the site of the largest lazaretto, or quarantine station, in the Mediterranean, situated on an island just off the coast of the city. The IHU-MI in the heart of the city continues that tradition with an institution designed to face the infectious diseases challenges of the 21st century.

John McConnell