



# Improving capacities in preparedness and response for radiation emergencies in Costa Rica

## The challenge

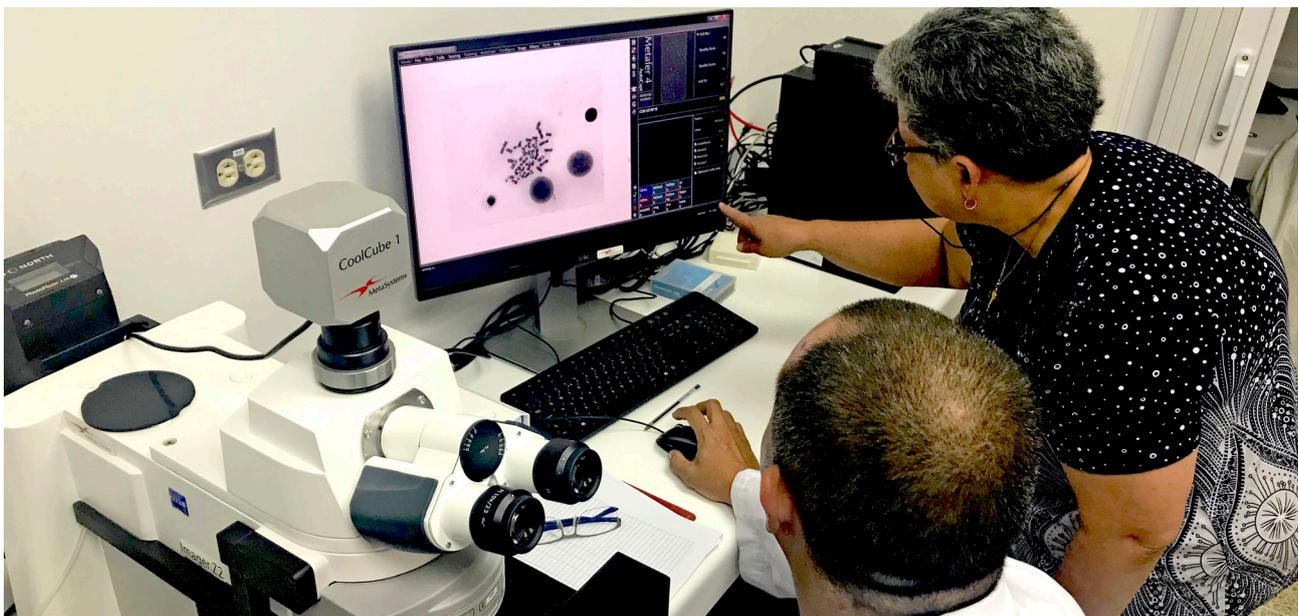
Radiation sources are widely used in Costa Rica in medical centres that provide nuclear medicine services. The country also uses radiation sources in industry: for fabrication, measurement and quality control. However, radiological accidents or unplanned radiation exposures, for example from a miscalculated dose of radiotherapy, can occur, and it is necessary to be prepared for these. In any emergencies affecting people, a dose assessment procedure to estimate the doses absorbed by persons involved in these situations might be necessary. Dose assessment is a key source of information for the medical management and treatment of these persons.

Costa Rica – and the Latin America region overall – has suffered radiological emergencies in the past, leading to the overexposure of patients, workers and in some cases the public. Prior to 2017, Costa Rica had no laboratories that could provide biodosimetric estimation of doses to individuals that had possibly

been overexposed to ionizing radiation. Without a service in the region that could provide timely and adequate support, it was impossible to assess the damage caused by individual overexposure.

## The project

Costa Rica's Institute of Health Research (INISA) worked together with the IAEA for several years, focusing on building the capacity of technical and professional staff from the cytogenetics laboratory of INISA through training at leading centres worldwide. Expert missions were also organized by the IAEA to provide guidance and advice to local experts in order to optimize infrastructure, equipment, supplies and human capacity. Key biological dosimetry techniques were implemented in the country, and one of the most modern automated systems in the world, comprising equipment and software, was acquired for the country for the evaluation of multiple samples in case of a radiological emergency involving a high number of persons. With this equipment, screening, analysis and photo



INISA staff analysing chromosomes using automated equipment. (Photo: R.Scamilla Andreo Aledo/IAEA)

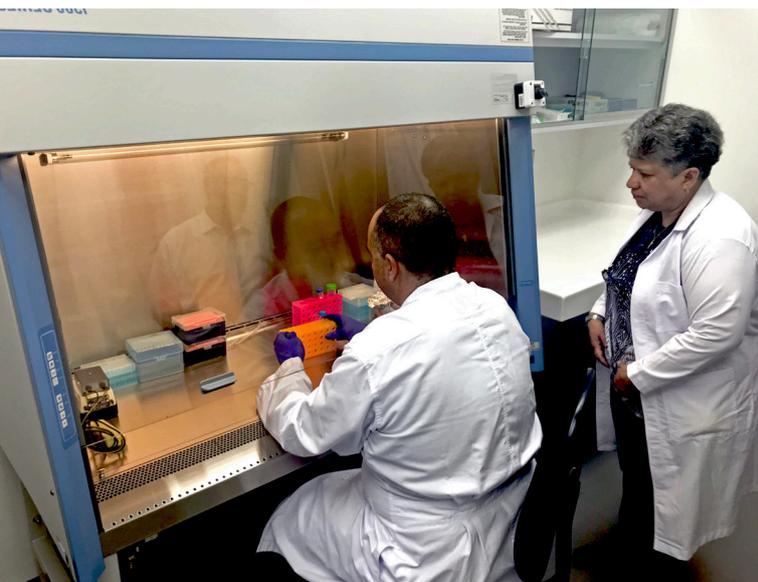
capture could be performed faster. In addition, the equipment supports the analysis of dicentric chromosomes, using special software to estimate the radiation dose absorbed by an individual in case of overexposure to ionizing radiation.

With the advice and collaboration of regional experts from the Latin American Biological Dosimetry Network (LBDNet), a dose-effect calibration curve for gamma rays was developed to provide a rapid response in case of need for an emergency doses calculation in the future.

Research in various areas of biological dosimetry is being conducted, and is planned for continuation in the area of individual radiosensitivity.

### The impact

The biodosimetry service is now a central part of Costa Rica's emergency response system. The biodosimetry laboratory, established through the IAEA project at INISA at the University of Costa Rica, addresses radiological emergencies at the national and could provide support at the regional level if required. It can provide a reliable and readily available biological dosimetry service to the Central America region.



INISA staff preparing samples for the chromosomal analysis.  
(Photo: R.Scamilla Andreo Aledo/IAEA)

## PROJECT INFORMATION

**Project No:** COS9009

**Project title:** Establishing a Biological Dosimetry Service

**Duration:** 2016-2017 (2 years)

**Budget:** €147 000 (and €30 000 government cost-sharing)

**Contributing to:**



### Partnerships and counterparts

The Radiotherapy Service of the San Juan de Dios Hospital was the main project partner during conception of the new biodosimetry service. Other collaborators included the personnel of the Ministry of Health, who provided support and guidance to INISA's lab.

The radiation protection personnel of the Costa Rican Social Security Fund (Caja Costarricense de Seguro Social) and the Ministry of Health of Costa Rica are strategic partners in the provision of the new dosimetry service.

At the international level, support was provided by the IAEA (including the Incident and Emergency Centre), LBDNet and different laboratories and institutions in Europe.

### Facts and figures

Costa Rica's biodosimetry service can now provide biological dose assessment in cases of radiation emergencies at the national and regional level.

### The science

Biological dosimetry is a technique that allows the estimation of absorbed doses received by a person exposed to high levels of ionizing radiation. The technique is used to assess the biological effects on the human organism, characterized by chemical changes in cells and damage to DNA.

In recent years, new uses of biological dosimetry are being continuously developed, and studies on patients receiving radiotherapy are being researched.