

# Towards a reference centre for the diagnosis of childhood cancers in Dakar, Senegal

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In order to reduce the healthcare gap in childhood cancers between high-income and low-middle-income countries, as has been strongly encouraged by the World Health Organization (WHO) since 2018, a Reference Centre for the Diagnosis of Childhood Cancers will be developed in Dakar, Senegal, to provide accurate diagnoses. This ambitious project has the overall goal of developing high-quality morphology, immunophenotyping, molecular biology and cytogenetics expertise in order to improve access to timely and accurate diagnoses of childhood cancers on the basis of WHO criteria. This project benefits from the involvement of local institutions, the faculties of medicine, university hospitals, the nongovernmental organization Alliance Mondiale Contre le Cancer (AMCC) and the Sanofi Espoir Foundation.

Each year, 200,000 to 300,000 new childhood cancer cases are diagnosed worldwide. In 2018, the World Health Organization (WHO) made a priority of managing these cases through the Global Initiative for Childhood Cancer (GICC). The GICC drew attention to the gap in managing childhood cancer between high-income countries and low- and middle-income countries (LMICs), where 80% of cases occurred with only a 20% or less survival rate. In contrast, more than 80% of children are cured in high-income countries. The WHO-GICC target for LMICs (1) is to attain at least a 60% survival rate for children with cancer by 2030. Limited access to healthcare includes a lack of capacity in cancer diagnosis, treatment difficulties and abandonment, and a low level of palliative care availability.

In Senegal, a West African country with 16,209,125

inhabitants and 50% of the population aged under 20, about 200 cases of childhood cancers have been reported per year. The same demographic situation can be observed throughout the West African sub-region. About half of the population lives around the capital city of Dakar. The French NGO, GFAOP (Groupe Franco-Africain d'Oncologie Pédiatrique) manages a pilot unit in Senegal, as in other Francophone Africa countries, to treat children with cancer. The Sanofi Espoir Foundation, through its “My Child Matters” programme, provides part of the funding (2).

However, in addition to the critical figures for the treatment of children with cancer, there are difficulties in diagnosis using the WHO criteria due to a lack of equipment, reagents and training in diagnostic laboratory work. The Alliance Mondiale Contre le Cancer (AMCC), the French branch of the

International Network for Cancer Treatment and Research (INCTR), promotes several programmes, such as a pathology programme that includes telepathology, with funding to set up additional techniques for diagnosis and research (3).

One of the aims of the AMCC pathology programme is to develop and improve the quality of tumour diagnosis, especially for childhood cancer. This aim will be part of the project to establish a Reference Centre for the Diagnosis of Childhood Cancer in Dakar, Senegal (Centre de Référence pour le diagnostic des Cancers de l'Enfant, CRDCE, Dakar, Senegal) with the support of the Sanofi Espoir Foundation "My Child Matters" programme. The overall project goal is to develop the cytological, histological, immunological, molecular and genetic diagnosis of childhood cancer according to the criteria defined by WHO, with the aim of improving survival rates for children with cancer in LMICs in French-speaking Africa by developing timely and accurate diagnoses. This project will be spread over two phases. The first phase, taking place over 18 months, includes the following specific objectives:

- ➔ Improve the sample flow and shorten diagnostic delays through optimal sampling and result management.
- ➔ Upgrade the paediatric anatomy and cytopathology department to improve morphological standards, a prerequisite for obtaining second opinions via telepathology.
- ➔ Implementation of complementary immunological techniques for diagnosis according to the WHO criteria by providing the reagents for these techniques on the basis of immunohistochemistry and flow cytometry.
- ➔ Provide technical training and expertise for African specialists over the longer term by establishing university degrees in anatomy and cytopathology in paediatric oncology.
- ➔ Encourage research at different levels – clinical, epidemiological and fundamental research – by providing equipment for sample banks (cells, tissues, plasma, DNA and RNA) and software to process epidemiological data.

The cytogenetic platform and the molecular biology lab will be developed under second phase (2022–2024) of this project.

The CRDCE will be established as a federation between the various services of the Cheikh Anta Diop University of Dakar (UCAD) and the haematology laboratories from two university hospitals - the Aristide le Dantec and the Dalal Jamm. A clinical research coordinator will be responsible for specimens and results management, and for coordinating diagnostic activities and links with clinicians. There is an existing agreement (*Accord de Coopération*) between the Faculty of Medicine, Pharmacy and Odontology-Stomatology (FMPOS) departments at the

University Cheik Anta Diop (UCAD) in Dakar and the AMMC, with the aim of coordinating activities between the Aristide Le Dantec and Dalal Jamm university hospitals, the FMPOS Faculty and the AMCC, which is supported by the Sanofi Espoir Foundation "My Child Matters" programme.

The UCAD anatomy and cytopathology service will be upgraded and the haematology laboratory will be equipped with a microscope and a digital camera to use telepathology via the i-Path/INCTR platform (3, 4). The current telepathology function using the i-Path platform will be extended to the existing network of 20 centres spread throughout Francophone Africa, including sub-Saharan Africa and the Maghreb. Telepathology enables the sharing of comments on consultation cases and second opinions on difficult cases, as well as for patients enrolled in clinical trials. The exchanges between South/North experts - and henceforth between South/South experts - will help decrease the effects of geographical remoteness (5-9).

The Dalal Jamm Hospital haematology laboratory is working with the hospital administration to develop flow cytometry. The cytometer will be provided, and this project will help obtain the reagents needed to start flow cytometry immunophenotyping to characterize haematological malignancies (10,11). In the UCAD pathology laboratory, under the responsibility of the pathologist, immunohistochemistry techniques will be developed to characterize solid tumours in childhood cancers.

The training aspect will be first developed in the field of telepathology, by providing comments on difficult cases, and then at technical levels once additional techniques have been set up, including immunohistochemistry and flow cytometry, and also in connection with the GFAOP e-learning programme which will provide courses and tutorials.

Research has been carried out by AMCC programmes since LMICs were first identified (12), and covers clinical, biological, epidemiological and fundamental activities. It is one of the reasons behind developing centralized sample libraries in UCAD and the university hospitals from the beginning, and the development of software using epidemiological data.

This Reference Centre, where complementary techniques, immunohistochemistry and flow cytometry will be developed during the first phase, will in due course be made available to other countries from West and Central Francophone Africa sub-regions, as well as to the pilot units of the GFAOP. This will constitute the first experience of sharing South/South samples for complementary techniques between sub-Saharan African countries.

The sustainability of the first phase of the project will be the most important criterion for launching the second phase, with the aim of creating a molecular biology laboratory and

a cytogenetic platform. Measurement indicators will be integrated at the end of the first phase of the project, including:

- ➔ The development and sustainability of the complementary techniques of immunohistochemistry and flow cytometry.
- ➔ Analysis of diagnosis accuracy and the concordance between initial and final diagnoses using telepathology by the kappa coefficient.
- ➔ The time needed between the arrival of the samples, morphological diagnosis, and complementary techniques.
- ➔ Proposals for research projects and links to the university, such as MD and PhD theses.
- ➔ The number of cases communicated by sub-Saharan Africa countries, especially from the West Africa sub-region, but also from the GFAOP pilot units and Central Africa.

Finally, this ambitious project covers all the steps needed to obtain the most accurate diagnosis of childhood cancer according to the WHO criteria, with shorter delays between sampling and results. This federation is coordinated by a clinical research coordinator linked closely to paediatric oncology departments, diagnosis laboratories, hospitals, and the university. It will also become available to other hospitals in the country as well as to other countries in the sub-region. Additionally, the GFAOP pilot units match the aims of the WHO Global Initiative on Childhood Cancer to expand in-country capacity to deliver best practices in childhood cancer care. ■

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**Professor Martine Raphaël, MD, PhD**, is Vice-President of the Alliance Mondiale Contre le Cancer (AMCC), France. She has been Professor of Haematology (1997–2012), Head of the Haematology Department of the Faculty of Medicine and University Hospitals of Paris-Sud (2003–2012) and Emeritus Professor, University Paris-Sud (2012–2018). Professor Raphaël was President of AMCC (2013–2019) and Vice-President since 2019. She is an Officer of the Légion d'Honneur. Since the 1980s, she has been involved in the diagnosis of lymphomas in low- and middle-income countries, especially in Africa, and in the development of telepathology in Francophone Africa using i-Path/INCTR.

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**Dr Fatou Bintou Diagne, MD**, is a paediatric oncologist at the Aristide Le Dantec University Hospital, Cheikh Anta Diop University, Dakar, Senegal. She has been working in paediatric oncology since 2007. She graduated from DIUOP, University Hospitals Paris-Sud, in 2014 and is interested in paediatric lymphoma and improving early diagnosis and cure rates.

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**Professor Aurore Coulomb, MD, PhD**, is a paediatric pathologist and Head of the Pathology Department at Armand Trousseau/La Roche Guyon University Hospital, AP-HP, Sorbonne University, Paris, France. An MD since 1993 and PhD since 2000, with 25 years' experience in paediatric pathology, her main interest is in paediatric oncology. She has been Professor of Pathology since 2007 and involved in research focusing on renal tumors in children. She is a member of PPS (Paediatric Pathology Society) and IPPA (International Paediatric Pathology Association), SFCE (Société

Française des Cancers de l'enfant), RTSG (Renal Tumor Study Group), SIOP (Société Internationale d'Oncologie Pédiatrique), and the AMCC (Alliance Mondiale Contre le Cancer).

**Doctor Elisabeth Auberger, MD**, is a pathologist at the Simone Veil Hospital, Eaubonne, France. She specializes in pathology, cytology and foetopathology, and is a hospital practitioner as Head of the Pathology Department at the Simone Veil Hospital. As coordinator for training programmes for pathologists in sub-Saharan Africa, she has led missions in several hospitals in Madagascar, Ivory Coast and Mali for the French African Group for Paediatric Oncology (GFAOP). She is a member of the Board of the Alliance Mondiale Contre le Cancer (AMCC), and is closely involved in telepathology via the telemedicine network i-Path and in e-learning for the African School of Paediatric Oncology EAOP.

**Dr François Desbrandes** is Head of the "My Child Matters" childhood cancer programme at the Sanofi Espoir Foundation in Paris, France. He has 30 years of experience in the pharmaceutical industry in low- middle- income countries, holding several positions in Sanofi, including Head of Industrial Development in the Asia Pacific, based in Ho Chi Minh City (Vietnam), and General Manager in West Africa, based in Dakar (Senegal). He developed Sanofi's Access to Medicines Operations and the Malaria programme for 10 years and served as the private sector representative on the Regional Steering Committee for the Mekong Malaria Elimination Initiative (RAI2E). After a CSR position as Head of Access to Healthcare for the Underserved, he joined the Sanofi Espoir Foundation as Head of the paediatric oncology "My Child Matters" programme.

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