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**Comprehensive Cancer Centers:  
a relevant model in France?**

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**Olivier EXERTIER**

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# Special Thanks

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- LENOIR Gilbert, Vice-President CANCER CAMPUS,
- SOLARY Eric, Director of Research IGR,
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## List of acronyms

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**ANR:** French National Research Agency

**ARC:** French Cancer Research Association

**CCC:** Comprehensive Cancer Center

**CCSG:** Cancer Center Support Grant

**CLCC:** French Cancer Treatment Centers

**CNRS:** French National Scientific Research Center

**FFCLC:** French Cancer Centers Federation

**HAS:** High Authority for Health

**IARC:** International Agency for Research on Cancer

**INCa:** French National Cancer Institute

**INSERM:** French National Institute of Health and Medical Research

**NCI:** US National Cancer Institute

**NIH:** US National Institutes of Health

**PIA:** Investments for the future program

**PLAN CANCER:** French National Cancer Plan

**PHUC:** University and hospital pole in oncology

**SIRIC:** Integrated research site in oncology

**UNICANCER:** French Cancer Centers Federation

# 1 Introduction

## 1.1 Cancer, a major public health issue at world-scale

Cancer is defined by WHO as a generic term for a large group of diseases (more than 100 types of cancers) that can affect any part of the body. “One defining feature of cancer is the rapid creation of abnormal cells that grow beyond their usual boundaries, and which can then invade adjoining parts of the body and spread to other organs. This process is referred to as metastasis and it is the major cause of death from cancer”.

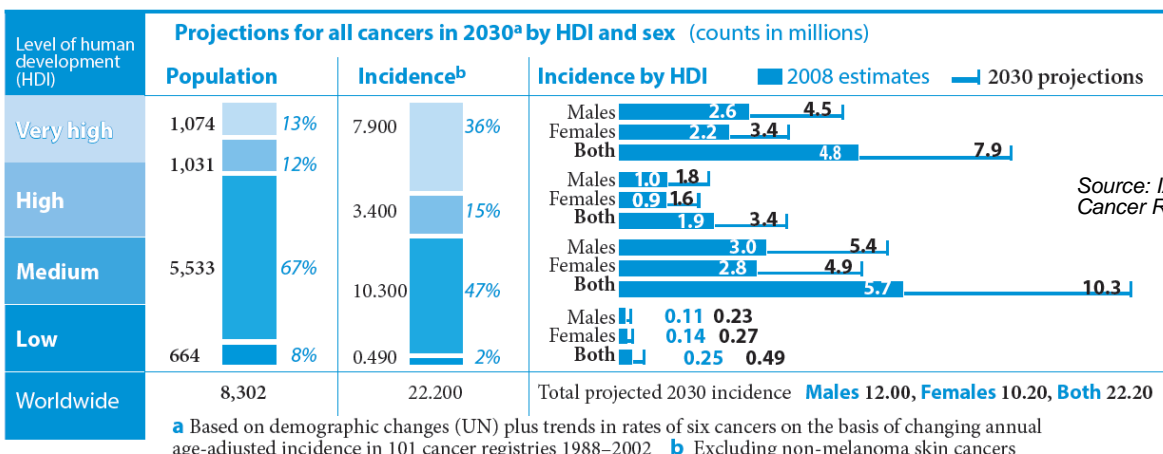
**KEY FACTS ABOUT CANCER**

- “Cancer is a leading cause of death worldwide, accounting for 7.6 million deaths (around 13% of all deaths) in 2008.
- About 30% of cancer deaths are due to the five leading behavioral and dietary risks: high body mass index, low fruit and vegetable intake, lack of physical activity, tobacco use, alcohol use.
- Tobacco use is the most important risk factor for cancer causing 22% of global cancer deaths and 71% of global lung cancer deaths.
- Cancer causing viral infections such as HBV/HCV and HPV are responsible for up to 20% of cancer deaths in low- and middle-income countries”

Source: IARC - WHO

Cancer is a major public health issue at world level, it still accounts for 7.6 million deaths per year (IARC 2008). The most common types of cancer that kill men and women are by frequency: lung (1.37 million deaths), stomach (736 000 deaths), liver (695 000 deaths), colorectal (608 000 deaths), breast (458 000 deaths), cervical cancer (275 000 deaths). About 70% of all cancer deaths occurred in low and middle-income countries.

Deaths from cancer worldwide are projected to continue to rise to over 13.1 million by 2030, the burden of cancer will increase to 22 million new cases each year. This represents a raise of 75% compared with 2008 (81% in low and middle HDI countries and 69% in high and very high HDI countries), according to the following figures:



Source: IARC - WHO, Cancer Research UK

## 1.2 Comprehensive Cancer Centers in the USA and in France

To face the challenge of cancer, Europe and North America have developed, for more than a century, dedicated healthcare institutions called “Cancer Centers”. This EH MBA dissertation aims to study the **development strategies of Cancer Centers, based on the concept of “Comprehensive Cancer Center” (CCC)**. It will start with the **US experience** and its **transposition in France** with the selection of some relevant cases.

This research starts from a program initiated by the American National Institutes of Health (NIH) and the National Cancer Institute (NCI) called “**Comprehensive Cancer Center**” (CCC). It will also cover the equivalent program in France launched by the French Cancer Institute (INCa) and called “Site de Recherche Intégrée sur le Cancer” (SIRIC). It will also consider the “Pôle hospitalo-universitaire en cancérologie” (PHUC) from “Programme investissements d’avenir (PIA)”. The aim of this analysis is to understand if the concept of Comprehensive Cancer Center is relevant in France and how the leading French Cancer Centers organize their **development from the inside** (organics growth) and from the **outside** (external growth) to provide better solution to fight cancer. A specific attention will be paid to the concept of “**Cancer Campus**” organized around major Cancer Centers.

Comprehensive Cancer Centers as institutions raise specific questions due to the unique status among healthcare organizations. Cancer Centers in France are private, non-profit establishments entirely devoted to fighting cancer, with a view to public service (cf. appendices I). Therefore, French Cancer Centers play an intermediate role between public hospitals and private clinics. In the USA, most Cancer Centers are attached to a University, but some of them are private.

In both countries, Cancer Centers are the only large healthcare organizations entirely dedicated to one disease, or to a specific group of diseases (more than 100 types of cancer). They take benefit of this pathology specialization, to work according to a more transdisciplinary approach and a more translational mode:

- “**Transdisciplinary Research** is defined as research efforts conducted by investigators from different disciplines working jointly to create new conceptual, theoretical, methodological, and translational innovations that integrate and move beyond discipline-specific approaches to address a common problem”<sup>1</sup>.
- “**Translational Medicine** is the process of efficiently and effectively translate basic scientific findings relevant to human disease into knowledge that benefits patients”<sup>2</sup>

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<sup>1</sup> *Harvard Transdisciplinary Research in Energetics and Cancer Center*, Harvard School of Public Health

<sup>2</sup> *Translational Medicine and Drug Discovery*, Bruce H. Littman and Rajesh Krishna Cambridge University Press, 2011

### 1.3 Methodology to analyze Comprehensive Cancer Centers

To analyze the concept of Comprehensive Cancer Centers we used both a qualitative and quantitative approach. Our qualitative analysis of Comprehensive Cancer Centers aims to:

- Understand the background and history of Cancer Centers in the USA and then in France, as well as the emergence of Comprehensive Cancer Centers in the USA and their equivalent in France, thanks to a literature review.
- Gather the visions of experts, managing Comprehensive Cancer Centers and national programs to fight cancer in France:
  - ATGER Véronique, Biology Department INCa,
  - FLAMANT Pascale, General Director UNICANCER,
  - GERBAUD Estelle, Translational research INCa
  - LENOIR Gilbert, Vice-President CANCER CAMPUS,
  - SOLARY Eric, Director of Research IGR,
  - VAL Romain, Technology Transfer INCa.

Our qualitative analysis of Comprehensive Cancer Centers aims to:

- Define the specific characteristics of Comprehensive Cancer Centers in France, thanks to national statistics coming from:
  - HospiDiag, a global database regarding the French healthcare institutions,
  - The French Cancer Center Federation UNICANCER,
  - INCa especially regarding SIRIC program,
  - Other institutions such as: ISI Web of Science, SIGAPS...
- Study more in details interesting cases of Comprehensive Cancer Centers:
  - In France: Institut Curie Comprehensive Cancer Center in Paris, Gustave Roussy Comprehensive Cancer Center in Villejuif, Léon Bérard Comprehensive Cancer Center in Lyon and Toulouse Comprehensive Cancer Center / Oncopole,
  - And get complementary inputs from other international experiences (MD Anderson Comprehensive Cancer Center in Houston USA, Oslo Comprehensive Cancer Center in Norway).

These statistics and quantitative data will enable us to qualify French Comprehensive Cancer Centers regarding the main dimension of their activities and resources:

- Medical activities of Cancer Centers (chemotherapies and radiotherapies, market shares of medical activities)
- Medical means (medical beds and operating theaters) and human resources
- Training, research (scientific publications) and clinical research (clinical trials)
- Finances (incomes and net results)



These statistics will be analyzed under the light of the Resource-based View theory developed by Birger Wernerfelt<sup>3</sup> to understand the resource concentration effect within Comprehensive Cancer Centers.

At this stage, it is important to warn the reader about some methodological precaution and limits regarding our analysis:

- We believe it would be interesting to gather and analyze statistics on the US Comprehensive Cancer Centers, so as to make a detailed comparison with the situation in France. However the statistics in the USA are not available under the same format as in France. It means that a specific study would have to be conducted in the USA regarding this specific topic.
- By definition at this stage of our work and before this quantitative analysis, we consider that Comprehensive Cancer Centers in France are the 8 Cancer Centers which are part of a SIRIC program (7), as well as the PHUC program (1):
  - Institut Curie in Paris (SIRIC CURIE),
  - Institut Gustave Roussy in Villejuif (SIRIC SOCRATE),
  - Centre Léon Bérard in Lyon (SIRIC LYRIC),
  - Institut Paoli Calmettes in Marseille (SIRIC PRRC),
  - Centre Oscar Lambret (SIRIC ONCOLILLE),
  - Institut Val d'Aurelle in Montpellier (SIRIC MC),
  - Institut Bergonié in Bordeaux (SIRIC BRIO),
  - Institut Claudius Regaud in Toulouse (PHUC Captor).
- We want to underline the fact that except the two first SIRIC (IC & IGR) these operations are based on a Center Center / University Hospital partnership. There are other interesting initiatives in France in the field of Cancer such as SIRIC Carpem (AP-HP) or PHUC PACRI (PRES – Sorbonne Paris Cité) that we are not covering because they are not organized around a Cancer Center.

We would like to stress the originality of this dissertation: at the stage of work literature review and experts interviews indicate that this would be the first academic analysis of Comprehensive Cancer Centers in France<sup>4</sup>.

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<sup>3</sup> *The Development of the Resource-based View : reflections from Birger Wernerfelt*, Andy Lockett, Rory P. O'Shea and Mike Wright, *Organization Studies* 29, 2008

<sup>4</sup> IEP Paris CSO will start this year a post-doc project supported by INCa and under the supervision of Patrick Castel, in order to study SIRIC programs in France.

## 1.4 Main questions on Cancer Centers and their development strategy

The development of Cancer Centers is an on-going process aiming to promote a more integrative approach of research and care for cancer within the institution and with its environment.

The purpose of this dissertation is to explore hypothesis relying on three levels of development: Cancer Centers, Comprehensive Cancer Centers and Cancer Campus. We believe that these three stages of developments raise specific questions and issues, which we would like to investigate:

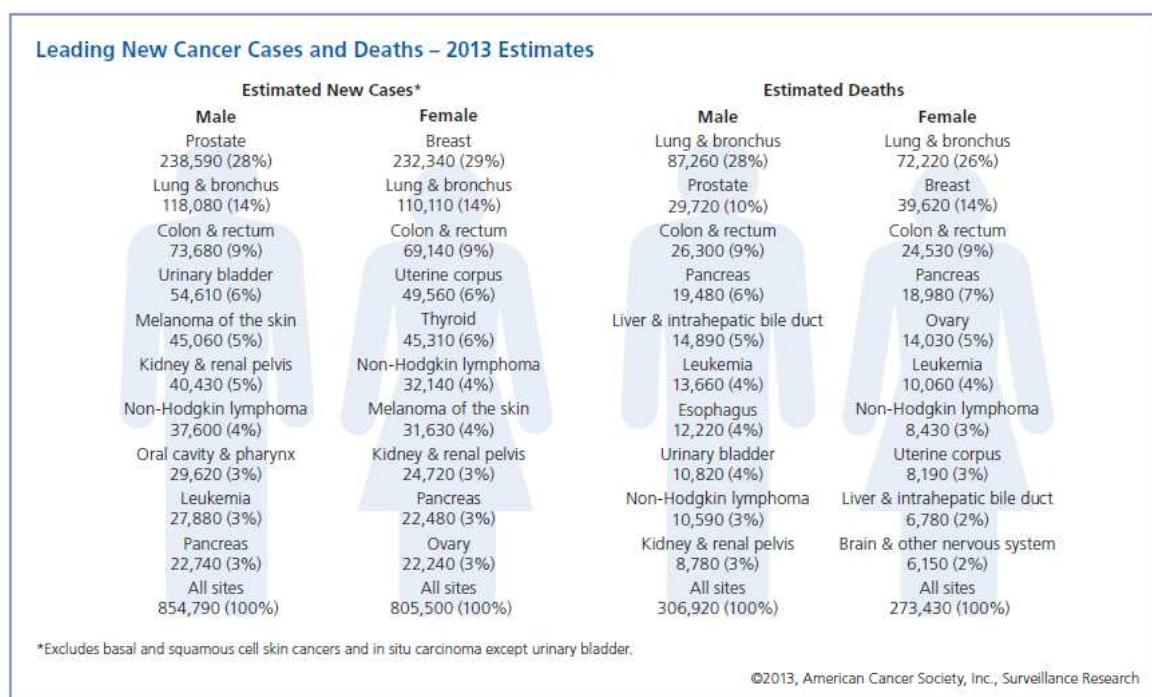
- **Cancer Centers**
  - What is specific on the status of Cancer Center, halfway between public hospitals and private clinics?
  - How does the organization of Cancer Centers differ from other hospitals?
  - What are the benefits of cancer focus and pathology specialization?
- **Comprehensive Cancer Centers**
  - What are the real benefits of transdisciplinary and translational research?
  - Do Comprehensive Cancer Centers rely on open innovation principles?
  - Do Comprehensive Cancer Centers have a specific model in terms of medical activities, medical means, HR, research, incomes?
- **Cancer Campus**
  - Do Cancer Centers play a growing role in terms of attractiveness?
  - Can Comprehensive Cancer Centers be the cornerstone of Cancer Campus?
  - Can Cancer Campus ecosystems become clusters (Cancer bio-clusters)

## 2 Transatlantic overview of Cancer Centers Programs

### 2.1 The US Comprehensive Cancer Centers program

Cancer is a major public health issue in the USA as there are 1.66 million new cases of cancer every year in the country and more than 580,000 annual deaths. The overall cost of cancer according to NIH was \$201.5 billion in 2008: \$77.4 billion for direct medical costs (total of all health expenditures) and \$124.0 billion for indirect mortality costs (cost of lost productivity due to premature death). The Comprehensive Cancer Centers represent one of the main tools to fight cancer in the USA.

#### A. NEW CASES AND DEATHS BY CANCER IN THE USA



#### 2.1.1 Historical perspective

Originally, the US Comprehensive Cancer Centers program comes from the following events. In the 19th century, appeared the first American Cancer Centers between 1884-1897: Roswell Park Cancer Institute in Buffalo, N.Y.; Memorial Sloan-Kettering Cancer Center in New York City; and the Wistar Institute.

In 1930, the American Congress passed the Ransdell Act to create the National Institute of Health (NIH). In 1937, the National Cancer Institute (NCI) was formed based on the union of Cancer research labs in Washington and Boston. Enacted into law by President Roosevelt the same year, it is in charge of an annual budget of \$700,000.

The National Cancer Institute Act of 1937 authorized NCI to conduct cancer research and approve grant-in-aid applications to support promising research projects on the causes, prevention, diagnosis and treatment of cancer. In 1944, the NCI became a division of the National Institutes of Health under Public Health Service legislation.

The year 1960 represents the beginnings of the NCI Cancer Centers Model as Congress recommended the creation of government-supported Cancer Centers. An NIH task force chaired by Dr. Carl Baker (future Director of NCI) concludes that specially designated cancer research centers should contribute to:

- Create a unity of purpose not possible in a traditional academic setting,
- Improve access to research infrastructure,
- Foster stability for cancer research careers,
- Provide a centralized home for education and training in cancer research.

Following these recommendations, NCI started providing grants to cancer-focused interdisciplinary centers that had already been created with state or private funds. In 1970, the Yarborough Committee, headed by Senator Ralph W. Yarborough, Chairman of the Senate Labor and Public Welfare Committee begins to work on developing a national program for cancer research. The Committee's report, "National Program for the Conquest of Cancer," becomes the basis for the National Cancer Act. It identifies Comprehensive Cancer Centers as the best organizational structure for expanding efforts to address cancer.

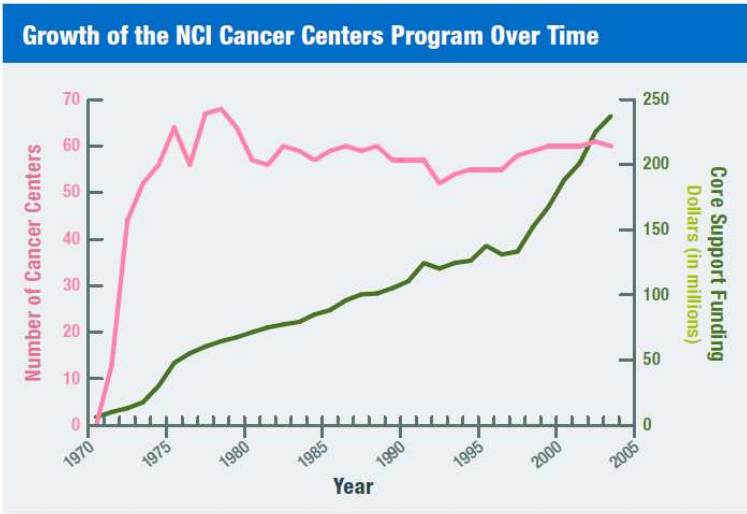
1971 is the key year in USA because the Federal authorities established the Cancer Centers Program thanks to the "National Cancer Act". The goal of this legislation was to create a centralized platform for sharing concepts and resources, and a management structure to contribute to prevent and to cure cancer. This act originated the official creation of 12 Cancer Centers (structures that were already getting support from NCI) and it authorized the establishment of additional Cancer Centers. The 1971's legislation also implemented a funding mechanism for Cancer Centers called the Cancer Center Support Grant (CCSG) and created an administrative and organizational home for the program at the NCI. The CCSG requirements have evolved over the years, but the focus of this program is to support research infrastructure that enhances collaborative, transdisciplinary research productivity.

In 1972, the Senate appropriated \$100 million for an expanded cancer research program, \$10 million of which to construct more centers. In 1973, NCI recognized eight Cancer Centers as "comprehensive," according to criteria established by the National

Cancer Advisory Board, and their main mission is to bring research results as rapidly as possible to the maximum number of people. In 1975, the Senate endorsed the establishment of 30 to 35 Comprehensive Cancer Centers to permit an estimated 80 percent of the U.S. population access within a reasonable driving distance.

In 1989, an evaluation conducted by the Institute of Medicine on the Cancer Centers Program recommended to increase funding, organizational relocation, and new program directions. In 2013, NCI recognizes 67 NCI Cancer Centers, in the 1 400 American establishments.

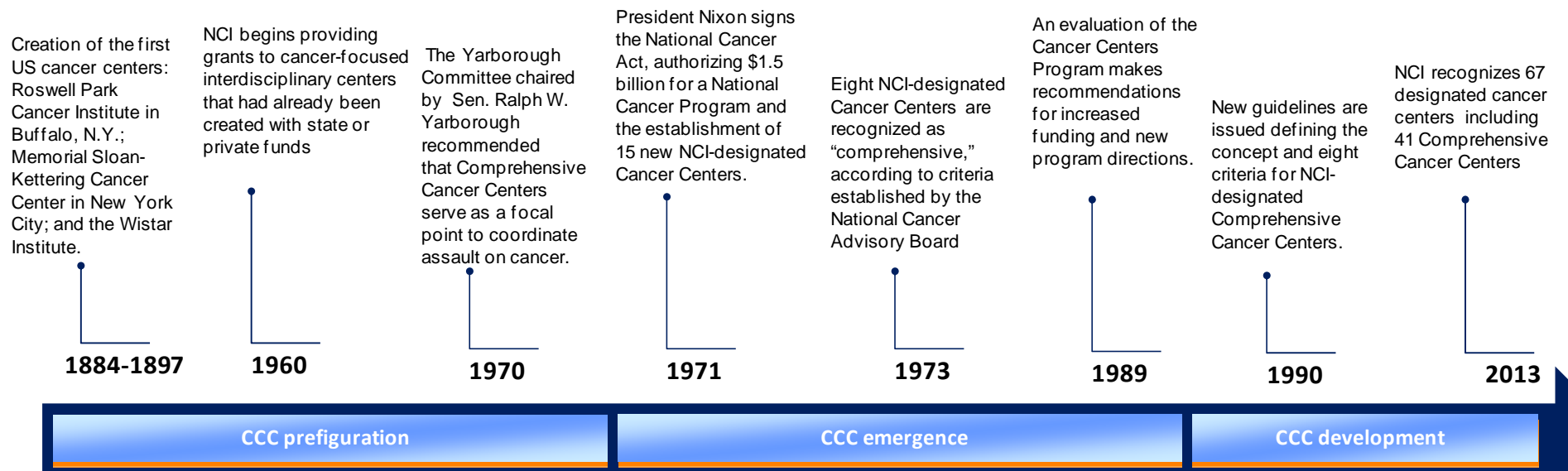
### B. NCI Budget for Cancer Centers



Source: NCI Financial Management Branch, <http://www3.cancer.gov/admin/fmb>

Every year, these NCI Cancer Centers receive about \$260 million of funding for research. They diagnose cancer in 250,000 patients every year and they provide treatment to an even larger number of patients.

## History of the NCI Cancer Centers Program in the USA



## 2.1.2 Cancer Centers and Comprehensive Cancer Centers

The NCI-designated Cancer Centers have 6 essential characteristics as described below. According to NCI “these 6 characteristics together maximize the scientific potential and produce a whole that is greater than the sum of its parts”.

### C. The six essential characteristics of an NCI Cancer Center

- **“Facilities:** *Physical facilities dedicated to the conduct of cancer focused research, and to the Center’s shared resources, and administration, are appropriate and adequate for the task.*
- **Organizational Capabilities:** *The Center takes maximum advantage of institutional capabilities in cancer research, engaging in appropriate planning and evaluation of Center strategies and activities. It also has a process for integrating education and training of biomedical researchers and health care professionals, including those from underserved populations, into programmatic research efforts. In addition to addressing research questions of broad applicability, it uses its available expertise and resources to address cancer research within the catchment area.*
- **Transdisciplinary Collaboration and Coordination:** *Substantial coordination, interaction, and collaboration, both among Center members from a variety of disciplines and between Center members and investigators in other institutions, enhance and add value to the productivity and quality of research. As appropriate to the nature of the research, Centers facilitate transition of scientific findings through the translational continuum, via coordination of research across NCI and other funding mechanisms and through collaborations with other partners.*
- **Cancer Focus:** *The Center members’ grants and contracts, as well as the structure and objectives of its formal research Programs, demonstrate a clearly defined cancer research focus.*
- **Institutional Commitment:** *The Center is a formal organizational component of the institution, with sufficient space, positions, and discretionary resources to ensure its stability and fulfill the Center’s objectives. The Center Director has authorities appropriate for managing the Center and furthering its scientific mission. The institution recognizes team science in its promotion and tenure policies.*
- **Center Director:** *The Director is a highly qualified scientist and administrator with leadership experience and expertise appropriate for establishing a vision for the Center, advancing scientific goals, and managing a complex organization. He or she is effective in using institutionally designated authorities to manage the Center and advance its scientific objectives.”*

Source: NIH & NCI

The original intent of US Congress was to have a Cancer Center within 200 miles of every U.S. resident, enhancing the application of cancer discoveries to patients and people at risk. Consequently, the number of NCI-designated Cancer Centers has grown extensively over the past several decades.



Today, every state with a density of more than 150 people per square mile has at least one NCI-designated Cancer Center. The location of the 67 NCI designated Cancer Centers in 34 states is shown on the following map:

#### D. CANCER CENTERS AND COMPREHENSIVE CANCER CENTERS IN THE USA



Source: NIH & NCI

In 2010, the NCI budget was \$5.1 billion, most of which was used to fund grants and contracts to universities, medical schools, Cancer Centers, research laboratories, and private companies in the United States and some other countries.

NCI distinguished two types of Cancer Centers (cf. details below):

- A Cancer Center has a scientific agenda focused on one of three major areas—laboratory, clinical, or population science—or some combination of the three.
- A Comprehensive Cancer Center has depth and breadth of research activity in all three areas and must demonstrate a commitment to public education and dissemination of advances into the communities they serve, as well as continual education of professions responsible for cancer care.



## E. Two types of Cancer Centers according to NCI

- **“Comprehensive Cancer Centers** demonstrate reasonable depth and breadth of cancer research activities in each of three major areas: basic laboratory; clinical; and prevention, control and population-based science. Comprehensive Cancer Centers also have substantial transdisciplinary research that bridges these scientific areas. They are effective in serving their catchment area, as well as the broader population, through the cancer research they support. They integrate training and education of biomedical researchers and community health care professionals into programmatic efforts to enhance the scientific mission and potential of the Center.
- **Cancer Centers** have a scientific agenda primarily focused on basic laboratory; clinical; and prevention, cancer control, and population-based science; or some combination of these components. All areas of research are linked collaboratively. While not all basic findings require a translational endpoint, basic laboratory Centers develop linkages with other institutions that will foster application of laboratory findings for public benefit where appropriate”.

Source: NIH & NCI

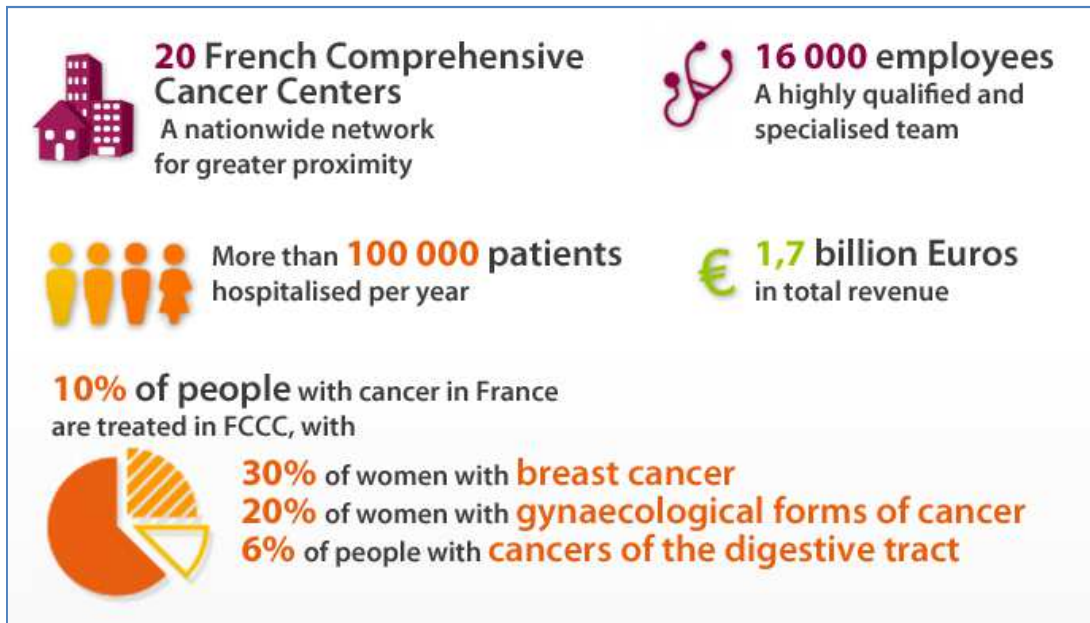
41 of the NCI-designated Cancer Centers are Comprehensive Cancer Centers and 26 are Cancer Centers. Among the 26, seven centers conduct only basic research and offer no clinical programs. The Commission on Cancer (CoC) of the American College of Surgeons accredited more than 1,400 facilities in the country. This means that the 41 Comprehensive Cancer Centers represent the top 3% of the American Cancer Centers. This prestigious status is based on a regular assessment managed by the NCI.

### 2.2 The Comprehensive Cancer Centers in France

INCa estimations indicate that 357,700 new cases of cancer were identified in France in 2010 (203,100 men and 154,600 women). More than half the estimated cases in 2010 (57%) were diagnosed in people aged 65 and over. Cancer mortality has decreased over the last twenty years; however, cancer remains the leading cause of death in France. In 2010, it was estimated that there were 146,500 deaths from cancer in France (84,500 men and 62,000 women). In men, lung cancer is the main cause of death, followed by colorectal and prostate cancers. In women, it is breast cancer followed by colorectal and lung cancers.

The overall cost of cancer in France according to INCa was estimated to 31 billion Euros in 2007: 14 billion Euros for direct medical costs (total of all health expenditures) and 17 billion Euros for indirect mortality costs (cost of lost productivity due to premature death). In France as well, fight against cancer represents a major health and economic issue. Cancer Centers which represent one part of the answer treat about 10% of patients hospitalized every year.

## F. KEY FIGURES ON CANCER CENTERS IN FRANCE



Source: Unicancer

### 2.2.1 Historical perspective

Despite the advanced research in France on radiotherapy and oncology, the French Cancer Centers emerged several decades after the first initiatives in the USA. The French Cancer Centers (CLCC) appeared in France at the beginning of the last Century. The first French Cancer Center was Institut Curie (Paris) created in 1909, when the University of Paris and the Institut Pasteur joined forces to build a large laboratory for Marie Curie (the Radium Institute), next to the school where Pierre and Marie Curie had discovered polonium and radium in 1898. The first oncology consultation open to the public in France was set up by Pr Gustave Roussy, on the 1<sup>st</sup> of October 1921 within Paul Brousse Hospital in Villejuif.

The concept of Cancer Centers became widespread at the national scale in the 1920's, with the birth of 8 new centers in 1923 (Villejuif, Lyon, Strasbourg, Bordeaux, Toulouse, Rennes, Montpellier, Caen), 4 centers in 1924 (Angers, Nancy, Nantes, Reims) and 1 center in 1925 (Marseille). The following creations took place in the 1950's (Lille, Saint Cloud), the 1960's (Dijon, Nice, Rouen) and in the 1970's (Clermont Ferrand).

Nowadays, France counts 20 Cancer Centers that gathered in a Federation (Unicancer) created in 1945. These private, non-profit establishments are dedicated to fighting cancer. Despite their smaller sizes, they have the same threefold mission as University hospitals: patient care, research and teaching. Due to these characteristics, they occupy a special place in the French health care system.

According to Unicancer, the model for Cancer Centers was “founded on an integral approach to patient care, prevention and/or early diagnosis up through post treatment follow-up... It was built around multidisciplinary practice, individualized treatment and a research-healthcare continuum”.

### **G. The 10 commitments of French Cancer Centers**

- 1/ Equal access to quality healthcare for all*
- 2/ Operating modes that ensure equality and ethical practices, with management that conforms to agreed rates and no private practices*
- 3/ A patient-centered approach based on multi-disciplinary, comprehensive patient care and the research-healthcare continuum*
- 4/ A joint medical and scientific project in order to make scientific and organizational progress available to patients as rapidly as possible*
- 5/ Personalized medicine (targeted treatments, measures for support, etc.) and integrated patient management from screening and/or early diagnosis to post treatment follow-up*
- 6/ Regular integration of innovation through cooperation between research and healthcare, including input from human and social sciences*
- 7/ The patient/partner culture, which recognizes the patients’ competence and in-depth knowledge of their own bodies and illness (patient committees, observatory of patient expectations)*
- 8/ Dissemination of knowledge in the field of oncology to all healthcare professionals through initial and on-going training*
- 9/ The development of employees’ skills at the Centers through career management*
- 10/ Regular benchmarking of the Group to assess quality and the relevance of practices, as well as the effectiveness of organizational structures.”*

*Source: UNICANCER*

In the 2000's, the fight against cancer took a new dimension in France with the Cancer plans and the creation of the French Cancer Institute. In July 2002, the fight against cancer was declared a national priority and a few months later, in March 2003, the French President Chirac launched Cancer Plan 1 for the 2003-2007 period. This long-term national policy on fighting cancer aimed at reducing the cancer death rate in France and improving quality-of-life for people suffering from cancer.

Cancer Plan 1 enabled the creation of seven clusters dedicated to cancer, the “Cancéropôles”. These specific networks brought together research laboratories, pharmaceutical companies, hospitals and medical schools. In May 2005, French Cancer Institute (INCa) was created in order to coordinated actions in the field of cancer. In spite of difficulties during the first years, INCa still runs the mission to implement Cancer Plan. In November 2009, Cancer Plan 2 (750 million Euros) was launched by President Sarkozy following the recommendations.

Its main priorities were:

- “Transfer” into the healthcare system,
- A more effective consideration of health inequalities in relation to cancer and the implementation of measures designed to correct them,
- A better coordination of patient care, including the extension of care beyond the hospital environment by involving referring doctors more effectively
- And new medical and community health initiatives to provide better support for people as part of “life during and after cancer”.

## H. The Cancer Plans in France

*Prompted by President Jacques Chirac, the first national mobilization plan against cancer was launched on the 24 March 2003 and proposed 70 measures structured around six operational chapters: prevention, screening, care, social support, staff training, and research. In 2003, the Cancer Plan 1 identified 7 regional Cancéropôles across the country. A direct result of this first Cancer Plan was the creation of the INCa, the French National Cancer Institute, which has grouped all cancer prevention stakeholders in France since 2005. In particular, its mission of coordinating cancer prevention actions includes:*

- *observing and assessing the cancer prevention system*
- *defining best practices in cancer research*
- *providing information to professionals and the public*
- *implementing medical and paramedical training actions*
- *funding and implementing research and development projects*
- *developing and monitoring joint actions between public and private bodies*
- *contributing to the development of European and International actions*

*The second 2009-2013 Cancer Plan is based on the report that Professor Jean-Pierre Grünfeld submitted to the President of the Republic, Nicolas Sarkozy, in February 2009. It follows on from the Cancer Plan 1 and is based on 30 measures divided into 118 concrete actions organized into 5 areas:*

- *Research and innovation*
- *Observation*
- *Prevention and screening*
- *Care*
- *Life during and after cancer*

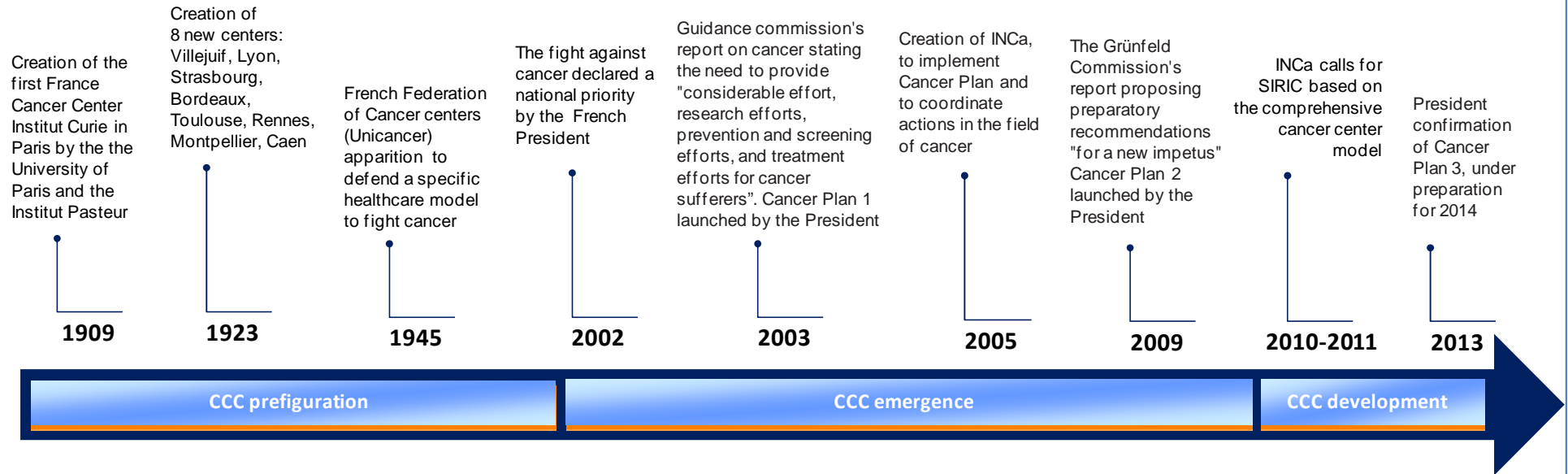
*Three major transversal themes structure and characterize the plan strategy, representing the new challenges which cancer prevention must face:*

- *Consider health inequalities in cancer*
- *Boost the analysis and consideration of individual and environmental factors*
- *Strengthen the General Practitioner's role*

*Source: Cancéropôle Ile de France*

In December 2012, French President Hollande announced a Cancer Plan 3 for 2014. Currently under construction, this plan may focus on 5 priorities: prevention, research and personalized medicine, ageing, training, life during and after cancer (cf. appendices II).

## History of the Cancer Centers Program in France



## 2.2.2 Bringing the FCCC model to Comprehensive Cancer Centers

In 2010 French Cancer Institute INCa launched a public call in order to promote in France, a model directly inspired from the American “Comprehensive Cancer Centers” called “Site de Recherche Intégrée sur le Cancer” (SIRIC). It is necessary to understand how and why France decided to take advantage of this transatlantic model. SIRIC is an important national initiative to strengthen integrated and translational research to fight cancer. It is part of the 6 flagship measures of Cancer Plan 2:

- “Research, measure 1: Increase resources for multidisciplinary research. Accredite five multidisciplinary cancer research integrated sites. These sites will be selected on a competitive basis and should help to transfer scientific research to patient care more quickly”.

According to the French Cancer Institute, “the SIRIC Program is a major “key” goal of INCa aiming to achieve the integration of medical, scientific and societal research on sites within the framework of joint and collaborative programs, working towards the production of knowledge and dissemination of new practices for the benefit of the fight against cancer”. Véronique Atger who managed the SIRIC call for INCa confirmed during our interview that this INCa program was directly inspired from the NCI Comprehensive Cancer Center program to promote translational research in France. INCa organized a special mission in the USA to understand to workings of the NCI Comprehensive Cancer Center program before to adapt it to the French context. Still according to Véronique Atger, the SIRIC program is more focus than its American model and does not insist as much on dissemination

The SIRIC program was implemented thanks to two calls for applications launched in 2011 and 2012. The first call received 12 applications and the second 9 applications, leading to 2 projects selected in 2011 and 6 in 2012 (cf. below for more details). The 8 selected SIRIC projects obtained a grant of approximately 2 million Euros each per year during a five-year period. This budget covers mainly integrated research programs and the platforms required to perform the work and management expenses. It is renewable for another five-year period.

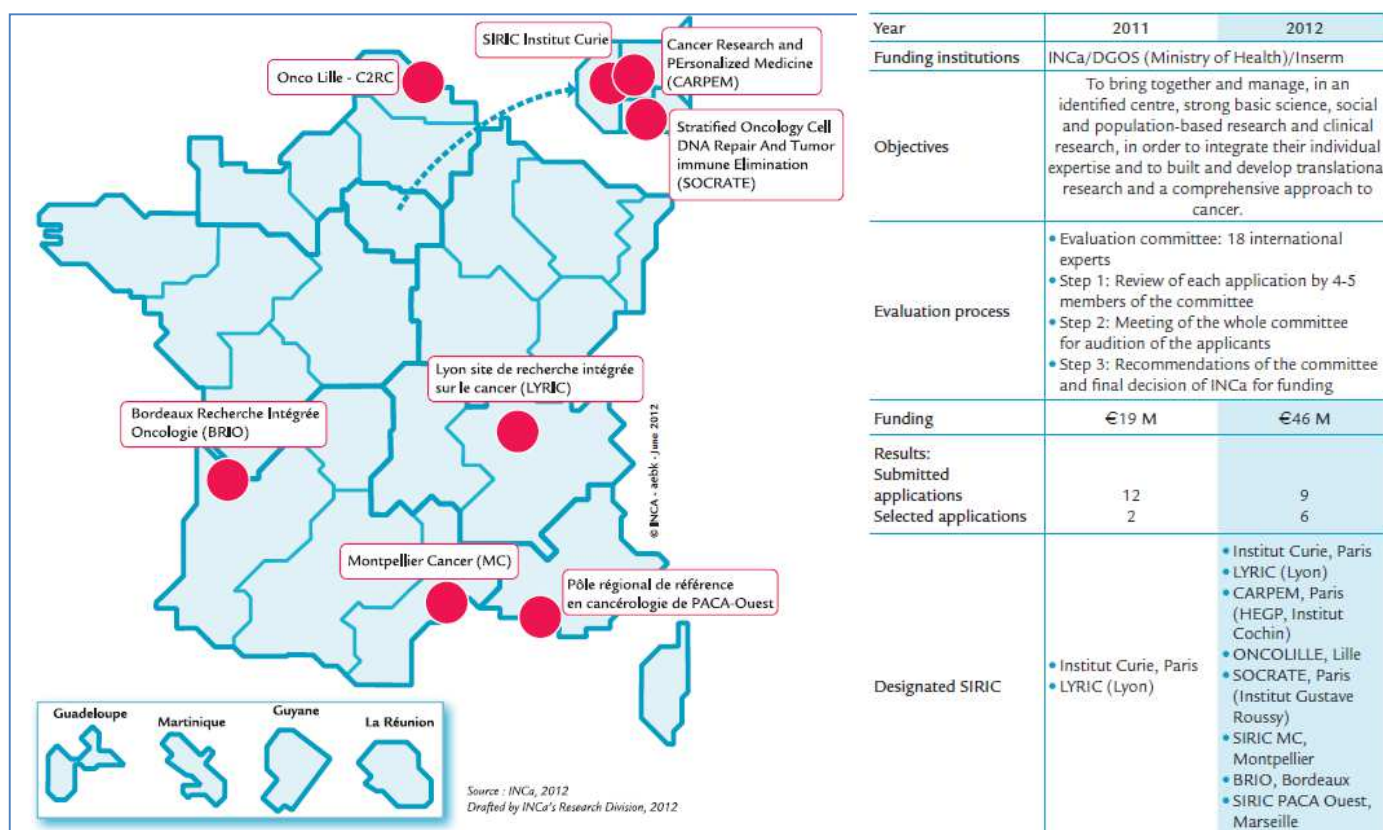
These 8 projects were chosen by an international jury, according to INCa specifications based on the 8 following dimensions:

- The integrated research programs: consistency in integrating research topics and the ability to react to the emergence of new concepts,
- The organization and management of SIRIC activities,
- The initiation and development of national and international collaborations,



- The commitment to transfer research results along with economic development partners,
- The ability to disseminate new knowledge and practices to professionals and patients,
- The ability to work towards the interdisciplinary goals of the Cancer Plan, in particular with regards to reducing health inequalities and work in the field of environmental and behavioral risks.

## I. Panorama of SIRIC program in France in 2011-2012 (INCa)



Source: INCa, 2012

Most of these SIRIC projects rely on partnerships gathering Cancer Centers, University Hospitals and Universities, Research Centers (CNRS, INSERM...) and with support from private companies and local public authorities (cf. Appendices III). However, two SIRIC projects in Paris region rely mainly on major Cancer Centers and their research partners: SIRIC Curie with Institut Curie and SIRIC Socrate with Institut Gustave Roussy in Villejuif.

### 3 Comparative analysis and profile of Comprehensive Cancer Centers in France

Our data analysis of French Cancer Centers aims to identify the characteristics and the profile of Comprehensive Cancer Centers. It relies mainly on the HospiDiag information (<http://hospidiag.atih.sante.fr>), the main database about French healthcare institutions. Out of the numerous indicators available on this database, we made a selection of relevant indicators regarding: medical activities, medical means and human resources, training, research and finances. Thanks to these statistics we are using a stratification method to identify the different groups of Cancer Centers and the characteristics of Comprehensive Cancer Centers.

#### 3.1 Medical activities of Cancer Centers

##### 3.1.1 Chemotherapies and radiotherapies

Data on medical acts within Cancer Centers can be analyzed according to the number of chemotherapies and radiotherapies every year. In 2012, French Cancer Centers took care of close to 302 000 chemotherapies and 839 000 radiotherapies<sup>5</sup>.

Three groups of Cancer Centers can be distinguished according to the annual number of chemotherapies:

- **Group 1 refers to Cancer Centers which realize at least 20 000 chemotherapies every year** and it includes IGR in Villejuif (94), IC in Paris (75), CLB in Lyon (69) and IPC in Marseille (13). Following the merger of Nantes and Angers Cancer Centers, ICO may also belong to this group.
- **Group 2 refers to Cancer Centers which realize 13 000 to 20 000 chemotherapies every year** and it includes CFB in Caen (14), OOL in Lille (59), IB in Bordeaux (33), CVA in Montpellier (34).
- **Group 3 refers to Cancer Centers which realize less than 13 000 chemotherapies every year** and it includes the 10 remaining Cancer Centers.

The 7 Cancer Centers belonging to a SIRIC program - IGR in Villejuif (94), IC in Paris (75), CLB in Lyon (69), IPC in Marseille (13), OOL in Lille (59), CVA Montpellier (34) and IB in Bordeaux (33) - are all part of groups 1 and 2. **These 7 Cancer Centers realize at least 13 000 chemotherapies every year.**

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<sup>5</sup> HospiDiag data show an important drop in 2011 (about -50%), both for chemotherapies and radiotherapies which could be due to a change of methodology.



Three groups of Cancer Centers can be distinguished according to the annual number of radiotherapies:

- **Group 1 refers to Cancer Centers which realize at least 50 000 radiotherapies every year** and it includes IC in Paris (75), IGR in Villejuif (94) and CGR ICO in Nantes. Following the merger of Nantes and Angers Cancer Centers, ICO ranks number 2 at national level after IC in Paris with over 90 000 radiotherapies every year.
- **Group 2 refers to Cancer Centers which realize 40 000 to 50 000 radiotherapies every year** and it includes CLB in Lyon (69), CFB in Caen (14), OOL in Lille (59), CVA in Montpellier (34), ICR in Toulouse (31), CHB in Rouen (76), CPSS in Strasbourg (67), CEM in Rennes (35) and ICL in Saint Etienne (42).
- **Group 3 refers to Cancer Centers which realize less than 30 000 radiotherapies every year** and it includes the 8 remaining Cancer Centers.

5 of 7 Cancer Centers belonging to a SIRIC program - IGR in Villejuif (94), IC in Paris (75), CLB in Lyon (69), OOL in Lille (59), CVA Montpellier (34) and - are part of groups 1 and 2. These 7 Cancer Centers realize at least 40 000 radiotherapies every year. However, the figure is not true for IPC in Marseille (13), IB in Bordeaux (33) providing less than 30 000 radiotherapies per year. We assume the reason is special agreements on cancer radiotherapies of these 2 Cancer Centers<sup>6</sup> with regional hospitals<sup>6</sup>.

## J. Medical activities of French Cancer Centers - Source HospiDiag 2013

| HospiDiag 2013<br>Year | Number of chemotherapies per year |                |                |                | Number of radiotherapies per year |                  |                |                |
|------------------------|-----------------------------------|----------------|----------------|----------------|-----------------------------------|------------------|----------------|----------------|
|                        | 2009                              | 2010           | 2011           | 2012           | 2009                              | 2010             | 2011           | 2012           |
| IGR Villejuif (94)     | 54 946                            | 56 286         | 30 114         | 31 757         | 97 402                            | 108 028          | 55 933         | 54 225         |
| IC Paris (75)          | 42 076                            | 41 820         | 21 489         | 33 342         | 106 140                           | 107 964          | 53 729         | 94 427         |
| CLB Lyon (69)          | 35 732                            | 34 006         | 19 336         | 20 970         | 82 082                            | 80 622           | 41 303         | 44 960         |
| IPC Marseille (13)     | 36 656                            | 36 646         | 19 031         | 21 650         | 52 336                            | 54 330           | 29 056         | 27 406         |
| CFB Caen (14)          | 24 232                            | 26 386         | 13 726         | 15 256         | 78 792                            | 82 746           | 45 836         | 46 603         |
| OOL Lille (59)         | 22 328                            | 23 768         | 12 774         | 14 042         | 85 130                            | 88 022           | 45 401         | 46 965         |
| IB Bordeaux (33)       | 23 112                            | 24 410         | 12 676         | 13 133         | 64 910                            | 66 102           | 32 860         | 29 298         |
| CVA Montpellier (34)   | 27 336                            | 29 126         | 15 259         | 17 033         | 74 284                            | 79 354           | 42 248         | 44 981         |
| ICR Toulouse (31)      | 22 256                            | 21 834         | 11 716         | 12 025         | 72 994                            | 78 522           | 43 762         | 46 478         |
| CAL Nice (06)          | 19 514                            | 20 000         | 11 971         | 12 286         | 60 200                            | 61 622           | 35 067         | 33 573         |
| CAV Nancy (54)         | 16 090                            | 17 452         | 8 442          | 9 142          | 59 282                            | 60 890           | 30 406         | 32 832         |
| CHB Rouen (76)         | 23 114                            | 23 240         | 10 884         | 12 403         | 71 640                            | 77 322           | 37 960         | 40 017         |
| CRG ICO Nantes (44)    | 23 150                            | 24 932         | 13 568         | 14 151         | 87 268                            | 95 956           | 49 016         | 50 146         |
| CJP Clermont F. (63)   | 17 182                            | 18 124         | 9 382          | 10 047         | 63 734                            | 63 754           | 32 650         | 35 104         |
| CGFL Dijon (21)        | 16 992                            | 16 634         | 8 303          | 9 592          | 49 048                            | 57 822           | 28 928         | 29 739         |
| CPSS Strasbourg (67)   | 21 304                            | 22 820         | 11 238         | 11 836         | 87 148                            | 84 758           | 42 642         | 40 668         |
| CPP ICO Angers (49)    | 25 744                            | 25 544         | 13 373         | 13 387         | 74 526                            | 78 142           | 41 925         | 41 535         |
| IJG Reims (51)         | 11 510                            | 11 946         | 6 347          | 6 705          | 41 308                            | 46 438           | 22 654         | 23 734         |
| CEM Rennes (35)        | 19 736                            | 20 664         | 9 866          | 10 284         | 63 020                            | 70 730           | 36 717         | 35 784         |
| ICL Saint Etienne (42) | 24 224                            | 24 360         | 11 807         | 12 652         | 84 642                            | 84 578           | 42 510         | 40 283         |
| <b>Total number</b>    | <b>25 362</b>                     | <b>26 000</b>  | <b>13 565</b>  | <b>15 085</b>  | <b>72 794</b>                     | <b>76 385</b>    | <b>39 530</b>  | <b>41 938</b>  |
| <b>Total number</b>    | <b>507 234</b>                    | <b>519 998</b> | <b>271 302</b> | <b>301 693</b> | <b>1 455 886</b>                  | <b>1 527 702</b> | <b>790 603</b> | <b>838 758</b> |
| Annual increase in %   |                                   | 2.5%           | -47.8%         | 11.2%          |                                   | 4.9%             | -48.2%         | 6.10%          |

<sup>6</sup> Rapport sur les coopérations entre les Centres hospitalo-universitaires et les Centres de lutte contre le cancer et recommandations pour un cahier des charges des pôles régionaux de cancérologie, Institut national du cancer, février 2009, page 8

### 3.1.2 Market shares of medical activities

Data on market shares of medical activities indicate the % of oncology hospitalizations and chemotherapies of Cancer Centers on their catchment area. These data show that market share of Cancer Centers for oncology hospitalizations is on average 11.9% per Cancer Center in 2012 and that it is currently increasing (10.9% in 2011). HospiDiag information reveal that market share of Cancer Centers for chemotherapies is on average 25.4% per Cancer Center in 2012 and that it is increasing as well (23.5% in 2011). It also confirms the recognition of the expertise of Cancer Centers to manage a large part of chemotherapies at national level.

Three groups of Cancer Centers can be distinguished based on their market share of oncology hospitalizations on their catchment area:

- **Group 1 refers to Cancer Centers which own over 14% of market share on their catchment area** and it includes IPC in Marseille (13), CFB in Caen (14), CAL in Nice (06), CGFL in Dijon (21), CPP ICO in Angers.
- **Group 2 refers to Cancer Centers which own 10 to 14% of market share on their catchment area** and it includes CLB in Lyon (69), CVA in Montpellier (34), CAV in Nancy (54), CHB in Rouen (76), CJP in Clermont Ferrand (63) and ICL in Saint Etienne (42).
- **Group 3 refers to Cancer Centers which own less than 10% of market share on their catchment area** and it includes the 8 remaining Cancer Centers.

Only 3 of the 7 Cancer Centers belonging to a SIRIC program - CLB in Lyon (69), IPC in Marseille (13), CVA Montpellier (34) and IB in Bordeaux (33) – are part of groups 1 and 2. Market share of oncology hospitalizations does not seem to be relevant to characterize the main Comprehensive Cancer Centers in France.

Four groups of Cancer Centers can be distinguished based on their market share of chemotherapies on their catchment area:

- **Group 1 refers to Cancer Centers that own over 40% of market share** on their catchment area and it includes CFB in Caen (14), CPP ICO in Angers (49) and ICL in Saint Etienne (42).
- **Group 2 refers to Cancer Centers that own 20 to 40% of market share** on their catchment area and it includes CAL in Nice (06), CAV in Nancy (54), CHB in Rouen (76), CRG ICO in Nantes (44), CJP in Clermont Ferrand (63), CGFL in Dijon (21), CPSS in Strasbourg (67) and CEM in Rennes (35).
- **Group 3 refers to Cancer Centers that own 11% to 20% of market share** on their catchment area and it includes CLB in Lyon (69), IPC in Marseille (13), OOL in Lille (59), IB in Bordeaux (33), CVA in Montpellier (34), ICR in Toulouse (31) and IJG in Reims (51).
- **Group 4 refers to Cancer Centers that own less than 11% of market share** on their catchment area and it includes the 2 remaining Cancer Centers IGR in Villejuif (94) and IC in Paris (75).

No Cancer Centers belonging to a SIRIC program are part of groups 1 and 2. Market share of oncology chemotherapies does not seem to be relevant to characterize the main Cancer Centers in France.

#### K. Market shares of French Cancer Centers – HospiDiag 2013

| <i>HospiDiag 2013</i>     | Market share in% for oncology hospitalizations |             | Market share in % for chemotherapies |             |
|---------------------------|--|-------------|--------------------------------------|-------------|
|                           | 2011   | 2012        | 2011                                 | 2012        |
| Year                      |  |             |                                      |             |
| IGR Villejuif (94)        | 7  | 7.8         | 9.1                                  | 9.7         |
| IC Paris (75)             | 4.4  | 8           | 6.3                                  | 10.6        |
| CLB Lyon (69)             | 9  | 10.1        | 17.8                                 | 18.8        |
| IPC Marseille (13)        | 13.4   | 14.8        | 16.1                                 | 18.8        |
| CFB Caen (14)             | 13.4   | 14.8        | 40.7                                 | 44.5        |
| OOL Lille (59)            | 8.8  | 9.7         | 14.2                                 | 16          |
| IB Bordeaux (33)          | 7.9  | 8.2         | 17.8                                 | 18.7        |
| CVA Montpellier (34)      | 11.2   | 11.4        | 18                                   | 19.8        |
| ICR Toulouse (31)         | 7.4  | 8.6         | 14.7                                 | 17.1        |
| CAL Nice (06)             | 15.1   | 15.4        | 22.1                                 | 23          |
| CAV Nancy (54)            | 12.5   | 13          | 17.8                                 | 20          |
| CHB Rouen (76)            | 11.3   | 11.6        | 19.8                                 | 23.8        |
| CRG ICO Nantes (44)       | 9.2  | 9           | 25.2                                 | 26.2        |
| CJP Clermont F. (63)      | 11   | 12.8        | 19.7                                 | 23.1        |
| CGFL Dijon (21)           | 19.6   | 21.4        | 23.3                                 | 27.4        |
| CPSS Strasbourg (67)      | 9.4  | 10.3        | 21.8                                 | 22.1        |
| CPP ICO Angers (49)       | 18.5   | 20.5        | 60.2                                 | 58.9        |
| IJG Reims (51)            | 8.6  | 9.9         | 14.4                                 | 15.7        |
| CEM Rennes (35)           | 8.5  | 9.2         | 29.7                                 | 28.8        |
| ICL Saint Etienne (42)    | 10.8   | 11          | 60.7                                 | 64.1        |
| <b>Aver. market share</b> | <b>10.9</b>                                    | <b>11.9</b> | <b>23.5</b>                          | <b>25.4</b> |

## 3.2 Medical means an human resources

### 3.2.1 Medical means

The numbers of medical beds and of operating theaters are relevant indicators to qualify the medical means of Cancers Centers. Cancer Centers in France have on average 95 medical beds. The evolution of the number of beds is rather flat: 94.95 beds in 2009, 97.05 beds in 2010 and 95.65 beds in 2011.

Cancer Centers which largely increased their medical beds during this period are IGR in Villejuif (94) +16 beds, IPC in Marseille (13) +6 beds, OOL in Lille (59) +12 beds and CPSS in Strasbourg (67) + 7 beds. Cancer Centers that significantly reduced their medical beds during this period are IC in Paris (75) -10 beds and ICL in Saint Etienne (42) -9 beds.

The average number of medical beds for the French Cancer Center is 95. Three groups of Cancer Centers can be distinguished according to their sizes in terms of medical beds:

- **Group 1 refers to Cancer Centers with over 130 beds** and it includes IGR in Villejuif (94) with 204 beds, IPC in Marseille (13) with 184 beds, IC in Paris (75) with 144 beds, CLB in Lyon (69) with 135 beds.
- **Group 2 refers to Cancer Centers, which offer between 90 and 120 medical beds** and it includes CFB in Caen (14) with 119 beds, OOL in Lille (59) with 111 beds, IB in Bordeaux (33) with 100 beds, CVA in Montpellier (34) with 99 beds and CAV in Nancy (54) with 94 beds. Following the merger of Nantes and Angers Cancer Centers, ICO may also belong to this group with 107 beds.
- **Group 3 refers to Cancer Centers, which offer less than 90 medical beds** and it includes the 11 remaining Cancer Centers.

The number of operating theaters is another indication of the sizes on medical centers. Cancer Centers in France have on average 5.5 operating theaters. The number of theaters remains rather constant in all Cancer Centers during the period 2009-2011, except in CVA Montpellier (34) going from 6 theaters in 2009 to 10 in 2011. Three groups of Cancer Centers can be distinguished according to their number of operating theaters:

- **Group 1 refers to Cancer Centers, which own over 6 operating theaters** and it includes IC in Paris (75), CVA Montpellier (34), IGR in Villejuif (94), OOL in Lille (59), CLB in Lyon (69) and IPC in Marseille (13). Following the merger of Nantes and Angers Cancer Centers, ICO may also belong to this group with 7 theaters. With 15 theaters IC in Paris (75), this center has an infrastructure three times larger than national average.

- **Group 2 refers to Cancer Centers, which own 5 operating theaters corresponding to national average.** It includes CFB in Caen (14) IB in Bordeaux (33), ICR in Toulouse (31) and CAL in Nice (06).
- **Group 3 refers to Cancer Centers, which offer 2 to 4 operating theaters and it includes the 6 remaining Cancer Centers.**

The 7 Cancer Centers belonging to a SIRIC program - IGR in Villejuif (94), IC in Paris (75), CLB in Lyon (69), IPC in Marseille (13), OOL in Lille (59), CVA Montpellier (34) and IB in Bordeaux (33) - are all part of groups 1 and 2 for both indicators. These 7 Cancer Centers all offer at least 100 medical beds and 5 or more operating theaters.

#### L. Medical means of French Cancer Centers – HospiDiag 2013

| HospiDiag 2013<br>Year      | Number of medical beds |              |              | Number of operating theaters |              |              |
|-----------------------------|------------------------|--------------|--------------|------------------------------|--------------|--------------|
|                             | 2009                   | 2010         | 2011         | 2009                         | 2010         | 2011         |
| IGR Villejuif (94)          | 188                    | 190          | 204          | 8                            | 9            | 9            |
| IC Paris (75)               | 154                    | 143          | 144          | 15                           | 15           | 15           |
| CLB Lyon (69)               | 134                    | 134          | 135          | 6                            | 6            | 6            |
| IPC Marseille (13)          | 178                    | 184          | 184          | 6                            | 6            | 6            |
| CFB Caen (14)               | 123                    | 159          | 119          | 5                            | 5            | 5            |
| OOL Lille (59)              | 99                     | 106          | 111          | 7                            | 7            | 7            |
| IB Bordeaux (33)            | 100                    | 100          | 100          | 5                            | 5            | 5            |
| CVA Montpellier (34)        | 101                    | 101          | 99           | 6                            | 6            | 10           |
| ICR Toulouse (31)           | 68                     | 68           | 68           | 5                            | 5            | 5            |
| CAL Nice (06)               | 73                     | 74           | 76           | 4                            | 4            | 5            |
| CAV Nancy (54)              | 94                     | 94           | 94           | 4                            | 4            | 4            |
| CHB Rouen (76)              | 81                     | 81           | 81           | 4                            | 4            | 4            |
| CRG ICO Nantes (44)         | 60                     | 60           | 57           | 3                            | 4            | 5            |
| CJP Clermont F. (63)        | 65                     | 65           | 63           | 2                            | 3            | 3            |
| CGFL Dijon (21)             | 84                     | 84           | 84           | 4                            | 4            | 5            |
| CPSS Strasbourg (67)        | 65                     | 65           | 72           | 3                            | 3            | 3            |
| CPP ICO Angers (49)         | 50                     | 50           | 50           | 2                            | 2            | 2            |
| IJG Reims (51)              | 55                     | 55           | 55           | 4                            | 4            | 4            |
| CEM Rennes (35)             | 59                     | 60           | 58           | 3                            | 3            | 3            |
| ICL Saint Etienne (42)      | 68                     | 68           | 59           | NA                           | NA           | NA           |
| <b>Average</b>              | <b>94.95</b>           | <b>97.05</b> | <b>95.65</b> | <b>5.05</b>                  | <b>5.21</b>  | <b>5.58</b>  |
| <b>Total number</b>         | <b>1899</b>            | <b>1941</b>  | <b>1913</b>  | <b>96</b>                    | <b>99</b>    | <b>106</b>   |
| <b>Annual increase in %</b> |                        | <b>2.2%</b>  | <b>-1.2%</b> |                              | <b>3.10%</b> | <b>7.10%</b> |

### 3.2.2 Human resources

Data on human resources (FTE of medical and non-medical staff) in the French Cancer Centers show several interesting trends. Human resources are growing in all Cancer Centers between 2009 and 2011. This total increase is +3.5% in 2010 and +2.7% in 2011, including +3.9% in 2010 and +3.6% in 2011 for medical staff, +3.4% in 2010 and +2.6% in 2011 for non-medical staff. During the same period, the French Public Hospitals are confronted to an opposite trend with important downsizing (up to 9 800 FET less out of 762 790 FTE at the national level).

The average number of FTE per Cancer Center at national level is about 750 people. Four groups of Cancer Centers can be distinguished according to their sizes:

- **Group 1 refers to Cancer Centers, which human resources rely on 1000 to 1900 employees**, with 127 to 230 medical staff and 1000 to 1700 non-medical staff. This group includes IGR in Villejuif (94), IC in Paris (75), CLB in Lyon (69) and IPC in Marseille (13). It corresponds to the 3 main French cities. Following the merger of Nantes and Angers Cancer Centers, ICO may also belong to this group with nearly 1000 employees.
- **Group 2 refers to Cancer Centers, which human resources rely on 670 to 770 employees**, with 60 to 85 medical staff and 650 to 800 non-medical staff. This group includes CFB in Caen (14), OOL in Lille (59), IB in Bordeaux (33), CVA in Montpellier (34), ICR in Toulouse (31) and CAL in Nice (06).
- **Group 3 refers to Cancer Centers, which human resources rely on 500 to 600 employees**, with 45 to 70 medical staff and 450 to 550 non-medical staff. This group includes CAV in Nancy (54), CHB in Rouen (76), CJP in Clermont Ferrand (63), CGFL in Dijon (21) and CPSS in Strasbourg (67).
- **Group 4 refers to Cancer Centers, which human resources rely on 350 to 400 employees**, with 30 to 50 medical staff and 300 to 350 non-medical staff. This group includes IJG in Reims (51), CEM in Rennes (35) and ICL in Saint Etienne (42).

Cancer Centers in group 1 are all part of a SIRIC program and most of Cancer Centers in group 2 are also part of a SIRIC program (Lille, Bordeaux and Montpellier while Toulouse is part of a PHUC program). It confirms that the status of Comprehensive Cancer Center is related to size in terms of human resources.

### M. Human resources of French Cancer Centers – HospiDiag 2013

| Hospidiag 2013         | Medical FTE    |                |                | Non medical FTE |                 |                 | Total FTE       |                 |                 |
|------------------------|----------------|----------------|----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
|                        | 2009           | 2010           | 2011           | 2009            | 2010            | 2011            | 2009            | 2010            | 2011            |
|                        | Year           |                |                |                 |                 |                 |                 |                 |                 |
| IGR Villejuif (94)     | 228.6          | 231.6          | 229.2          | 1545.78         | 1612.28         | 1670.27         | 1774.38         | 1843.88         | 1899.47         |
| IC Paris (75)          | 190.66         | 192.93         | 196.91         | 1401.24         | 1413.36         | 1428.34         | 1591.9          | 1606.29         | 1625.25         |
| CLB Lyon (69)          | 116.59         | 123.66         | 127.79         | 908.26          | 954.02          | 1023.2          | 1024.85         | 1077.68         | 1150.99         |
| IPC Marseille (13)     | 128.3          | 138.3          | 141.22         | 954.13          | 996.31          | 992.25          | 1082.43         | 1134.61         | 1133.47         |
| CFB Caen (14)          | 67.13          | 70.26          | 80.56          | 681.92          | 686.75          | 687.86          | 749.05          | 757.01          | 768.42          |
| OOL Lille (59)         | 79.3           | 78.9           | 84.2           | 636.38          | 660.93          | 678.06          | 715.68          | 739.83          | 762.26          |
| IB Bordeaux (33)       | 75.95          | 78.55          | 79.75          | 589.93          | 661.9           | 680.18          | 665.88          | 740.45          | 759.93          |
| CVA Montpellier (34)   | 61.02          | 72.01          | 73.37          | 628.1           | 656.82          | 686.18          | 689.12          | 728.83          | 759.55          |
| ICR Toulouse (31)      | 61.37          | 61.21          | 61.78          | 631.17          | 592.64          | 607.33          | 692.54          | 653.85          | 669.11          |
| CAL Nice (06)          | 62.98          | 66.08          | 73.28          | 534.89          | 543.88          | 570.8           | 597.87          | 609.96          | 644.08          |
| CAV Nancy (54)         | 54.48          | 57.55          | 56.42          | 514.76          | 536.3           | 535.71          | 569.24          | 593.85          | 592.13          |
| CHB Rouen (76)         | 56.69          | 55.01          | 60.35          | 507.62          | 504.39          | 507.41          | 564.31          | 559.4           | 567.76          |
| CRG ICO Nantes (44)    | 58.34          | 59.17          | 60.76          | 449.04          | 467.91          | 502.61          | 507.38          | 527.08          | 563.37          |
| CJP Clermont F. (63)   | 59.04          | 59.17          | 67.92          | 423.49          | 442.68          | 479.09          | 482.53          | 501.85          | 547.01          |
| CGFL Dijon (21)        | 40.21          | 43.77          | 46.15          | 438.83          | 462.78          | 487.28          | 479.04          | 506.55          | 533.43          |
| CPSS Strasbourg (67)   | 42.52          | 50.75          | 49.01          | 418.37          | 481.18          | 469.77          | 460.89          | 531.93          | 518.78          |
| CPP ICO Angers (49)    | 43.6           | 42.9           | 49.3           | 314.67          | 313.78          | 353.44          | 358.27          | 356.68          | 402.74          |
| IJG Reims (51)         | 35.35          | 35.05          | 39.35          | 360.49          | 363.13          | 353.99          | 395.84          | 398.18          | 393.34          |
| CEM Rennes (35)        | 40.17          | 44.07          | 44.87          | 316.22          | 337.33          | 333.26          | 356.39          | 381.4           | 378.13          |
| ICL Saint Etienne (42) | 33.15          | 35.45          | 31.4           | 343.85          | 347.51          | 335.04          | 377             | 382.96          | 366.44          |
| <b>Average FTE</b>     | <b>76.77</b>   | <b>79.82</b>   | <b>82.68</b>   | <b>629.96</b>   | <b>651.79</b>   | <b>669.10</b>   | <b>706.73</b>   | <b>731.61</b>   | <b>751.78</b>   |
| <b>Total FTE</b>       | <b>1535.45</b> | <b>1596.39</b> | <b>1653.59</b> | <b>12599.14</b> | <b>13035.88</b> | <b>13382.07</b> | <b>14134.59</b> | <b>14632.27</b> | <b>15035.66</b> |
| Annual increase in %   |                | 3.9%           | 3.6%           |                 | 3.4%            | 2.6%            |                 | 3.5%            | 2.7%            |



### 3.3 Training and research

#### 3.3.1 Training

Training in medical oncology is part of the mission of the French Cancer Centers that play an active role to train new doctors. According to Unicancer, the Cancer Centers welcome every year in their staff more than **200 interns and train them** to become medical oncologist, surgeons, radiotherapists or anesthetists...

Training in medical oncology within Cancer Centers relies mainly on collaborations with local and regional universities (medical schools). Following the new status of French universities (LRU), Cancer Centers can now sign a contract on training activities in medical oncology with universities. Unicancer federation is trying to organize this kind of agreements at national level which is directly connected with research activities.

#### 3.3.2 Research

Research in oncology is largely concentrated on the major French cities as showed by the data below presenting scientific publications in oncology in France.

#### N. Scientific publications in oncology of the major French cities in 2010 - SIRIC LYRIC ISI Web of Science

|            | Publication Number | % in France | H factor |
|------------|--------------------|-------------|----------|
| Paris      | 10994              | 33,1        | 146      |
| Lyon       | 5769               | 17,3        | 125      |
| Villejuif  | 4138               | 12,4        | 115      |
| Marseille  | 2237               | 6,7         | 74       |
| Toulouse   | 1661               | 5,0         | 63       |
| Bordeaux   | 1444               | 4,3         | 71       |
| Strasbourg | 1396               | 4,2         | 70       |
| Nice       | 1162               | 3,5         | 62       |
| Nantes     | 1139               | 3,4         | 57       |
| Grenoble   | 1067               | 3,2         | 56       |
| Nancy      | 1040               | 3,1         | 47       |

*Title: Comparison of publication production within the field of cancer at a national level with the relative ratio expressed in %. H Factor quantifies productivity of public institution related to its geographic origin within the country. Data source have been provided by ISI Web of Science (Topic « cancer » address: « city » in December 2010).*

The number of publications and their impact (H factor) are directly related to the number of inhabitants. However, two specificities should be underlined at national level:

- First, **Lyon benefits from the presence of IARC**: the WHO International Agency for Research on Cancer, which contributes to approximately one third of Lyon

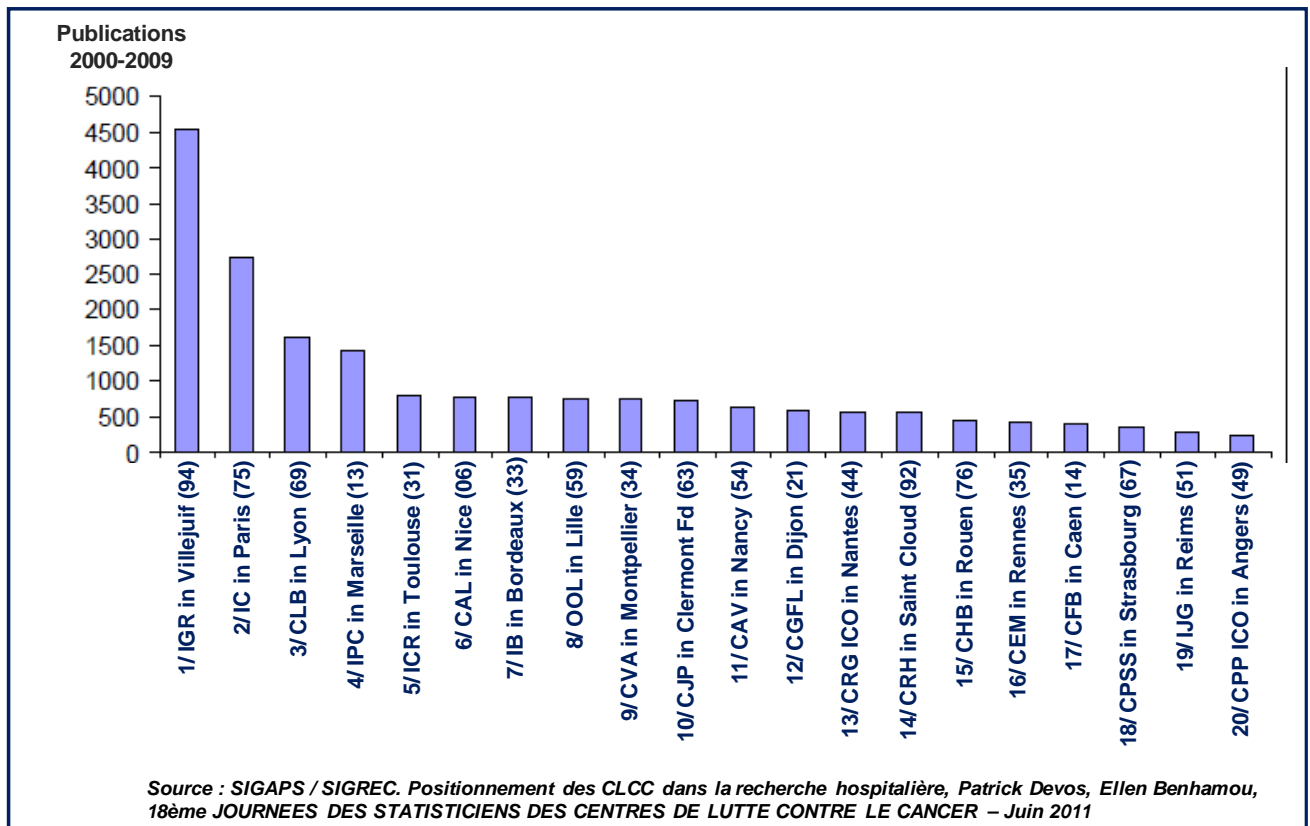


publications in oncology according to Alain Puisieux - Research Director of CLB in Lyon (69).

- Secondly, **Villejuif benefits from the presence of IGR** which is a major European Cancer Centers. It is located in a suburb of Paris and it has not only a national influence, but an international scientific recognition.

An analysis of the publications of the Cancer Centers themselves during the last decades shows another interesting perspective.

### O. Scientific publications 2000-2009 of the French Cancer Centers - SIGAPS SIGREC



Cancer Centers in France produce on average 95 scientific publications every year during the last decade. Three groups of Cancer Centers can be distinguished according to their annual production of scientific publications:

- **Group 1 refers to Cancer Centers which produce every year on average at least 140 scientific publications** and it includes IGR in Villejuif (94), IC in Paris (75), CLB in Lyon (69) and IPC in Marseille (13). It corresponds to the 3 main French cities.
- **Group 2 refers to Cancer Centers which produce every year on average 75 scientific to 140 publications** and it includes ICR in Toulouse (31), CAL in Nice (06), IB in Bordeaux (33), OOL in Lille (59), CVA in Montpellier (34) and CJP in Clermont

Ferrand (63). Following the merger of Nantes and Angers Cancer Centers, ICO may also belong to this group.

- **Group 3 refers to Cancer Centers which produce every year less than 75 scientific publications** and it includes all the remaining Cancer Centers.

Cancer Centers in group 1 are all part of a SIRIC program and most of Cancer Centers in group 2 are part of a SIRIC program (Lille, Bordeaux and Montpellier while Toulouse is part of a PHUC program), with the exception of Nice and Clermont-Ferrand. These figures confirm that scientific production is a major criterion for the Comprehensive Cancer Centers.

### 3.3.3 Clinical research

Unicancer data on clinical trials in French Cancer Centers shows several instructive dimensions. Out of the 89 702 cancer patients hospitalized in 2012 in Cancer Centers, 16 002 took part in clinical trials. The average number of patients included in clinical trials per Cancer Center is 889 cancer patients and the average number of active clinical trials is 155. The large majority of these clinical trials rely more on academic sponsorship (82%) rather than on industrial sponsorship (18%).

The average proportion of Cancer Center patient taking part into clinical trials is 15.08% at national level in 2012 (a raising proportion: 14.16% in 2010). This proactive access to medical innovation is unique, the average proportion of cancer patients included in clinical trials being around 10% for French hospitals.

Three groups of Cancer Centers can be distinguished according to the rate of inclusion into clinical trials:

- **Group 1 refers to Cancer Centers for which inclusion rate is over 17%** and it gathers IGR in Villejuif (94), OOL in Lille (59), CGFL in Dijon (21), CLB in Lyon (69) and CAL in Nice (06). We should underline the rate of IGR in Villejuif (94) which is over 28% and which corresponds to world class standards.
- **Group 2 refers to Cancer Centers for which inclusion rate ranges from 13% to 17%** and it gathers CAV in Nancy (54), CFB in Caen (14), IC in Paris (75), CVA in Montpellier (34), IB in Bordeaux (33), IPC in Marseille (13) ICO in Nantes-Angers (44) and CPSS in Strasbourg (67).
- **Group 3 refers to Cancer Centers for which inclusion rate is below 13%** and it gathers IJG in Reims (51), ICR in Toulouse (31), CJP in Clermont-Ferrand (63), CHB in Rouen (76) and CEM in Rennes (35).

The 7 Cancer Centers belonging to a SIRIC program - IGR in Villejuif (94), IC in Paris (75), CLB in Lyon (69), IPC in Marseille (13), OOL in Lille (59), CVA Montpellier (34) and IB in Bordeaux (33) - are all part of groups 1 and 2. **These 7 Cancer Centers have an inclusion rate in clinical trials of at least 13.85% of hospitalized patients.** ICR in Toulouse (31) (PHUC) represents an exception with a rate of 11.19%.

## P. Clinical trials in French Cancer Centers in 2012 - Unicancer

| Cancer Center  | City                | Active file of cancer patients (source PMSI) | Total patients included in a clinical trial | Total number of active clinical trials | Total patients/active clinical trials | % hospitalized patients enrolled in a clinical trial | Academic sponsorship        |                                |  | Industrial sponsorship      |                                  |
|--|---------------------|--|---|--|---------------------------------------|--|-----------------------------|--------------------------------|--|-----------------------------|----------------------------------|
|  |                     |  |   |  |                                       |  | Number of patients included | Number of open clinical trials | % patients enrolled in an academic trial | Number of patients enrolled | Number of active clinical trials |
| Institut Gustave Roussy                                      | Villejuif           | 9 880  | 2 808                                       | 322                                    | 8,72                                  | 28,42 %  | 2 188                       | 174                            | 77,92 %                                  | 620                         | 148                              |
| Centre Oscar Lambret   | Lille               | 5 873  | 1 352                                       | 171                                    | 7,91                                  | 23,02 %  | 1 246                       | 124                            | 92,16 %                                  | 106                         | 47                               |
| Centre Georges-François Lederc                               | Dijon               | 3 614  | 710   | 156                                    | 4,55                                  | 19,65 %  | 615                         | 108                            | 86,62 %                                  | 95                          | 48                               |
| Centre Léon Bérard   | Lyon                | 7 237  | 1 291                                       | 239                                    | 5,40                                  | 17,84 %  | 1 031                       | 165                            | 79,86 %                                  | 260                         | 74                               |
| Centre Antoine-Lacassagne                                    | Nice                | 4 314  | 736   | 159                                    | 4,63                                  | 17,06 %  | 638                         | 115                            | 86,68 %                                  | 98                          | 44                               |
| Institut de Cancérologie de Lorraine                         | Nancy               | 3 820  | 638   | 114                                    | 5,60                                  | 16,70 %  | 590                         | 89                             | 92,48 %                                  | 48                          | 25                               |
| Centre François Badesse                                      | Caen                | 5 489  | 876   | 171                                    | 5,12                                  | 15,96 %  | 765                         | 120                            | 87,33 %                                  | 111                         | 51                               |
| Institut Curie   | Paris / Saint-Cloud | 10 589                                       | 1 674                                       | 199                                    | 8,41                                  | 15,81 %  | 1 457                       | 142                            | 87,04 %                                  | 217                         | 57                               |
| Institut régional du Cancer Montpellier (ICM)                | Montpellier         | 5 463  | 823   | 129                                    | 6,38                                  | 15,06 %  | 651                         | 99                             | 79,10 %                                  | 172                         | 30                               |
| Institut Bergonié  | Bordeaux            | 4 960  | 700   | 177                                    | 3,95                                  | 14,11 %  | 541                         | 117                            | 77,29 %                                  | 159                         | 60                               |
| Institut Paoli-Calmettes                                     | Marseille           | 6 194  | 858   | 215                                    | 3,99                                  | 13,85 %  | 637                         | 131                            | 74,24 %                                  | 221                         | 84                               |
| Institut de Cancérologie de l'Ouest (P. Papin/R. Gauducheau) | Angers / Nantes     | 9 032  | 1 216                                       | 222                                    | 5,48                                  | 13,46 %  | 903                         | 128                            | 74,26 %                                  | 313                         | 94                               |
| Centre Paul Strauss  | Strasbourg          | 3 625  | 485   | 84                                     | 5,77                                  | 13,38 %  | 438                         | 63                             | 90,31 %                                  | 47                          | 21                               |
| Institut Jean Godinot  | Reims               | 2 681  | 318   | 72                                     | 4,42                                  | 11,86 %  | 290                         | 58                             | 91,19 %                                  | 28                          | 14                               |
| Institut Claudius Regaud                                     | Toulouse            | 5 147  | 576   | 118                                    | 4,88                                  | 11,19 %  | 362                         | 67                             | 62,85 %                                  | 214                         | 51                               |
| Centre Jean Perrin   | Clermont-Ferrand    | 3 942  | 356   | 75                                     | 4,75                                  | 9,03 %   | 323                         | 58                             | 90,73 %                                  | 33                          | 17                               |
| Centre Henri Becquerel                                       | Rouen               | 4 019  | 330   | 113                                    | 2,92                                  | 8,21 %   | 263                         | 80                             | 79,70 %                                  | 67                          | 33                               |
| Centre Eugène Marquis  | Rennes              | 3 703  | 255   | 62                                     | 4,11                                  | 6,89 %   | 196                         | 40                             | 76,86 %                                  | 59                          | 22                               |
| <b>TOTAL</b>   |                     | <b>89 702</b>                                | <b>16 002</b>                               |  |                                       | <b>17,84 %</b>                                       | <b>13 134</b>               |                                | <b>82,08 %</b>                           | <b>2 868</b>                |                                  |
| Moyenne/CLCC   |                     | 5 532  | 889   | 155                                    | 5                                     | 15,08 %  | 730                         | 104                            | 82,59 %                                  | 159                         | 51                               |
| +/-SD  |                     | 2 220  | 602   | 66                                     | 2                                     | 5,06 %   | 484                         | 37                             | 7,83 %                                   | 139                         | 32                               |
| Médiane  |                     | 5 054  | 723   | 158                                    | 5                                     | 14,59 %  | 626                         | 112                            | 83,24 %                                  | 109                         | 48                               |
| MIN  |                     | 2 681  | 255   | 62                                     | 3                                     | 6,89 %   | 196                         | 40                             | 62,85 %                                  | 28                          | 14                               |
| MAX  |                     | 10 589                                       | 2 808                                       | 322                                    | 9                                     | 28,42 %  | 2 188                       | 174                            | 92,48 %                                  | 620                         | 148                              |

File active 2012 = nombre de patients ayant eu au cours de l'année un séjour ou une séance en hospitalisation avec cancer "certain".

\* DP, DR Algo INCA et/ou pour lesquels des codes d'actes de chimiothérapie ou de radiothérapie ont été trouvés.

## 3.4 Finances

### 3.4.1 Incomes

Data on financial profiles of the French Cancer Centers shows that global incomes increase regularly between 2009 and 2011; the trend is about +4% per year. In 2011, the average incomes of a French Cancer Center are 93 M€.

Three groups of Cancer Centers can be distinguished according to their annual incomes:

- **Group 1 refers to Cancer Centers which annual incomes are over 120 M€** and it includes IGR in Villejuif (94), IC in Paris (75), CLB in Lyon (69) and IPC in Marseille (13). Following the merger of Nantes and Angers Cancer Centers, ICO is also part of this group. Only these 5 Cancer Centers have annual incomes over the national average of 93 M€.
- **Group 2 refers to Cancer Centers which annual incomes range from 70 to 90 M€** and it includes CFB in Caen (14), OOL in Lille (59), IB in Bordeaux (33), CVA in Montpellier (34), ICR in Toulouse (31) and CAL in Nice (06) and CHB in Rouen (76).
- **Group 3 refers to Cancer Centers which annual incomes are below 60 M€** and it includes CAV in Nancy (54), CJP in Clermont-Ferrand (63), CGFL in Dijon (21), CPSS in Strasbourg (67), IJG in Reims (51), CEM in Rennes (35) and ICL in Saint Etienne (42).

The 8 Cancer Centers belonging to a SIRIC or PHUC program - IGR in Villejuif (94), IC in Paris (75), CLB in Lyon (69), IPC in Marseille (13), OOL in Lille (59), CVA Montpellier (34), IB in Bordeaux (33) and ICR in Toulouse (31) - are all part of groups 1 and 2 for annual incomes. These 7 Cancer Centers have at least 75 M€ of total incomes.

### 3.4.2 Net result

During the 2000 decade, the French Cancer Centers were in a rather positive financial situation. In 2009, the average net result was -14 K€ (and even positive by +10 K€ if we consider strictly the 18 Unicancer members). The global financial position of Cancer Centers has however worsened since 2010.

Five Cancer Centers have a positive net result over the last three years: IGR in Villejuif (94), IPC in Marseille (13), OOL in Lille (59), CVA in Montpellier (34) the four of them being part of a SIRIC program, as well as CGFL in Dijon (21) and CEM in Rennes (51). The Cancer Centers with highest deficit are IC in Paris (75), ICR in Toulouse (34), CAV in Nancy (54), UJG in Reims (51) and ICL in Saint Etienne (42).

## Q. Financial resources of French Cancer Centers – HospiDiag 2013

| HospiDiag 2013<br>Year | Total income in €    |                      |                      | Net result in €  |                    |                    |
|------------------------|----------------------|----------------------|----------------------|------------------|--------------------|--------------------|
|                        | 2009                 | 2010                 | 2011                 | 2009             | 2010               | 2011               |
| IGR Villejuif (94)     | 239 154 157          | 254 514 558          | 262 690 630          | 404 809          | 1 965 673          | 1 358 022          |
| IC Paris (75)          | 201 223 999          | 208 889 119          | 214 681 652          | - 513 800        | - 2 409 168        | - 2 368 344        |
| CLB Lyon (69)          | 124 703 561          | 133 391 298          | 146 330 189          | 267 549          | 285 779            | - 1 538 502        |
| IPC Marseille (13)     | 130 571 675          | 137 095 025          | 142 987 200          | 1 861 370        | 677 113            | 636 837            |
| CFB Caen (14)          | 76 509 127           | 79 821 787           | 81 422 009           | - 3 008 866      | - 1 102 464        | 63 425             |
| OOL Lille (59)         | 82 861 972           | 87 759 560           | 88 277 376           | 843 581          | 205 047            | 262 475            |
| IB Bordeaux (33)       | 82 271 254           | 83 425 029           | 89 931 574           | 51 303           | - 587 153          | - 158 296          |
| CVA Montpellier (34)   | 72 035 822           | 74 047 175           | 79 167 580           | 136 924          | 631 745            | 418 510            |
| ICR Toulouse (31)      | 73 937 108           | 73 090 024           | 75 561 837           | - 2 313 053      | - 4 242 032        | - 1 981 018        |
| CAL Nice (06)          | 69 228 300           | 70 240 742           | 77 088 926           | - 385 327        | - 999 594          | - 1 448 959        |
| CAV Nancy (54)         | 58 684 343           | 59 276 718           | 59 411 999           | 290 444          | - 1 705 594        | - 1 943 193        |
| CHB Rouen (76)         | 79 515 134           | 84 630 022           | 85 750 573           | - 1 163 187      | - 33 944           | 1 392 204          |
| CRG ICO Nantes (44)    | 112 387 617          | 117 833 724          | 126 520 387          | 1 727 920        | 1 182 108          | 1 779 884          |
| CJP Clermont F. (63)   | 56 541 963           | 58 852 702           | 58 325 716           | 1 096 677        | 86 459             | - 31 405           |
| CGFL Dijon (21)        | 54 744 063           | 57 098 676           | 60 499 093           | 116 031          | 66 694             | 7 285              |
| CPSS Strasbourg (67)   | 53 413 096           | 54 637 104           | 55 188 723           | 1 096 677        | 86 459             | - 31 405           |
| IJG Reims (51)         | 42 658 317           | 42 699 749           | 42 502 398           | - 385 179        | - 1 321 715        | - 1 521 897        |
| CEM Rennes (35)        | 46 478 842           | 47 937 377           | 49 598 845           | 63 255           | 118 519            | 307 228            |
| ICL Saint Etienne (42) | 48 066 860           | 49 062 469           | 49 676 354           | - 456 106        | - 1 076 084        | - 144 752          |
| <b>Total in €</b>      | <b>1 704 987 210</b> | <b>1 774 302 858</b> | <b>1 845 613 061</b> | <b>- 268 978</b> | <b>- 8 172 152</b> | <b>- 4 941 901</b> |
| <b>Average in €</b>    | <b>89 736 169</b>    | <b>93 384 361</b>    | <b>97 137 530</b>    | <b>- 14 157</b>  | <b>- 430 113</b>   | <b>- 260 100</b>   |
| Annual increase in %   |                      | 4.1%                 | 4.0%                 |                  |                    |                    |

As a result, after several years of excellent financial result, the **global deficit of Cancer Centers** started this decade with 8 million € loss in 2010, 5 million € loss in 2011 and about 10 million € loss in 2012. According to Unicancer (Josy Reiffers President and Pascal Flamant General Director) this evolution is due to several factors (cf. appendices for more details):

- The main one is the new system implemented in France to fund healthcare institutions in 2005 (T2A), for which evolutions are not positive especially for Cancer Centers. This global funding system tends to **support hospitals mainly regarding the number of days of hospitalization**. The **budget to support research, innovation and teaching (MERRI)** is **not sufficient** at the national level, particularly for Cancer Centers that invest significant amounts in these fields.
- Another reason is that most Cancer Centers have new and **high tech medical equipments**. This is one condition to **provide efficient, personalized and fast treatments for cancer patients**. The benefits and financial coverage is not recognized like it should be, especially it impacts to reduce the duration of hospitalizations.

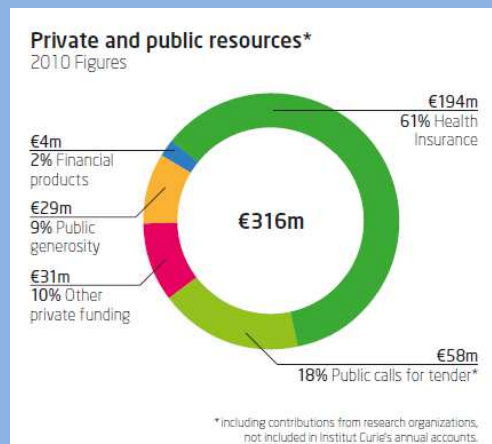
It should also be pointed out that Comprehensive Cancer Centers are implementing new strategies to increase their incomes, including:

- **Fundraising operations** such as the “*unejonquillepourcurie*” initiated in 2004 by IC in Paris (75) that enables the Comprehensive Cancer Center to get closed to 30 M€ per year (9% of its budget) from public generosity (cf. details below).
- **International promotion** to take care of high income foreign patients, such the program started in 2008 by IGR to welcome foreign patients (especially from Persian Gulf, Egypt, Algeria and China) representing today 5% of total patients and providing new incomes for the Comprehensive Cancer Center.

### R. Institut Curie and its fundraising policy

Key figures about Institut Curie Comprehensive Cancer Center in 2010 :

- Annual budget: 300 M€, including 9% from public donations
- Employees: 3 000 professionals
- Care: 287 beds
- Patients: 13 000 patients treated and 170 000 consultations
- 102,000 m2 of hospitals and research laboratories in Paris, Orsay & Saint-Cloud
- Research: 966 staff in the research center,
- Valorization: 120 patent families, 10 spin-off companies created to date



As a registered charity, Institut Curie is authorized to receive donations and legacy gifts. In 2010, Institut Curie received 29 M€ in donations and legacy gifts, thanks to 187,000 donors. 77% of these donations were channeled directly into the foundation's social missions: cancer research, patient care, and teaching. The remainder was used for institute operations (11%) and to cover fundraising costs (12%). The same year also saw 104 new legacy gifts, donations, and life insurance policy contributions to Institut Curie (with the support from some notaries and financial advisers). Financial support also relies on citizens taking part in events held throughout France for the benefit of Institut Curie through individual or collective initiatives. For example, the *Courir pour la Vie, Courir pour Curie* (Run for Life, Run for Curie) charity run, a long-standing Institut Curie donor, brought 12,149 people out to run in the 2010 event, an athletic and financial challenge that ultimately rose over €84,000. Businesses support represents another important income for Institut Curie with 31 M€ in 2010. It consists mainly in corporate sponsorships as well as industrial research contracts...

Source: Institut Curie

### 3.5 Profile and definition of Comprehensive Cancer Centers

It is interesting to consider these statistics under the light of the Resource-based View theory developed by Birger Wernerfelt<sup>7</sup> to analyze the resource concentration effect within Comprehensive Cancer Centers. This theory focusing on firms seems to be relevant as well for Comprehensive Cancer Centers:

- *“(1) firms are fundamentally heterogeneous; (2) a firm should base its strategy on its strengths; (3) tomorrow’s strengths are likely to be developed from today’s strengths. Rather than emphasize market structures, Wernerfelt’s seminal work proposed that the unique assets and resource endowments of firms are important factors that give rise to firm efficiencies, imperfect competition, and the attainment of super-normal profits. The implication of this work has led to the notion that a firm’s ability to attain and retain profitable market positions depends on its ability to gain and defend advantageous resource endowments”.*





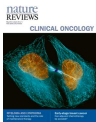
A profile of Comprehensive Cancer Centers in France can be built thanks to these different statistics on medical activities, medical means and human resources, training, research and clinical research, as well as financial results of Cancer Centers.

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<sup>7</sup> *The Development of the Resource-based View : reflections from Birger Wernerfelt, Andy Lockett, Rory P. O’Shea and Mike Wright, Organization Studies 29, 2008*



## S. Main characteristics of French Cancer Centers and Comprehensive Cancer Centers

|   | <b>French Cancer Centers</b>  | <b>French Comprehensive Cancer Centers</b>  |
|---|---|---|
|    | <b>MEDICAL ACTIVITIES</b><br>Chemotherapies: 6 000 to 33 000 per year<br>Radiotherapies: 23 000 to 94 000 per year<br>Market shares: 8% to 22%                      | <b>MEDICAL ACTIVITIES</b><br><b>Chemotherapies: 15 000 per year minimum</b><br>Radiotherapies: not relevant<br>Market shares: not relevant                                      |
|    | <b>MEDICAL MEANS</b><br>Medical beds: 50 to 200 beds<br>Operating theaters: 2 to 15 theaters  | <b>MEDICAL MEANS</b><br><b>Medical beds: 100 beds minimum</b><br>Operating theaters : 5 theaters minimum  |
|    | <b>HUMAN RESOURCES</b><br>Medical FTE: 30 to 230 FTE<br>Non medical FTE: 330 to 1700 FTE<br>Total FTE: 360 FTE to 1900 FTE  | <b>HUMAN RESOURCES</b><br>Medical FTE: 75 FTE minimum<br>Non medical FTE: 600 FTE minimum<br><b>Total FTE: 675 FTE minimum</b>  |
|    | <b>FINANCE</b><br>Incomes: 50 to 260 M€ per year<br>Net result: - 2.4 M€ to + 1.3 M€  | <b>FINANCE</b><br><b>Incomes: 80 M€ minimum per year</b><br>Net result: not relevant  |
|  | <b>RESEARCH</b><br>Scientific publications: 30 to 450 per year<br>Clinical trials: 62 to 322 trials per year<br>Inclusion rate: 6.9% to 28.4% of patients in trials | <b>RESEARCH</b><br><b>Scientific publications: 75 minimum per year</b><br><b>Clinical trials: 150 trials minimum per year</b><br><b>Inclusion rate: 14% minimum of patients</b> |

The profile of Comprehensive Cancer Centers in France is a healthcare institution dedicated to cancer care and offering at least 15 000 chemotherapies every year. It has a minimum of 100 medical beds and 5 operating theaters. Its human resources rely on a minimum of 75 medical Full Time Equivalent (doctors) and 600 non-medical FTE. Its annual incomes are at least 80 M€. It has a significant research activity with at least 75 scientific publications every year, 150 clinical trials and an inclusion rate of patients in clinical trials of 14% minimum.



For most of these indicators, the minimum requirements of Comprehensive Cancer Centers in France correspond more or less to the national average of French Cancer Centers (number of chemotherapies, medical beds, operating theaters, clinical trials and inclusion rate). Minimum requirements for FTE, annual incomes and publications tend to be slightly below average of the French Cancer Centers. Other indicators such as the number of radiotherapies, market shares, and financial result do not appear to be relevant to qualify Comprehensive Cancer Centers.

A more detailed analysis on resources shows that Comprehensive Cancer Centers have on average twice as much resources as the other Cancer Centers. This is true for human resources with 1095 FTE on average while the other French Cancer Centers have 523 FTE. Comprehensive Cancer Centers have 130 medicals beds and 7.8 operating theaters on average, while the other French Cancer Centers have 72 medical beds and 3.9 operating theaters. Their annual average incomes reach 138 M€, while the other French Cancer Centers have on average 68 M€ of incomes per year.

In terms of outputs, Comprehensive Cancer Centers manage 20 500 chemotherapies on an annual basis, while the other French Cancer Centers make 11 500 chemotherapies every year. They produce on average 170 scientific publications every year, while other Cancer Centers produce 47 annual publications. They conduct about 196 clinical trials and they include about 1260 patients in these trials every year, while other Cancer Centers have 123 clinical trials and 592 patients included.

**As a general conclusion, regarding their human and material resources the Comprehensive Cancer Centers have a slightly lower productivity than the other Cancer Centers in terms of care, a similar productivity for the clinical trials, but a lot higher productivity for scientific production.**

## 4 Benefits and limits of the Comprehensive Cancer Centers model

### 4.1 The pathology specialization and volume effects

Cancer Centers represent a unique model in the world of healthcare in France as in the USA. They are the sole large healthcare institutions which have the same three missions as public hospitals (care, training and research) and which are dedicated to a specific pathology<sup>8</sup>. Many private clinics have chosen to focus on one or a few pathologies /areas such as: cardiology, gynecology, ophthalmology, neurology... However their model is rather different from public hospitals because their missions and status are different.

The effects and benefits of specialization is a major medical issue and many studies were conducted about this topic. Because of our specific interest about Comprehensive Cancer Centers, it is also interesting to take into consideration the volume effect of medical activities on patient outcomes. A study published in 2007, based on an analysis of more than 1000 publications give a detailed overview of the impact of surgery and specialization on patient outcomes<sup>9</sup>.

Out of 1075 publications, this work examined the 163 most relevant and exhaustive studies covering 9 904 850 patients, 42 different surgical procedures, spanning 13 surgical specialties. The main learning of the study is that high surgeon volume and specialization are associated with improved patient outcomes, while high hospital volume is of limited benefit:

- *“Hospital volume was reported in 127 studies; high-volume hospitals had significantly better outcomes in 74.2 per cent of studies, but this effect was limited in prospective studies (40 per cent).*
- *Surgeon volume was reported in 58 studies; high-volume surgeons had significantly better outcomes in 74 per cent of studies.*
- *Specialization was reported in 22 studies; specialist surgeons had significantly better outcomes than general surgeons in 91 per cent of studies. The benefit of high surgeon volume and specialization varied in magnitude between specialties”.*

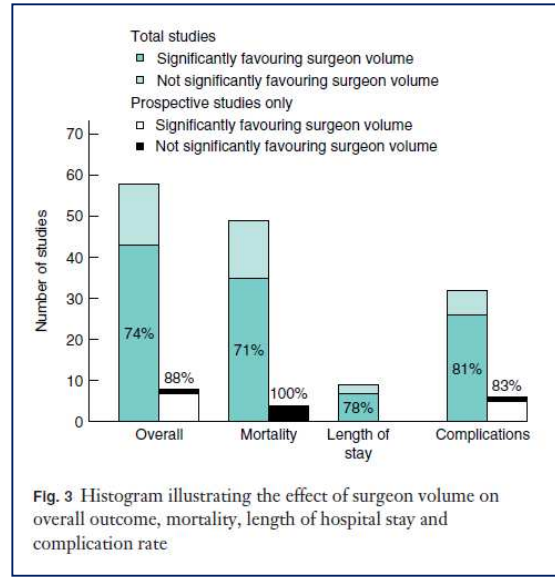
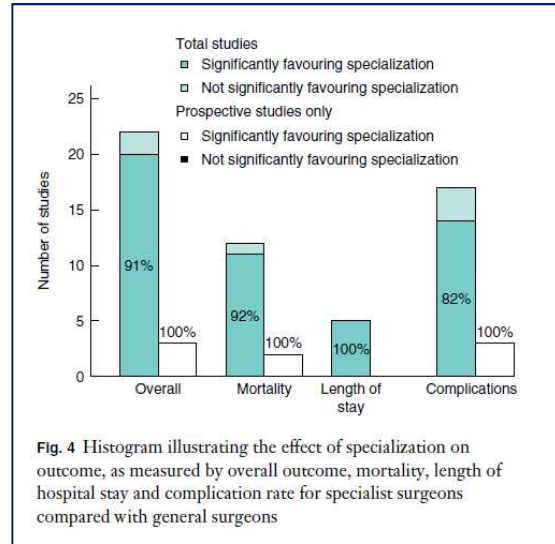
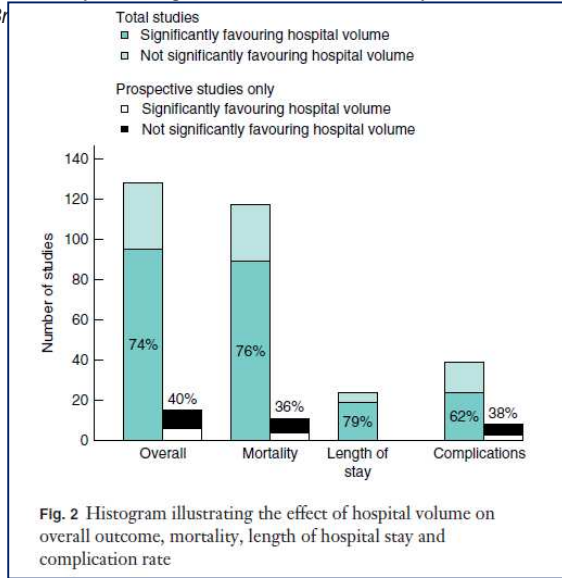
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<sup>8</sup> Institut Pasteur was originally a healthcare institution with the three same missions as University Hospitals and Cancers Centers. However it stopped in 1999 its cares activities (except vaccination) in order to focus on research and teaching.

<sup>9</sup> *A systematic review of the impact of volume of surgery and specialization on patient outcome*, M. M. Chowdhury, H. Dagash and A. Pierro, Wiley, InterScience, British Journal of Surgery ; 94: 145–161, 8 January 2007

**T. Impact of the volume of surgery and specialization on patient outcomes - British Journal of Surgery Society, 2007**

Source : A systematic review of the impact of volume of surgery and specialization on patient outcome, M. M. Chowdhury, H. Dagash and A. Pierro, Wiley, InterScience, Br



According to this study, the differences in outcomes between specialist and general surgeons may be explained by the effect of high volume, because specialist surgeons are more likely to perform higher volumes of select procedures. Another explanation is the systematic differences in choice of treatment and the contribution of other healthcare professionals.

Even if the benefits of volume effect are not systematic at the scale of hospitals, this study chooses interesting figures in the field of cancer (cf. Tables below). High hospital volume and better patient outcomes can be demonstrated for a limited number of procedures and it leads to recommendations about a minimum volume of procedures per year for each hospital. The effect of surgeon volume varies between specialties, but high volume is

beneficial in 9 studies out of 13 in surgical oncology (69%). There are also recommendations about a minimum volume of procedures per year for oncology surgeon.

## U. Impact of volume of surgery and specialization on patient outcome - British Journal of Surgery Society, 2007

**Table 3** Hospital volume thresholds: recommended annual volume of operations per hospital

| Procedure          | Reference | High volume | Low volume | Significant difference |
|--------------------|-----------|-------------|------------|------------------------|
| Lung cancer        | 44        | 20–100      | < 9        | Yes†                   |
| Oesophageal cancer | 51        | > 6         | < 6        | Yes                    |
| Oesophageal cancer | 62        | 30          | 1–5        | Yes                    |
| Colorectal cancer  | 63        | > 18        | < 11       | Yes                    |
| Colorectal cancer  | 56        | > 33        | < 23       | Yes                    |
| Colorectal cancer  | 45        | 40          | 20         | Yes†                   |
| Colorectal cancer  | 49        | 70          | < 40       | Yes                    |
| Oncology‡          | 54        | > 11        | 1–5        | Yes†                   |

Oncology ‡ study considered cancer of pancreas, lung, oesophagus, liver and colon.

**Table 6** Surgeon volume thresholds: recommended annual volume of operations per surgeon

| Procedure          | Reference | High volume | Low volume | Significant difference |
|--------------------|-----------|-------------|------------|------------------------|
| Oncology           |           |             |            |                        |
| Colorectal cancer  | 46        | 13          | 1          | Yes*                   |
| Colorectal cancer  | 49        | > 10        | < 5        | Yes                    |
| Colorectal cancer  | 56        | > 33        | < 23       | Yes                    |
| Colorectal cancer  | 137       |             | < 21       | Yes*                   |
| Gastrectomy        | 46        | > 6         | < 1        | Yes*                   |
| Lobectomy          | 46        | 50          | 1.5        | Yes*                   |
| Oesophageal cancer | 50        | > 12        | < 4        | No*                    |
| Oesophageal cancer | 152       | > 6         | < 6        | Yes                    |

Source : A systematic review of the impact of volume of surgery and specialization on patient outcome, M. M. Chowdhury, H. Dagash and A. Pierro, Wiley, InterScience, *British Journal of Surgery* ; 94: 145–161, 8 January 2007

According to an Australian oncologist (Jane O'Brien, Epworth Centre Richmond VIC, Melbourne) three possible explanations of the benefits of surgeon specialization on long-term outcomes for patients can be considered regarding breast cancer<sup>10</sup>.

- The first explanation is about the **volume effect**. Specialists tend to perform a more specific type of surgery and therefore may have better results, thanks to experience and habits.
- The second explanation is about surgical skills and training. Specialist breast surgeons have **advanced training** and therefore they are better trained to perform breast cancer surgery and may perform a technically superior operation.
- The third explanation is about **global treatment**. Specialist breast surgeons are trained not only in surgical techniques, but also in the biology of cancer and the role of radiation and systemic therapies in cancer treatment. Therefore they may be more likely to use relevant adjuvant therapies (radiotherapies, chemotherapies...) to take care of patients.

<sup>10</sup> Benefits of Breast Surgical Specialization, Jane O'Brien, Epworth Centre Richmond VIC, Australia

As a conclusion on the effects of specialization and volume for the treatment of cancer and the interests of the Comprehensive Cancer Centers model, we would like to add one quote from the study published in the *British Journal of Surgery*:

- *“The survival of patients with cancer treated at oncology centers appears to be better than those treated at general surgical units of similar volume<sup>11</sup>. While this may be attributable exclusively to the specialist surgeon, the contribution of other multidisciplinary team members such as oncologists or nurse specialists, which may be less available in general surgical units, has not been examined and, indeed, may be impossible to isolate”.*

## 4.2 New philosophy of care and its organization

Cancer Centers and especially Comprehensive Cancer Centers have contributed to the promotion of a new philosophy of care and its organization. The approach can be visible through the Cancer Center organization, and even through the building architecture.

### 4.2.1 An organization focusing on patient

As a reminder, we would like to underline that NCI Cancer Centers in the USA have for basic principle *“Transdisciplinary Collaboration and Coordination: Substantial coordination, interaction, and collaboration, both among Center members from a variety of disciplines and between Center members...”* The UNICANCER promotes a similar philosophy with the 10 commitments of French Cancer Centers: *“a patient-centered approach based on multi-disciplinary, comprehensive patient care and the research-healthcare continuum”.*

In 2005 the HPST law initiated a reform of hospital organization, in order to implement “pôles”<sup>12</sup>. This reform has given partial result in French hospitals and it is not yet considered as completed<sup>13</sup>. However, following this reform a report from the French

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<sup>11</sup> Harmon JW, Tang DG, Gordon TA, Bowman HM, Choti MA, Kaufman HS *et al.* Hospital volume can serve as a surrogate for surgeon volume for achieving excellent outcomes in colorectal resection. *Ann Surg* 1999; **230**: 404–411.

Hannan EL, Radzyner M, Rubin D, Dougherty J, Brennan MF. The influence of hospital and surgeon volume on in-hospital mortality for colectomy, gastrectomy, and lung lobectomy in patients with cancer. *Surgery* 2002; **131**: 6–15.

<sup>12</sup> Definition: « *L'organisation par pôles va permettre de décloisonner l'hôpital tant sur le plan des disciplines et des services que sur celui de la stratification des modes décisionnels entre administratifs, médecins et soignants. Le pôle doit être conçu comme un ensemble humain tourné vers des objectifs communs et doit être un facteur d'adhésion et de fédération. Il doit donc, non seulement disposer d'instances de participation propre (conseil de pôle) mais se traduire aussi par une direction homogène entre le responsable de pôle, le cadre supérieur de santé coordonnateur, le référent de la direction de l'hôpital d'une part et par un projet stratégique et managérial d'autre part. Ce projet, qui doit être formalisé et intégré dans le projet stratégique de l'hôpital, sera un élément déterminant de tout programme architectural ou organisationnel.* »

<sup>13</sup> *Bilan de l'organisation en pôles d'activité et des délégations de gestion mises en place dans les établissements de santé*, IGAS, Février 2010

Ministry of Health gives an interesting overview of the organization issues to create “pôles” in french hospitals.<sup>14</sup> Based on these elements, you will find below a synthesis of the benefits and limits of the main organizational scenarios for healthcare institutions:

| <b>Organizational scenarios for healthcare institutions: principles, benefits and limits</b> |   |  |  |
|--|---|--|--|
| <b>Organization</b>  | <b>Principles</b>   | <b>Benefits</b>  | <b>Limits</b>  |
| <b>Disciplines</b>   | <ul style="list-style-type: none"> <li>▪ Independent units with proper equipments and means: surgery, radiology...</li> <li>▪ Relevant for middle size institutions</li> </ul>  | <ul style="list-style-type: none"> <li>▪ Simplicity</li> <li>▪ Relevant for important emergency activity</li> </ul>  | <ul style="list-style-type: none"> <li>▪ Few synergies between teams</li> <li>▪ Low innovation</li> <li>▪ Creation of rivalries</li> </ul>                   |
| <b>Organs</b>  | <ul style="list-style-type: none"> <li>▪ Gathering specialties to treat one organ within a pole: hepato gastro enterology to create a digestive pole</li> <li>▪ Common organization in large hospitals (CHU)</li> </ul> | <ul style="list-style-type: none"> <li>▪ General support from medical staff (tradition)</li> <li>▪ Easy interface with universities and medical schools</li> </ul> | <ul style="list-style-type: none"> <li>▪ Not relevant for poly-pathologies</li> <li>▪ Not relevant for global care</li> <li>▪ Creation of chapels</li> </ul> |
| <b>Patient &amp; treatment</b>   | <ul style="list-style-type: none"> <li>▪ Poles organized according to the process of patient treatment</li> <li>▪ Organization based on clinical pathways and patient needs</li> </ul>                                  | <ul style="list-style-type: none"> <li>▪ Optimization of means economic performance, and flexibility</li> <li>▪ Patient focus</li> </ul>                           | <ul style="list-style-type: none"> <li>▪ Frequent moves of medical staff</li> <li>▪ Requirement for centralized medical record</li> </ul>                    |
| <b>Flow</b>  | <ul style="list-style-type: none"> <li>▪ Poles organized according to different flows within the institution</li> <li>▪ Global approach of hospital activities, including suppliers...</li> </ul>                       | <ul style="list-style-type: none"> <li>▪ Efficient ergonomics of working places and easy movements</li> <li>▪ Optimization of surfaces</li> </ul>                  | <ul style="list-style-type: none"> <li>▪ Specific requirement for emergencies</li> </ul>   |

Source : *Nouvelles Organisations et Architectures Hospitalières*, Ministère de la Santé, Septembre 2009

IGR in Villejuif (94) is a relevant example of organizational and architectural evolution within a Comprehensive Cancer Center. IGR was built in the 1970 on a vertical scheme with 18 levels. Originally, IGR was organized by disciplines and organs like most major hospitals. The levels of IGR were dedicated to one discipline or organ and the patients had to move from one floor to another in order to see the relevant specialist. The medical services also became progressively rivals rather than partners explained Gilbert Lenoir and Eric Solary from IGR.

Considering that, this center organization was not efficient and not appropriate for patient treatment, the IGR management initiated a double change in 1990 & 2000's:

- IGR went from an organ organization to a patient organization,
- In 2000, IGR started a new architectural project focusing on patient care. Between 2001 and 2007, the Comprehensive Cancer Centers built a large technical support center, at the bottom of the original building, which mission was to become the meeting point of patients and doctors. (cf. details below)

<sup>14</sup> *Nouvelles Organisations et Architectures Hospitalières*, Ministère de la Santé, Septembre 2009

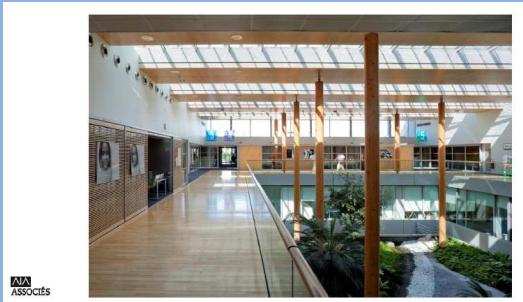
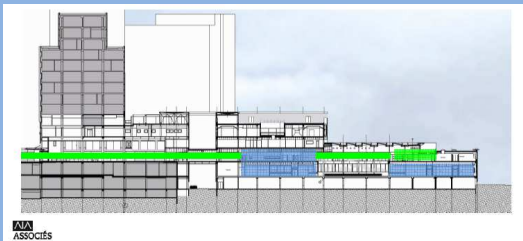


## 4.2.2 An architectural translation

### V. IGR and its technical support centre/platform

Key figures about IGR Comprehensive Cancer Center :

- IGR annual budget: 260 M€
- 2,500 professionals
- 12,098 patients treated and 167,921 consultations in 2010
- Care: 339 beds, 86 day hospital places, 880 care-givers, 210 tenured physicians
- Research consolidated annual budget : 63 M€
- Including research units 29 M€, clinical research 26.8 M€, core facilities 7.8 M€
- Research resources: 27 teams, 305 researchers, 7 technical platforms
- Teaching: 5,000 teaching hours, 2,800 students, researchers and physicians trained per year.



Between 2000 and 2007, IGR realized an investment of 75 million Euros in order to set up its new technical platform and patient reception within a new building of 30 000 square meters:

- 1998: Design of the architectural program,
- 2000: Launch of the construction works,
- 2005: Opening of the technical platform which gathers laboratories, diagnostic and interventional medical imaging, radiotherapy, brachytherapy, nuclear medicine,
- 2007: Opening of a new block of 14 operating theaters, combining surgical endoscopy and interventional imaging disciplines...

*Source: IGR & AIA associés*

The architects "AIA associés" who coordinated the operation promote three main principles for the organization of hospital buildings:

- For diagnosis and tertiary activities: movement.
- For technical platform: flexibility.
- For hospitality: comfort.



This new organization and technical centers introduced several important evolutions within the IGR Comprehensive Cancer Center:

- Medical staff moves to take care of patients, while it used to be the opposite in the former organization.
- Patients are not anymore transferred on a regular basis from one floor to another and they have access to all the technical services in one area.
- Collaboration between the different members of medical staff improved and became more focus on patients.

The IGR experience is a great example of combination of organizational and architectural change in order to make the Comprehensive Cancer Center more efficient and more patient focus.

### 4.3 Beyond the borders of the Comprehensive Cancer Center

To characterize the Comprehensive Cancer Centers, it is also essential to take into consideration their partnerships, their networks and their ecosystems.

#### 4.3.1 Comprehensive Cancer Centers and their network of partners

It is very difficult to identify the different partners of Comprehensive Cancer Centers. SIRIC programs give some indications about the key partners and the on-going collaborations of the major Cancer Centers, as well as the PHUC program for Toulouse.

| Panorama of the partnerships<br>of the French Comprehensive Cancer Centers (SIRIC and PHUC Programs) |   |   |   |
|--|---|---|---|
| Comprehensive Cancer Center  | Hospitals   | Research centers  | Universities  |
| Institut Curie in Paris (SIRIC CURIE)  | -   | <ul style="list-style-type: none"> <li>INSERM, CNRS, ESPCI-ParisTech, INSB délégation régionale – IDF Est</li> </ul>  | <ul style="list-style-type: none"> <li>Universities Paris V, VI, XI &amp; Versailles-Saint-Quentin-en-Yvelines</li> </ul>   |
| Institut Gustave Roussy in Villejuif (SIRIC SOCRATE)   | -   | <ul style="list-style-type: none"> <li>INSERM, CNRS</li> </ul>  | <ul style="list-style-type: none"> <li>Paris-Sud 11 University</li> </ul>   |
| Centre Leon Berard in Lyon (SIRIC LYRIC)   | <ul style="list-style-type: none"> <li>Hospices Civils de Lyon (HCL)</li> </ul>                     | <ul style="list-style-type: none"> <li>INSERM, CNRS, INRIA, CRCL, SLC Foundation, International Agency for Research in Cancer (WHO)</li> </ul>  | <ul style="list-style-type: none"> <li>Claude Bernard Lyon 1 University</li> </ul>  |
| Institut Paoli Calmettes in Marseille (SIRIC PRRC)   | <ul style="list-style-type: none"> <li>Assistance Publique-Hôpitaux de Marseille (AP-HM)</li> </ul> | <ul style="list-style-type: none"> <li>INSERM, CNRS</li> </ul>  | <ul style="list-style-type: none"> <li>Aix-Marseille University (AMU).</li> </ul>   |
| Centre Oscar Lambret (SIRIC ONCOLILLE)   | <ul style="list-style-type: none"> <li>CHRU de Lille</li> </ul>                                     | <ul style="list-style-type: none"> <li>Institut Pasteur de Lille, Institut de Recherche sur le Cancer de Lille (IRCL), Lille Institute of Biology, Centre de Référence Régional en Cancérologie (CRRC), ONCOVET, European Centre for Human and Social Sciences (MESHS)</li> </ul> | <ul style="list-style-type: none"> <li>Lille 2 University “Law and Health”</li> <li>Lille 1 University “Sciences and Technology”</li> <li>Lille 3 University “Sciences and Technology”</li> </ul> |
| Institut Val d’Aurelle in Montpellier (SIRIC MC)   | <ul style="list-style-type: none"> <li>CHU Montpellier</li> </ul>                                   | <ul style="list-style-type: none"> <li>IRCM, IGF, IGH, IGMM, CRBM, IRB</li> </ul>   | <ul style="list-style-type: none"> <li>Montpellier University</li> </ul>  |
| Institut Bergonié in Bordeaux (SIRIC BRIO)   | <ul style="list-style-type: none"> <li>CHU Bordeaux</li> </ul>                                      | <ul style="list-style-type: none"> <li>INSERM, Réseau de Cancérologie d’Aquitaine.</li> </ul>   | <ul style="list-style-type: none"> <li>Bordeaux Segalen University</li> </ul>   |
| Institut Claudius Regaud (PHUC Captor)   | <ul style="list-style-type: none"> <li>CHU de Toulouse</li> </ul>                                   | <ul style="list-style-type: none"> <li>INSERM, CNRS</li> </ul>  | <ul style="list-style-type: none"> <li>Toulouse III Paul Sabatier University</li> </ul>   |

All Comprehensive Cancer Centers (SIRIC and PHUC) have a partnership with local university/universities; most of them have a partnership with the main national research centers (INSERM & CNRS). All of them also have a partnership with the regional hospital (CHU), except the 2 Comprehensive Cancer Centers in Paris area (IC & IGR). This collaboration is a very sensitive dimension, and it was a major difficulty to implement the SIRIC program.

The French national authorities (Minister of Health and INCa) try to implement more coordination regarding cancer care between Cancer Centers and public hospitals. The implementation of regional poles of oncology is part of French Cancer Plan measures (n°30). In September 2009, the National Federation of Cancer Centers (UNICANCER) and the National Oncology Federation of University Hospital (CHU FNC) signed a framework agreement on the establishment of health cooperation groups (“groupement de coopération sanitaire” - GCS) which was planned for the establishment of 17 GCS in oncology at the national level. These health cooperation groups (GCS) aim to encourage the coordination of cancer care at regional level.

One of the oldest and most famous experiences of collaboration in France is the IHOP in Lyon. This cooperation between Lyon Comprehensive Cancer Center (CLB) and Lyon University Hospital (HCL) is dedicated to oncopediatrics cooperation and it represents one of the main strength of SIRIC LYRIC (cf. below for details).

### **W. CLB collaboration with HCL for Oncopediatrics (IHOP)**

Key figures about CLB Comprehensive Cancer Center :

- CLB annual budget: 135 M€
- Employees: 1 400 employees including 170 physicians in 2012
- Patients: 7 500 patients treated and 54600 outpatient consultations per year
- Care: 266 beds
- Research: 15 teams, 380 researchers, 130 publications per year
- Clinical research : 200 Clinical trials, 986 patients included in 2009

“The IHOP (Institute of Haematology and Paediatric Oncology) is a specialised hospital, created and managed jointly by the Leon Berard Cancer Center and the Hospices Civils de Lyon. It is one of the first achievements of the Lyon Cancerologie Universitaire (GCS structure). The IHOP gathers the whole Paediatric Haematology recruitment (malignant and non-malignant) and paediatric oncology. Created in March 2001 as part of LCU, the IHOP’s medical project, adopted in June 2002 resulted in the establishment of a Regional Network of Paediatric Oncology (ONCORAP). The IHOP now includes 54 beds divided into 4 units: an outpatient department (12 beds), a week unit (12 beds), a complete hospitalisation unit (15 beds) and a sterile unit (15 Intensive care unit beds). Since February 2008, 200 new patients are accepted per year. It is one of the reference centers of paediatric oncology at national and European level.

The IHOP has a nationally recognised position in home cares. This enables particularly phases I and II strategies within the international network Innovative Therapy in Children Cancer (ITCC) European consortium. The IHOP has a nationally and internationally recognised leadership position in palliative cares. The IHOP has also a national leading position in the management of adolescent and young adults: with an active participation in the national think tank from the INCA on this topic. Research in the IHOP deals with haematological and oncological malignancies occurring in children, adolescents and young adults. It integrates on the same site basic research (mostly on neuroblastoma, sarcoma and haematological malignancies) with clinical research (through leadership of French and/or European consortia) and excellence in supportive care”.

According the INCa report (“Rapport sur les coopérations entre les Centres hospitalo-universitaires et les Centres de lutte contre le cancer”), the IHOP is one the most advanced cooperation in the field of cancer at national level with a shared information system unique in France.

Source: CLB & SIRIC LYRIC

An assessment sponsored by INCa focusing on the cooperation between University Hospitals and Cancer Centers<sup>15</sup> gives an exhaustive overview of the ongoing collaborations. This analysis leads to several interesting conclusions regarding the Comprehensive Cancer Centers.

Between 2005 & 2009 cooperation between Cancer Centers and University Hospitals have increased significantly in France, leading to the following collaborations in 2009:

- **Sharing of heavy equipments:** scanners (6 cooperations), MRI (11 cooperations), PET scan (15 cooperations),
- **Sharing of technical platforms:** nuclear medicine (8 cooperations), radiotherapy (4 cooperations), surgical robot (2 cooperations), labs (12 cooperations), sterilization (4 cooperations), Omics platforms (11 cooperations), tumor banks (13 cooperations),
- **Specialties collaborations:** oncopediatrics (3 cooperations), rare tumors (6 cooperations), oncogenetics (7 cooperations),
- **Clinical research:** 16 out of the 20 French Cancer Centers coordinate their clinical trials with the regional university hospital and 7 have an agreement to collaborate within the hospital clinical investigation center (CIC). Of course, clinical research implies as well partnership with pharmaceutical companies (cf. clinical trials in French Cancer Centers in 2012 - Unicancer).

Considering these data on collaborations, Comprehensive Cancer Centers seem to be part of the “Open innovation” process described by H. Chesbrough<sup>16</sup>:

<sup>15</sup> *Rapport sur les coopérations entre les Centres hospitalo-universitaires et les Centres de lutte contre le cancer et recommandations pour un cahier des charges des pôles régionaux de cancérologie*, Institut national du cancer, février 2009

<sup>16</sup> *Open Innovation: Researching a New Paradigm*, Henry Chesbrough, Joel West and Wim Vanhaverbeke; Oxford University Press, 2006.

- “Open innovation is the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively. This paradigm assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as they look to advance their technology.”

Regarding a previous work about regarding Open innovation<sup>17</sup>, we consider that the activities of Comprehensive Cancer Centers correspond to several dimensions of Open innovation, including: Networks & clusters, Technology & shared facilities, Human capital & cooperation with labs & universities, Business models & valorization with patents et spin off. The table below shows the current situation for the 4 Comprehensive Cancer Centers in Paris, Lyon and Toulouse:

| <b>Comprehensive Cancer Centers and open innovation: three examples</b> |   |  |  |   |
|---|---|--|--|---|
| <b>Comprehensive Cancer Center</b>                                      | <b>1/ Networks and clusters</b>   | <b>2/ Technology: shared facilities</b>  | <b>3/ Human capital: Cooperation with labs &amp; universities</b>  | <b>4/ Business models: IP and Spin off policy</b>   |
| <b>Institut Curie in Paris (SIRIC CURIE)</b>                            | <ul style="list-style-type: none"> <li>▪ Ile de France Cancéropôle, Medicen competitiveness cluster...</li> </ul>                                     | <ul style="list-style-type: none"> <li>▪ Tumor banks,</li> <li>▪ BIO CANPEDIF (Oncopediatrics)</li> </ul>                          | <ul style="list-style-type: none"> <li>▪ INSERM, CNRS, ESPCI-ParisTech, INSB délégation régionale – IDF Est Universities Paris V, VI, XI &amp; Versailles-Saint-Quentin-en-Yvelines</li> </ul> | <ul style="list-style-type: none"> <li>▪ Direction of patents and industrial collaborations</li> </ul>    |
| <b>Institut Gustave Roussy in Villejuif (SIRIC SOCRATE)</b>             | <ul style="list-style-type: none"> <li>▪ Ile de France Cancéropôle, Medicen competitiveness cluster...</li> </ul>                                     | <ul style="list-style-type: none"> <li>▪ BIO CANPEDIF (Oncopediatrics)</li> </ul>  | <ul style="list-style-type: none"> <li>▪ INSERM, CNRS, Paris-Sud 11 University</li> </ul>  | <ul style="list-style-type: none"> <li>▪ IGR&amp;D</li> </ul>   |
| <b>Centre Leon Berard in Lyon (SIRIC LYRIC)</b>                         | <ul style="list-style-type: none"> <li>▪ CLARA Cancéropôle, CRCL, Lyonbiopôle competitiveness cluster...</li> </ul>                                   | <ul style="list-style-type: none"> <li>▪ CLARA Tumor banks, GCS IHOP (Oncopediatrics), Platform of molecular biology...</li> </ul> | <ul style="list-style-type: none"> <li>▪ INSERM, CNRS, INRIA, CRCL, HCL, SLC Foundation, International Agency for Research in Cancer (WHO) Claude Bernard Lyon 1 University</li> </ul>         | <ul style="list-style-type: none"> <li>▪ Service of valorization and industrial collaborations</li> </ul> |
| <b>Institut Claudius Regaud (PHUC Captor)</b>                           | <ul style="list-style-type: none"> <li>▪ Cancer Bio-Santé competitiveness cluster, Grand Sud-ouest Cancéropôle, InNaBioSanté Foundation...</li> </ul> | <ul style="list-style-type: none"> <li>▪ UIC, Animal house facilities, Proteomics platform...</li> </ul>                           | <ul style="list-style-type: none"> <li>▪ INSERM, CNRS, Toulouse Hospital, Toulouse III Paul Sabatier University</li> </ul>   |   |

<sup>17</sup> Comprehensive guide to “Efficient Open Innovation, Benefits & challenges - A European perspective, ACE - Algoé, 2012

Collaborations between Cancer Centers and University Hospitals are becoming stronger and stronger at national level. The major French Comprehensive Cancer Center can negotiate these collaborations with University Hospitals. However for some of the smallest Cancer Centers, these collaborations can progressively lead to a process of fusion with University Hospitals.

## X. Cooperation between French Cancer Centers and University Hospitals

« L'accord cadre de coopération conclu entre la Fédération Nationale de Cancérologie des CCLCC et la Fédération Nationale de Cancérologie des CHRU et la stratégie de réponse commune des CHU et des CLCC aux appels d'offres de l'Institut national du cancer ont permis aux CHU et aux CLCC de faire évoluer et de développer, en moins de quatre ans, l'objet et le périmètre de leurs coopérations. L'effet structurant sur les pôles régionaux de cette dynamique nouvelle est illustré par la mise en place de nombreux groupements de coopération sanitaire (GCS) et de projets médicaux communs entre CHU et CLCC (...). »

« Si l'on ne retient que les coopérations formalisées par un GCS « global » entre un CHU et un CLCC ou bien les coopérations portées par un projet médical commun (...), on dénombre au 15 octobre 2008 :

- Dix GCS publiés : Angers, Clermont-Ferrand, Dijon, Lille, Lyon, Montpellier, Nantes, Nice, Reims, Rennes,
- Trois GCS en cours d'élaboration : Caen, Strasbourg, Toulouse,
- Dix projets médicaux communs adoptés, dont 7 sont des projets globaux et 3 ne concernent que certains secteurs d'activité, par exemple onco-pédiatrie à Lyon, ORL à Nice (...). »

« Dans tous les cas, l'*entente* et le *respect des identités* entre les équipes sont considérés comme des facteurs primordiaux de réussite des coopérations (...). Du côté du corps médical, la coopération doit s'affranchir d'éventuelles ambitions contraires de *leadership médicoscientifique et intellectuel* qui sont souvent le fruit d'inimitiés ou de crispations historiques entre équipes médicales ou entre directions. Du côté des politiques d'établissement, certains projets de coopération peuvent se heurter à une compétition sur certaines activités présentes dans les deux établissements, compétition entretenue par l'enjeu financier d'une Tarification A l'Activité « hospitalo-centrée ». De fait, la T2A est très souvent incriminée comme élément de non incitation à la coopération. Les difficultés inhérentes aux différences de statuts des personnels sont également citées. Clairement évoqué par une seule équipe, le « syndrome existentiel propre au risque fusion absorption » est cependant perceptible en filigrane chez un assez grand nombre de CLCC. »

*Source: Rapport sur les coopérations entre les Centres hospitalo-universitaires et les Centres de lutte contre le cancer et recommandations pour un cahier des charges des pôles régionaux de cancérologie, INCa, février 2009*

Three cases with different status can be identified at national level:

- In Toulouse: creation of University Institute of Cancer gathering the oncology activities of the Toulouse University Hospital and the Claudius Regaud Cancer Center, with the new buildings of Oncopole (IURCT & CRCT) to be open in 2015.
- In Strasbourg: creation planned in 2017 of the Hautepierre Regional Institute of Cancer, gathering Hautepierre Hospital and Paul Strauss Cancer Center,
- In Rennes: current discussion about a consolidation between Eugène Marquis Cancer Center and Rennes University Hospital.

The Toulouse experience is interesting because several Comprehensive Cancer Centers attempt to develop according to a campus model, such as the Oncopole. It implies a totally new approach in terms of infrastructures, partners, governance...

#### **4.3.2 Campus and innovation parks**

Several major Comprehensive Cancer Centers at international level are currently implementing a development strategy based on Innovation Park or Campus. Other healthcare institutions which are not Comprehensive Cancer Centers but hospitals with significant oncology activities are working on similar programs such as Karolinska Hospital in Stockholm – Sweden (Hagastaden operation).

The largest Comprehensive Cancer Center is MD Anderson in Houston - Texas USA. The institution founded in 1941 is organized around 4 areas and is considering gathering all the buildings in one single location (cf. Appendices VI).

In Europe, similar approaches are being implemented mainly around some major Comprehensive Cancer Centers:

- Oslo Comprehensive Cancer Center in Norway (cf. Appendices VII),
- Toulouse Comprehensive Cancer Center in France,
- IGR Villejuif Comprehensive Cancer Center in France.

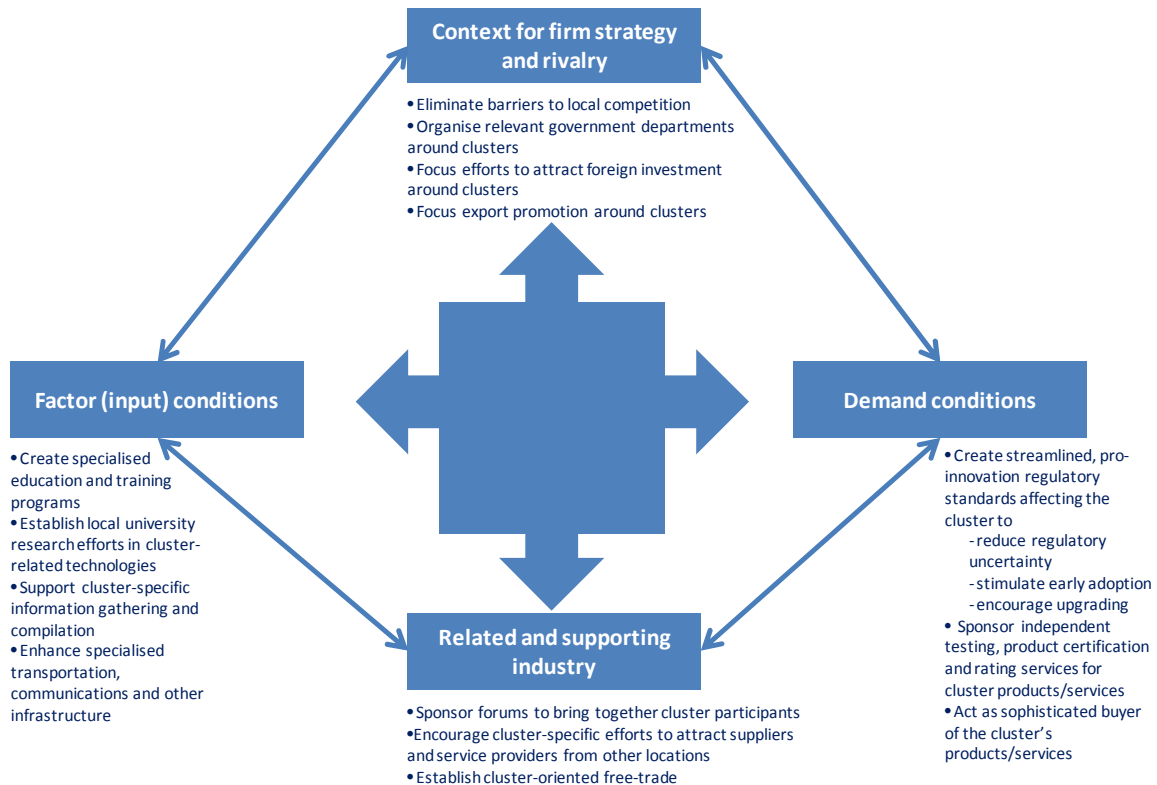
We consider that these operations correspond to the Michael Porter theory about clusters. According to Michael Porter<sup>18</sup> the components of a cluster are the following:

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<sup>18</sup> *Clusters and the new economics of competition*, Porter, M. E. Harvard Business Review, Vol. 76 Issue 6, p77, Nov/Dec 1998



## A. Cluster development according to Michael Porter



Cancer Campus, Oncopole and other initiative target the development of “oncobio-clusters”. By implementing this network approach, the Villejuif and Toulouse Comprehensive Cancer Centers develop a new strategy. They consider that their development depends not only on their internal means but also on their relationships with their surrounding partners. They define a program to attract scientific and industrial actors around the Comprehensive Cancer Centers because they will all benefit from each other proximity and collaborations.

Toulouse Oncopole project is a very interesting initiative because it is very ambitious, it relies since the beginning on a public – private partnership and the new Comprehensive Cancer Center represents the cornerstone of the operation.

## B. Oncopole project in Toulouse

Key figures about Toulouse Oncopole project:

- Size: 220 hectares Campus, including 65 hectares for economic, clinical and scientific development.
- Investment: One billion Euros in public-private investments including 300 million Euros for the Comprehensive Cancer Center with 310 beds hospital.
- Employees: By 2014, 4000 people will work on the site including 400 public researchers and 200 private researchers respectively from the Inserm, the CNRS, the University and the CHU, and from Laboratoires Pierre Fabre and Sanofi Aventis, as well as 1 200 healthcare workers

- 300 000 m<sup>2</sup> of new buildings, laboratories and other real-estate programs
- 40 000 m<sup>2</sup> set aside for hotel accommodation and services including a business center, a multi-services/reception area, service residences and stores, etc

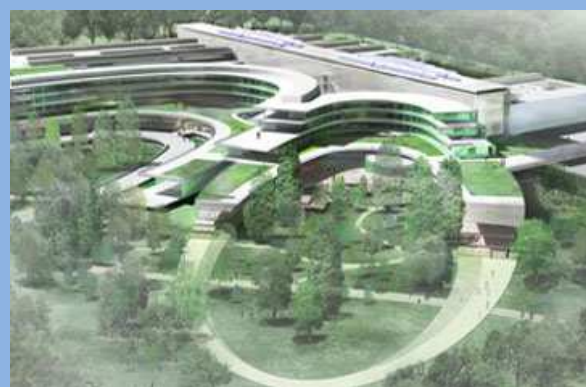


The Oncopole of Toulouse was defined in 2004 to bring together on a single site public and private research, academic organizations, industry including pharmaceutical leaders and SMEs, medical and clinical expertise in the field of oncology. The project aims to pool resources for common projects, to encourage synergies between different fields and technologies, to nurture partnerships between public and private research. The goal is to encourage transfers and exchanges between fundamental research and patient care, thereby driving therapeutic innovation and improving the quality of treatment.

The project is located on a site of 220 hectares in the heart of Toulouse, developed by the Communauté d'Agglomération du Grand Toulouse in partnership with the Conseil Régional de Midi-Pyrénées, the French Government and the European Community. Over one billion Euros were already invested in the Oncopole of Toulouse in order to build:

- A public health & scientific project to fight cancer and a new Comprehensive Cancer Center,
- An economic development initiative,
- An urban planning program to rebuild the southern sector of Toulouse damaged by the AZF explosion in 2001.

Within Oncopole campus, the Comprehensive Cancer Center will be the University Cancer Institute. It results in a partnership between the University Hospital Center of Toulouse, l'Institut Claudius-Regaud, Cancer Center, the General Hospital Centers, the Oncomip Network, The French Blood Organization and the University. Thanks to a 300 million Euros investment, it will consist of 1 200 healthcare professionals, 310 beds, 97 consultation rooms, 7 operating theaters, 1 radiotherapy platform (7 rooms), 22500 square meters.



Source: Oncopole

In spite of major investments and high level political mobilization, its implementation is considered as too slow and not satisfactory. A mission for the French Health Ministry and Research Ministry was recently conducted by Pr Thierry Philip and Pr André Syrota<sup>19</sup> to analyze the situation and the current difficulties, which includes<sup>20</sup>:

- A global medical project which is not precise enough,
- An important number of partners with numerous legal status,
- Too many divisions within the research system and not enough integration of fundamental research, translational research and clinical research,
- A cost assessment which does not cover all costs of the Oncopole program.

Cancer Campus project corresponds to a context different from Oncopole, because the IGR Comprehensive Cancer Center is already in place and is growing on a regular basis. According to our analysis, the ultimate goal and challenge of this program is to be generated from the “quadruple helix” effect. This theory promoted by the Scandinavian countries considers that competitiveness and strength of a biocluster depends on the frequency and on the quality of collaborations between 4 keys stakeholders<sup>21</sup>: Universities, Industries, Public authorities, Hospitals and patients (users)

### C. Cancer Campus project around IGR in Villejuif-Paris

Key figures about Cancer Campus project:

- Size: 90 hectares
- New buildings : 600 000 square meters of new buildings for companies, housing, services including 100 000 square meters for labs, training and companies in healthcare
- Employees: 4 000 jobs in 2025

Founded on a synergistic relationship between training, research, hospitals and enterprise, Cancer Campus project started in 2006 in order to create a research and innovation park in Villejuif around IGR Comprehensive Cancer Center. The members of the association implementing the Cancer Campus plan are the IGR, the Paris Hospital network (AP-HP), the relevant local authorities (the Val-de-Marne department, the city of Villejuif, and the district council of Val-de-Bievre), and the Paris Chamber of Commerce and Industry (CCIP). Public support also includes: finance institution "Caisse des Dépôts", Genopole, Medicen competitiveness cluster and the Paris region cancer hub Cancéropôle.

<sup>19</sup> *Rapport de la mission « ONCOPOLE DE TOULOUSE » & dossier de presse, Thierry Philip & André Syrota 15 juillet 2013*

<sup>20</sup> « *Initié dès 2004, le projet a pris du retard et n'était pas finalisé nonobstant un investissement public et privé de près d'un milliard d'euros en 10 ans. Début 2013, aucune réponse juridique, budgétaire, et de gouvernance n'était en mesure d'être apportée et d'être acceptée par tous les partenaires, chacun considérant que ce projet s'attaquait à ses prérogatives institutionnelles et légales. Ainsi le CHU vivait le transfert de ses activités comme une perte ou une amputation au bénéfice de l'autre établissement. Par ailleurs, les acteurs des sites de Rangueil et de Purpan, professeurs à l'université, travaillant dans des services orientés en oncologie et destinés à rester dans le CHU ne comprenaient pas leur mise à l'écart de ce projet. Dans le même temps, le centre de lutte contre le cancer, l'Institut Claudius Regaud, considérait que sa culture, son mode de fonctionnement et son appartenance à la famille des centres était remise en cause. L'Institut avait la crainte de perdre sa visibilité. Enfin, le secteur privé jugeait qu'il avait été oublié au cours du temps dans le projet.* »

<sup>21</sup> *Exploring Quadruple Helix - Outlining user-oriented innovation models, Robert Arnkil, Anu Järvensivu, Pasi Koski, Tatu Piirainen, Institute for Social Research, University of Tampere, 2010*



Cancer Campus aims to increase the critical mass of research and training centers, establish new science platforms, create a business incubator and a biopark for enterprise, improve accessibility, and structure the site to generate high-quality living and working conditions. Around IGR, the site to be developed represents 150 acres, permitting the construction of around 8 600 000 sq. ft of buildings for medical innovation businesses, university education, services, accommodation (including student residences). Cancer Campus will also include public facilities such as day-care center, conference and professional training centers, sport facilities...



The "Zone d'Aménagement Concerté" (co-ordinated development zone) launched in September 2011, aims to transform the structure of the site, improving its accessibility from the city center. Located a few minutes from Paris, Cancer Campus has been chosen to become a major hub in the metropolitan region. As part of the new "Greater Paris" public transport network, a metro station will be built on the site to serve two lines connected to central Paris (11mn), Orly and Charles de Gaulle Airport (7-45 mn), la Défense business district (19mn) in 2018. The first landmark in the creation of this real estate offer is the start up center and business hotel opened in October 2011 (18 million Euros of investment). The following buildings located next to the IGR will be available in 2014. Cancer Campus aims to welcome 4 000 employees in 2025 (researchers, healthcare professionals...)

## LES HUIT AXES QUI STRUCTURERONT CANCER CAMPUS®

### 1 Un pôle d'excellence scientifique associant les grandes institutions de la médecine du futur

Le développement du potentiel scientifique présent sur le site, intégrant avec l'environnement et doté de compétences pluridisciplinaires restera le socle essentiel de Cancer Campus®. Les plates-formes technologiques en constante évolution seront parmi les outils fondamentaux des collaborations avec les entreprises. L'esprit de Cancer Campus® est d'associer dans ces investissements les grands partenariats académiques et hospitaliers-français autour de projets communs et de ressources partagées.

Ce développement s'inscrit dans l'héritage basé par une lignée prestigieuse de médecins et de chercheurs qui se sont consacrés, à Villejuif, à la lutte contre le cancer, depuis Gustave Roussy jusqu'à aujourd'hui (André Lwoff, Laurent Schwartz, Pierre Doinik, Georges Mathé et Maurice Tubiana...).

### 2 Une offre de formation pluridisciplinaire, précède et accompagne les évolutions des métiers de la santé.

L'offre de formation sur le site sera en fort développement, fondé sur les compétences de l'Institut Gustave Roussy, désormais établissement hospitalo-universitaire, associé à l'université Paris Sud. Cette reconfiguration des formations dans la vallée scientifique de la Seine (avec notamment la création par Paris Sud d'un « Centre Interdisciplinaire de Santé »), répondra aux évolutions des nouveaux métiers de la santé, accompagnera les parcours professionnels des personnels hospitaliers en santé publique.

Cancer Campus®, qui a des relations constantes avec le groupe IONIS (EPiA, Sup BioTech...) pourra accueillir des formations privées et encourager les collaborations avec les grandes écoles notamment celles du Réseau de BioCity.

### 3 Une gamme complète de prestations pour le développement et la compétitivité des entreprises

Chaque entreprise présente sur le site bénéficiera d'un avantage compétitif grâce à la mise à disposition de services permettant la fertilisation croisée recherche/industrie, l'accès à des ressources financières, intellectuelles et scientifiques spécialisées, la mise en commun d'expériences et de ressources :

- Accès aux plates-formes technologiques ;
- Mise à disposition de ressources immobilières d'une grande flexibilité ;
- Bénéfices en valorisation et en propriété industrielle ;
- Aides et conseils pour l'accès à des financements spécialisés (amorçage, capital-risque, aide à la preuve de concept, financements nationaux et européens...)

• Accompagnement spécifique pour les créateurs ;

- Services de vie quotidienne pour les collaborateurs ;
- Aides à la communication et à la promotion internationale.

Les entreprises reconnues pour leur innovation, les potentialités de développement et leur contribution au développement français et national, pourront bénéficier d'un label « Cancer Campus® ».

### 4 Une excellente accessibilité et des nouveaux services pour les professionnels de santé et les patients, les chercheurs et étudiants, les riverains.

En 2026, Cancer Campus® aura accès depuis 6-8 ans à deux lignes reliant le site en quelques minutes notamment à Châteaufort, Orly, la Défense et Marne la Vallée. Ce progrès majeur sera l'occasion de développer :

- Une offre de services pour les chercheurs et étudiants, aide à l'installation, mise à disposition de résidences, scolarisation des enfants, obtention de cartes de séjour, cours de langue...

Parallèlement, des logements seront réservés aux professionnels et des nouvelles créches seront mises en service.

### 5 Cancer Campus®, un territoire de santé maillé avec son environnement

L'action territoriale du pôle citoyen permettra de développer progressivement un « territoire de santé », structuré pour et par les patients, les habitants et les professionnels, un réseau de pratiques innovantes qui contribueront à l'amélioration de l'accès à la santé, de la prévention, du diagnostic et de la prise en charge.

- L'accroissement de l'offre de services pour les patients et les proches : accès traitements innovants (via les essais cliniques) et aux soins palliatifs, possibilité ponctuelle de résidence et de travail à distance pour les proches des patients, lieux informels de rencontres et d'échanges...

### 6 Une implication dans le tissu économique local

L'aménagement du site, la création de nouveaux logements, l'arrivée du métro... auront des répercussions importantes sur le milieu urbain qui acquerra une nouvelle visibilité. Le tissu économique local tirera profit de cette attractivité supplémentaire. Les nouvelles activités médico-scientifiques généreront une demande importante en services externes (maintenance et entretiens, hôtellerie et restauration, transports...) intégré dans la ville en tant que campus urbain, Cancer Campus® pourra s'impliquer encore davantage en permettant des projets de créations d'activités.

### 7 Un urbanisme de grande qualité

Les parti pris architecturaux et de l'aménagement urbain seront une source de fierté pour les habitants et les personnes qui travaillent, un moteur de communication pour la ville et le site. Aussi privilégieront-ils :

- Une forte capacité d'adaptation aux demandes immobilières d'entreprises souvent très spécifiques ;
- Un souci esthétique et de qualité de vie, incarné notamment par quelques bâtiments emblématiques, des lieux de « respiration », de rencontre et d'échanges informels (gardes, cafés...)

### 8 S'inscrire dans une tradition culturelle forte

Cancer Campus® comme tout lieu innovant est un territoire de brassage et d'ouverture, prêt à tous les échanges y compris sur des sujets non scientifiques. La place laissée aux créateurs, à la vie associative, aux équipements publics (bibliothèques, salle de spectacle et d'exposition...) dans la continuité de l'héritage porté à la culture par les collectivités locales du Val-de-Marne, sera un facteur supplémentaire d'animation du site, d'articulation et de communication entre la ville et les activités scientifiques.

Source: Cancer Campus, IGR, SIRIC Socrate

The Thierry Philip & André Syrota report, as well as the interview we had with Gilbert Lenoir - Vice President of Cancer Campus demonstrates that several issues must be taken into consideration in major operation such as in Toulouse and Villejuif:

- Design the program according to translational research principles and for the benefits of patients (cf. 1.2 for definition) and “keep in mind that we are treating patients not tumors”,
- “Be ambitious, be innovative and target excellence” by gathering the best competences originating from public and private partners,
- “Define the appropriate governance” in order to get adequate support from all the stakeholders (Cancer Center, Hospital, University, companies, public authorities, patients...),
- “Give time to the operation”, creating a Cancer Campus is like building a bio-cluster; it requires at least a decade to see the take off.

## 5 Conclusion

### 5.1 Comprehensive Cancer Center, a relevant concept in France

As a conclusion, we can now affirm that the US concept of Comprehensive Cancer Centers is also relevant in France. Figures show that these centers correspond more or less to the 8 cancers centers for which means (RH, medical means and finances), as well as activities (care, research and clinical research) are above the national average of cancer centers. Figures also show that the French Comprehensive Cancer Centers have a slightly lower productivity than the other Cancers Centers in terms of care, a similar productivity for the clinical trials, but a lot higher productivity for their scientific production.

The major French Comprehensive Cancer Centers (IC & IGR) have a leading position in Europe. However if we compare them to the leading American Comprehensive Cancer Centers (MD Anderson Cancer Center in Houston, Memorial Sloan Kettering Cancer Center in New York or Dana Farber Cancer Center in Boston), they represent more or less half of the size, the care and scientific production of the world leaders. In other words, the French Comprehensive Cancer Centers are still small at national level compared to the oncology activities of French Hospitals, but also small compared to the international standards of Comprehensive Cancer Centers. As we mentioned in the introduction, the French analysis of US Comprehensive Cancer Centers would require a specific work for an in-depth analysis.

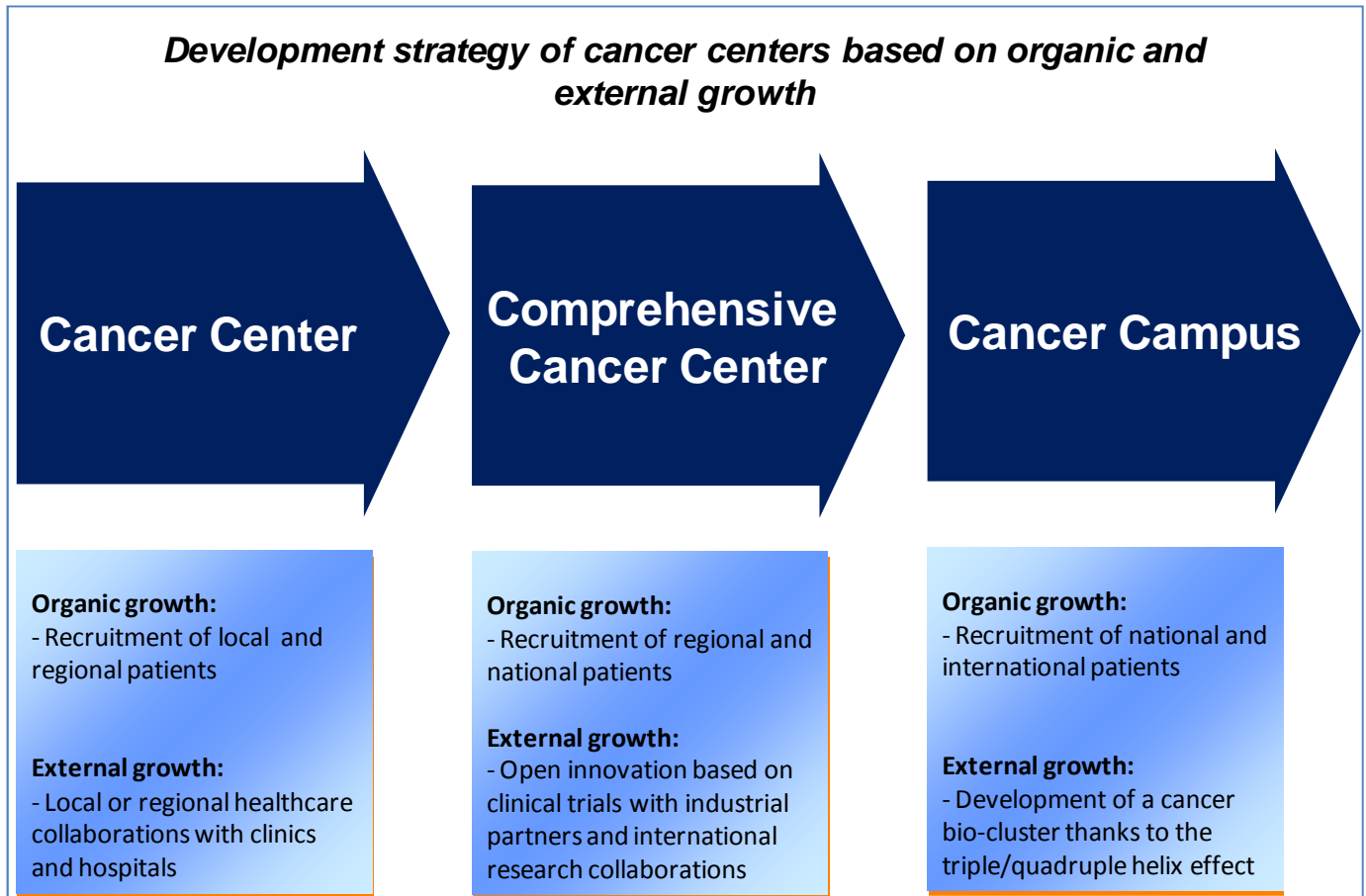
Pascale Flamant, General manager of UNICANCER, during her interview confirmed that “Cancer Centers are small institutions in the field of healthcare; they represent only 10% of cancer patients. However, they play an important role as laboratories or testing grounds for other healthcare institutions”. French Comprehensive Cancer Centers were pioneers in France to implement:

- New organizations focusing on patients and translational research principles with dedicated human resources
- Medical innovations such as nuclear medicine, minimally invasive surgery, medical imagery...
- Proactive clinical research with high level of patient inclusion rate,
- New business models to generate new incomes, etc.

We consider that the SIRIC (and PHUC) programs correspond to a great opportunity for Comprehensive Cancer Centers and University Hospitals to share and develop their scientific and medical innovations in order to fight cancer.

## 5.2 Three stages of development and possibly four

Our general conclusion will focus on the development strategies of Cancer Centers. The data we collected and cases we studied confirm that 3 stages of development of Cancer Centers can be highlighted. They correspond to specific principles of organic growth and external growth as described below.



- **1/ Cancer Centers (CC):** these healthcare institutions focus mainly on curing cancer and they offer service of proximity to patients.
- **2/ Comprehensive Cancer Centers (CCC):** these healthcare institutions function like University Hospitals specialized in cancer, with three missions: care, research and training. Their scientific reputation and activities enable them to participate in international research collaborations to fight cancer. These Comprehensive Cancer Centers take benefits of “open innovation process”. Because of their characteristics (inputs and outputs), as well as their organization they correspond to a new category of healthcare institutions.



- **3/ Cancer Campus:** these projects, often relying on public private partnerships, have for main objective the creation of a global collaborative environment organized around Comprehensive Cancer Centers. Thanks to their attractiveness, these Cancer Centers attempt originate the emergence of dedicated eco-systems. These eco-systems try to get benefits of cluster models promoted by Michael Porter as oncobio-clusters. They still are emerging in France.

As a discussion, we would like to raise the point that there might be in the coming decades a fourth stage development of Cancer Centers in a context of globalization. Thanks to its success, MD Anderson Comprehensive Cancer Center has built progressively subsidiaries outside the Texas and outside the USA. These MD Anderson subsidiaries include Albuquerque in New Mexico, Orlando in Florida, Phoenix in Arizona, as well as Istanbul in Turkey, Madrid in Spain.

We understand that IGR Comprehensive Cancer Center in Villejuif which has a close relationship with this American partner is also considering implementing a similar strategy. This internationalization of Comprehensive Cancer Centers may be a new topic of interest for the next years.

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# Appendices

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## I. Legal status of French Cancer Center

Code de la santé publique, Partie législative, Sixième partie : Etablissements et services de santé, Livre Ier : Etablissements de santé, Chapitre II : Centres de lutte contre le cancer.

### **Article L6162-1**

Modifié par Ordonnance n°2005-406 du 2 mai 2005 - a rt. 14 JORF 3 mai 2005

Les centres de lutte contre le cancer assurent les missions des établissements de santé et celles du service public hospitalier, dans le domaine de la cancérologie.

A titre subsidiaire et en vue d'en optimiser l'utilisation, ils peuvent, dans des conditions définies par le contrat d'objectifs et de moyens, ouvrir leurs plateaux techniques et leurs équipements à des patients relevant d'autres pathologies.

Sous réserve des dispositions du présent chapitre, les articles L. 6161-7 et L. 6161-8 sont applicables aux centres de lutte contre le cancer.

### **Article L6162-2**

Modifié par Ordonnance n°2005-406 du 2 mai 2005 - a rt. 14 JORF 3 mai 2005

Ces établissements sont des personnes morales de droit privé. Ils peuvent recevoir des dons et legs.

### **Article L6162-3**

Modifié par Ordonnance n°2005-406 du 2 mai 2005 - a rt. 14 JORF 3 mai 2005

Le ministre chargé de la santé arrête la liste des centres de lutte contre le cancer.

### **Article L6162-4**

Modifié par Ordonnance n°2005-406 du 2 mai 2005 - a rt. 14 JORF 3 mai 2005

Chaque centre doit disposer d'une organisation pluridisciplinaire garantissant une prise en charge globale du patient et comprenant au moins des moyens en chirurgie, oncologie médicale, radiothérapie et anatomo-cyto-pathologie.

### **Article L6162-5**

Modifié par Ordonnance n°2005-406 du 2 mai 2005 - a rt. 14 JORF 3 mai 2005

Les centres de lutte contre le cancer passent avec les universités et les centres hospitaliers universitaires les conventions mentionnées à l'article L. 6142-5 en vue de définir une organisation commune en matière d'enseignement et de recherche cancérologiques.

### **Article L6162-6 (abrogé au 26 février 2010)**

Modifié par Ordonnance n°2005-406 du 2 mai 2005 - a rt. 14 JORF 3 mai 2005

La centralisation des renseignements médicaux recueillis par les centres est assurée par l'Institut national du cancer.

### **Article L6162-7**

Modifié par Ordonnance n°2005-406 du 2 mai 2005 - a rt. 14 JORF 3 mai 2005

Chaque centre est administré par un conseil d'administration comportant :

1° Le représentant de l'Etat dans le département ;

2° Le directeur de l'unité de formation et de recherche de médecine avec laquelle le centre a passé la convention prévue à l'article L. 6142-5 ou, en cas de pluralité d'unités de formation et de recherche, le président du comité de coordination de l'enseignement médical ;

3° Le directeur général du centre hospitalier universitaire avec lequel le centre a passé la convention prévue à l'article L. 6142-5 ou, en cas de contractualisation avec plusieurs centres hospitaliers universitaires, le directeur général de l'un d'entre eux, désigné par le directeur de l'agence régionale de l'hospitalisation ;

4° Une personnalité scientifique désignée par l'Institut national du cancer ;

5° Un représentant du conseil économique et social régional désigné par cette assemblée ;

6° Des personnalités qualifiées, des représentants des personnels du centre et des représentants des usagers, dans des conditions définies par voie réglementaire.

La présidence du conseil d'administration appartient au représentant de l'Etat dans le département.

Le directeur général du centre, accompagné des collaborateurs de son choix, et le directeur de l'agence régionale de l'hospitalisation ou son représentant assistent au conseil avec voix consultative.

### **Article L6162-8**

Modifié par Ordonnance n°2005-406 du 2 mai 2005 - a rt. 14 JORF 3 mai 2005

Nul ne peut être membre d'un conseil d'administration :

1 A plus d'un titre ;

2 S'il encourt l'une des incapacités prévues par les articles L. 5 et L. 6 du code électoral ;

3 S'il a personnellement ou par l'intermédiaire de son conjoint, de ses ascendants ou descendants en ligne directe un intérêt direct ou indirect dans la gestion d'un établissement de santé privé qui n'assure pas l'exécution du service public hospitalier ;

4 S'il est lié à l'établissement par contrat, notamment s'il est agent salarié de l'établissement ;

5° S'il a une autorité sur l'établissement en matière de tarification ou s'il est membre de la commission exécutive de l'agence régionale de l'hospitalisation.

Toutefois, l'incompatibilité prévue au 4° ci-dessus n'est opposable ni aux représentants des salariés mentionnés au 6° de l'article L. 6162-7 ni aux représentants mentionnés aux 2° et 3° du même article ayant passé avec le centre la convention prévue à l'article L. 6142-5 ni à ceux mentionnés au 6° ayant conclu avec lui les contrats prévus aux articles L. 1110-11 et L. 1112-5. Au cas où il est fait application d'une autre incompatibilité à ces représentants, la commission médicale, le comité d'entreprise, le conseil de l'unité de formation et de recherche, le comité de coordination de l'enseignement médical, ou le directeur de l'agence régionale de l'hospitalisation désignent un remplaçant.

### **Article L6162-9**

Modifié par Ordonnance n°2005-1112 du 1 septembre 2005 - art. 3 JORF 6 septembre 2005

Le conseil d'administration arrête la politique générale du centre ainsi que sa politique d'évaluation et de contrôle. A ce titre il procède aux contrôles et vérifications qu'il juge opportuns et délibère sur :

1° Le projet d'établissement et le contrat pluriannuel d'objectifs et de moyens ;

2° La politique d'amélioration continue de la qualité et de la sécurité des soins ainsi que des conditions d'accueil et de prise en charge des usagers ;

3° L'état des prévisions de recettes et de dépenses prévu à l'article L. 6145-1, ses modifications, ses éléments annexes, le rapport préliminaire à cet état, ainsi que les propositions de tarifs de prestations mentionnés à l'article L. 174-3 du code de la sécurité sociale ;

4° Les comptes et l'affectation des résultats d'exploitation ;

5° Les dons et legs ;

6° La participation aux réseaux de santé mentionnés à l'article L. 6321-1 et les actions de coopération mentionnées au titre III du présent livre ;

7° Les acquisitions, aliénations, échanges d'immeubles et les conditions des baux de plus de dix-huit ans ;

8° Les conventions avec des organismes de recherche et les prises de participation nécessaires à la réalisation de projet de recherche ou à l'exploitation des résultats ;

9° Les conventions mentionnées à l'article L. 6162-5 ;

10° Le règlement intérieur ;

Le président du conseil d'administration dispose d'une voix prépondérante en cas de partage égal des voix.

NOTA:

Ordonnance 2005-406 2005-05-02 art. 13 IV A : Pour l'application en 2005 du présent article les mots : " état des prévisions de recettes et de dépenses " ou : " état " sont remplacés par le mot : " budget ".

#### **Article L6162-10**

Modifié par Ordonnance n°2005-406 du 2 mai 2005 - a rt. 14 JORF 3 mai 2005

Le directeur général du centre est compétent pour régler les affaires du centre autres que celles énumérées à l'article L. 6162-9. Il assure la conduite générale de l'établissement et en rend compte au conseil d'administration. Il représente le centre en justice et dans tous les actes de la vie civile.

Le directeur général est nommé, pour une période de cinq ans renouvelable, par le ministre chargé de la santé après avis du conseil d'administration et de la fédération nationale la plus représentative des centres de lutte contre le cancer.

Le président du conseil d'administration peut demander au ministre chargé de la santé de mettre une fin anticipée au mandat du directeur du centre.

#### **Article L6162-11**

Modifié par Ordonnance n°2005-406 du 2 mai 2005 - a rt. 14 JORF 3 mai 2005

Des décrets déterminent, en tant que de besoin, les conditions d'application du présent chapitre ainsi que les adaptations ou dérogations nécessaires aux conditions particulières de fonctionnement de l'institut Gustave Roussy et de la fondation Curie.

## **II. French Cancer Plan n°3**

### **3e plan cancer : Jean-Paul Vernant recommande que l'Inca soit « l'opérateur unique du financement de la recherche » (source AEF)**

L'une des pistes permettant de « dynamiser la recherche en cancérologie » consiste à « pérenniser les crédits attribués à la recherche sur le cancer avec l'Inca (Institut national du cancer) comme opérateur unique du financement de la recherche ». C'est ce que préconise Jean-Paul Vernant, professeur d'hématologie à l'UPMC, dans les « recommandations pour le troisième plan cancer » qu'il remet vendredi 30 août 2013 à Geneviève Fioraso, ministre de l'Enseignement supérieur et de la Recherche, et Marisol Touraine, ministre des Affaires sociales et de la Santé. Les deux ministres indiquent que les propositions de Jean-Paul Vernant « viendront enrichir le travail important des groupes de travail » qu'elles ont mis en place « en collaboration avec l'Inca » pour élaborer le plan cancer 3, qui sera « annoncé en début d'année 2014 ».

La recherche, qui constituera l'un des cinq « axes thématiques » du prochain plan cancer, fait l'objet de nombreuses propositions parmi toutes les recommandations que le professeur Jean-Paul Vernant remet au gouvernement, le 30 août 2013. Ainsi que l'avait demandé le président de la République François Hollande en décembre 2012, lorsqu'il avait annoncé ce troisième plan cancer, deux objectifs sont assignés à la recherche : « le développement de la médecine personnalisée » et « le rapprochement des structures de recherche et de soins ».

### **FAIRE ÉVOLUER LES MISSIONS DES CANCÉROPÔLES**

D'une manière générale, Jean-Paul Vernant estime que « la définition de l'Inca comme opérateur unique de gestion des crédits de recherche qui doivent demeurer pérennes apparaît comme un gage d'efficacité et de lisibilité ». En conséquence, il recommande d'« affecter l'ensemble des financements publics des recherches fondamentale, translationnelle et clinique (programmes de recherche, matériels, bourses...) à l'Inca ». Ceci doit aller de pair avec le souci d'« accroître les synergies entre l'Inca et les financeurs associatifs de la recherche » que sont par exemple l'ARC ou la Ligue contre le cancer.

Toujours en matière d'organisation de la recherche, et dans un souci de renforcer l'articulation entre les soins et la recherche, qui reste « faible », Jean-Paul Vernant est partisan de « faire évoluer les missions des cancéropôles vers celles d'instituts interrégionaux ». Il recommande notamment de leur donner, à ce niveau, « l'ensemble des fonctions d'expertise et d'animation exercées au plan national par l'Inca », et de leur confier la mission de « faire progresser la recherche hors Siric ».



## **AUTRES RECOMMANDATIONS DU RAPPORT CONCERNANT LA RECHERCHE :**

**Poursuivre la structuration de la recherche amont.** Jean-Paul Vernant recommande de « favoriser l'agrégation fonctionnelle aux Siric de nouvelles structures de recherche des organismes publics », telle Aviesan (Alliance nationale pour les sciences de la vie et de la santé). Il s'agit également de « maintenir le soutien aux plates-formes (...) destinées à produire des séquençages complets des tumeurs ». De « nouvelles orientations » doivent aussi être soutenues, à travers quatre actions :

- 1/ « stimuler la coopération des biologistes avec des mathématiciens, des physiciens et des informaticiens » ;
- 2/ « fournir aux Siric des équipements en informatique et des postes de bioinformaticiens » ;
- 3/ « financer les projets » focalisés sur certains domaines : « génomique, protéomique et métabolomique, pharmacogénétique, épigénétique, interaction tumeur-environnement, hétérogénéité tumorale » ;
- 4/ « maintenir au moins 50 % du budget recherche pour le financement des 'projets libres' ».

**Favoriser la multidisciplinarité.** Le rapport préconise de « favoriser la multidisciplinarité, ce qui implique que les équipes de recherche privilégient le travail avec les universités et les disciplines qui y sont représentées ». Une autre suggestion consiste à « favoriser le rapprochement » des écoles doctorales de physique-mathématiques avec celles de biologie-santé, et à « soutenir les écoles doctorales interdisciplinaires ». S'agissant des jeunes chercheurs, Jean-Paul Vernant plaide pour leur donner « plus de responsabilités (...) et pour ce faire allonger les contrats en les faisant passer de trois à au moins cinq ans ». Il pense notamment aux contrats post-doctoraux « Atip/Avenir » proposés via Aviesan.

**Développer la recherche translationnelle.** Le rapport préconise de « favoriser l'agrégation fonctionnelle aux Siric de nouvelles structures cliniques » et de « développer de façon générale des coopérations entre les établissements de santé ayant une activité de recherche clinique en cancérologie, les structures de recherche pluridisciplinaire et les universités ». Il faudrait par ailleurs « pérenniser les appels à projets sur la recherche translationnelle » et « poursuivre l'attribution de bourses et la formation des acteurs » en y impliquant les EPST (établissements publics à caractère scientifique et technologique). Enfin, Jean-Paul Vernant attire l'attention sur la nécessité de régler « certaines contradictions » entre les réglementations européenne et française, « afin que les 14 UTCG (unités de thérapie cellulaire et génétique) des CHU et des CLCC (centres de lutte contre le cancer) puissent poursuivre leur activité thérapeutique et productrice de publications ».

**Amplifier la recherche clinique.** Jean-Paul Vernant pointe un « problème » avec les PHRC (programmes hospitaliers de recherche clinique), dont « 25 % à 30 % n'arrivent pas à terme » et « 30 % n'y parviennent qu'avec un important retard, ce qui implique des surcoûts ». Pour améliorer ces résultats, le rapport estime que « la faisabilité pratique des projets (...) doit être l'un des critères essentiels de sélection des PHRC ». Il est également recommandé de « poursuivre une politique de développement des centres d'essais précoces » à travers le soutien aux 16 Clip2 (centres d'essais cliniques de phase précoce) existants et à la création de nouveaux Clip2 dédiés à l'onco-pédiatrie. Le rapport fait enfin des propositions pour « assurer la pérennité des groupes coopérateurs à l'origine de grands essais cliniques ».

**Soutenir les recherches thématiques et technologiques.** Le rapport préconise de soutenir la recherche en radiothérapie. De même, il souligne l'importance de « développer des nouvelles technologies contribuant au diagnostic et au traitement des cancers », par la « mise en place de structures de recherche technologique sur les thèmes de l'imagerie, de la robotique et de l'analyse des données ». Par ailleurs, il recommande de faire un effort pour « améliorer la qualité des biobanques ». Au fil du rapport sont aussi formulées plusieurs propositions visant à développer la recherche dans certaines spécialités : oncopédiatrie, oncogériatrie, qualité de vie pendant et après le cancer, traitements de la douleur.

**Impliquer davantage les sciences humaines et sociales.** Jean-Paul Vernant souligne que la recherche française reste « peu développée dans le champ de la prévention et des modifications de comportements ». Il appelle donc au « renforcement de la recherche cognitive (mesure des risques, comportements) et interventionnelle » (1). Cette dernière devrait notamment être sollicitée pour évaluer des actions de prévention ciblées « en impliquant les équipes de sciences humaines et sociales ». Il suggère pour cela deux « pistes » : « la nécessité de fédérer les différents financeurs pour attirer les chercheurs » ; « le développement de démarches intégrées entre acteurs de la recherche en sciences humaines et sociales et de la recherche en santé publique ». De même, il plaide pour « augmenter le nombre d'équipes de recherche travaillant sur les liens entre cancer et environnement » en soutenant la constitution de cohortes spécifiques.

### III. Presentation of SIRIC programs in France

Source : *French National Cancer Institute – Scientific Report 2011-2012*, Institut National du Cancer, France (2012)

#### T features of the SIRIC

**LYRIC**, LYon integrated Research Institute in Cancer  
Director: Pr Jean-Yves BLAY

##### Structures and institutions part of the SIRIC

Co-piloted by the Centre Leon Berard and Hospices Civils de Lyon, through the Lyon Cancerologie Universitaire structure. Associated with Inserm & CNRS, the CRCL, the SLC Foundation, the University of Lyon, the International Agency for Research in Cancer (IARC).

>600 researchers in basic, translational and clinical research

##### General aim of the LYRIC

Therapeutic development with an improved personalisation of the treatment, on the tumour cell, on the immune stroma, and on the macroscopic tumour, with paradigm changes in the biology and therapeutic of cancer (on breast carcinoma, lymphoma, sarcoma, NET, pediatric tumours).

##### 3 integrated programmes

- Embryonic development pathways in tumour cells – role in progression and resistance
- Immunosurveillance of cancer and escape: from concepts to therapeutic applications
- Targeting macroscopic tumors *in vivo*: Image Guided Local Treatment

##### Research in Human and Social Sciences

Tight collaboration with IARC for joint projects on molecular epidemiology and nutrition embedded in the 3 main programmes

#### SIRIC CARPEM

Cancer Research and PErsonalized Medicine, Paris  
Director: Pr Pierre LAURENT-PUIG

##### Structures and institutions part of the SIRIC

2 Paris-based hospitals, HEGP and Cochin/Hôtel-Dieu, both linked to Paris Descartes University

> 250 researchers and 100 hospital-based, cancer-dedicated physicians

##### General aim of CARPEM

- To decipher mechanisms of carcinogenesis and the relationship between tumor and host microenvironment, in order to translate this knowledge into an improved cancer patient management.
- To develop new prognostic and theranostic biomarkers as well as innovative therapeutics  
Specific tumour types: digestive, lung, head and neck, renal, endocrine, haematological.

##### Integrated research programmes

- “From genes to personalized medicine”: to solve core problems related to the treatment of selected solid and haematological tumours
- “From cell to personalized medicine” to establish a bridge between comprehensive analysis of tumour microenvironment and the identification of relevant biomarkers predicting the clinical outcome of patients and/or the response to various cancer therapies
- Ethical and psychosocial aspect of cancer as complementary to the above programmes of research

#### SIRIC CURIE, Paris

Director: Pr Olivier DELATTRE

##### Structures and institutions part of the SIRIC

2 hospitals dedicated to cancer patients and a research centre, which hosts 83 research teams within major departments in biology, physics and chemistry.

##### General aim of the SIRIC CURIE

To lean upon and foster the translational organization in Institut Curie in order to reach a new level of integration and transfer quality in 8 main scientific programmes.

##### 8 integrated programmes

- Molecular pathogenesis: Biomarkers and therapeutic targets
- Immunological approaches for therapeutic interventions
- Disseminating diseases
- Genetic susceptibility factors
- Radiobiology and Radiation biology
- Imaging approaches for cancer diagnostic and therapy
- Pre-clinical models and early clinical trials
- Human and Social Sciences

#### SIRIC ONCOLILLE, Lille

Director: Pr Eric LARTIGAU

##### Structures and institutions part of the SIRIC

2 regional academic centres, the CHRU (Centre Hospitalier Régional Universitaire) and the Cancer Centre (Centre Oscar Lambret) common medical policy (C2RC: centre de référence régional en cancérologie) in the field of oncology, in association with the CNRS, Inserm and Universities.

##### General aim of ONCOLILLE

- Tumour resistance and persistence after loco-regional treatments
- Biological models, imaging and clinical research to drive new studies in the field of adaptive and personalised medicine.

##### 2 integrated programmes

- Tumour and host resistance to loco-regional treatments in the field of head and neck, oesophagus, liver and gynaecological tumours.
- Tumour dormancy and persistence in the field of haematology, melanoma and prostate cancer.

## SIRIC SOCRATE

Stratified Oncology Cell DNA Repair And Tumour immune Elimination, Institut Gustave Roussy  
Director: Pr Jean-Charles SORIA

### Structures and institutions part of the SIRIC

Institut Gustave Roussy (11,000-new patients/y with all types of cancer) in close interaction with University Paris-Sud 11 and its Medical School, Inserm, and CNRS.

### General aim of SOCRATE

DNA repair in cancer development and therapy /tumour immunology/molecular cancer medicine with the aim to transition from an empirical approach to personalized medicine.

### 3 integrated programmes

- DNA repair: basic molecular mechanisms of genetic stability maintenance during the cellular response to spontaneous and induced DNA damage.  
Optimization of the use of DNA damaging agents, with decreased ionising radiation doses and reduced toxicity, and finally a reduced incidence of secondary cancers.
- Tumour immunology: to explore new concepts (immunogenic cell death induced by chemotherapeutic drugs) and create novel targets (metabolomic targets for immunomodulation), to identify immune biomarkers, and conduct immuno-monitoring studies of large trials testing immunotherapeutic (anti-CTLA4, anti-PD1) and molecular targeted agents.  
Developing exosome-based vaccines, explore NK cell-based immunosurveillance and conduct innovative early phase trials.
- Molecular cancer medicine: to explore the concept of personalized cancer medicine, to better tailor currently used treatments, and to improve cure rates in difficult-to-treat disease by identifying key molecular targets.  
To rapidly and accurately identify, then to precisely target the key oncogenic driver(s), and to prevent / detect / overcome resistance and avoid toxicity.

## SIRIC PRRC PACA Ouest, Marseille

Director: Pr Patrice VIENS

### Structures and institutions part of the SIRIC

2 hospitals, Institut Paoli Calmettes (IPC) and the Assistance Publique-Hôpitaux de Marseille (AP-HM)  
>750 scientists and physicians, 2 main research units are CRCM and CRO2

### General aim of SIRIC PRRC

To optimize the integration of biological research, clinical research, socio-medical research and patient care procedures through strong collaborations in shared fields of expertise such as pancreatic cancer and acute leukaemia, using existing experience with breast cancer and brain tumours as models.

### 4 integrated programmes

- Breast Cancer programme
- Acute myeloid leukemia and myelodysplastic syndromes programme
- Glioma programme
- Pancreatic cancer programme

## SIRIC MC, Montpellier

Director: Pr Marc YCHOU

### Structures and institutions part of the SIRIC

6 research institutes (IRCM, IGF, IGH, IGMM, CRBM, IRB) and 2 university hospitals of Montpellier (CHU Montpellier and Val d'Aurelle Institute).  
>1,000 people working in a 3-kilometer wide campus.

### General aim of SIRIC MC

To strengthen previous and ongoing initiatives to advance the multidisciplinary approach to cancer, bringing it to a new level of organization; to integrate basic concepts and findings into current clinical practices

### 4 integrated programmes

- Management of colorectal cancer: from the improvement of current treatment towards the therapeutic innovation
- Personalized radiobiology applied to oncology: the PersoRx programme
- Treatment failure: the TreatFail programme
- Social and human interventions: a comprehensive approach to cope with cancer

## SIRIC BRIO

Bordeaux Recherche Intégrée Oncologie, Bordeaux

Director: Pr Pierre-Louis SOUBEYRAN

### Structures and institutions part of the SIRIC

The BRIO SIRIC is based on a strong University

### General aim of SIRIC BRIO

To develop and organize 4 tumour-oriented and 2 topic-oriented programmes based on the best scientific and methodological expertise's in Bordeaux area.

### 6 integrated programmes

- NeoBreastNet Programme: Neoadjuvant and post-neoadjuvant treatment of breast cancer
- Sarcoma Programme: an integrated programme towards a personalized treatment in sarcoma
- Leukemic Haematopoiesis and Therapeutic Targets. The model of Chronic Myeloid Leukaemia and other myeloid disorders to optimize treatment
- Hepatocellular Carcinoma and liver metastasis: optimizing the care. From mechanisms of carcinogenesis to innovative concepts and treatments
- Geriatric Oncology Programme: from suboptimal to optimal therapy for cancer in the elderly
- Innovative molecular targets and cancer therapeutics programme



#### **IV. Financial situation of Cancer Centers: UNICANCER point of view**

##### **Le déficit des 18 CLCC devrait doubler à 10 millions d'euros sur 2011-2012**

« L'essentiel du déficit 2012 des CLCC se concentre sur quatre établissements : Léon Bérard, Bergonié, Gustave Roussy et Paoli-Calmettes. Pour Unicancer, ils pâtissent des méfaits de la T2A sur l'innovation. Et de plaider, via son plan stratégique 2012-2015, pour une réelle refonte du système tarifaire. Après avoir présenté un déficit cumulé de 5 millions d'euros en 2011, les 18 Centres de lutte contre le cancer (CLCC) actent actuellement un déficit anticipé 2012 qui frôle les 20 millions, lequel devrait toutefois être ramené a priori à 10 millions en fin d'exercice, confie le Pr Josy Reiffers, président du groupe Unicancer, à l'occasion ce 20 novembre de la présentation du nouveau plan stratégique 2012-2015 de la fédération. Qu'il soit – ou non – au mieux doublé, le déficit se concentre en grande partie sur les établissements ayant "le plus d'actions innovantes", précise l'intéressé : le Centre Léon Bérard de Lyon, l'Institut Bergonié de Bordeaux, l'Institut Gustave Roussy (IGR) de Villejuif et l'Institut Paoli-Calmettes de Marseille. Si elle n'est "pas catastrophique", cette dégradation comptable des CLCC atteste, s'il le fallait encore pour le président d'Unicancer, de l'impérieuse nécessité de réformer la Tarification à l'activité (T2A) et tout particulièrement le financement de l'innovation. En effet, si l'activité des centres continue de croître, c'est bien cette part "innovation" qui grève aujourd'hui les budgets. "L'enveloppe liées aux Missions d'enseignement, de recherche, de référence et d'innovation (MERRI) ne prend pas en compte l'innovation. Nous sommes remboursés sur une partie des Aides à la contractualisation (AC), un dispositif très hétérogène et souvent gelé qui sert de variable d'ajustement. Or, ce gel s'est fortement accru en 2012, mettant en péril l'équilibre budgétaire d'un certain nombre de centres", précise Josy Reiffers.

Plus globalement, un point d'ailleurs sous-jacent au plan stratégique 2012-2015, c'est bien la T2A, système jugé "inadapté" pour ne pas dire "inerte" voire "délirant" par le dirigeant d'Unicancer, qu'il importe de modifier. Or, selon lui, les pouvoirs publics n'ont pas pleinement conscience des modifications passées et à venir dans la prise en charge des cancers, lesquels changements sont justement laissés de côté par la T2A. Face au triptyque d'ores et déjà amorcé d'une médecine de plus en plus personnalisée, chronique et ambulatoire, "l'équilibre budgétaire va devenir obsolète avec une T2A fondée sur le remboursement des séjours", note Josy Reiffers. Et les exemples sont légions, liste l'intéressé. La tumorectomie pour les cancers du sein, acte sur lequel le site nantais de l'Institut de cancérologie de l'Ouest (ICO) est particulièrement en verve, est ainsi moins bien remboursée en ambulatoire qu'en mode de soins traditionnel. L'assurance maladie ne propose également aucune incitation financière au développement de la radiothérapie per-opératoire, malgré les économies nées de cette procédure. Enfin, le remboursement à la séance n'incite également pas à "la désescalade thérapeutique" sur la radiothérapie, tout comme celui au séjour n'engage pas à concentrer deux séances par jour pour réduire la durée de traitement, une seule séance étant alors remboursée ».

**Source: Hospimedia, Nov. 2012**

## **V. Cooperation between Cancer Centers and Hospitals**

### **La FNCLCC (UNICANCER) et la FNCCHRU renforcent les synergies entre les Centres Hospitaliers Universitaires et les Centres de Lutttes Contre le cancer (Ministère de la Santé, le 10 juillet 2009)**

Cinq ans après l'accord cadre pour la constitution des groupements de coopération sanitaire en cancérologie (GCS), la Fédération nationale des Centres de lutte contre le cancer (FNCLCC) et la Fédération nationale de cancérologie des CHU (FNCCHRU) ont signé un avenant en présence d'Annie Podeur, directrice de l'hospitalisation et organisation des soins, afin de renforcer les collaborations dans les domaines de l'enseignement et de la recherche.

La signature officielle par les présidents des deux fédérations, Thomas Tursz et Norbert Ifrah s'est tenue au Ministère de la santé et des sports le lundi 29 juin 2009, en présence d'Annie Podeur, directrice de l'Hospitalisation et de l'Organisation des soins (DHOS), et de Dominique Maraninchi, président de l'Institut national du cancer (INCa).

L'accord cadre signé en 2004 par la FNCLCC et la FNCCHRU a favorisé la création de GCS entre CHU et CLCC de manière à assurer conjointement leur représentation au sein des pôles régionaux de cancérologie. A ce jour, douze GCS sont opérationnels à Angers, Caen, Clermont-Ferrand, Dijon, Lille, Lyon, Nantes, Nice, Reims, Rennes, Strasbourg et Toulouse.

La collaboration engagée dans le cadre de ces GCS s'est traduite par la mise en place de projets médicaux communs, par le financement et le partage de plateaux techniques spécialisés, ainsi que par le développement de stratégies de recherche communes notamment dans le domaine de la recherche translationnelle. En menant à bien ces projets, les GCS ont contribué à la dynamique du Plan cancer 2003-2007.

#### **Concertation accentuée dans la recherche et dans la formation au sein des GCS**

Les responsables de la FNCCHRU et de la FNCLCC ont souhaité aller encore plus loin dans la définition commune de la stratégie médicale en modifiant l'accord cadre, afin d'accentuer la concertation au sein du GCS sur les activités de recherche et de formation. Le nouvel avenant vise ainsi à rendre obligatoire la consultation de l'instance délibérante du GCS sur les projets de coordination des formations, les travaux de recherche, ainsi que sur la révision des effectifs médicaux hospitalo-universitaires des disciplines dans le domaine de la cancérologie.

Ce rapprochement doit permettre de conforter le rôle des pôles régionaux de cancérologie dans leurs quatre grands domaines-clés d'implication, à savoir :

- les activités d'appui régionales ;
- les expertises diagnostiques et thérapeutiques, régionales ou interrégionales ; d'enseignement ;
- la recherche académique d'amont ;
- les essais thérapeutiques précoces en lien avec le cancéropôle.

Annie Podeur, directrice de la DHOS, a souligné lors de la signature l'importance de cette coopération : *"la signature de cette convention cadre concrétise un nouvel élan, celui du futur deuxième plan cancer :*

- elle marque la volonté de partager des projets fondés sur la triple mission des établissements hospitalo-universitaires dans le droit fil de la loi HPST, en attente de promulgation ;
- elle crée pour les signataires une obligation d'animation des réseaux régionaux, fédérant les établissements et les professionnels de santé et associant pleinement les associations d'usagers pour donner sens à la notion de prise en charge globale. "

Pour le Pr Thomas Tursz, "il s'agit d'une étape importante dans la constitution d'un réseau de centres d'excellence garantissant le continuum soins, enseignement et recherche à la dimension des enjeux européens".

Selon le Pr Nohert Ifrah cet avenant renforce les pôles régionaux : "Les pôles régionaux deviennent des lieux électifs de soins concertés sur la recherche, l'innovation et les projets de soins en cancérologie. La concertation sur les recrutements médicaux, hospitalo-médicaux, comme hospitalier, s'inscrit dans cette logique comme une preuve de maturité".

#### **A propos d'UNICANCER**

Créée en 1964, la Fédération nationale des Centres de lutte contre le cancer (FNCLCC - UNICANCER) est l'une de quatre fédérations hospitalières représentatives en France. Elle regroupe les 20 Centres de lutte contre le cancer et a pour mission de défendre les intérêts de ses membres et de développer avec eux des projets pour améliorer la prise en charge des malades et faire progresser la science. Les 20 Centres de lutte contre le cancer (CLCC) sont des établissements de santé privés à but non lucratif, participant au service public hospitalier, exclusivement dédiés à la prise en charge des cancers. Ils assurent des missions de soins, de recherche et d'enseignement, avec la volonté permanente d'accroître la qualité et l'accessibilité aux soins. Constituant un réseau à la fois régional et national, les Centres sont porteurs d'un modèle de prise en charge globale et multidisciplinaire des personnes atteintes d'un cancer.

#### **A propos de la FNCCHRU**

Créée en 1998, la Fédération de cancérologie des CHRU a pour objectif de coordonner au niveau national l'action de ses membres en matière de cancérologie et de les représenter auprès des ministères, des organismes de tutelle et des institutions publiques. Elle regroupe l'ensemble de composantes hospitalo-universitaires des 32 CHRU : Doyens de Faculté de médecine, Présidents de CME, Directeurs Généraux au travers de leurs conférences ainsi que les représentants des structures locales de coordination pluridisciplinaire de cancérologie. La Fédération a notamment pour missions :

- d'assurer en matière de cancérologie une prise en charge des patients pluridisciplinaire et coordonnée et une délivrance de soins de qualité correspondant aux besoins des malades ;
- de participer à l'élaboration d'une politique de santé publique pour la prévention, le dépistage, le diagnostic et le traitement des cancers ;
- de favoriser l'enseignement de la cancérologie dans tous ses aspects (formation initiale et continue) ;
- de développer la mise en commun de protocoles de prise en charge et de recherche, ainsi que la transmission des connaissances et du savoir-faire ;
- de mesurer et faire reconnaître la place occupée par les Centres Hospitaliers Régionaux et Universitaires dans le dispositif de prise en charge de ces pathologies ;

La FNCCHRU a tissé des liens forts et mène de nombreuses actions communes avec la Fédération Nationale de Cancérologie des Centres hospitaliers. Toutes deux vont se regrouper en 2009 au sein d'une nouvelle Fédération sous l'égide de la FHF



## VI. MD Anderson Comprehensive Cancer Center and its campus

Key figures about MD Anderson Comprehensive Cancer Center in Texas :

- Creation: 1941
- Annual budget: M€
- Employees: 19 000 professionals including 1 644 faculty
- Patients: 22 000 patients treated in 2012 (900 000 since 1944)
- Care: 630 beds
- Research annual budget : 647 M\$
- Clinical research: 1 078 protocols, 8 500 patient registrants
- Teaching: 7 500 students-trainees



The MD Anderson is the largest Comprehensive Cancer Center world-wide and it ranks among the top healthcare institutions in the USA. Being part of The University of Texas System, MD Anderson Cancer Center is managed under a nonprofit structure. It is growing quickly, increasing in size by 50% in the past 10 years. The complex now includes more than 600 inpatient beds, several research buildings and outpatient clinic buildings, two faculty office buildings, and a patient-family hotel in addition to other off-site facilities for clinical and research use.

The M.D. Anderson Houston Campus is comprised of 94 acres within and near the Texas Medical Center and is divided into four areas: Main Campus – North of Holcombe, Main Campus – South of Holcombe, Mid Campus, and the South Campus. In addition, M.D. Anderson owns and operates research/animal holding facilities in Smithville and Bastrop, Texas.

- **MAIN CAMPUS -NORTH OF HOLCOMBE:** This campus consists of 19 acres bounded by Holcombe Boulevard, Bertner Avenue, Moursund, and MD Anderson Avenue. The primary structures on this campus are Anderson Central, East and West Buildings, the Basic Research Building, the Lutheran Pavilion, Alkek Hospital, the Clinical Research Building, the Basic Science Research Building and the Clark/Love/LeMaistre Clinic; and are dedicated to clinic, research, and patient care.
- **MAIN CAMPUS -SOUTH OF HOLCOMBE:** This campus currently consists of twenty-five acres bounded by Holcombe Boulevard, Bertner Avenue, Braes Bayou and Main Street. The primary structures on this campus are the Ambulatory Clinic Building (ACB), including three levels of below grade parking, the Cancer Prevention Building, a multi-purpose office building comprised of department offices, clinics, support services, and a 1600-car parking garage connected via a pedestrian bridge.
- **MID CAMPUS:** The Mid Campus area consists mainly of warehouses, service buildings, surface parking, single-family residences, and apartments and is located directly south of the South of Holcombe Campus. Future development will include office/administration buildings and Patient Care facilities.
- **SOUTH CAMPUS:** The South Campus is predominantly research buildings, a physical plant, and warehouses. Future planned construction includes M.D. Anderson of Texas Research Park, and additional research laboratory and educational buildings.

Recently completed construction projects include two new research buildings on MD Anderson's South Campus and the addition of nine floors that can accommodate more than 300 new inpatient beds in Alkek Hospital on the North Campus. MD Anderson's first facility on its Mid Campus, a 25-story building to support current office space and future growth needs, opened in 2011.

MD Anderson Cancer Center Campus



MD Anderson is considering also gathering all together the currently disparate sites into a comprehensive campus. The management of the Comprehensive Cancer Center worked on a master plan with Perkinswill architects based on MD Anderson's "Economic Growth Model" to define a global project. We do not know if this project is still on the agenda for MD Anderson.

*Source: MD Anderson & Perkinswill.*

## VII. Oslo Cancer Cluster and Innovation Park

“Oslo Cancer Cluster is a research and industrial cluster specialised in cancer created in 2006. The cluster is organized as a network, comprising research institutes, hospitals and universities, biotechnology companies and pharmaceutical companies. In 2007, the Oslo Cancer Cluster got the status of Norwegian Center of Expertise (NCE), the only health cluster out of the 12 clusters. Innovation is cornerstone of Oslo Cancer Cluster activities: aiming to develop new cancer therapeutics and diagnostics that can only be done through innovation.



In mid-April 2013 began work to build Oslo Cancer Cluster Innovation Park next to the Norwegian Radium Hospital. The location is far from being randomly chosen, the purpose is to ensure a close and good contact with the Institute for Cancer Research in Oslo University. The initiators of the Oslo Cancer Cluster Innovation Park are Jónas Einarsson, CEO the Norwegian Radium Hospital Research Foundation and Kaare Norum, former Rector of the University of Oslo. The vision of the Innovation Park is to create the leading environment for education, research and industrial biotechnology and life sciences - and to reduce the development time of cancer drugs and diagnostics.

The cooperation between the school and the Innovation Park is unique in the world. The Innovation Park is the only one to integrate a high school (Ullern). Integration is not only physical, but involves a real school academic cooperation between Oslo Cancer Cluster and school for better science and entrepreneurship. Oslo Cancer Cluster and Ullern high school share a common vision through collaboration: To educate tomorrow's scientists and entrepreneurs, to ensure recruitment of biotechnology and research. The Oslo Cancer Innovation Park will also house a business incubator that will support start-up businesses in cancer research and development. In addition, a number of biotechnology companies will be able to rent office space and laboratory facilities in the building. Oslo Cancer Cluster Innovation Park will be ready for occupation in May 2015”.

Cancer research offers a great potential for innovation: during the last decade, 13 new businesses established in the Oslo area, were all direct "spin-offs" from the Norwegian Cancer Research. An essential part of the Innovation Park will be an incubator for startup businesses based on cancer research conducted in the cluster. The Oslo Cancer Cluster has established lighthouse projects in some areas; Immuno-Oncology, clinical trials in cancer, creation and funding of biotech companies, financing of new cancer drugs and national program for optimal cancer treatment. Annually, meetings and workshops are organized to gather people across the cluster to encourage networking and information exchange. The Oslo Cancer Cluster meetings include; membership meetings - R & D network meetings, Cross Cancer Links - Which brings together oncologists, haematologists and clinicians, International Cancer Cluster Showcase - a seminar in conjunction the world's largest biotechnology exhibition BIO in the U.S. and European Cancer Cluster Partnering which are organized together with the Oslo Cancer Cluster and the French Cancer Cluster Cancer-Bio-Santé.

Source: [www.oslocancercluster.no/](http://www.oslocancercluster.no/)

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## **Comprehensive Cancer Centers: a relevant model in France?**

University partnership : ESCP Europe, LSE, Mailman School of Public Health

### **Abstract :**

In 1990, the NCI initiated a new program in the USA called Comprehensive Cancer Centers to support the major American Cancer Centers. This dissertation aims to analyze if this model is relevant in France and how it has been implemented by INCa since 2010 thanks to the SIRIC program. After an historical presentation, this work develops a quantitative and qualitative analysis of the French Cancer Centers to identify and characterize the Comprehensive Cancer Centers at national level.

The statistics collected (HopsiDiag, Unicancer, INCa...) show that a specific group of Cancer Centers can be identified in France. Our analysis exposes that Comprehensive Cancer Centers correspond to a rather homogenous reality in France with minimum standards. Their inputs (HR, medical means and finance) are above national average, as well as their output (patients treated, clinical research and scientific publications). Considering the resource based view, we find out that regarding their human and material resources, the French Comprehensive Cancer Centers have a slightly lower productivity than the other Cancer Centers in terms of care, a similar productivity for clinical trials, but a lot higher productivity for their scientific production.

Comprehensive Cancer Centers are unique in the national healthcare landscape due to their high degree of specialization. They were pioneers in France by implementing new medical principles and organizations such as "Transdisciplinary research & translational medicine" and as a result, they represent a new kind of organization. However, a case analysis (Villejuif, Toulouse and other international experiences) demonstrates that it corresponds only to a second level of development for Cancer Centers. A third stage of strategy development consists in a growth outside the borders of the Comprehensive Cancer Center, leading to the creation of a new kind of bio-clusters: Cancer Campus.

### **Key words :**

Cancer Centers, Comprehensive Cancer Centers, Bio-cluster, Cancer Campus, Oncology, Specialization, Patient focus, Resource-based view, Open innovation

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