LAS/ANS

SYMPOSIUM "ENERGY CRISIS IN LATIN AMERICA AND NUCLEAR POWER

Round Table Meeting on:

"EVOLUTION OF NUCLEAR TECHNIQUES IN MEDICINE"

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June 28

Buenos Aires, ARGENTINA

NUCLEAR MEDICINE IN BRAZIL

PRODUCTION OF RADIOPHARMACEUTICALS

From the report "The Untold Story: The Economic Benefits of Nuclear Technologies". Published by the Nuclear Energy Institute – USA (jun/1997)

- **Power and Non Power Nuclear Energy produce sgnificant economic and employment benefits for the USA. In 1995 they generated approximately**

→ **4.4 million jobs (*) and,**

→ **US$ 421 billion in sales (*), (6% of total gross domestic product**

- **One Third of Americans hospitalized every year are treated by nuclear medicina techniques.**

(*) Of these about 80% are due to the Non Power Nuclear Energy

From the report "The Journal of Nuclear Medicine. Vol. 39, nº 2, Feb, March and July 1998"

- **Diagnostic Radiopharmaceutics Market: Percent of Revenues by Geographic Region, 1996**

Region	Revenues US$ Million	Percent of Total
USA	531.0	47.0
Asia/Pacific	298.3	26.4
Europe	220.4	19.5
Latin América	28.5	2.5
Rest of World	51.8	4.6
TOTAL	1,130.0	100

From the report "The US Market Diagnostic radiopharmaceuticals", Bio Tech System, June 2001

- **The Market for radiopharmaceuticals Products in the USA**

Product/year	2000 US$ million	2007 US$ million
Diagnostic	840.9	2,655.8
Therapeutic	220.8	2,746.6
TOTAL	1,061.7	5,399.4

RADIOPHARMACEUTICALS IN BRAZIL

The Institute for Nuclear and Energy Research – IPEN in São Paulo produce and suply almost all of the radiopharmaceutics used in Brazil for nuclear medicine

A SHORT PROFILE OF IPEN

The IPEN was created in 1956 with the main purpose of performing research and development in the area of nuclear energy and its applications.

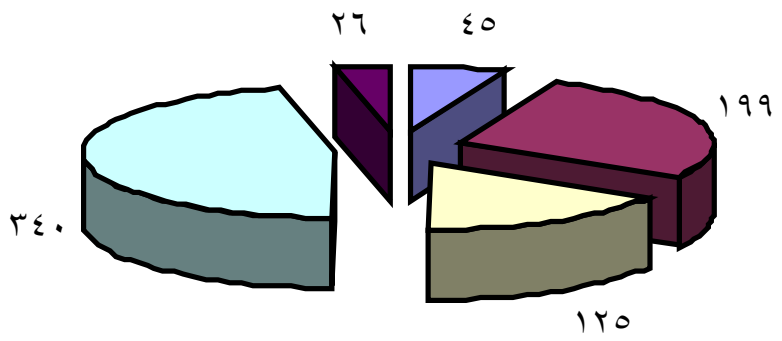
The main facilities include:

- **Nuclear research reactor IEA-R used for neutron difratometry, material irradiation and production of radioisotopes.**
- **Electron accelerators for industrial applications.**
- **Cyclotron accelerators for radioisotopes production.**
- **Cobalt irradiators.**
- **Chemical and isotope analysis laboratories.**
- **Pilot plants in nuclear fuel cycle area, and many other laboratories.**

- **It is located at the *campus* of University of São Paulo in an area of nearly 500,000 square meters and its staff is about 1.100 persons, more than 30% with Post Graduate degree.**

A SHORT PROFILE OF IPEN

Scientific Production 2005

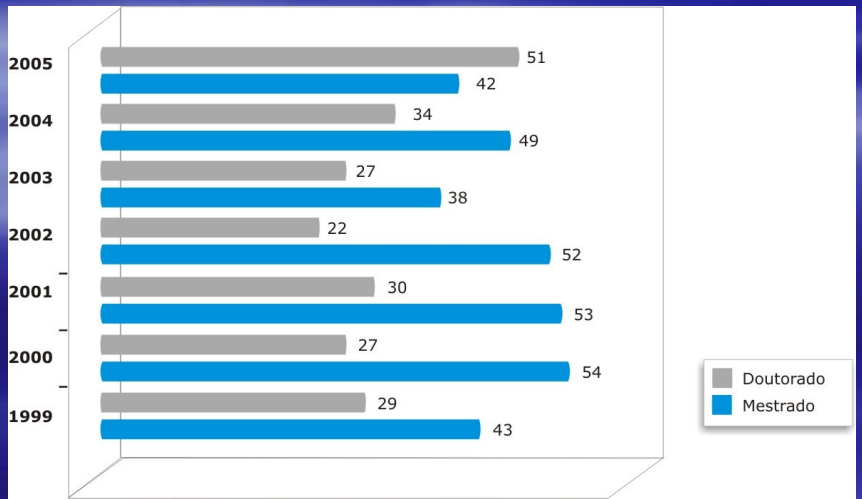


TOTAL: 735

A SHORT PROFILE OF IPEN

IPEN/USP Post Graduate Course

Number of Post Graduate students at IPEN



In 2005, 51 doctorate and 42 master degrees were granted

A SHORT PROFILE OF IPEN

Research and Development Units:

- CRPq – Research Reactor Center
- CLA – Laser and Applications Center
- CR – Radiopharmaceutical Center
- CCTM – Materials Science and Techonology Center
- CAC – Cyclotron Accelerators Center
- CEN – Nuclear Engineering Center
- CQMA – Chemical and Environmental Technoloy Center
- CBM – Molecular Biology Center
- CCN – Nuclear Fuel Center
- CTR – Radiation Technology Center
- CMR – Radiation Metrology Center

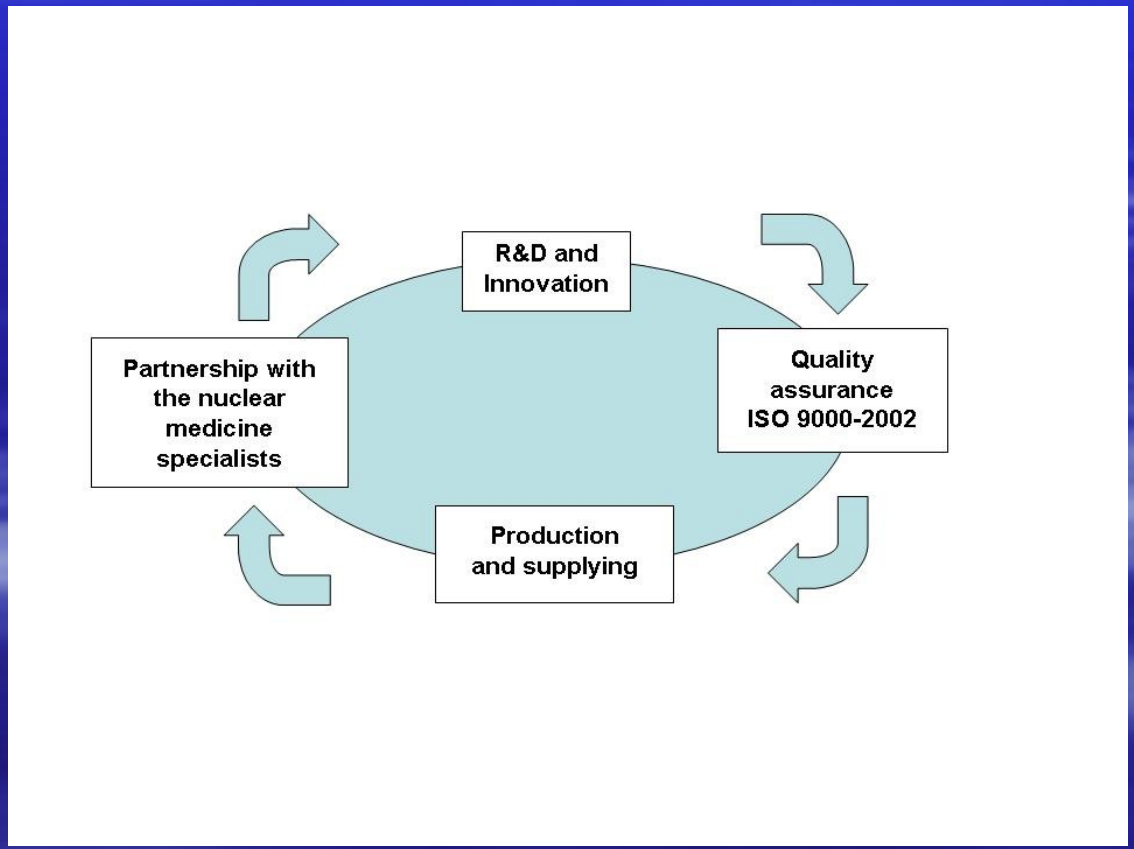
RADIOPHARMACEUTICAL CENTER – IPEN/CR

- A current production and distribution of radiopharmaceutical for Brazilian customers needs;
- A program for partial nationalization of radioisotopes;
- A quality program for all of the activities;
- A continuos and permanent program towards the development of new products.

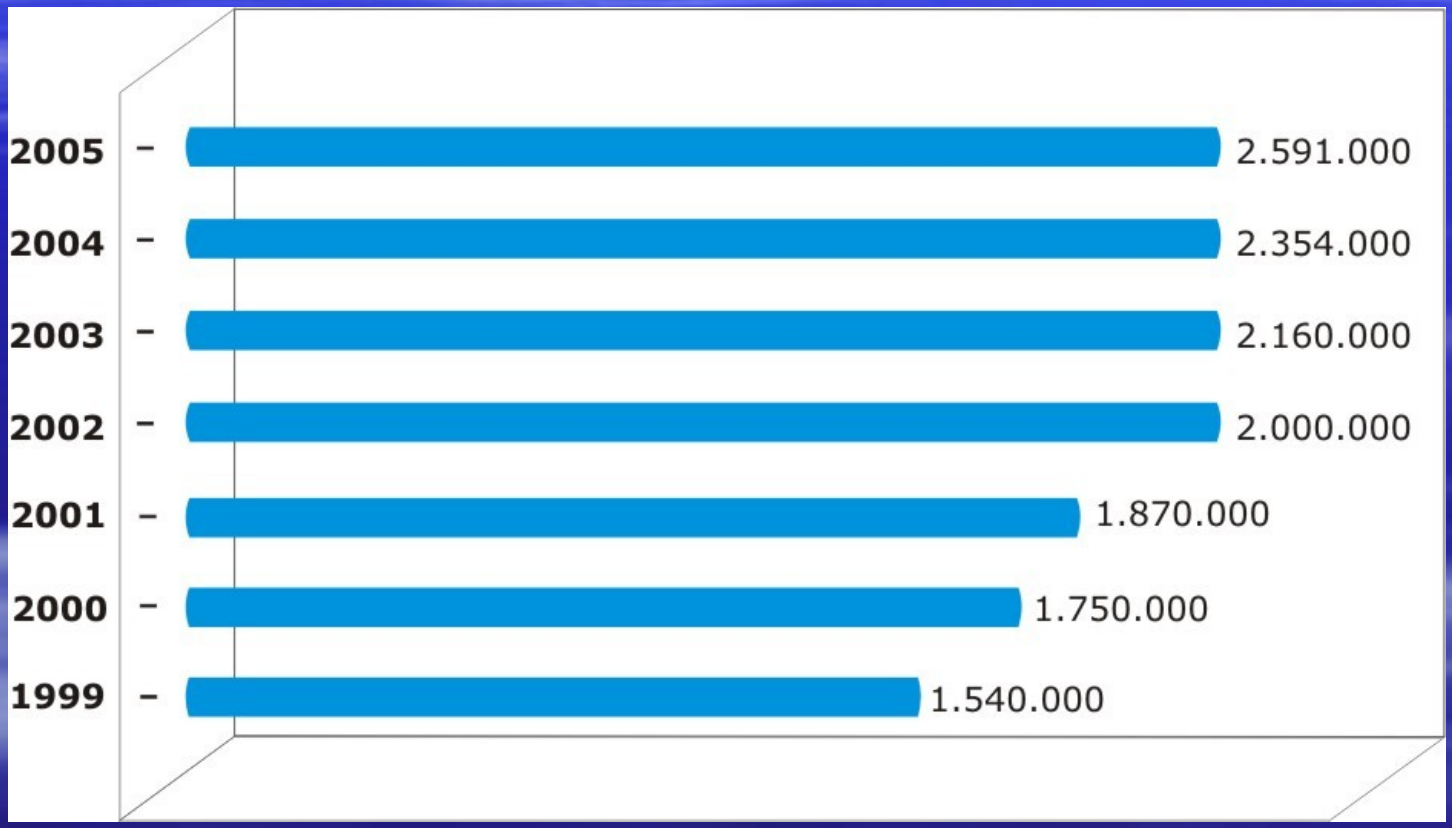
2.6 million of medical procedures/year were attended with IPEN radiopharmaceutical products (year of 2005)

RADIOPHARMACEUTICAL CENTER – IPEN/CR

IPEN-CR strategy for assuring its leadership to attend the demand of its clients

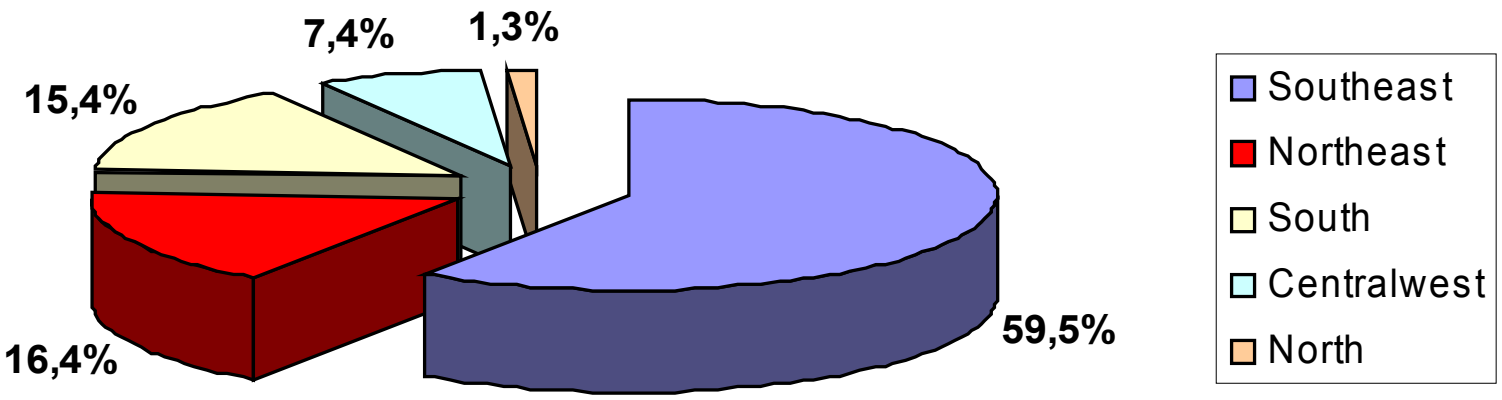


RADIOPHARMACEUTICAL CENTER – IPEN/CR

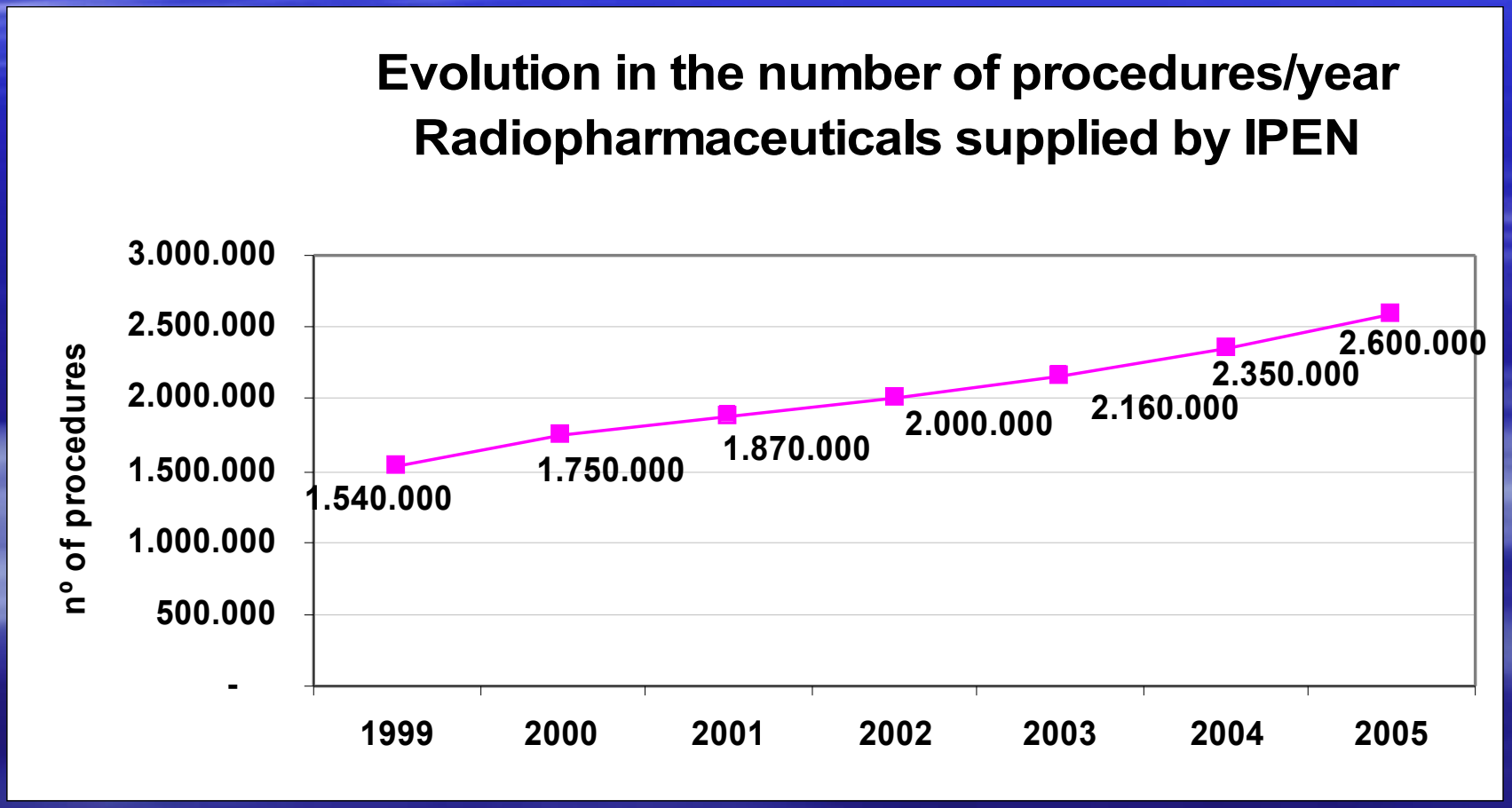


The figure below shows the evolution in the number medical procedures/year with the radiopharmaceuticals produced by IPEN

RADIOPHARMACEUTICAL CENTER – IPEN/CR



RADIOPHARMACEUTICAL CENTER – IPEN/CR



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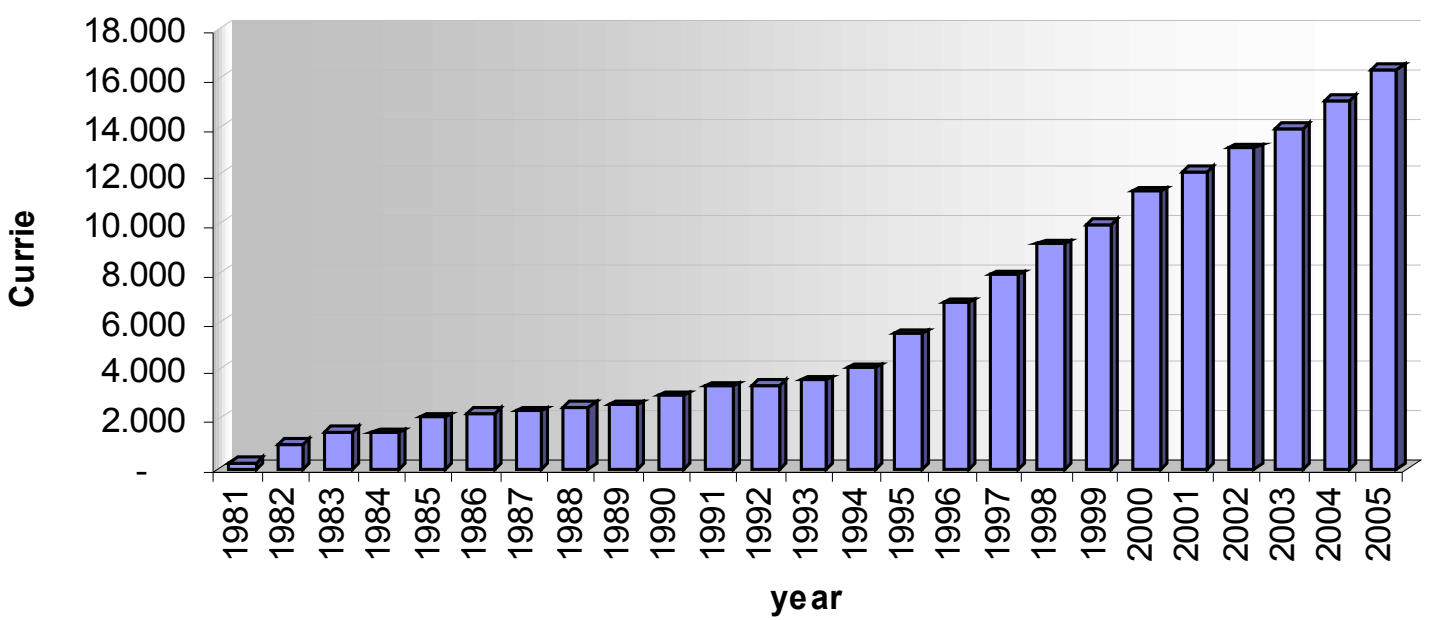

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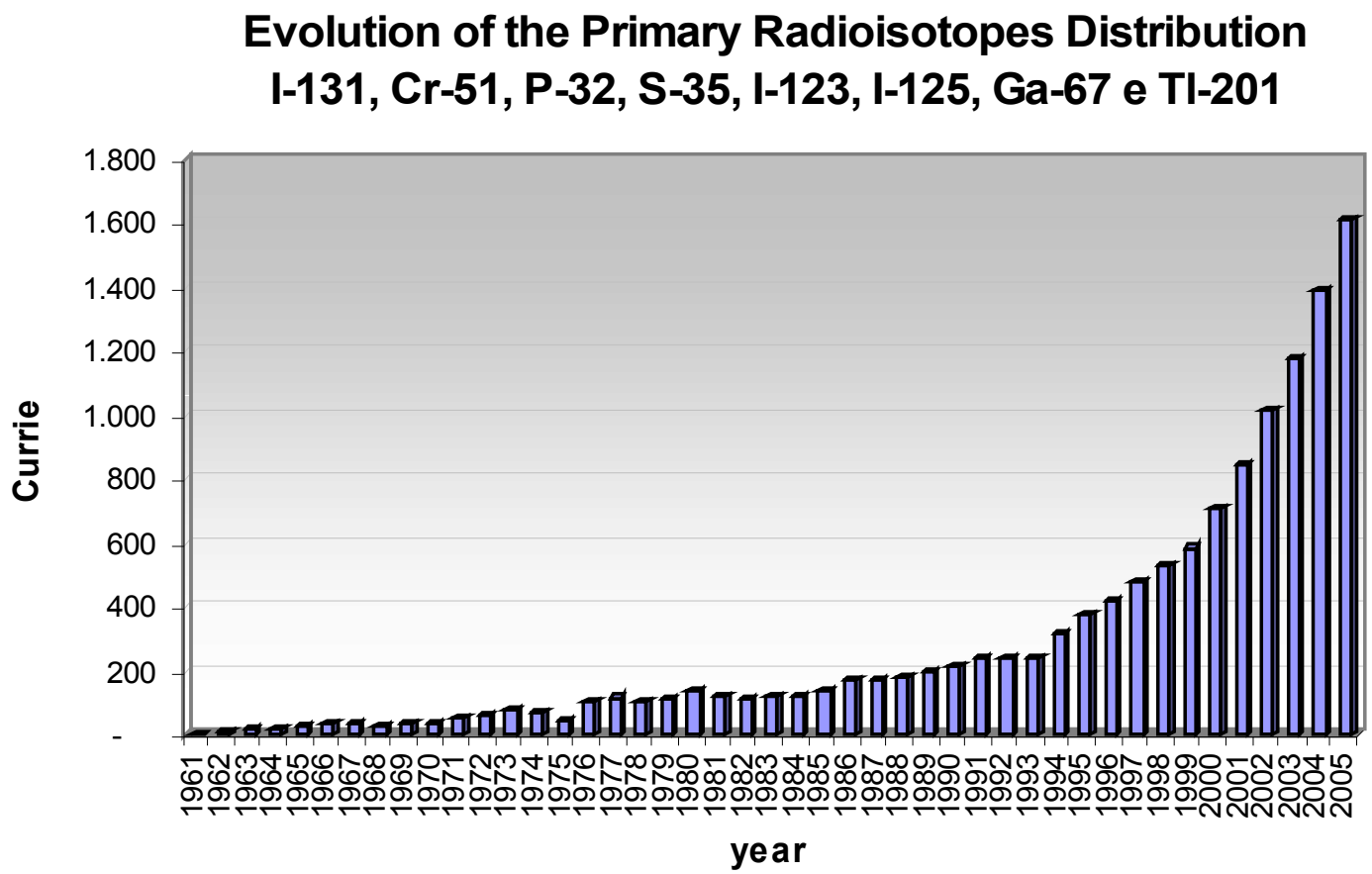

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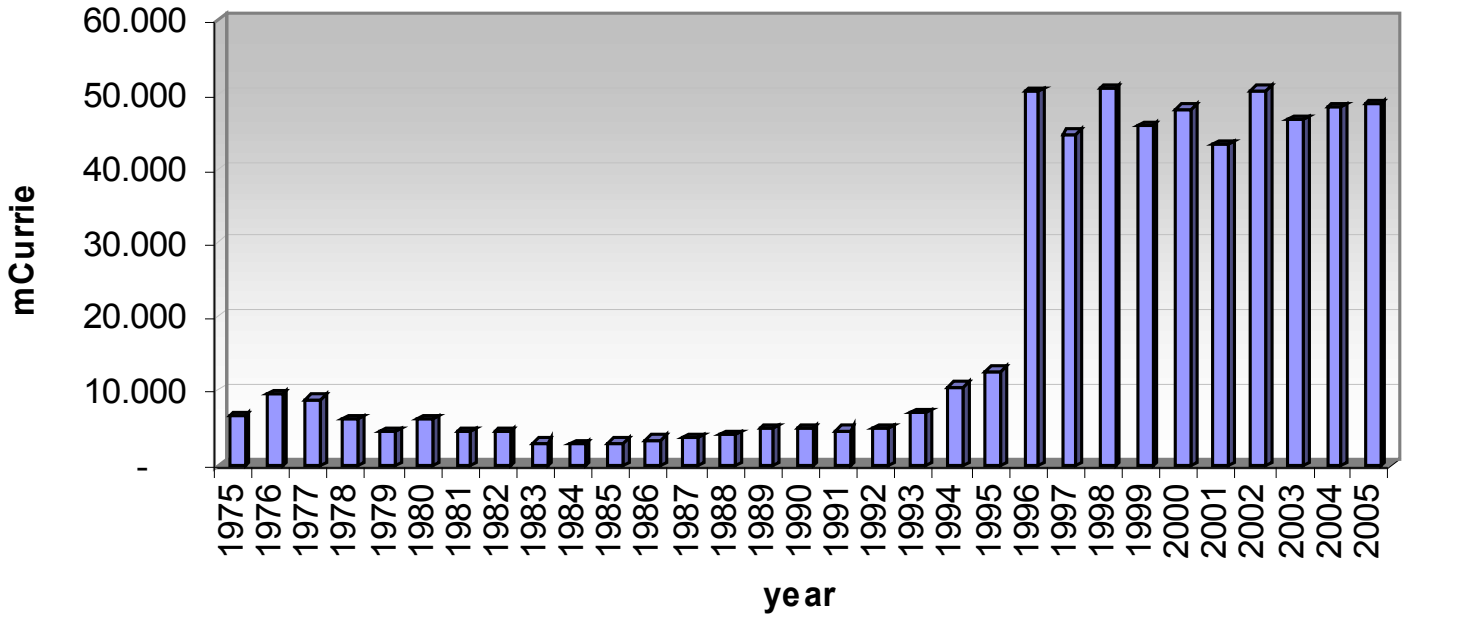

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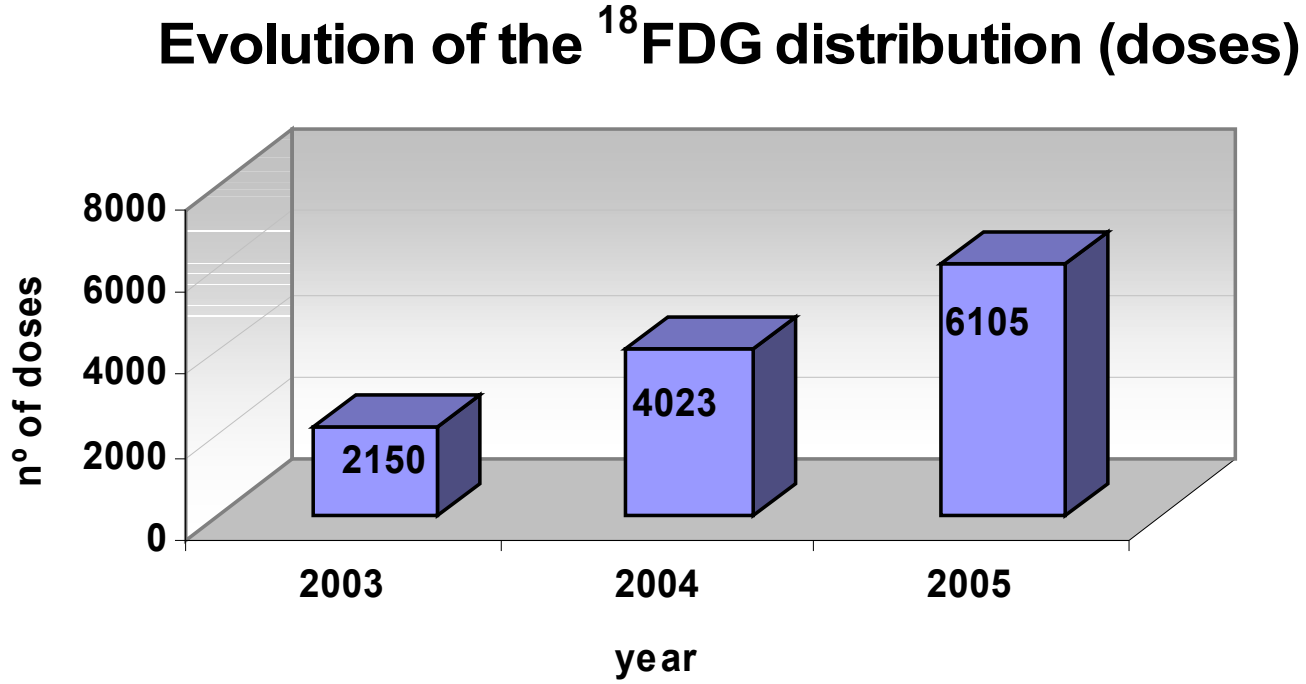

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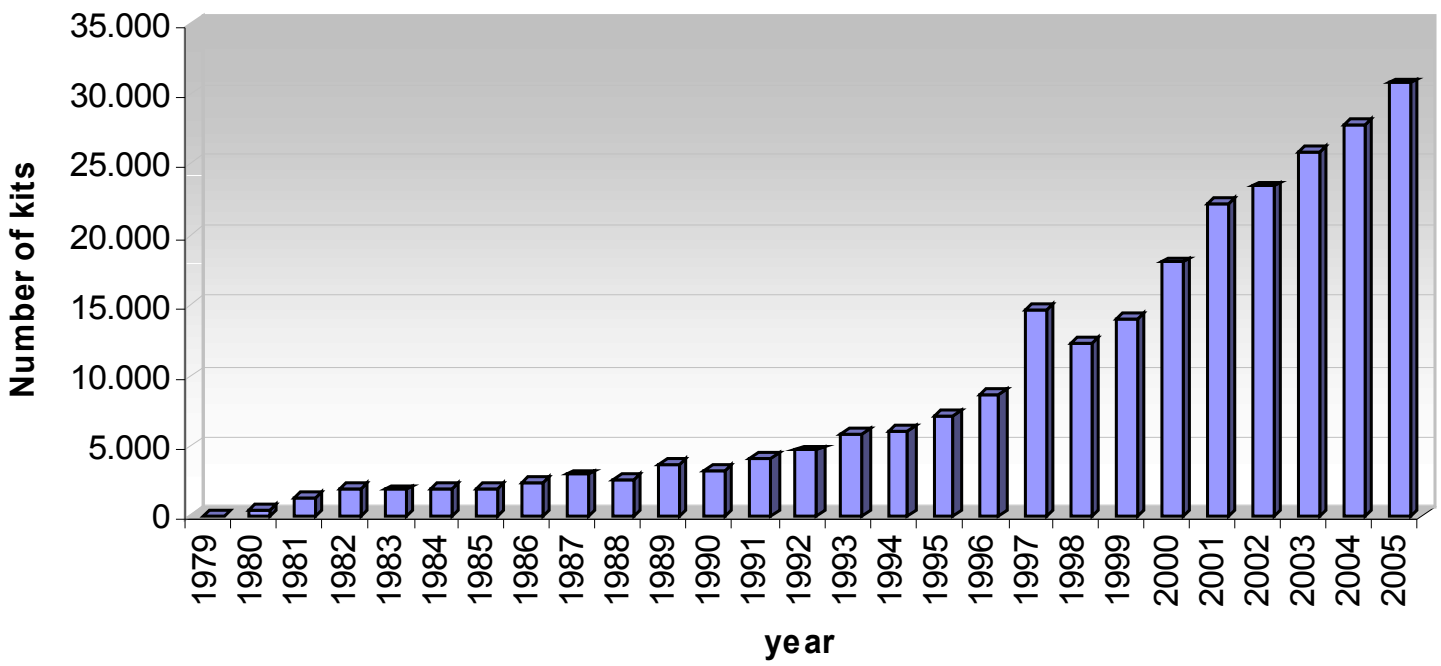

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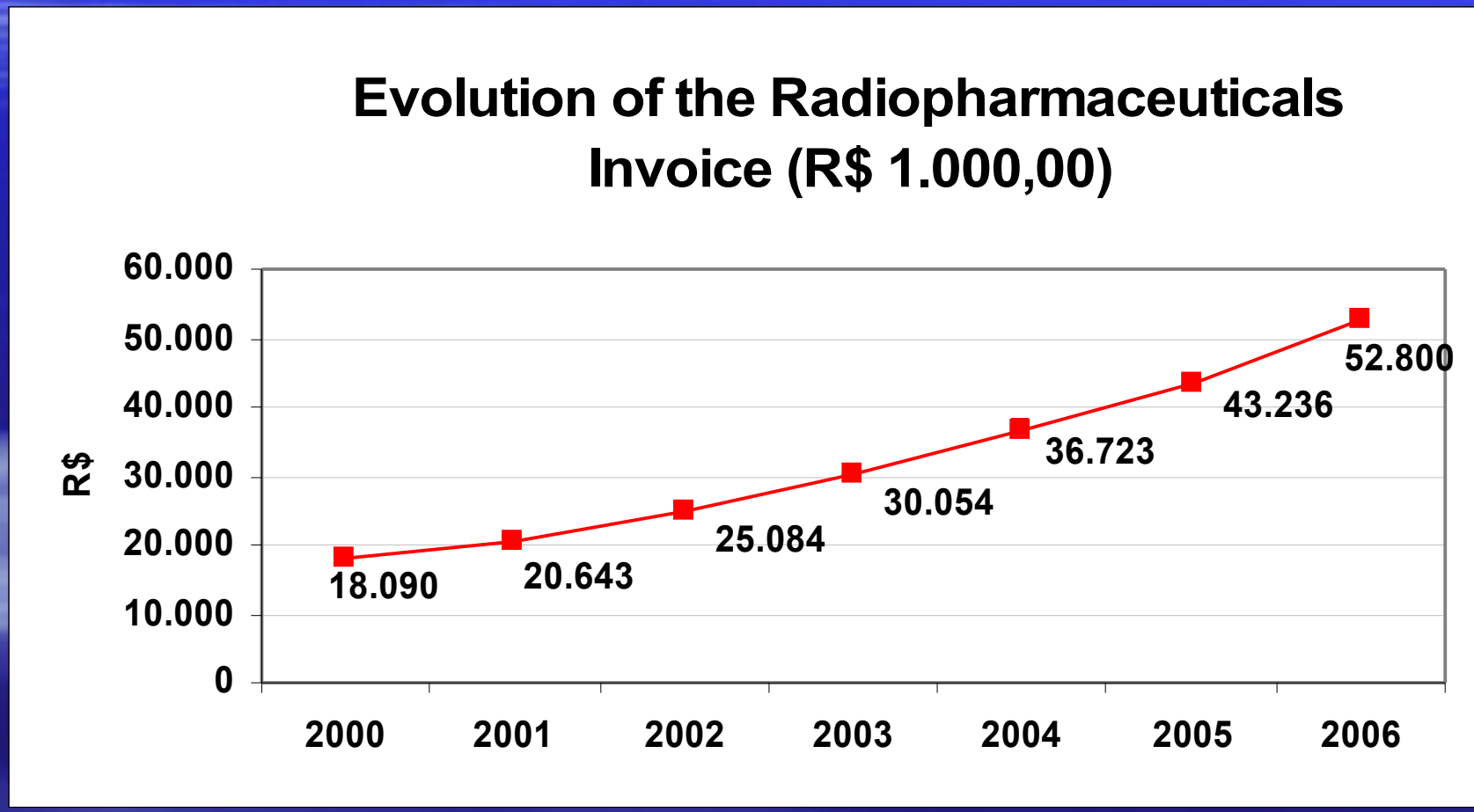
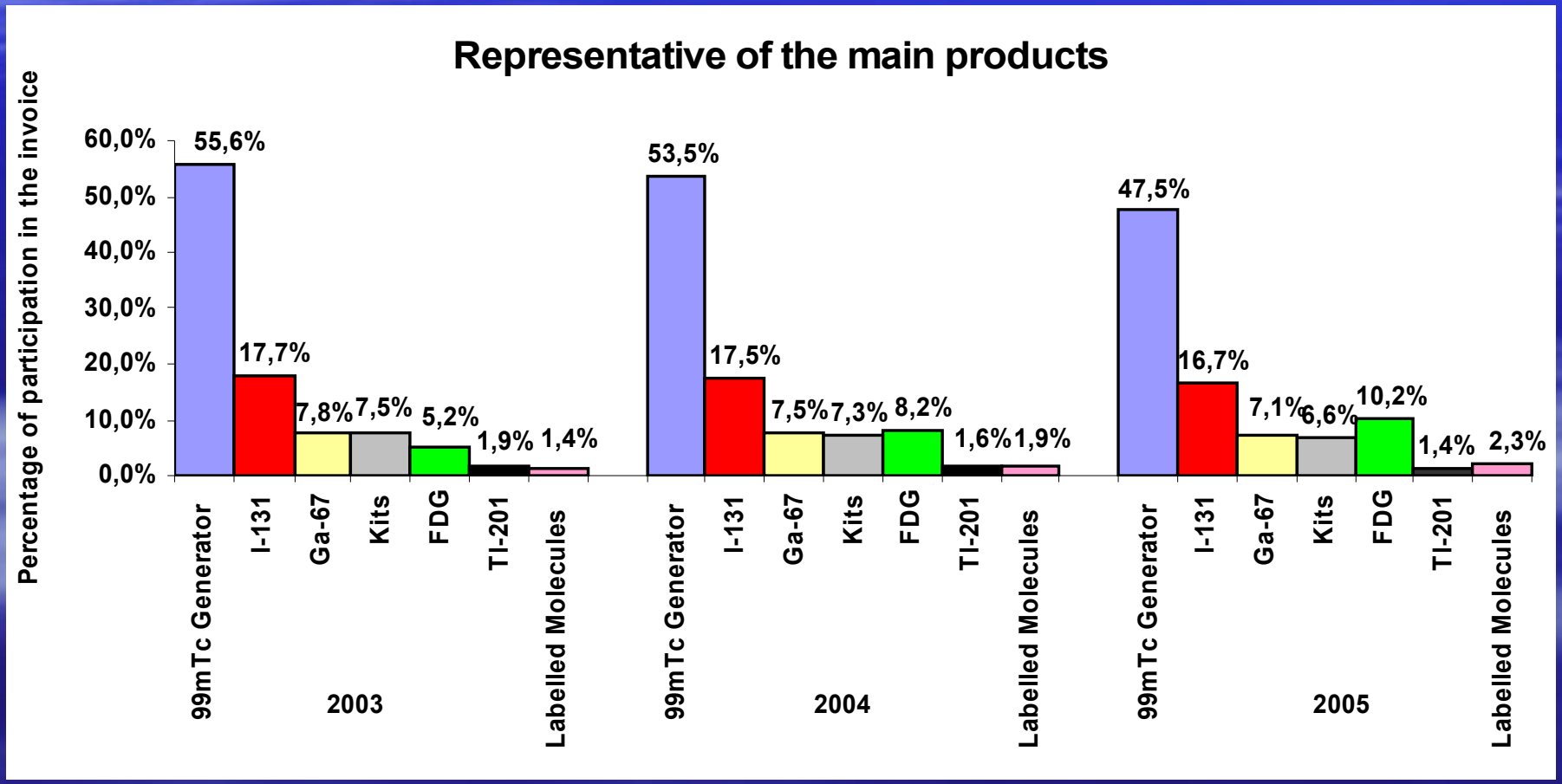


RADIOPHARMACEUTICAL CENTER – IPEN/CR



RADIOPHARMACEUTICAL CENTER – IPEN/CR

Radiopharmaceuticals for Diagnosis

RADIONUCLIDE	CLINICAL APPLICATION DIAGNOSIS	RADIONUCLIDE PRODUCTION
Tecnetium ^{99m}Tc	**SCINTIGRAPHY :** • Thyroid, salivary glands and bleeding research • Kidney and brain • Lung, liver and bone • Acute myocardial infarction and labelling of red blood cells • Circulatory studies and lymphatic system • Localization of sentinel linfonode	^{99}Mo produced in Research Nuclear Reactor • 100% imported
Iodine-131	• Renal and thyroid function • Determination of plasmatic volume	Nuclear Reactor • 40% imported • 60% national – produced in the IEA-R1 reactor
Iodine-123	• Thyroid function study • Diagnosis of neuroblastoma and pheocromacitoma	Cyclotron • 100% national

RADIOPHARMACEUTICAL CENTER – IPEN/CR

Radiopharmaceuticals for Diagnosis

RADIONUCLIDE	CLINICAL APPLICATION DIAGNOSIS	RADIONUCLIDE PRODUCTION
Fluorine-18	• Diagnosis in oncology, brain perfusion and myocardial viability	Cyclotron • 100% national
Indium-111	• Diagnosis of neuroendocrine tumors	Cyclotron • Imported
Chromium-51	• Labelling of red cells and spleen imaging • Determination of glomerular filtration rate • Protein loss enteropathy study	Reactor • Imported
Gallium-67	• Localization of soft tissue tumors and inflamatory leseon	Cyclotron • 100% national
Thallium-201	• Cardiac imaging	Cyclotron • 100% national

RADIOPHARMACEUTICAL CENTER – IPEN/CR

Radiopharmaceuticals for Therapy

RADIONUCLIDE	CLINICAL APPLICATION DIAGNOSIS	RADIONUCLIDE PRODUCTION
Iodine-131	• Treatment of thyroid cancer or hyperthyrodism • Treatment of neuroblastoma and pheochromocitoma	Nuclear Reactor • 40% imported • 60% national – produced in IEA-R1 reactor
Samarium-153	• Bone pain palliation • Arthrites/Arthrosis	Nuclear Reactor • 100% national
Yttrium-90	• Arthrites/Arthrosis	Nuclear Reactor • Imported
Lutecium-177	• Treatment of neuroendocrin tumors (clinical studies)	Nuclear Reactor • Imported

RADIOPHARMACEUTICAL CENTER – IPEN/CR

Changing Market for PET Brings Challenges and Opportunities

The demand for PET increased 48% in 2003, reaching 650,000 procedures.

The rapid growth is expected to continue, with procedure volume rising as much as 35% in 2004, to about 900,000 procedures. By 2010, PET procedure volume should rise to 2.1 million procedures.

Fonte: Boletim Bio-Tech Systems, Inc. – 01/03/2005

ACTUAL OBJECTIVES

- Instalation of a new Cyclotron Accelerator to attend the crescent demand of FDG-18
- Partnerships for new markets (Latin America)

Thank you