Latin America

- Part of North America (Mexico)
- Central America
- Caribbean (CUB, DOM, PUR)
- South America
- Most languages spoken: Spanish (64%) and Portuguese (33%)
- Main colonization: Spain and Portugal
- Inequities in equipment, accessibility and qualified human resources.

Influences of original cultures (Mexico, Guatemala, Peru, Bolivia, Paraguay)
- Similar idiosyncrasy, religion and cultural characteristics
Medical Physics in LA: distribution by area

Distribution in LA

- 75% RT
- 14% NM
- 11% DR

Total: 1035

Source: S. Guzman, ECI 2015

Medical Physics in LA: organizations

- Latin American Society of Medical Physics (ALFIM)
- Established in 1984.
- Congress every 3 years
- Next congress: Córdoba, Argentina

Available

Required

RO MP needs in LA countries (2007)

400 Medical Physicists needed, only in Radiotherapy
RO MP needs in LA countries
Update required

IAEA Excel Worksheet

New estimations required
Need to calculate in excess!!

Latin America

POSTGRADUATE PROGRAMS
IN MEDICAL PHYSICS

2007

WELL ESTABLISHED
RECENTLY ESTABLISHED
NONE OR NOT INFO AVAILABLE
MP Education and Training in LA:
Background

• Regional MS program in MP (2000-2004)
  – IAEA Regional Cooperation Project ("ARCAL 50")
  – 2-year IAEA fellowships for 30 MPs from all LA countries
  – Support for expert missions (lecturers)
  – Several national MS-MP programs boosted up:
    • VEN (host), ARG, BRA, CUB, CHI, COL, COS, PER

IAEA - Proyecto ARCAL

MAESTRIA EN FISICA MEDICA

Programa de posgrado internacional en fisiologia nuclear (area de fisica de la medicina)

IAEA

MP Education and Training in Latin America

POSTGRADUATE PROGRAMS
IN MEDICAL PHYSICS
2012
- WELL ESTABLISHED
- RECENTLY ESTABLISHED
- NONE OR NOT INFO AVAILABLE

CLINICAL TRAINING PROGRAMS
IN MEDICAL PHYSICS
2012
- RESIDENCY PROGRAMS
- NONE OR NOT INFO AVAILABLE

26 vacancies in RT
9 vacancies in Imaging (DR & NM)
• Regional MS program in MP (2000-2004)
  – IAEA Regional Cooperation Project ("ARCAL 50")
  – 2-year IAEA fellowships for 30 MPs from all LA countries
  – Support for expert missions (lecturers)
  – Several national MS-MP programs boosted up:
    • VEN (host), ARG, BRA, CUB, CHI, COL, COS, PER

MP Education and Training in LA
IAEA approach

- Expert in MP
- Clinically Qualified Medical Physicist (CQMP)
- Supervised Clinical Training
- BS in Physics (or related field)
- 4-5 years
- Postgraduate (MS) in Physics, RO, NM, DR
- 1-2 years
- Supervised Clinical Training
- 2-3 years
- 6 years of clinical practice
- MS or PhD in Physics (or related field)
- 2-4 years

The Cuban Experience

Andreo (IAEA), Jimenez (PAHO), Alfonso (CUB), Brandan (MEX), Brunetto (ARG), Castellanos (COL), Da Cruz (BRA), Gutti (VEN),
- IAEA Project - RLA/6/051

Complete, if needed, additional education in MP
1 year
- BS in Physics (or related field)
- 4-5 years

Supervised Clinical Training
2-3 years
- MS or PhD in Physics (or related field)
- 2-4 years

The Medical Physicist:
Criteria and recommendations for academic and clinical training and certification in Latin America
January, 2010
Cancer in Cuba

Population: 11,224,190
Density: 102.1 inhab/Km²
Men: 5,628,911
Women: 5,628,911

Cancer incidence /2011
38,563 cases

Source: Anuario Estadístico de Salud/2014

Main causes of death in CUBA

Source: Ministry of Health, Cuba

RT services in CUBA

Legend
- Cobalt
- LINAC
- HDR

Source: Ministry of Health, Cuba
NM services in CUBA

Legend
- NM: Nuclear Medicine
- SPECT: Single Photon Emission Computed Tomography
- SPECT/CT: SPECT with CT Integration
- Iodine Therapy

NM services in CUBA

MP Education and Training: CUBA

Academic

Compulsory subjects
- Diploma in "RO Physics"
- Diploma in "NM Physics"

Optional subjects

MP Education and Training: CUBA

Clinical

- On-the-job training
- Required by Nuclear Regulatory Body for RO & NM.
- Not regularized yet by health authorities (MINSAP)
• **Currently no professional certification exist**

  - IAEA: provides fellowships for **on-the-job training** in specific topics of MP.
  - InSTEC (Higher Institute of Technologies and Applied Sciences): provides academic training (BS, MS & PhD)
  - CNSN (Cuban Nuclear Regulatory Body): licensing process (mandatory)


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**CNSN Resolution No.41/2011**

Guía de seguridad para la práctica de Radioterapia
Rev. 01/11

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**CNSN Resolution No.40/2011**

Guía de seguridad para la práctica de Medicina Nuclear
Rev. 01/11
**Cuba: Distribution of MP**

**Distribution of MP by area**

- Radiotherapy: 7%
- Nuclear Medicine: 29%
- Diagnostic Radiology: 52%
- Radiation Protection: 12%

Source: A. López, President, Cuban Society of Medical Physicists (personal communication, 2016)

**Distribution in LA**

- Radiotherapy (RT): 14%
- Nuclear Medicine (NM): 52%
- Diagnostic Radiology (DR): 11%

Source: S. Guzman, ECI 2015

**Cuba: Diversity by Gender**

Sources:
- Census, Cuban National Statistics Office, ONEI, 2012
- A. López, President, Cuban Society of Medical Physicists (personal communication, 2016)

**Source of Bachelorettes**

- Nuclear Engineering: 33.5%
- BS in Nuclear Physics: 36.5%

70% of Cuban MPs are graduated of nuclear related programs
Cuba: Diversity by Gender

Current students at InSTEC

<table>
<thead>
<tr>
<th></th>
<th>Female</th>
<th>Male</th>
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</thead>
<tbody>
<tr>
<td>General Population</td>
<td>50.2%</td>
<td>49.8%</td>
</tr>
<tr>
<td>Univ. graduates</td>
<td>58.0%</td>
<td>42.0%</td>
</tr>
<tr>
<td>Med. Physicists</td>
<td>27.1%</td>
<td>71.4%</td>
</tr>
</tbody>
</table>

Women in Nuclear Careers:
- BS in Nucl. Phys.: 24%
- Nucl. Engineering: 30%

Cuba: Diversity by Color of Skin

<table>
<thead>
<tr>
<th></th>
<th>White</th>
<th>Mulato</th>
<th>Black</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Population</td>
<td>64.0%</td>
<td>26.6%</td>
<td>9.3%</td>
</tr>
<tr>
<td>% with Univ. level</td>
<td>66.1%</td>
<td>23.6%</td>
<td>10.3%</td>
</tr>
<tr>
<td>Med. Physicists</td>
<td>48.6%</td>
<td>45.0%</td>
<td>8.6%</td>
</tr>
</tbody>
</table>

Sources:
- Galván González D.E., "La Población Cubana según el Color de la Piel" (Cuban Population according to Color of Skin) ONEI, February 2016.
- A. López, President, Cuban Society of Medical Physicists (personal communication, 2016)

Cuban Cooperation in Medical Physics

Diversity helps faster and smoother integration to different environments and cultures
• Lack of promotion of the medical physics (MP) profession
• There are no legal frameworks regulating the MP profession
• Inappropriate professional status and salary
• Few groups of MP with national and international renowned
• MP less recognized than other Physicist at the University
  – Medical Physics = Applied Physics, less status than theoretical or experimental physics
  – Medical Physics = “Technical work”
• Profession not recognized in the general medical environment

D. Venencia, AAPM Annual Meeting 2010

Pres. Obama playing domino at the most popular Cuban TV show. March 23, 2016

It is not easy, but is not difficult either!

Thanks!!