Innovations in biomedical technology for essential health care in Cameroon

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Global Health Catalyst Summit, HARVARD MEDICAL SCHOOL, 26th May 2018, Boston

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What is HEALTH?

"Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity".

*The **WHO Constitution** was adopted by the International Health Conference held in New York from 19 June to 22 July 1946, **signed on 22 July 1946** by the representatives of 61 States and entered into force on 7 April 1948.*

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Cameroon : the paradoxical paradise
One of the wealthiest countries in the world but overwhelming public health problems

CAMEROUN

YAOUNDE
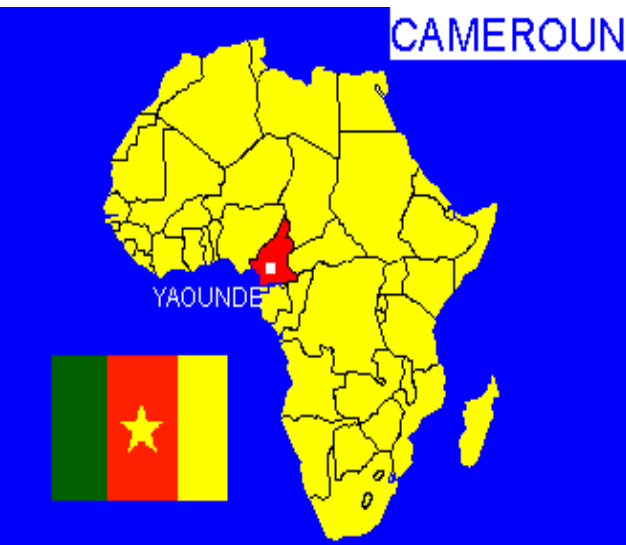
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- Richest country since about 5000 years (Iron age)
- Traumatised by brain drain (Slavery, colonialism, post-colonialism)
- Overwhelming natural ressources (75000km2)
  - ➤ Population 28 millions /
  - ➤ Evergreen rainforest
  - ➤ Abondant water and sun Rainfal
  - ➤ Oil, Iron, Gold, Bauxite, Diamond etc…

3

Cameroon GDP per capita 1960-2018 | Data | Chart | Calendar | Forecast

The Gross Domestic Product per capita in Cameroon was last recorded at 1357.10 US dollars in 2016. The GDP per Capita in Cameroon is equivalent to 11 percent of the world's average. GDP per capita in Cameroon averaged 1151.49 USD from 1960 until 2016, reaching an all time high of 1726.80 USD in 1986 and a record low of 819.40 USD in 1967.

Historical   Alerts   Data   API   Forecast   Consensus

CAMEROON GDP PER CAPITA

SOURCE: TRADINGECONOMICS.COM : WORLD BANK

Context: The health map of Cameroon

- Estimate 28 millions people

- 10 Regions (8 Fr + 2 English speaking)

- 189 Health districts

- 1553 Health facilities

- Less than 2 physicians / 10000 people (World Bank 2014)

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The burden of malaria

- Endemic disease,mostly *Plasmodium falciparum infection* from a mosquito (female *Anopheles)* bite

- Most important decompensation factor in liver and heart diseases

- Highest prevalence of morbidity and mortality

- Main decompensation factor in metabolic diseases

- 40-50% of hospitalisations

- 40% of death in hospitals

- 40% child mortality

- Children and pregnat women most affected

- 3000 deaths in 2017 though mass distribution of bednets and free drugs for children and pregnant women

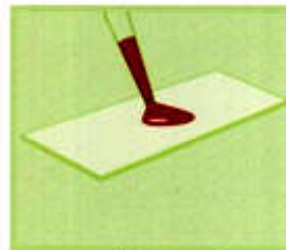**LEHMAN**

2 diagnostic

DAPI pre-treated slides

Fluorescence microscope

Etape 1
Piquer au bout du doigt

Etape 2
Déposer la goutte de sang sur la lame "P-DAPI" au-dessus du réactif. Recouvrir avec une lamelle et attendre 1 minute

Etape 3
Passer à l'observation sur le CyScope en lumière UV

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Our approach

1. Plaidoyer

2. mass diagnostic

Our approach
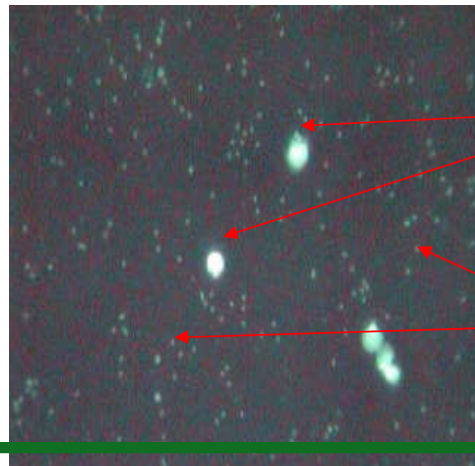
3. Treatment

4. Barrier

Results

- ✓ **3 microscopists 300 tests/ 8 hrs**
- ✓ **1 min 36 sec / test**

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Malaria prevalence in enterprises
2012 - 2016

	2012	2013	2014	2015	2016	TOTAL
ENTREPRISES	3	/	9	15	8	**35**
Screened	823	/	1590	2178	1092	**5683**
Positives	203	/	481	657	344	**1685**
PREVALENCE (%)	24,67	/	30,25	30,17	31,50	**29,65**

Malaria prevalence in communities
2012 - 2016

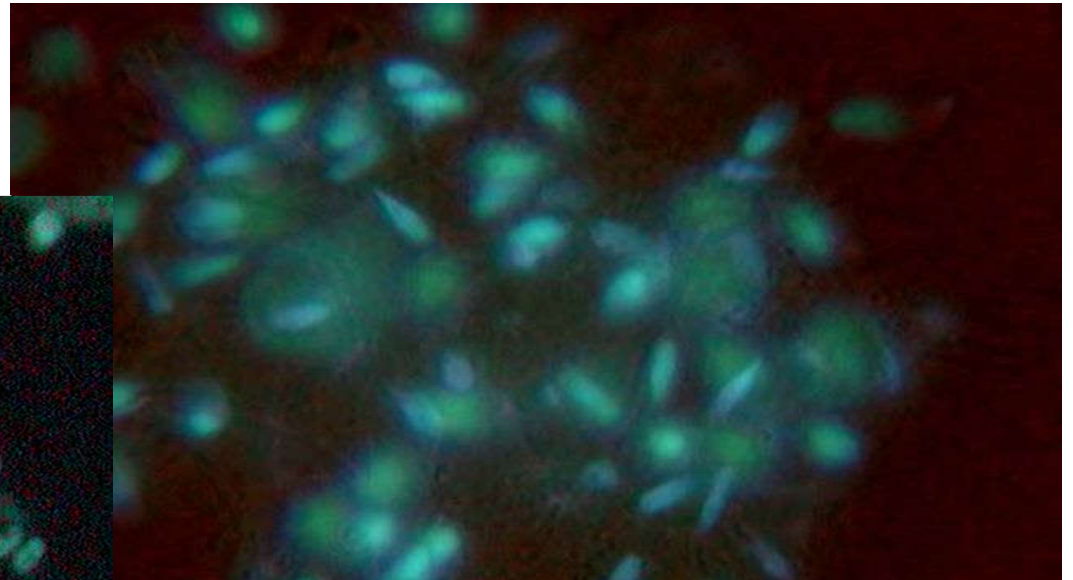|	2012	2013	2014	2015	2016	TOTAL
COMMUNITIES	6	7	7	4	6	**30**
Screened	2191	2122	1501	907	1345	**8066**
Positives	887	811	538	266	403	**2905**
PREVALENCE (%)	40,48	38,22	35,84	29,33	29,96	**36,02**

Multidisciplinary approach for malaria elimination
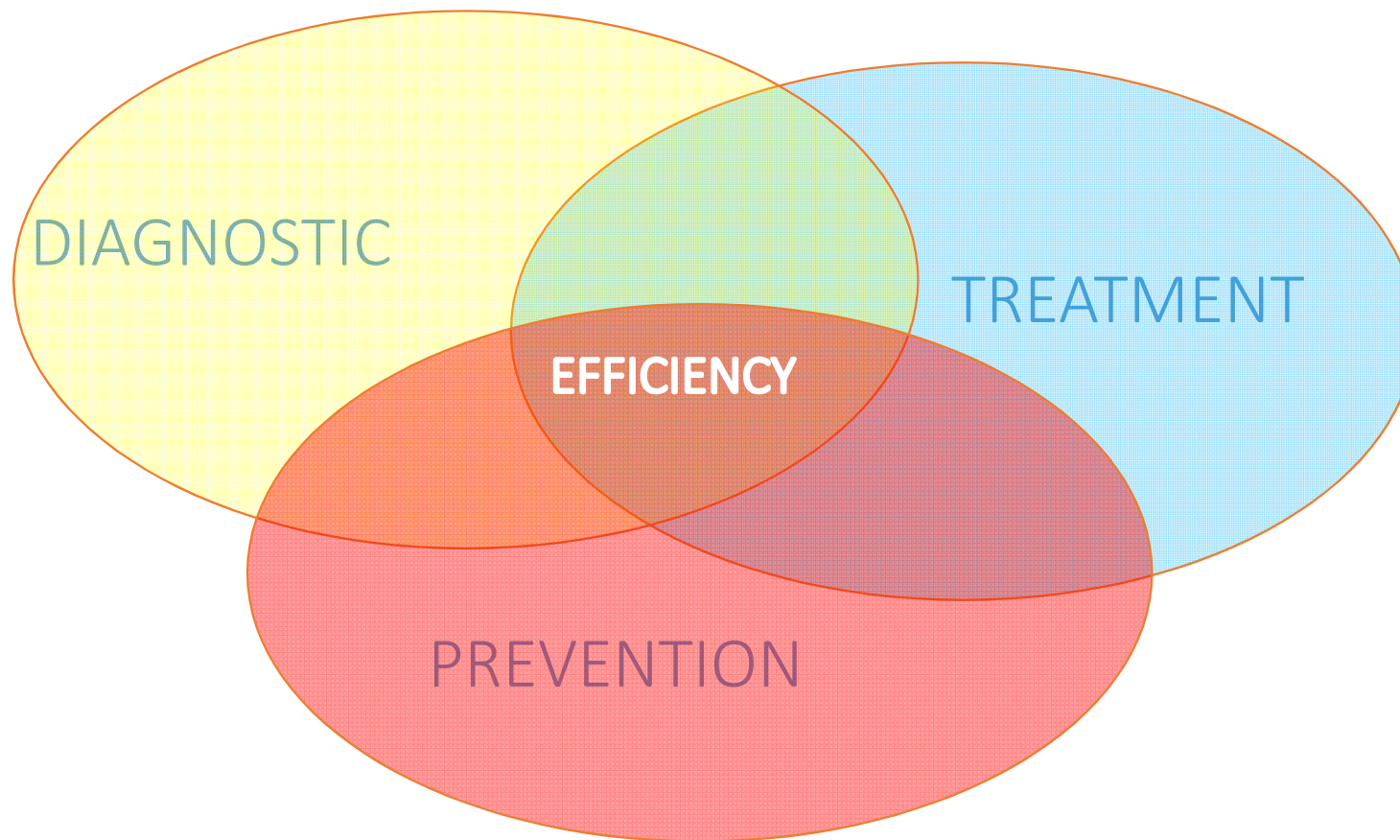
Other neglected tropical diseases

Shistosoma haematobium in urine pellet

Loa Loa in blood

New led fluorescence microscopes
For Active Case Detection in Douala and remote rural areas

CyScope®

DISCONTINUED

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HIV/AIDS

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Epidemiology of HIV in Cameroon

2nd worst affected country in West and Central Africa (WCA) region

• Average HIV prevalence: 4.3 % among 15-49 years old

•Decrease from 5,5% in 2005 probably related to improvement of access to ARVs & prevention activities

5.6 % in children in 2014 thanks introduction of Option B+ at 489 PMTCT sites,

• 612,445 PLHIV in 2014

• 45,338 under treatment (<350 CD4/µl)

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CANCER

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Cancer Treatment in Cameroon

very expensive

- Chemotherapy:200 USD/month

- Surgery : 600-1000 USD

- Radiotherapy : 300–500USD

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Radiotherapy: Two Cobalt 60 bombs

- Management of Cancers is done mainly in 06 oncology services the reference hospitals
- Medical oncology in Hôpital Laquintinie de Douala and in Hôpital Général de Yaoundé
- Oncology and palliative care in Bonassama District Hospital
- Radiotherapy and Oncology service of Hôpital général Douala
- Paediatric oncology Service of the Mother and Child Centre of the Chantal Biya Foundation
- Service of haemato-paediatric oncology of Chantal Biya Fondation
- Service of surgical oncology at theMbingo Baptist Hosital Bamenda (mainly by visiting oncologists)
- The radiotherapy service of Hôpital Général de Yaoundé is currently being rehabilitated.
- Furthermore, some medical oncological consultations are done in confessional hospitals of the Cameroon Baptist Convention and Hôpital Protestant Norvégien, Ngaoundéré)

Human Resources

Acute shortage of specialised personnel to provide standard care for cancer patients.

- 05 onco-radiotherapist 02 women.

- 06 Medical oncologists distributed as follows: 03 inYaounde, 01 in Douala and 02 awaiting full employment

- Oncological Surgeons (03) all in Douala

- Till date, Only 30 medical professionals trained in palliative care. However most of them carry out routine nursing care in health facilities nation-wide.

- 15 Anatomo-Pathologists

Nanoparticles: the future

- Nanoparticles awaken immune cells to fight cancer

SCIENCE , Robert F. Service Jan. 5, 2017

- Recent success of silver nanoparticles combined to various molecules

- Millions of plant with known healing properties can be used

Journal of Materials Research and Technology (2017)

- **Sizing of silver and palladium nanoparticles mediated plant extract and ionic liquid by different methods: powder x-ray diffraction and dynamic light scattering**

- **Mosquito larvicidal effect of silver nanoparticles mediated *Cymbopogon citratus* extract**

NEEDS

PRODUCTS

- Cytotoxic drugs and those used as adjuvant therapy
- Supportive materials for patients and those who provide them assistance (Information sheets on chemotherapy, radiotherapy, commonest cancersetc.)

TRAINING OF HEALTH PROFESSIONALS

- Training in palliative care for MD and nurses
- Refresher courses for MD
- Training and refresher courses for nurses and radiotherapy technicians

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Innovations in biomedical technology
Innovations in the use of natural substances

A great challenge: innovative tools to be more available

Two examples

- Infectious diseases: Fluorescence microscopy detecting parasites in 2 min

- Non communicable diseases: Nanoparticles from local medicinal plants Eg. *Annona muricata* = Soursop, Corrossol)

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Technology innovation and the challenge of After sales service

Maintenance of Flow cytometers In towns & remote settings
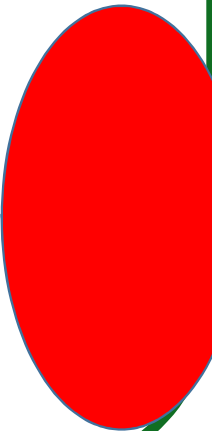
General conclusion

➢ Cameroon is a very rich country but the ignorance of our history kept us blind from our heritage

➢ The heath system is poor due to incorrect tackling of the main issues like in other sectors e.g. infrastructure, education, nutrition etc…

➢ Innovations can be fostered by the use of novel technology and nanoparticles

➢ There is need for collaboration (South- South / North – South) in training, care, equipment…

➢ There is hope for brighter future

Aknowledgement
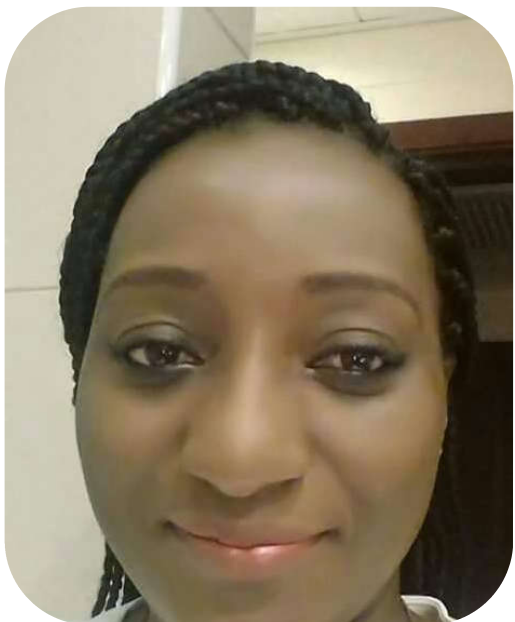
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Vielen Dank

Merci

Thanks