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# **Innovation in Oncology : Why to Talk about Efficiency and Sustainable Accessibility ?**

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# Le patient cancéreux : de la prévention à la guérison

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- La prévention (mode de vie, médicamenteuse)
  - Le dépistage (ciblé ou de masse)
  - Le diagnostic (Imagerie classique et moléculaire)
  - L'approche thérapeutique multidisciplinaire
  - La prise en charge des toxicités aiguës, subaiguës et chroniques (toute discipline)
  - La prise en charge des co-morbidités (toute discipline)
  - Le support psychologique et la réinsertion sociale
  - Le suivi
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# **La survie et la qualité des soins du patient cancéreux dépendent:**

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- **De la prise en charge cancérologique et non-cancéreuse**
  - **Du niveau élevé et compétitif de la recherche clinique, translationnelle et fondamentale**
  - **De l'expertise des équipes soignantes (éducation continue) et de leur dévouement**
  - **Des conditions humaines et financières de l'institution, de l'équipe soignante et du patient**
  - **De la bonne santé du « Health Care System »**
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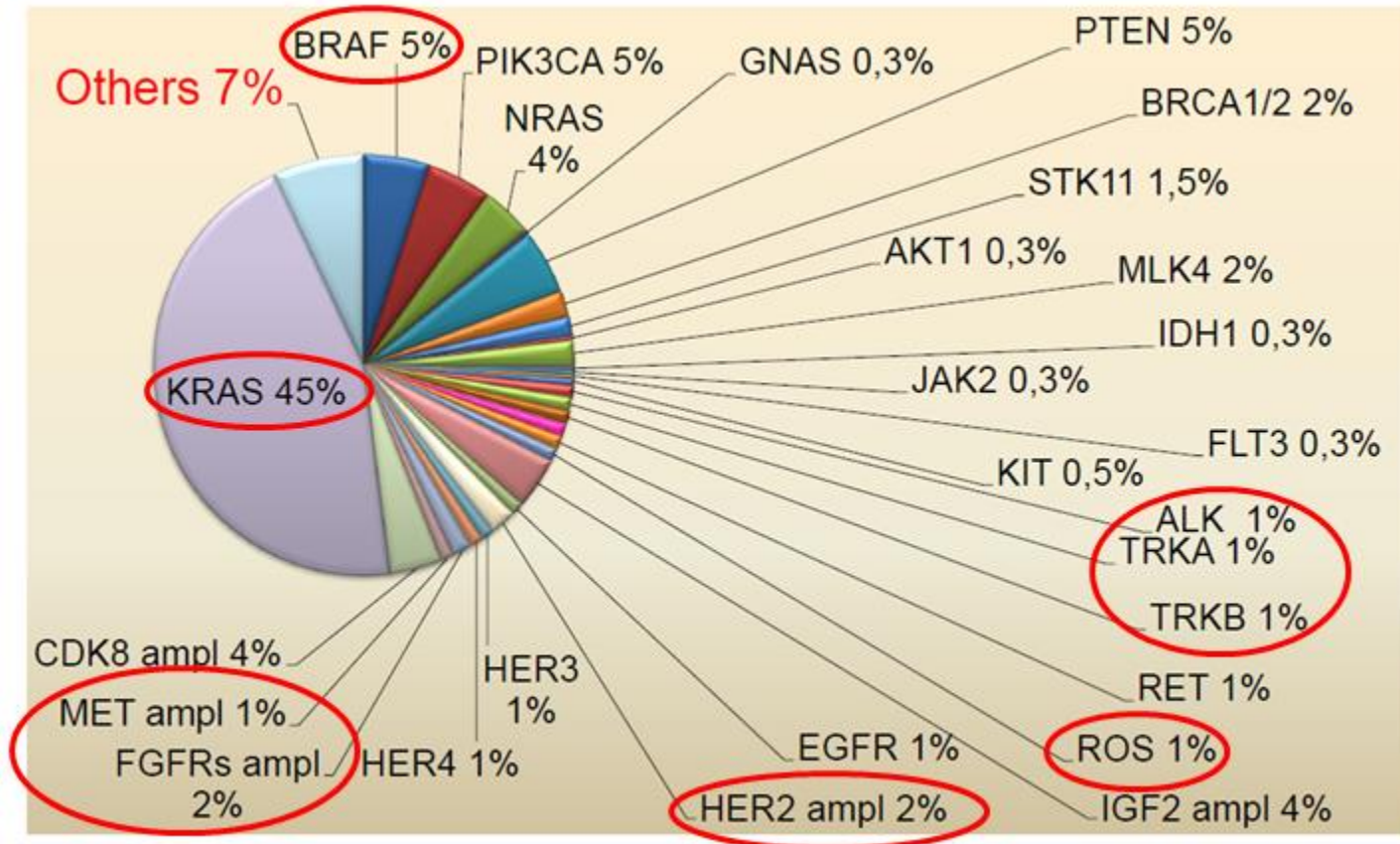
# Le diagnostic anatomo-pathologique implique:

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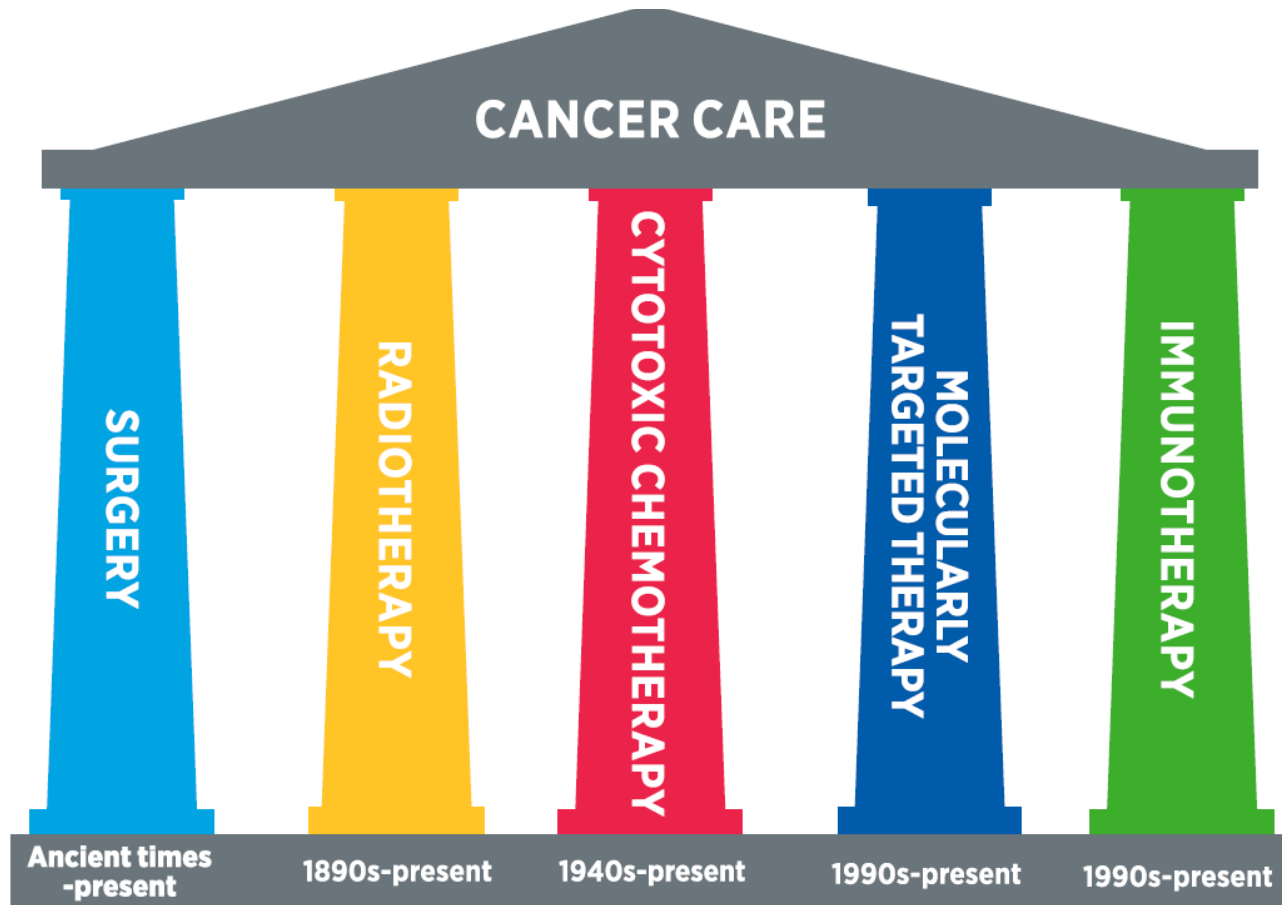
- L'histologie
- L'immunohistochimie
- La biologie moléculaire
- Le séquençage tumoral
- Le profilage génomique

a subdivisé les tumeurs en multiples cancers génomiquement différents

# Genomic classification of Colorectal Cancer



# The Pillars of Cancer Care



# Therapeutic approaches of cancer : Innovations

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- **Surgery (robotic...)**
  - **Radiotherapy (targeted, proton...)**
  - **Chemotherapy (targeted via antibody drugs conjugates)**
  - **Molecular – targeted therapy**
  - **Immunotherapy**
- } A huge development  
(tsunami of new  
drugs)
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# **Background of Precision Oncology in Medical Treatment of Cancer**

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- 1. The emergence of molecular technologies enabling deep tumor biological analysis and understanding**
  - 2. The identification of targets/pathways involved in the carcinogenesis process (drivers) and drug sensitivity/resistance (predictive biomarkers)**
  - 3. The discovery of “selective” targeted therapies**
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# Targets importantly involved in carcinogenesis and their inhibitors (1)

Target	Tumor	Inhibitor	Predictive markers of sensitivity/resistance	Disease setting
ER	Breast	Tamoxifen, AI, fulvestrant	ER expression ER mutation (Resistance)	Adjuvant & advanced disease
EGFR	Head&neck	Cetuximab	-	Locally/advanced H&N cancer
EGFR	NSCLC	Gefitinib/Erlotinib/ Afatinib	Mutation of EGFR	Metastatic NSCLC
EGFR	Colorectal	Cetuximab Panitumumab	Ras status (Resistance)	Metastatic colorectal cancer
HER-2/neu	Breast, gastric	Trastuzumab, Pertuzumab Lapatinib T-DM1	HER-2/neu amplification	Adjuvant (breast) & advanced disease (breast, gastric)

# Targets importantly involved in the carcinogenesis and their inhibitors (2)

Target	Tumor	Inhibitor	Predictive markers of sensitivity	Disease setting
VEGF	NSCLC, colorectal, renal, breast, ovary, cervix	Bevacizumab, Aflibercept (colon)	VEGFA?	Advanced disease
VEGFR	Hepatocarcinoma Colorectal Gastric	Sorafenib Regorafenib Ramucirumab	-	Advanced disease
VEGF(R); M-TOR	Renal	MTKs, Bevacizumab Everolimus Temsirolimus	-	Advanced disease
VEGFR; M-TOR'	Neuroendocrine(pancreas), Soft tissue sarcomas	Sinutininib, Everolimus Pazopanib,	-	Advanced disease
VEGFR, RET	Thyroid	Vandatinib, Sorafenib Lenvatinib	-	Advanced disease
M-TOR	Breast	Everolimus	-	Advanced disease
CDK 4/6	Breast	Palbociclib, ribociclib	-	Advanced disease

# Targets importantly involved in the carcinogenesis and their inhibitors (3)

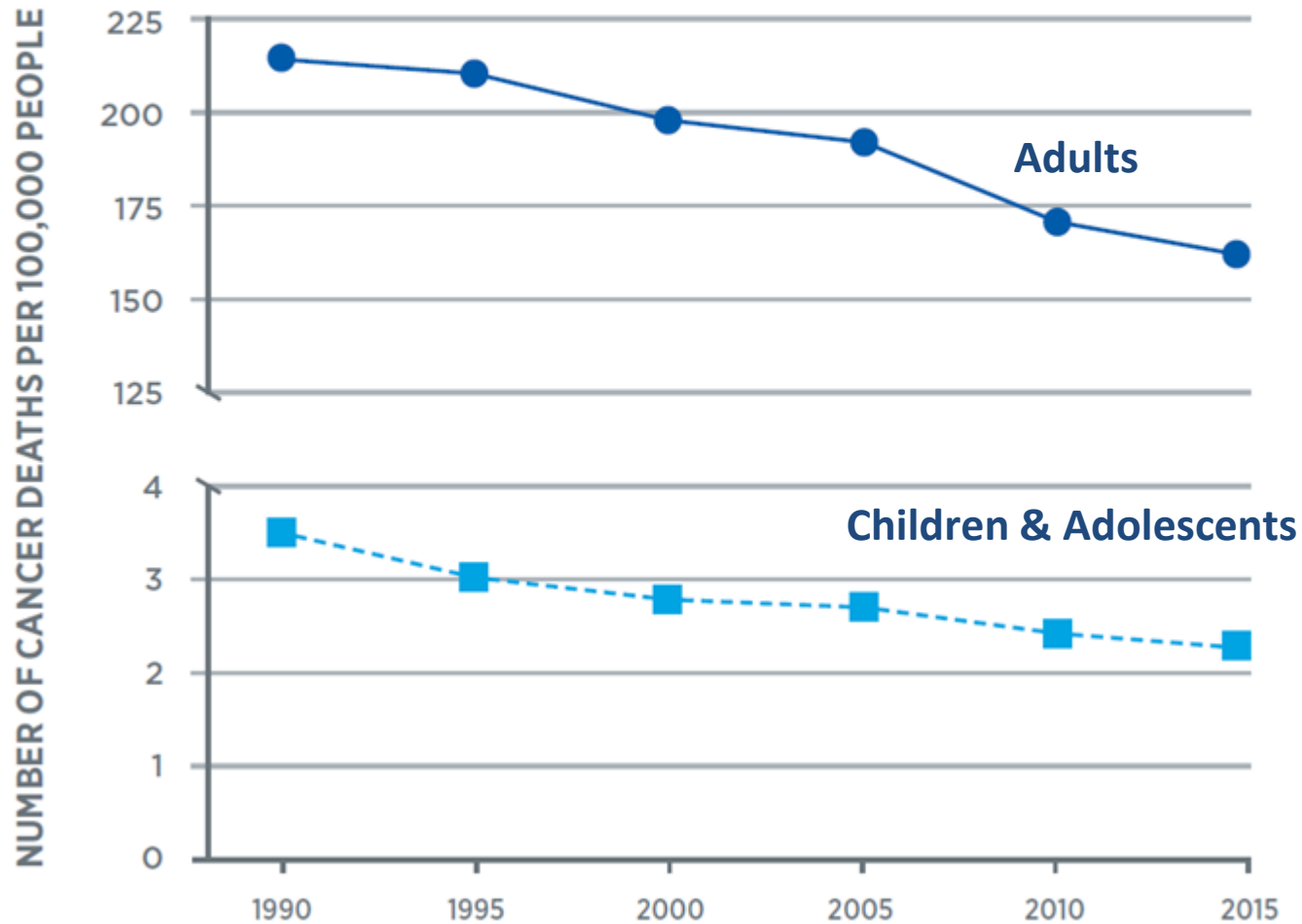
Target	Tumor	Inhibitor	Predictive markers of sensitivity/resistance	Disease setting
C-Kit	GIST	Imatinib Sunitinib, Regorafenib	C-Kit mutation PDGFR mutation	High risk or metastatic GIST
EML4-ALK ROS1	NSCLC	Crizotinib, Ceritinib	EML4-ALK translocation/ROS1	Advanced NSCLC
RANKL	Bone metastases; Giant cell tumors	Denausumab	-	Advanced disease
Hedgehog	Basal cell carcinoma	Vismodegib	-	Advanced disease
BRAF, MEK	Melanoma	Vemurafenib Dabrafenib Trametinib	BRAF mutation	Advanced disease
PARP	Breast, ovary (BRCA tumors)	Olaparib, niraparib	BRCA mutation	Advanced disease
CTLA4	Melanoma	Ipilimumab	-	Advanced disease
PD-1/PD-L1	Melanoma, NSCLC, RCC, gastric, H&N, urothelial, ...	Nivolumab, Pembrolizumab,...	(PD-L1 protein) ?	Advanced disease
Androgen receptor; immune system; Met	Prostate	Aberaterone, Enzalutamide, Sipuleucel-T, cabozantinib	Androgen receptor variant 7 (Resistance)	Advanced disease

# Immune therapy approaches

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- **Checkpoints inhibitors**
  - **Adoptive cells therapy approaches (TILs, TCR, CAR)**
  - **Intratumoral: Oncolytic viruses (e.g., T-VEC)**
  - **IDO inhibitors**
  - **Bispecific antibodies**
  - **Vaccines**
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# Making Progress against Cancer



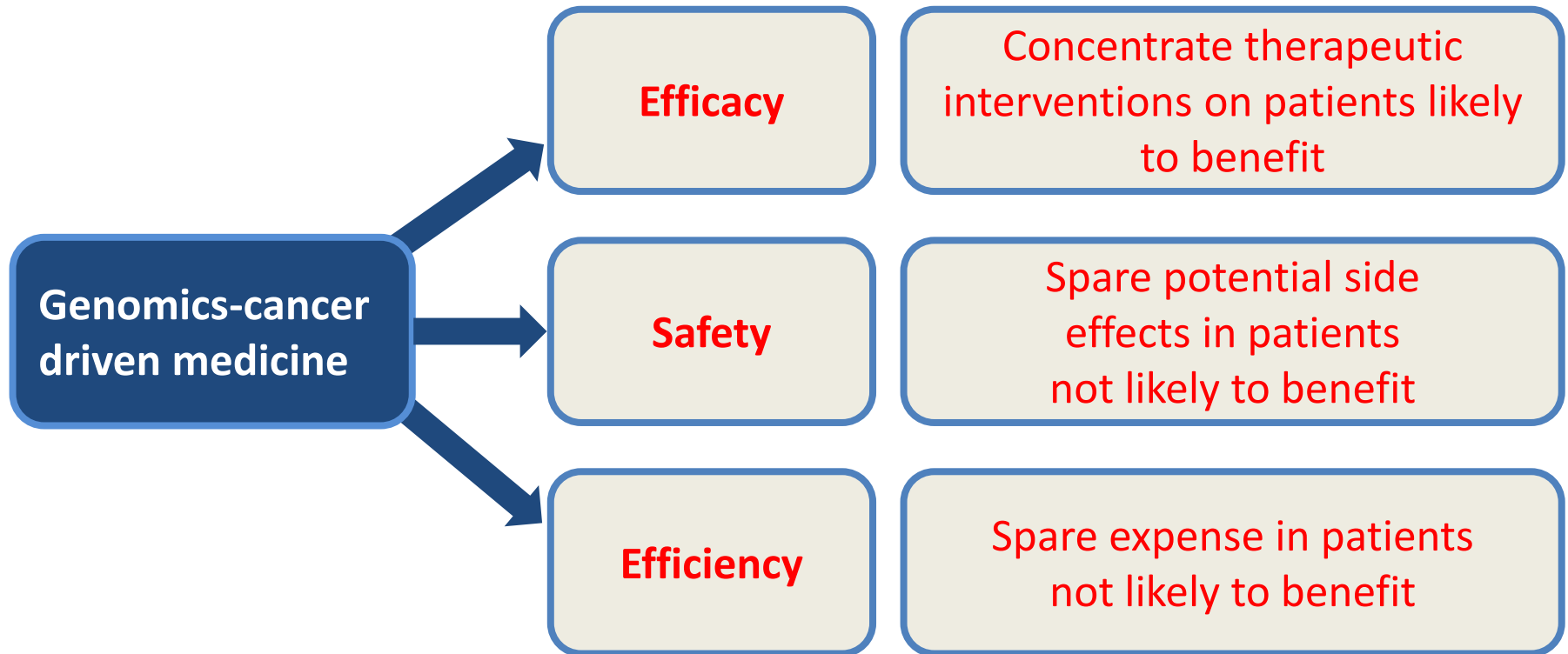
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# Genomics-driven cancer treatment has the great potential to improve clinical outcomes



But there are many challenges and limitations which need to be overcome !!!

# Keynote comment : Reimbursement for molecular targeted anticancer agents (MTT)

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- Regulatory agencies will need to be prepared to assess a large variety (tsunami) of new biological agents
- Health-care system will need to have a long-term strategy
- The identification of patients who are most likely to benefit from MTT should be the primary objective of academic researchers and the pharmaceutical industry (to reduce the costs)
- Rigorous pharmaco-economic studies must be part of the new drug development and marketing process
- Efficacy, safety and cost-effectiveness of new drugs must be periodically assessed
- The aim : Increase efficiency and the number of patients treated and to decrease drug-related costs

# Why modern therapy will impact the organization of healthcare in cancer centers? (1)

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- **Positive results were observed in solid and hematological cancers**
- **A significant number of patients will be treated and might be responding for a long duration and so will be treated for a long period**

 **The need of a reorganization of outpatient clinics**

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# Why modern therapy will impact the organization of healthcare in cancer centers? (2)

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- More consultations (and human resources) are needed to follow these patients
- The number of survivors is increasing. Medical problems of these survivors need to be managed by multidisciplinary teams (social, psychological and medical levels)



The need of a reorganization of existing frameworks

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# Looking to the future

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- **Innovations in science and technology will shape the future of clinical cancer care**
  - **Integration and mining of health care data from various sources will probably improve patient outcomes**
  - **Liquid biopsies have the potential to transform early detection, diagnosis and treatment of cancer**
  - **More hereditary cancers are identified and need specific cancers**
  - **How to manage life after cancer**
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**Thank you**

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