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*If it were not for the great variability among individuals, medicine might as well be a science and not an art.*

Sir William Osler  
Johns Hopkins School of Medicine  
Baltimore 1892

# Human genome – what does our genes do?



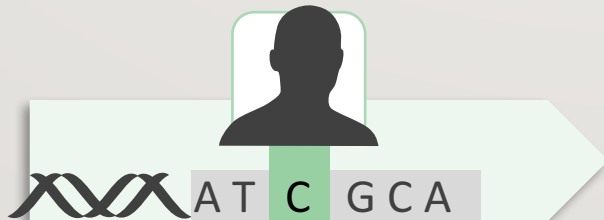
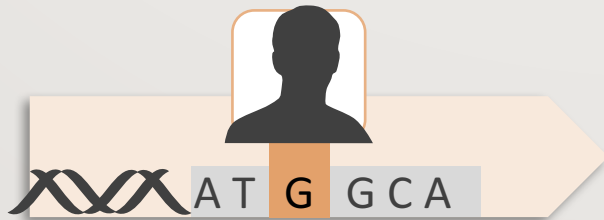
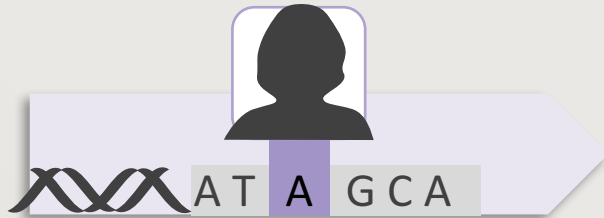
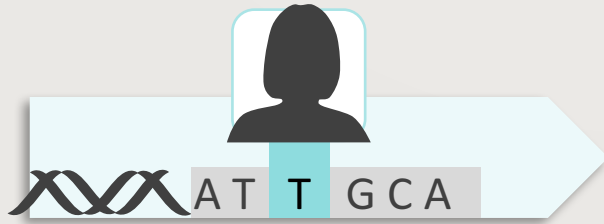


**GENOMICS**

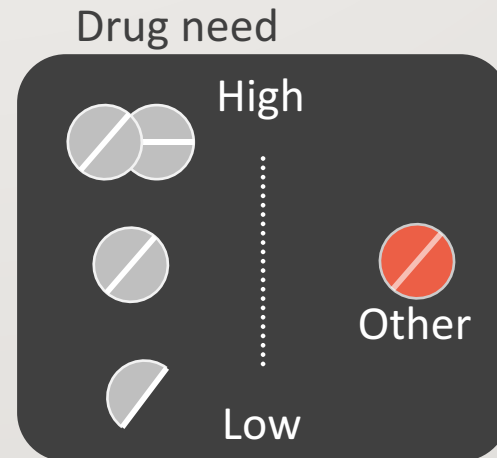
# Understanding human diversity

David B. Goldstein and Gianpiero L. Cavalleri

Variation : 1 per mille or 6-10 millions small differences  
that together constitute our  
**individual genetic "make-up"**



⋮  
Variability; SNPs



All artwork:



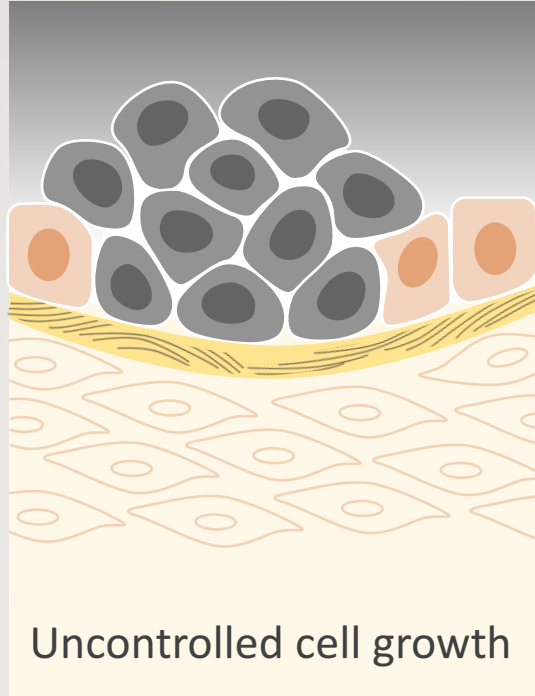
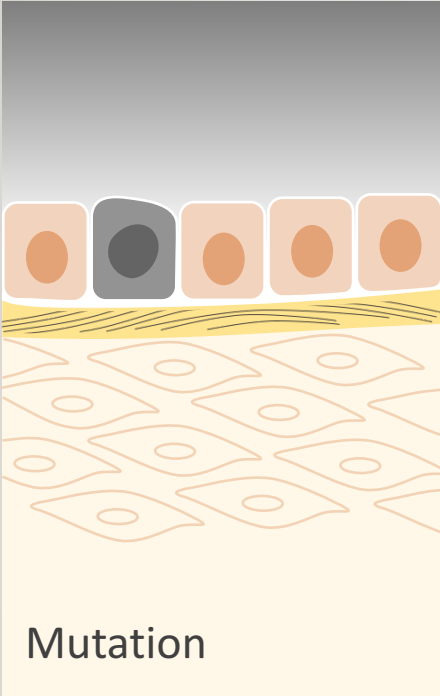
## Precision Medicine Challenge

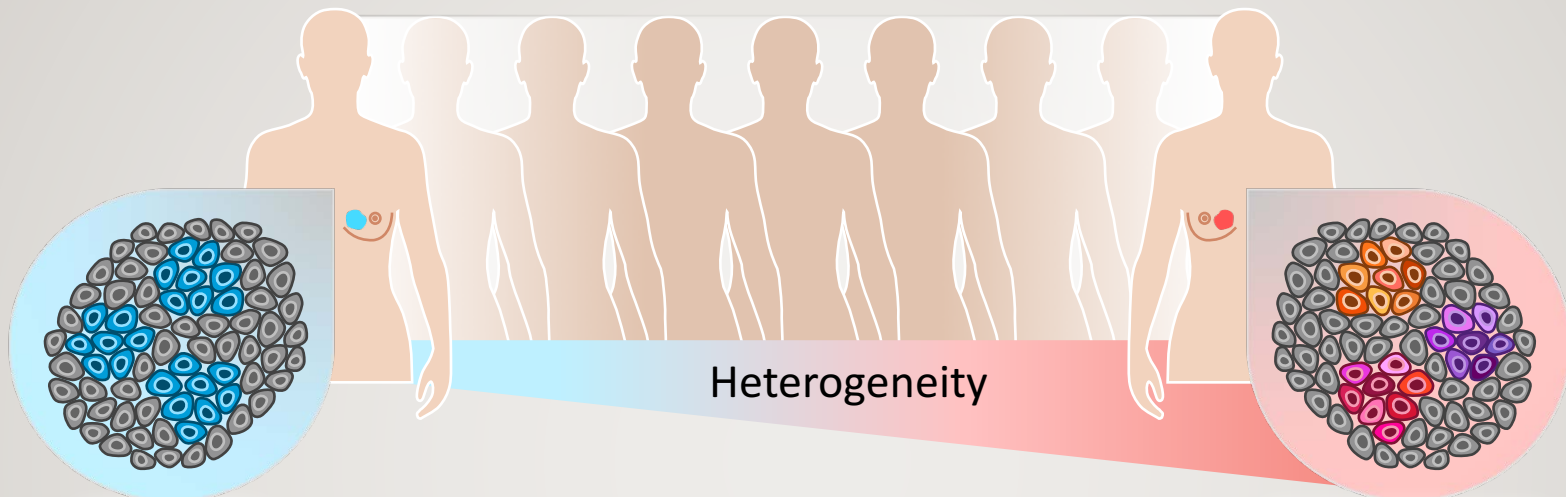
- Each patient his or her disease
- One disease in each patient
- Observations are  $n=1$
- Challenges disease classification and diagnosis systems



## Future in Molecular Medicine

- Know all disease genes
- Diagnose (but no treatment..)
- Preventive measures
- Targeted and personalized treatment
- FUTURE IS NOW – ALREADY STARTING IN CANCER TREATMENT



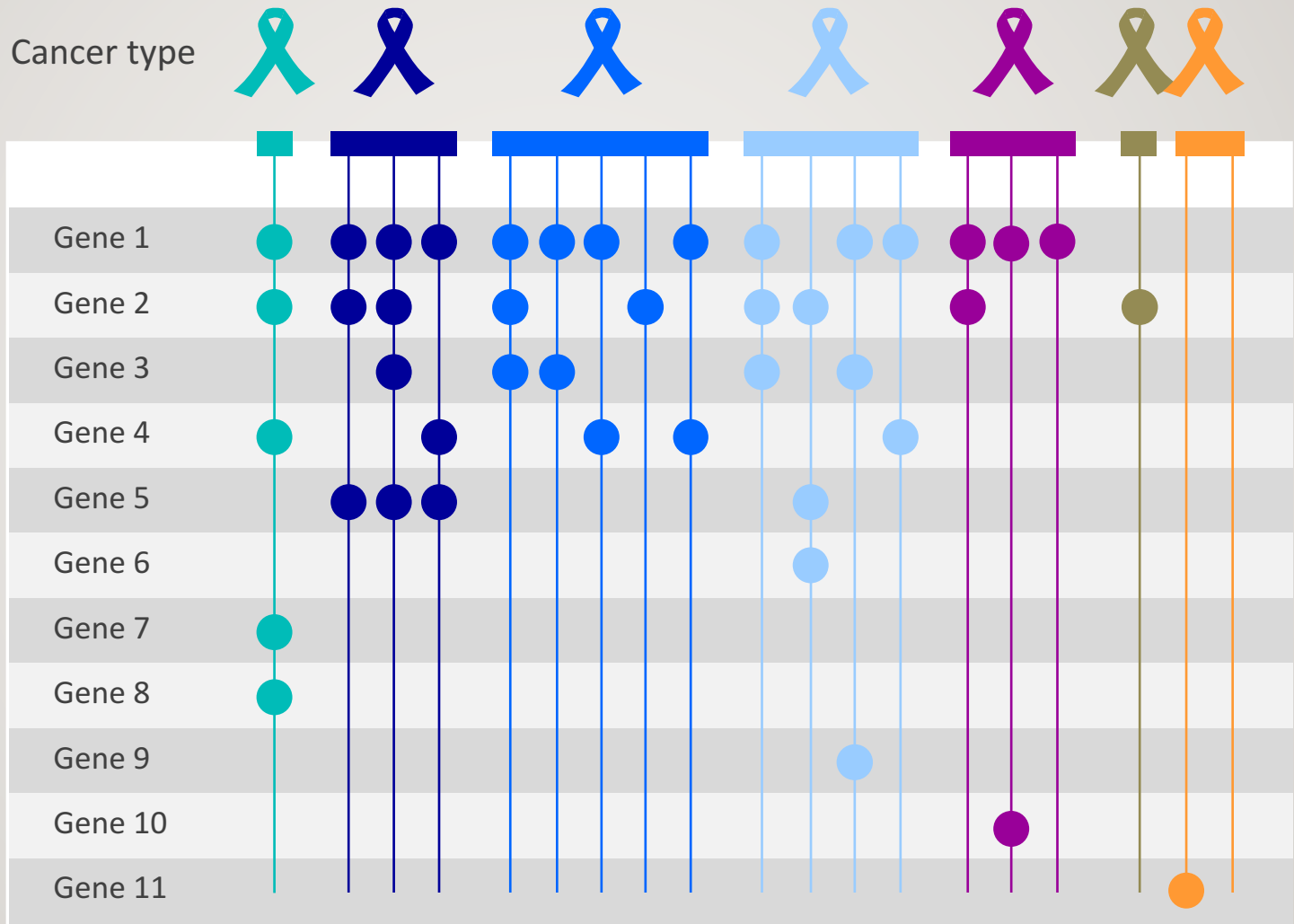


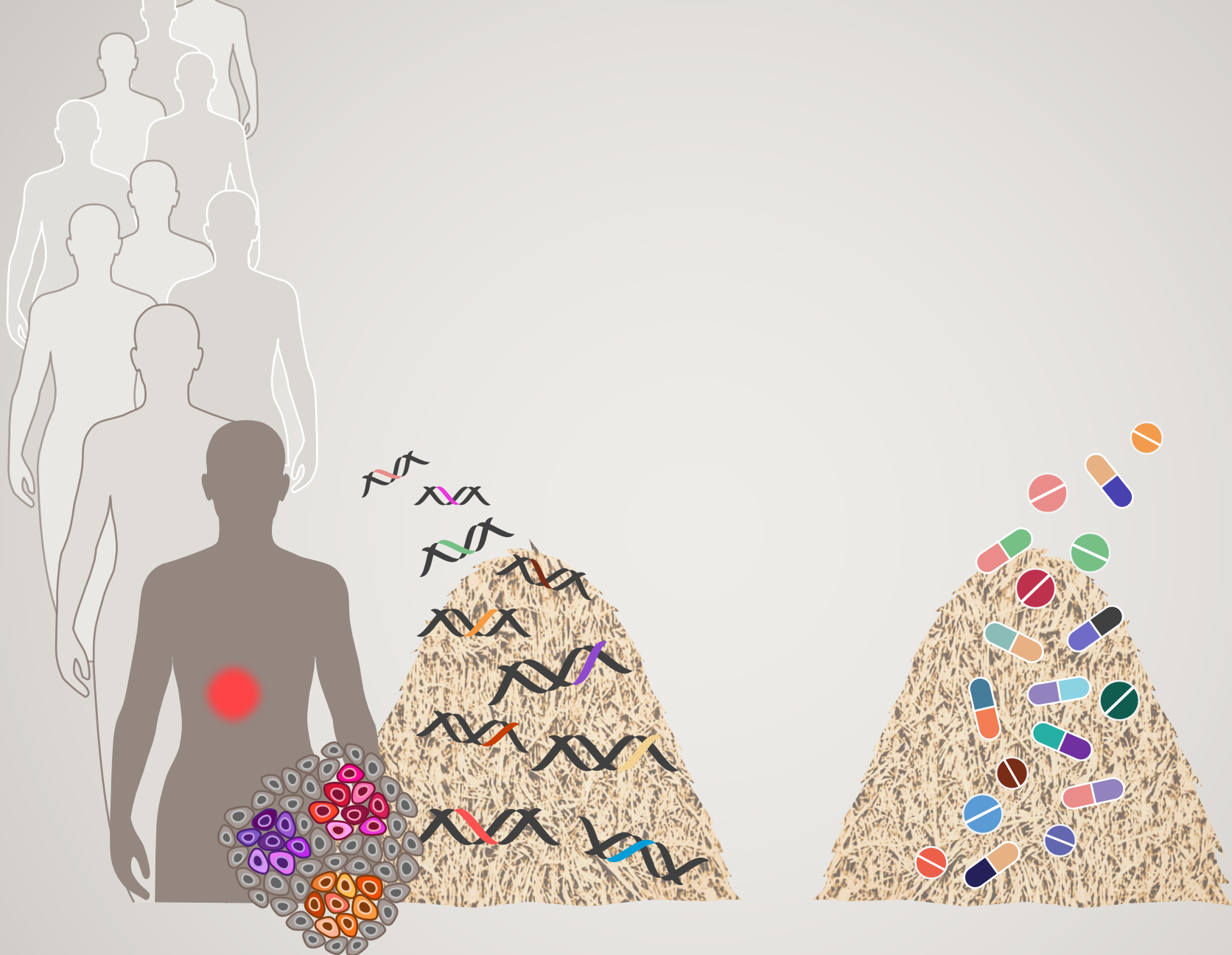
Few mutations

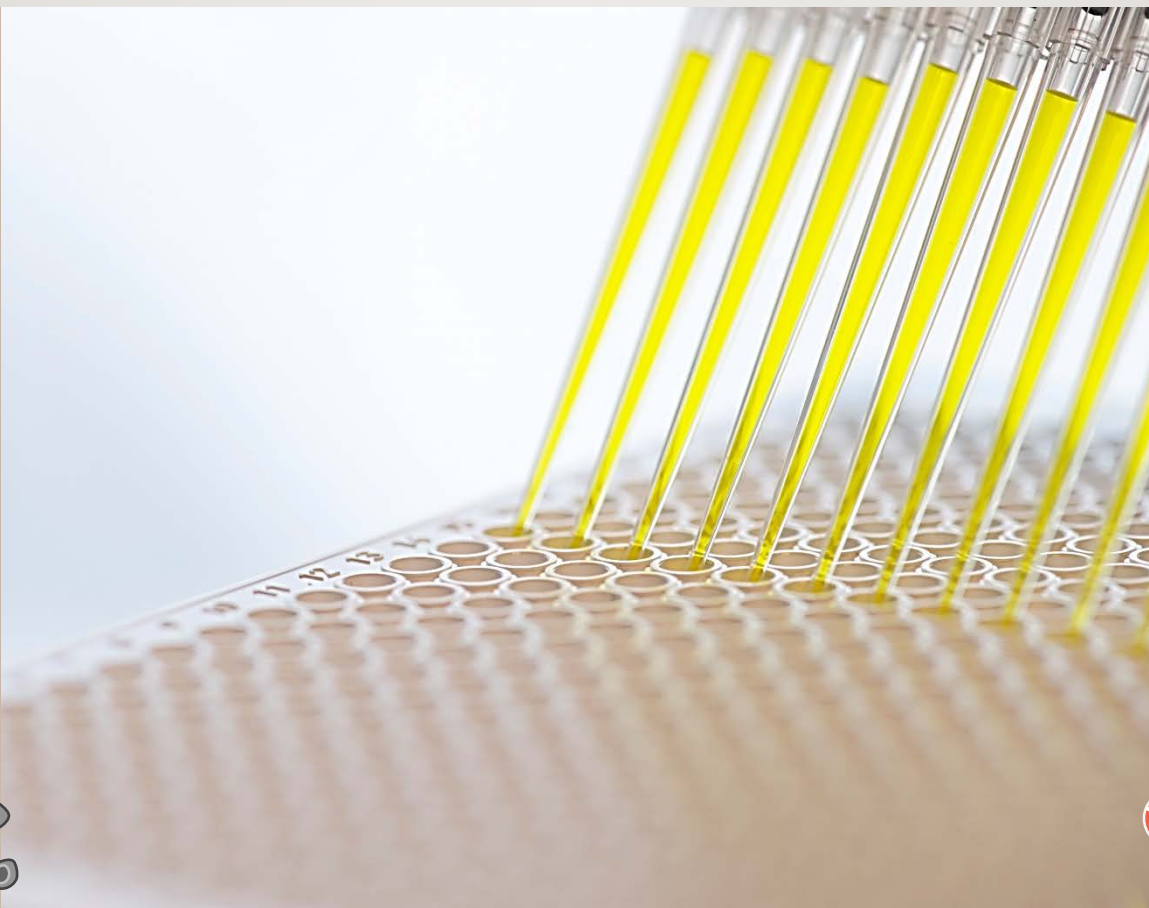
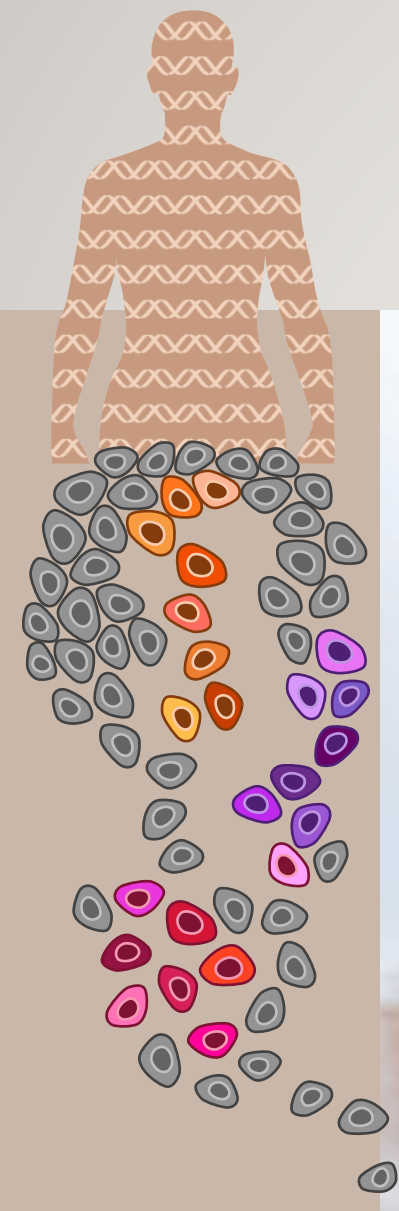


Many mutations



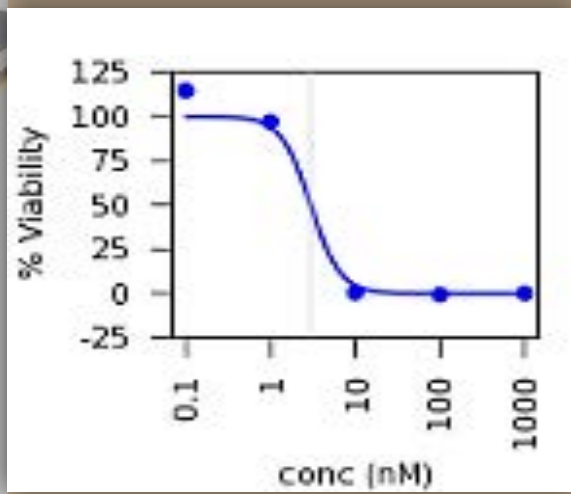
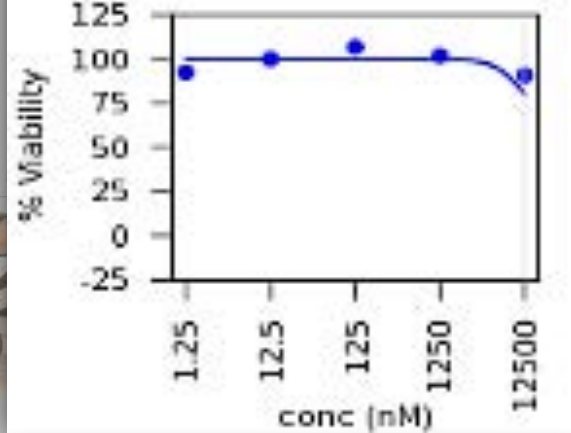
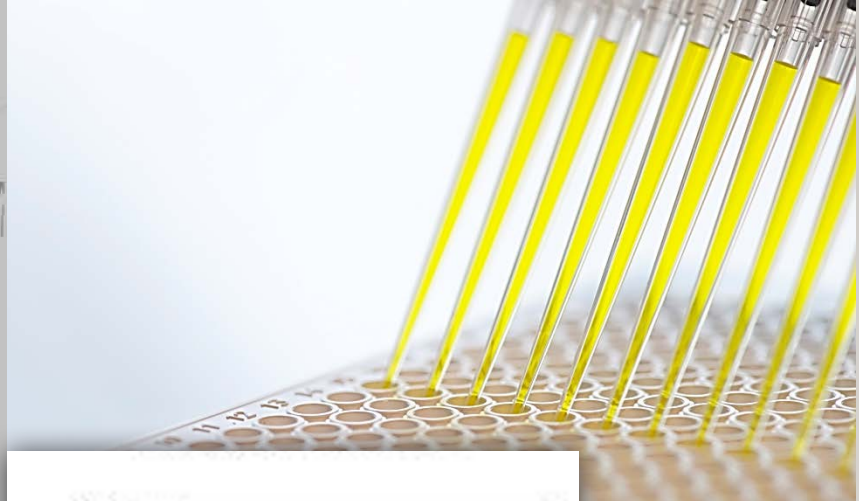






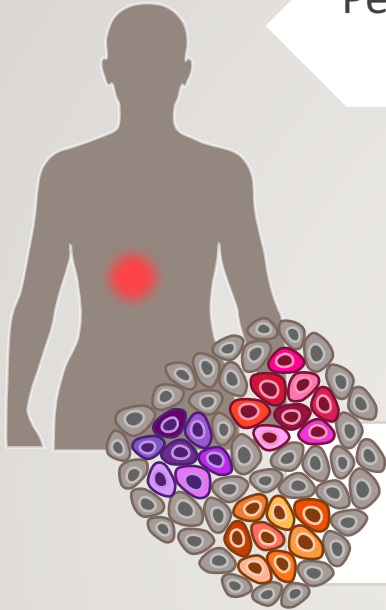
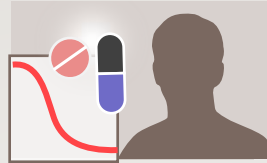
Hematology pipeline project: Taskén / Munthe / Tjønnfjord & Schjesvold / Frigessi groups / NOR-OPENSREEN



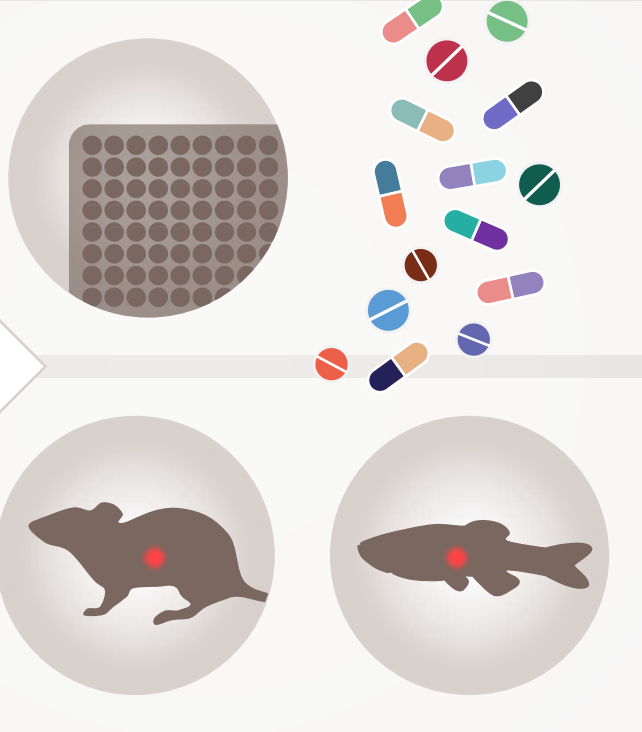


Single drug or combination

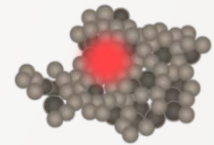
Personalized therapy



Sample

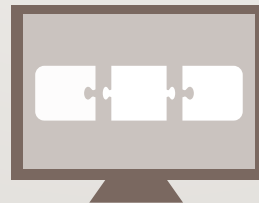
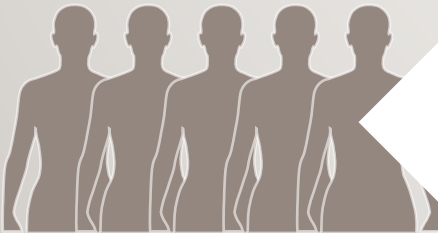


Omics



(...)

New therapy



Iterative learning

PERSONALIZED MEDICINE can lead to a redefinition of the term "*evidence-based medicine*" as not only will it be possible to determine *whether* a treatment is effective for anybody, but also to determine for *whom* does it give clinical benefit.