

About principles, activities and resources

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Minerals, fish and genetic resources

Mineral resources

- Extractive
- Finite and depleting
- High environmental impact
- Exclusive licenses
- High investment
- High technology requirements
- Value created at sea
- Limited market

MGR

- Non-extractive
- Non-depleting
- No to low environmental impact
- ?
- Medium to High investment
- High technology requirements
- Value created exclusively on land
- Limited market

applying principle

Common heritage of mankind:

- Principle related to *resources*
- Linked to the management of resources
- Important components: benefit sharing, future generations, non-appropriation, joint and sustainable management

Freedom of the high seas

- Principle related to *activities*
- Not an unrestricted freedom

Management of MGR

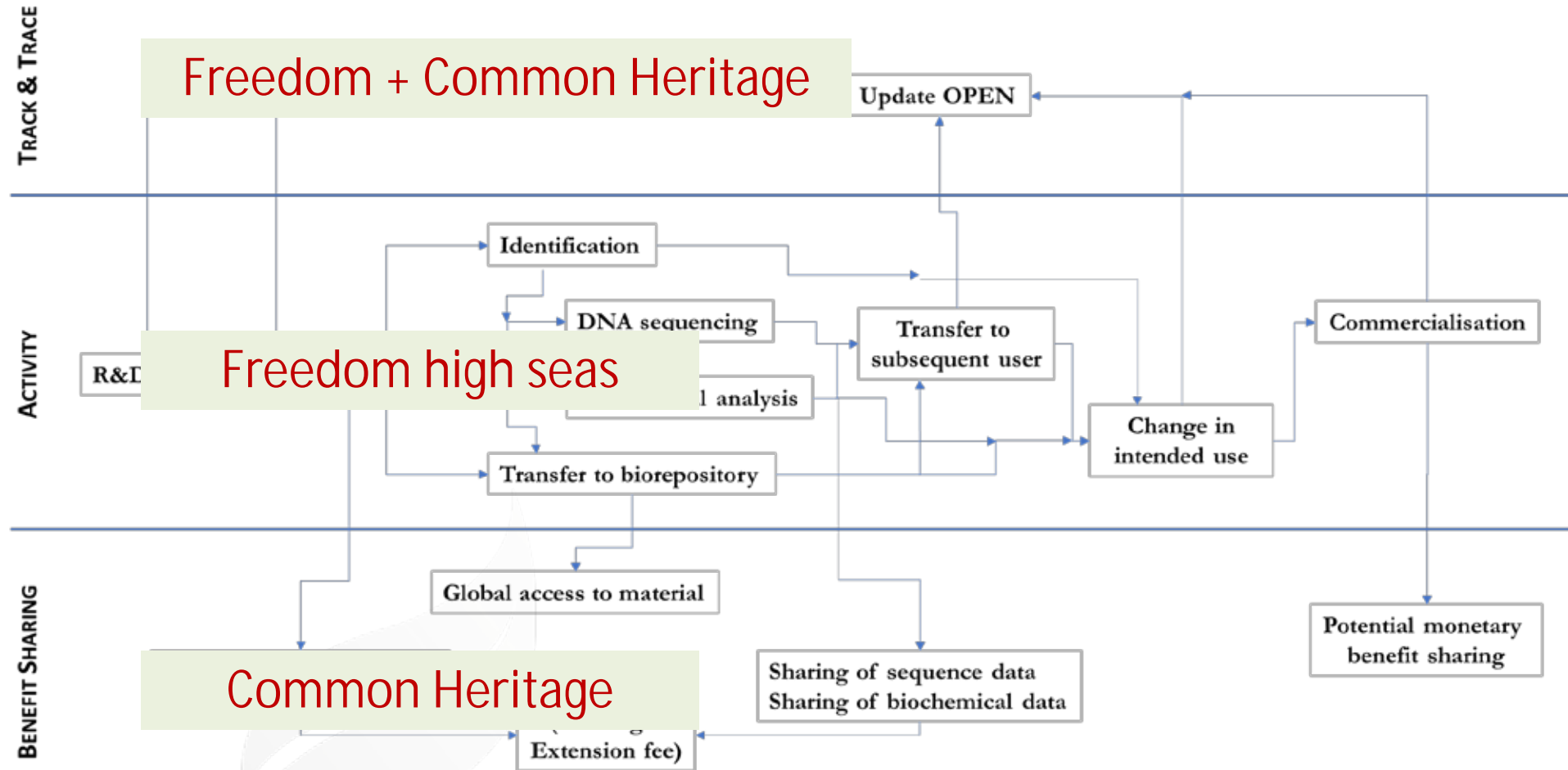
Benefit sharing

Capacity building

Management of (M)SR
on MGR

Track & trace

Mare Geneticum



Mare Geneticum and the principles

Common heritage

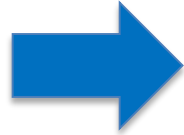
- Benefit sharing
- Joint management (e.g. biorepositories)
- Future generations (e.g. curation)
- Non appropriation (open access + biorepositories)

Freedoms

- In principle no restriction to the MSR activity linked to MGR
- Not unrestricted
- Limitations depending on location (MPA), gear (impact) and volume

Supportive vs restrictive

In situ
organism



Ex situ
Organism/Genetic material



In silico
Genetic resource



Mandatory benefit sharing

- Meaningful
- High impact for developing states and for the scientific community
- Low 'cost' to the users
- Search for a bundling of resources available to BS

(Mandatory) benefit sharing

- Sharing of metadata
- Sharing of GSD
 - *Possibility for extended embargo period for a fee*
- Sharing of biochemical data voluntary
- Engagement in CB and TT
 - *Possible idea: organized through research funding organizations*

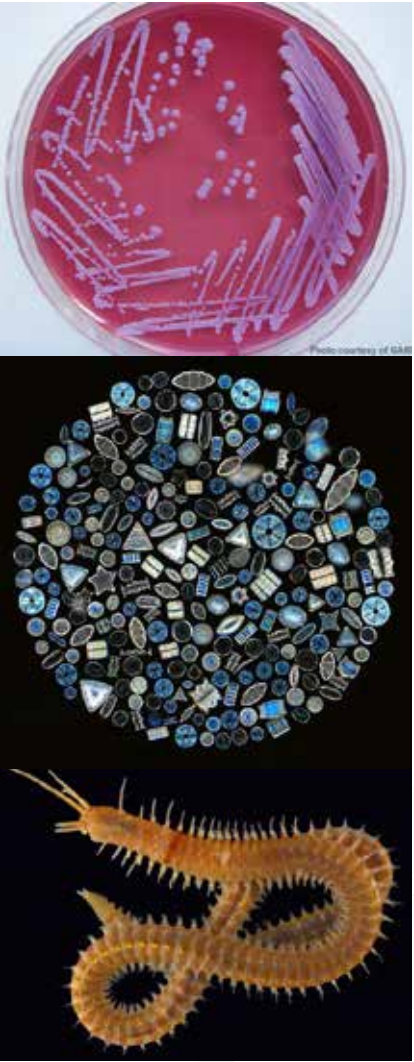
Types of Data the *Mare Geneticum* Proposal Could Cover:

Categories of information	Explanation	Types of data
Data only	Raw data (e.g. genetic sequence data)	<ul style="list-style-type: none"> • Metadata associated with the samples • Initial taxonomic analysis of the samples • Genetic sequence data (DNA) • Transcriptome data (RNA of the genes that are functional at that time) • Automatic gene/transcriptome function annotations • Protein sequence data (DNA/RNA data automatically translated to give amino acid sequence)
Data and analysis	Genetic sequence data which has been annotated with putative gene functions using an algorithm	<ul style="list-style-type: none"> • Initial taxonomic analysis of the samples (DNA methods?) • Automatic gene/transcriptome automatic function annotations • Protein sequence data (DNA/RNA data automatically translated to give amino acid sequence) • <i>Protein structure data (Embargo)</i> • <i>Metabolite data (mainly commercial databases)</i>
Data, analysis and interpretation	Critical evaluation of the data and its analysis conducted by an expert	<ul style="list-style-type: none"> • Full taxonomic analysis of the samples • Manual gene/transcriptome function annotations • <i>Protein structure data (Embargo)</i> • <i>Metabolite data (mainly commercial databases)</i>

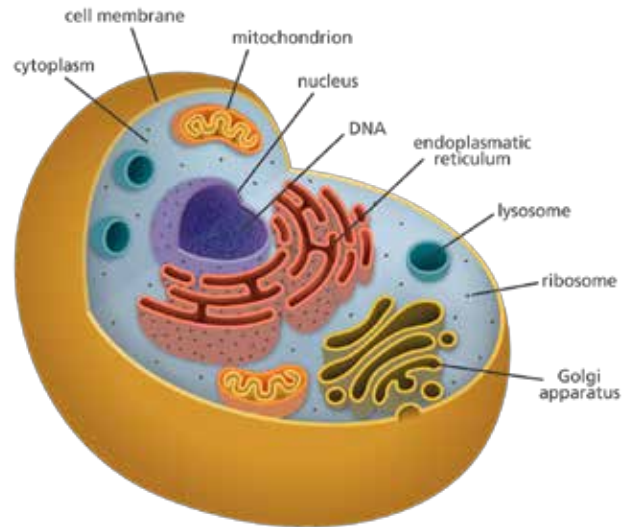
Thank you!

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Organisms



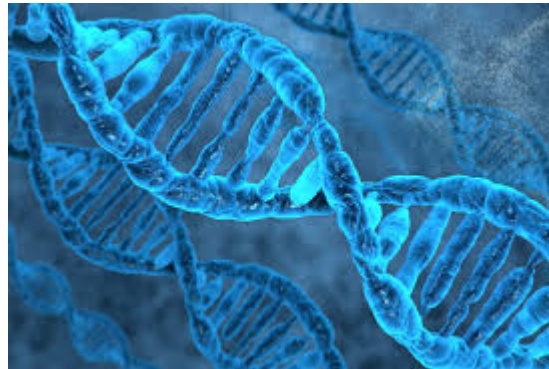
Genetic Material



Genetic Resource

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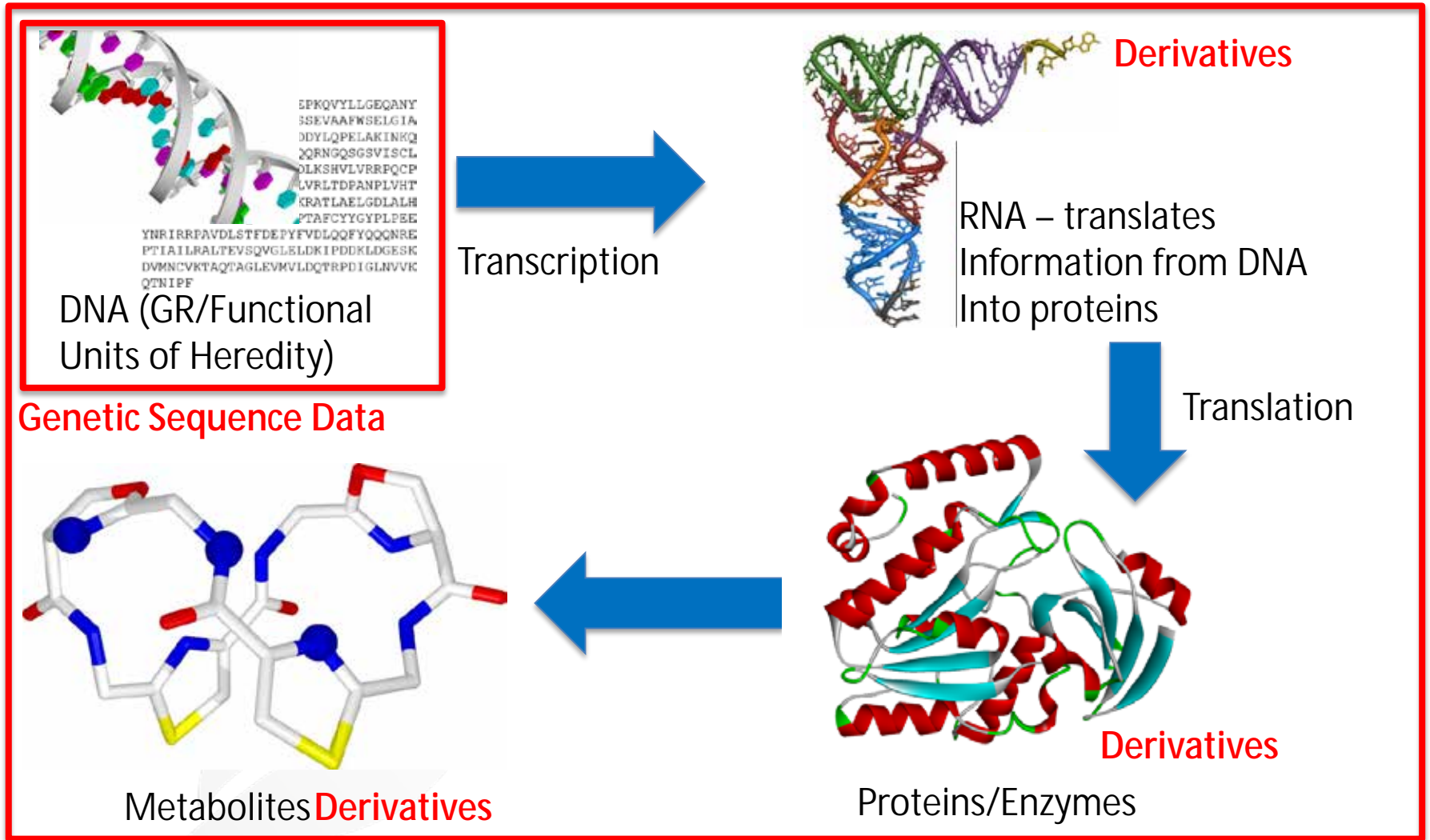
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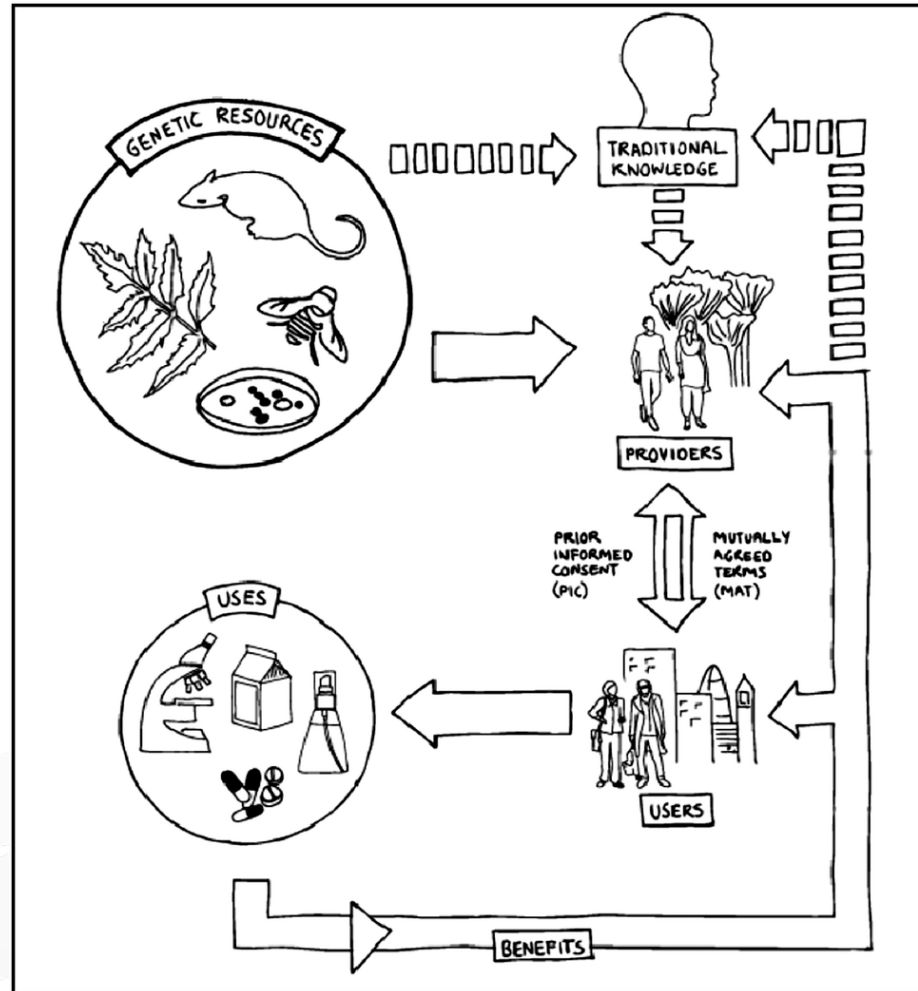
What are (M)GR?



Central dogma of molecular biology



What is Access and Benefit Sharing (ABS)?



Elements of an ABS regime for ABNJ

• ACCESS

- Definitions
- Scoping (temporal and material)
- When?
- Who? Transfer? Intend?
- Access and/or Utilization?

• BENEFIT SHARING

- What kind of benefits (non-monetary vs. monetary)
- By whom? Transfer?
- With whom and what for?
- When?

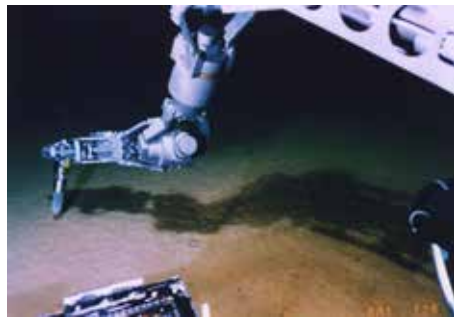
• COMPLIANCE

- Workable
- Enforcable

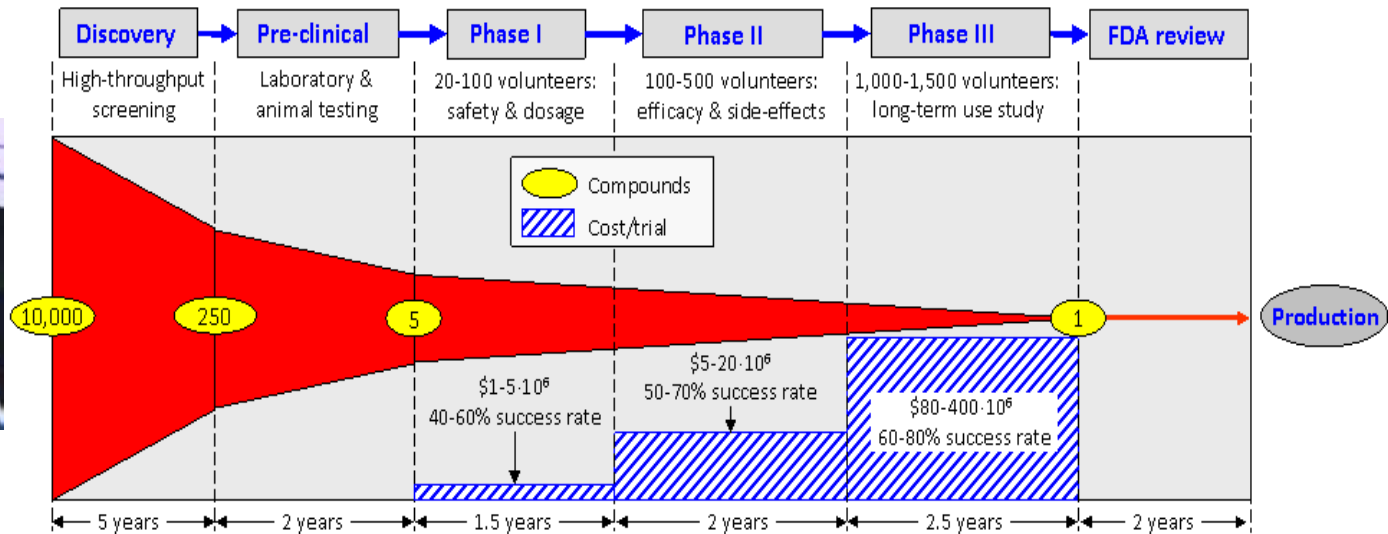
Biodiscovery pipeline



Taxonomy



Sampling in ABNJ

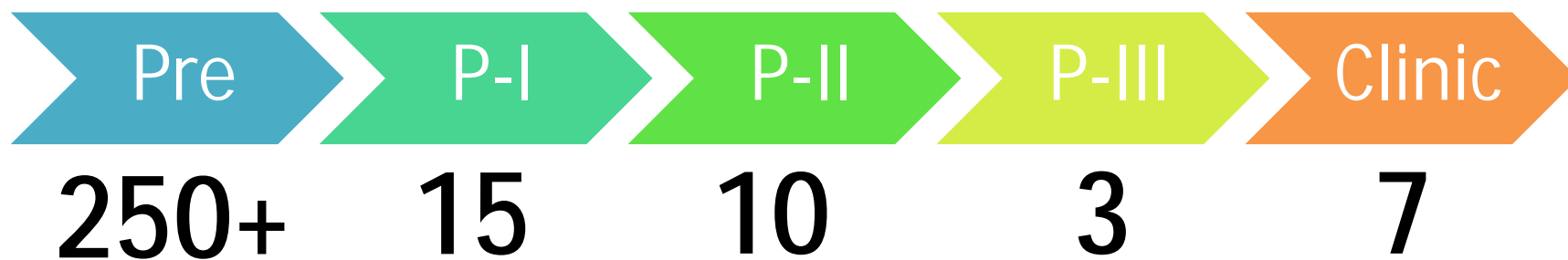


Universities
Public funding

Universities and SME's
Mixed funding

Large companies
Private funding

Translating to the context of BBNJ



None from ABNJ – mainly reef derived

7 successful compounds came from 28,000 known marine compounds

Mainly anti-cancer with a few analgesics and antivirals

What are potential solutions?

Requirements:

- Inclusivity of developing states
- Facilitated access for the scientific community
- Legal certainty, predictability and stability for industry
- Enforceability for the regulator

What are potential solutions?

Access:

- Online notification system instead of permitting system
- Conditional access
- Embargo period
- Threshold for environmental impact assessment
- One regime for all MGR, both Area and High Seas

What are potential solutions?

Benefit Sharing:

- Mandatory deposit of material in biorepositories
- Mandatory sharing of meta data and raw data (including DSI)
- Possibility of extending embargo period in return for a fee
- If monetary benefits are requested: at the point of commercialization, and not negotiated
- Where possible organization of benefit sharing at international or state level, not at user level

What are potential solutions?

Compliance:

- User friendly to avoid involuntary non-compliance
- Preferably compatible with Nagoya Protocol compliance
- Linked clearing house mechanism

MGR Derived Pharmaceutical Products on the Market



Soft tissue carcinoma



Ecteinascidia turbinata



Chronic pain (analgesic)



Conus magus



Breast cancer



Halichondria okadai



Ara-C
(cytarabine)
treatment of leukemia



Ara-A (vidarabine)
antiviral



Tethya crypta



Hodgkin's Lymphoma



Dolabella auricularia



lowering very high
triglyceride levels



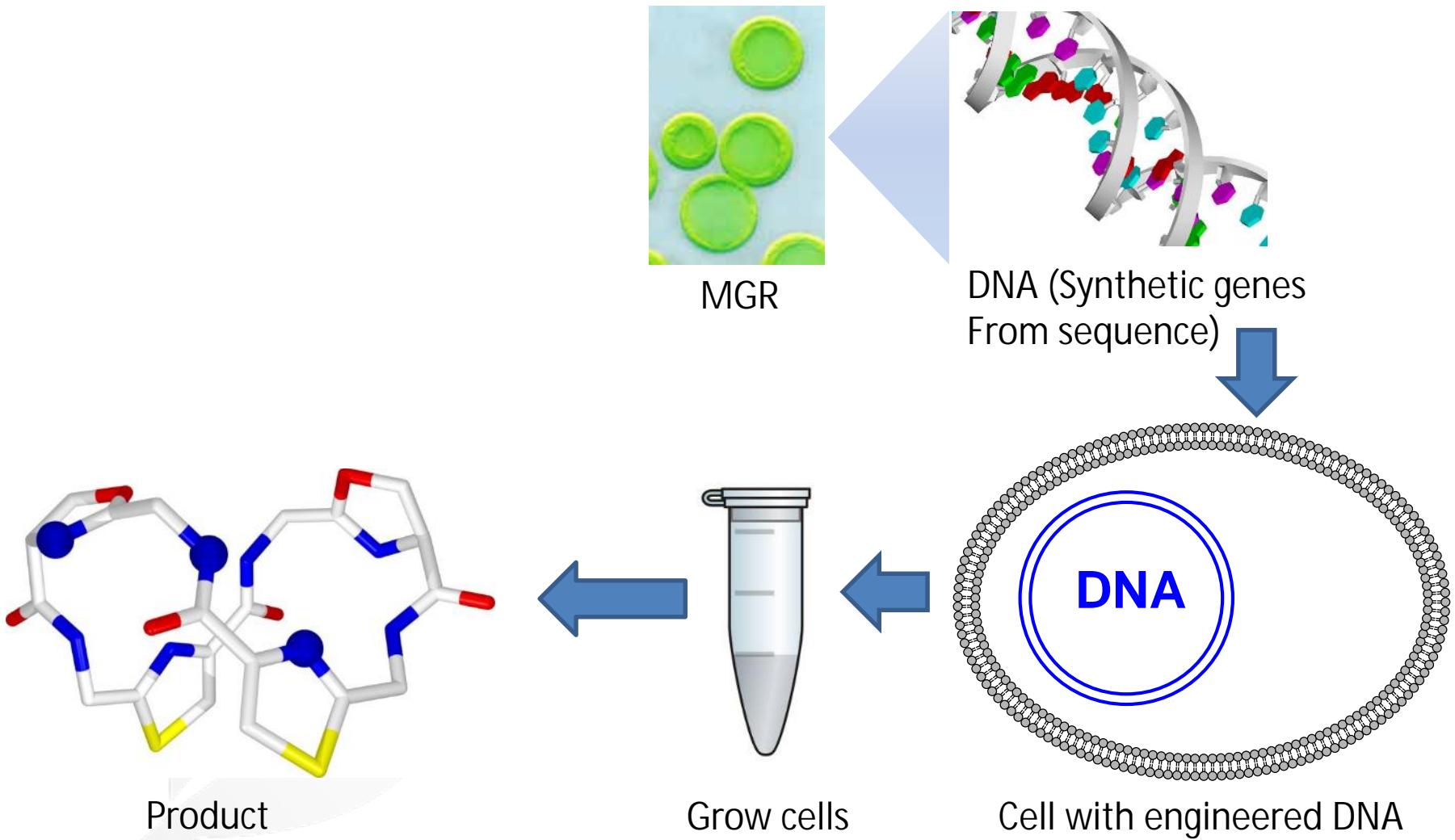
Purified
fish oil

All from EEZ apart from 1 (high seas) – All prior to CBD coming into force
None rely on harvesting natural source except fish oils

A What is the environmental impact?

- Number of cruises is and will remain very low (cost)
- Gravity coring leaves a 10cm hole that closes within 1h
- During an entire cruise, 0,5m² of seabed will be cored
- Removing 0,5m² of ABNJ = 0,19cm² of Yellowstone NP
- MGR are not *mined*, you only need them once
- Environmental impact of bioprospecting is negligible
- EIA requirement for bioprospecting seems redundant
- Allow bioprospecting in MPA's?

A Synthetic Biology – From Genes to Products



Geographical scope: seabed versus water column

Scientific point of view:

- 'Valuable' MGR in seabed, water column and subsoil
- Location can be life-stage specific: e.g. pelagic larvae
- Arguments to not distinguish between seabed and water column

Compliance point of view:

- The easier, the more likely users will voluntarily comply
- The more difficult, the more likely users will be involuntarily non-compliant

Material scope: commodity *versus* genetic resource

Cod U

Commodity or *biological* resource

Based on original resource → *harvest*

Overview

Cod Uracil-DNA Glycosylase (Cod UNG) from Atlantic cod is the only commercially available UNG enzyme that is completely and irreversibly inactivated by moderate heat treatment. The enzyme is produced in a recombinant *E. coli* (ung⁻) strain that con

The main advantages of Cod UNG

Glycerol-free Cod UNG is now available

Heat-labile, completely and irreversibly inactivated at 55°C

genetic resource

Based on processed information

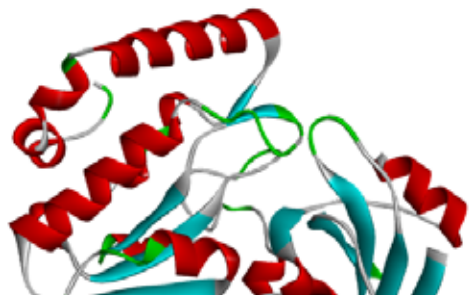
→ *sample or harvest*

Cod DNA

Estimated Cost = US\$ 1 Bn/gramme

Material scope: derivatives

molecules

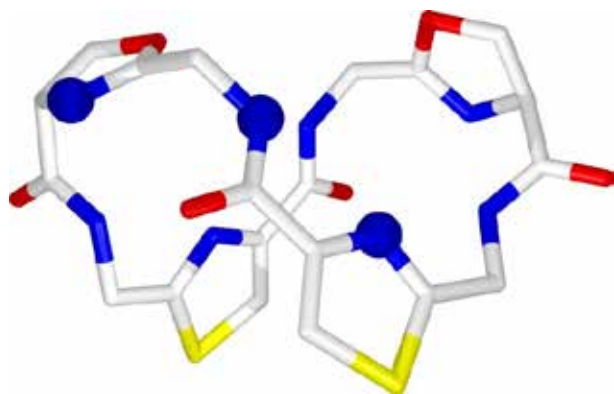


application/product



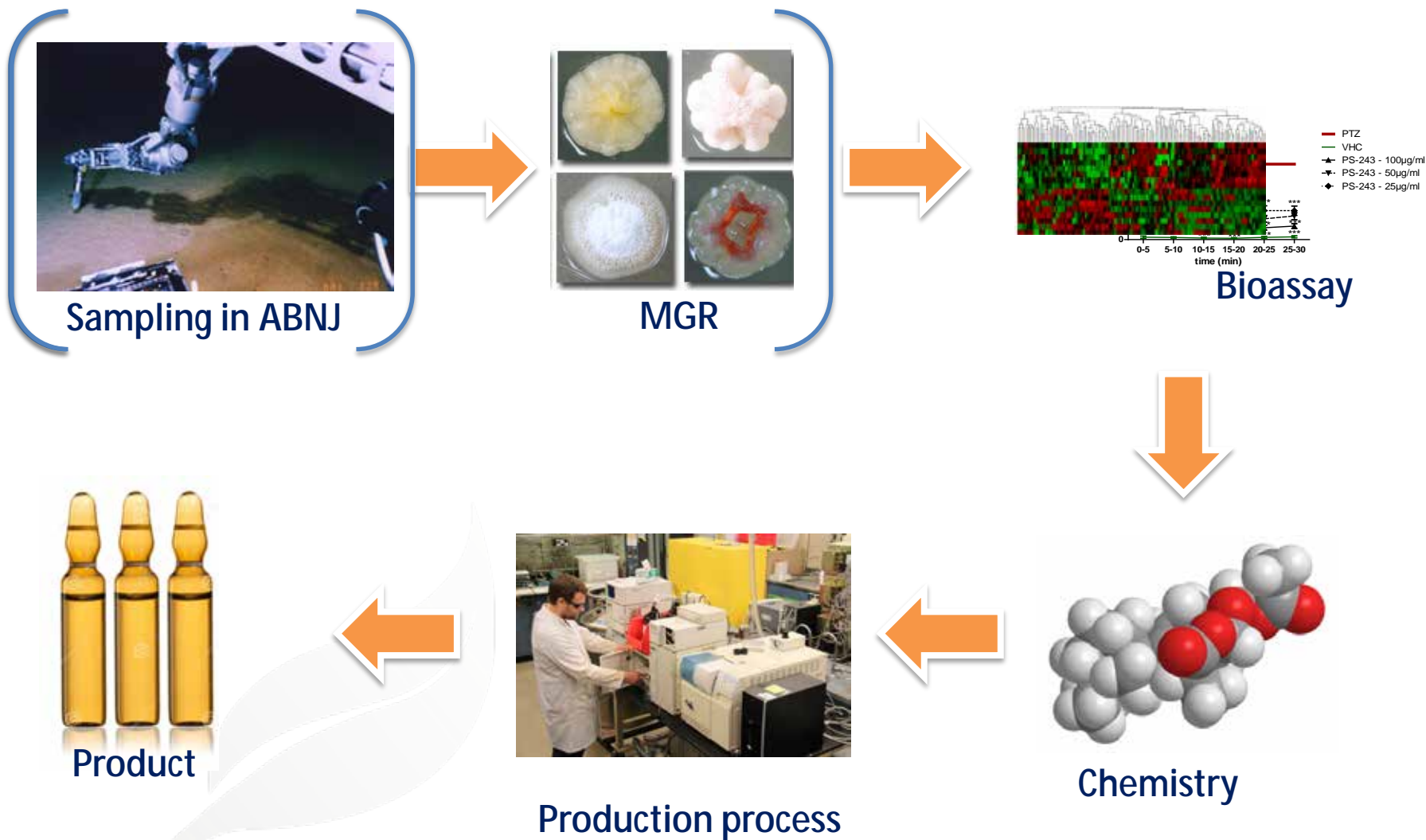
Genes as such do not hold value

It was what they encode (=derivatives) that *can* have value

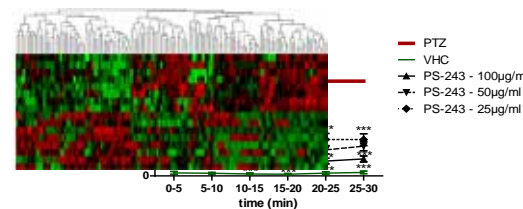
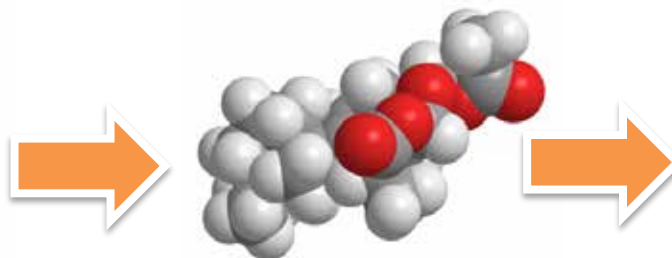


Metabolites

Material scope: DSI



Material scope: DSI



Not targeted for MGR, let alone BBNJ
Based on open access and *huge* numbers
Totally untraceable



Product



Production process

Intellectual Property: patentability of 'life'

Requirements for a patent:

1. Novel
 2. Inventive step or 'non-obvious'
 3. Life as such cannot be patented
 4. Patenting does not work prohibitive for R&D on life
Limited in time to allow for investment in R&D
- The 1994 TRIPS agreement under international law
 - International agreements related to trade (WTO) and IP (WIPO)
 - Limited lifespan

Intellectual Property: disclosure of origin

What does it mean?

- Obligation to disclose location where GR was obtained *in situ*

Why?

- Disclosure of origin can work as compliance tool
- BUT: incomplete re within national jurisdiction
- BUT: incomplete re only applicable to patented GR
- BUT: draft text excludes BBNJ

Why not?

- Incomplete compliance tool