UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

100 YEARS
OF VETERINARY EDUCATION

The role of research institutions in shaping the future of veterinary pharmaceuticals and pharmacology

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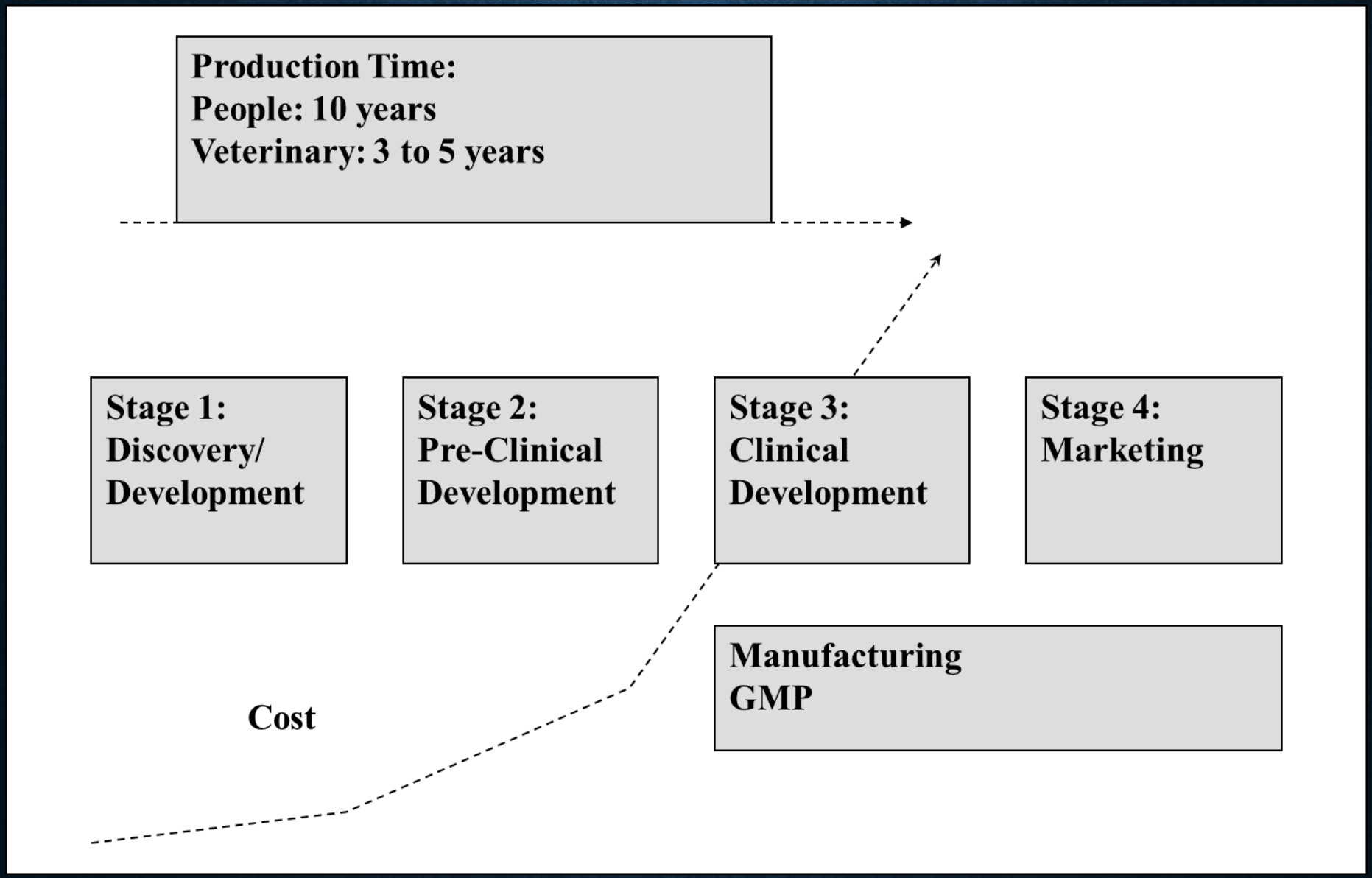
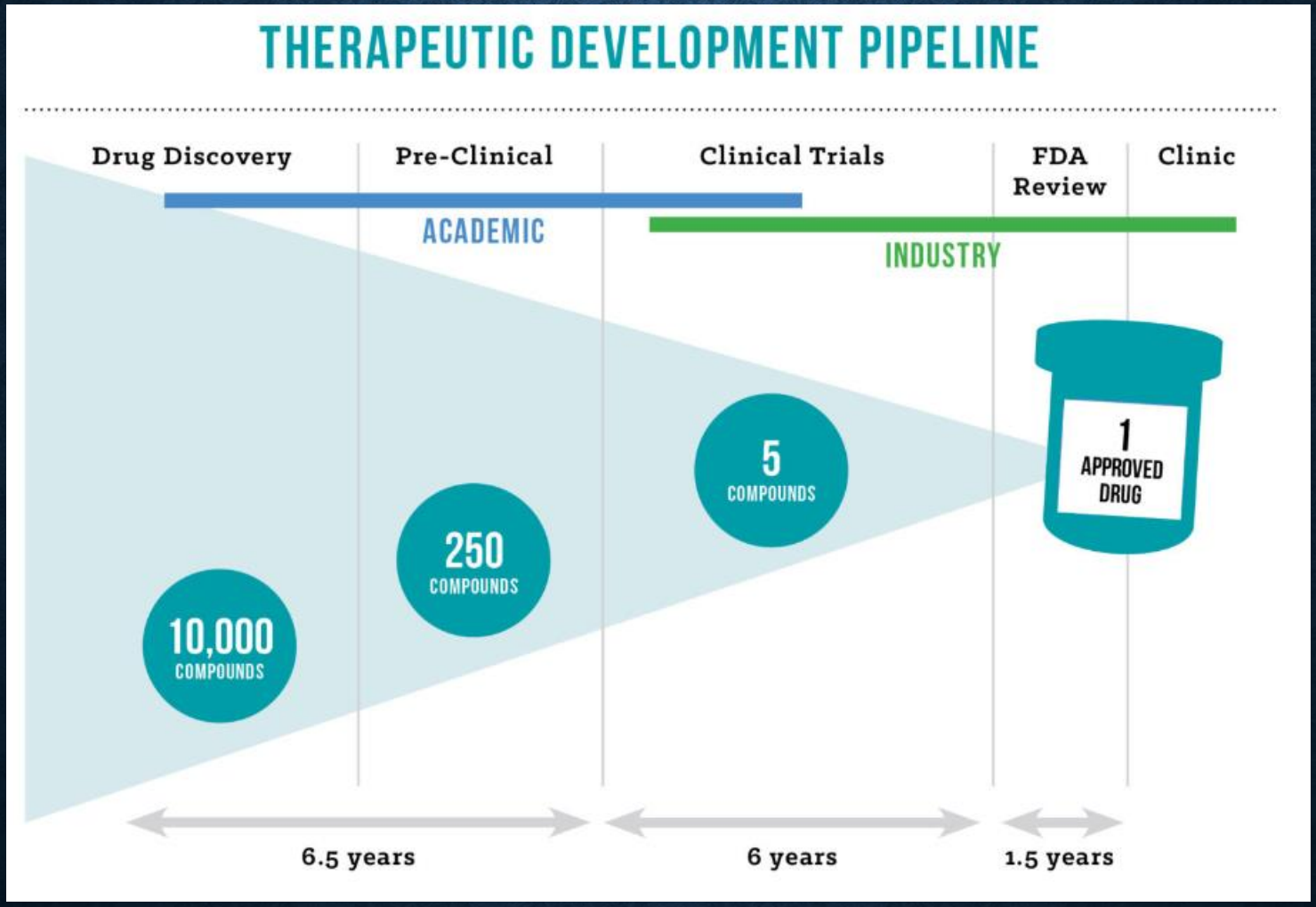
ROLE OF VET PHARMACOLOGISTS

- Teach: General and applied/clinical pharmacology
- Clinical consultations
  - Optimized treatments
  - Specialized support (epilepsy, oncology, AMR)
- Research
  - Basic and development research
  - Toxicity testing
  - Clinical trials
- Animals Ethics
  - Ethics committees and specialized support
- Regulatory
  - Evaluations and compliance
  - Pharmacovigilance


Production Time:
People: 10 years
Veterinary: 3 to 5 years
Stage 1: Discovery/ Development
Stage 2: Pre-Clinical Development
Stage 3: Clinical Development
Stage 4: Marketing
Manufacturing GMP
Cost



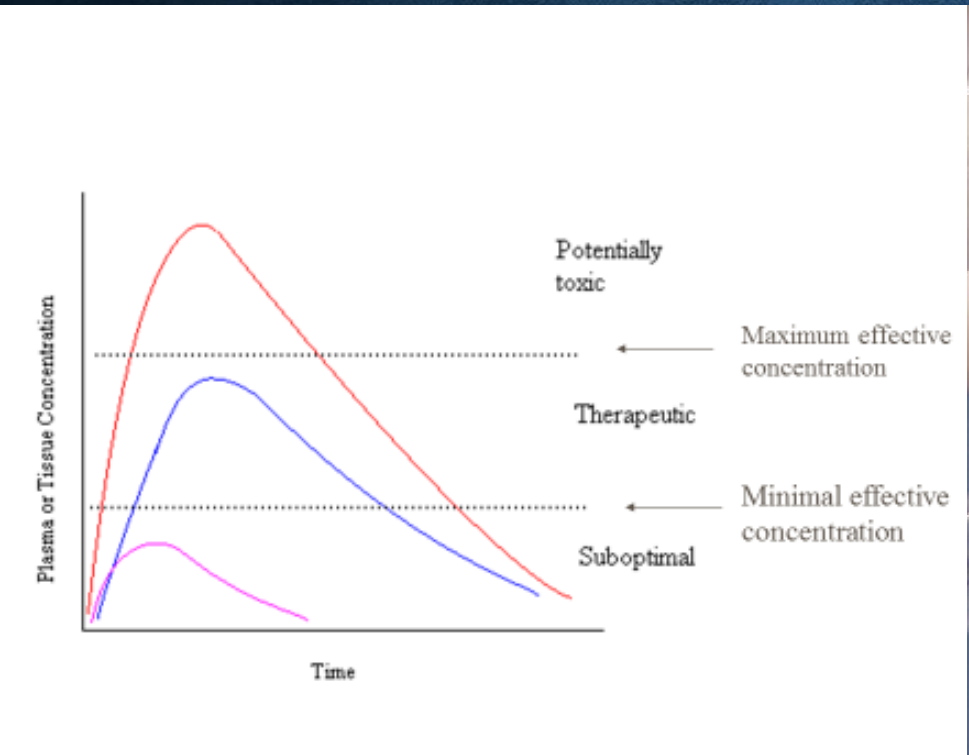
https://pediatricsnationwide.org/2017/04/24/discovery-to-drug-development-expanding-the-role-of-academic-centers/

ANIMAL CLINICAL TRIALS

- Two aspects of animals used in research
  - Preclinical Toxicity Testing: Testing using selected animals to elucidate the toxic potential of a molecule.
  - Clinical Testing
    - Target animal pharmacology
    - Target animal toxicity testing
    - Target animal efficacy testing
    - Generic drug development
    - Food safety studies

TARGET ANIMAL PHARMACOLOGY

- To determine the basic pharmacology of the drug
  - Pharmacokinetics
  - Basic efficacy in disease models or induced disease
  - Optimal formulation
  - Dose finding studies



TARGET ANIMAL TOXICITY STUDIES

- Undertaken in the target species
- To elucidate the basic safety of the molecule (Similar to Phase II clinical Study)
- Controlled overdose study
  - 0, 1, 3, and 5x (or 10x) overdose
  - Simulate worst case scenario
  - Small sample size (5 to 10 animals per group)
  - High dose accounts for smaller sample size
  - Usually terminal, with full necropsy evaluation

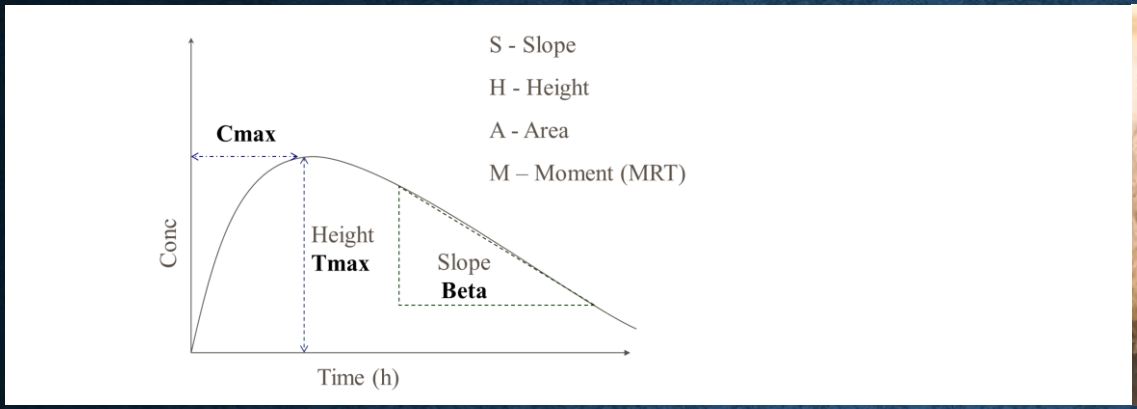



TARGET ANIMAL EFFICACY STUDIES

- Proof that a product works (Equivalent to phase III)
- Conducted under field conditions
  - Species specific
  - Final formulation at the recommended dose
  - Treat the each indication as it occurs naturally
  - Under the stress conditions in the field
  - Uses owner animals
  - Same ethics process as Phased clinical studies



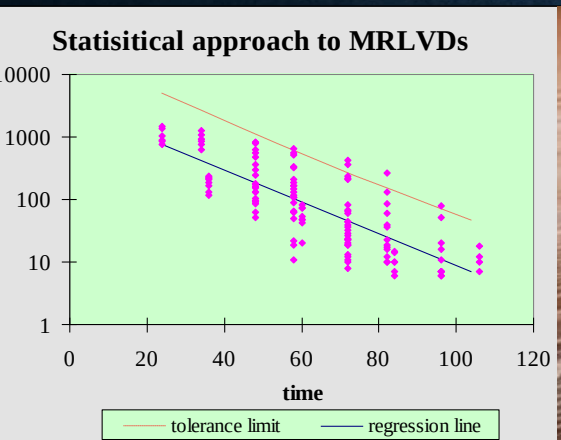

GENERIC DRUG DEVELOPMENT



- Bioequivalence Studies
  - Animal Study: Per Species at the max dose
- Biowaivers
  - Identical formulations
  - Oral water soluble products (simple solutions)
  - Injectable water soluble (needs motivation, based on excipients)
  - BCS classification: Not acceptable
  - Dissolution: Only accepted for showing equivalence between different dosage strengths and International and SA formulation

FOOD SAFETY STUDIES

- To prove the food is safe for consumption or production
- Treating animals and collecting samples and prove they safe (Milk, eggs, meat)
- Concentration measured agains MRLs



COSTS OF DRUG DEVELOPMENT

- New human medicines
  - $2 billion
- New veterinary medicines
  - $22.5 million - companion animal product
  - $30.5 – livestock product
  - Are molecules really vet specific??
    - Carprofen, pimobendin, VetMABS, Antibiotics

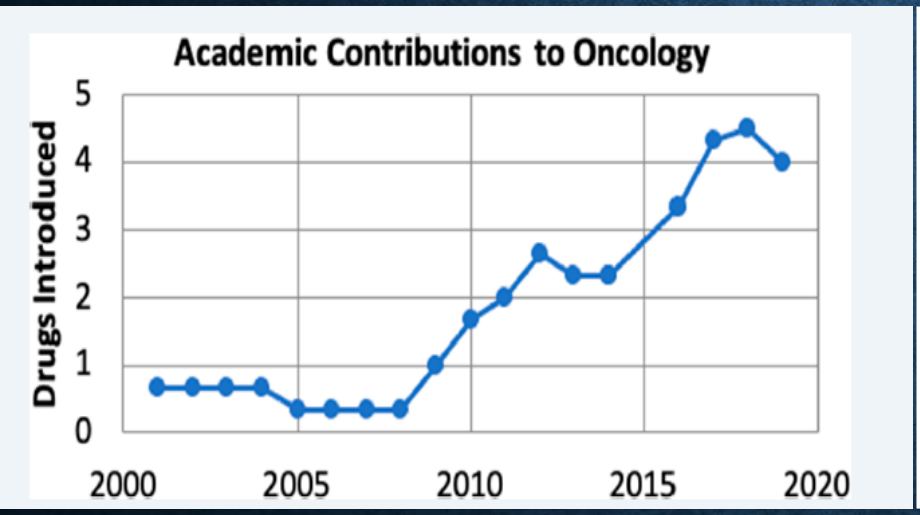
MANUFACTURING

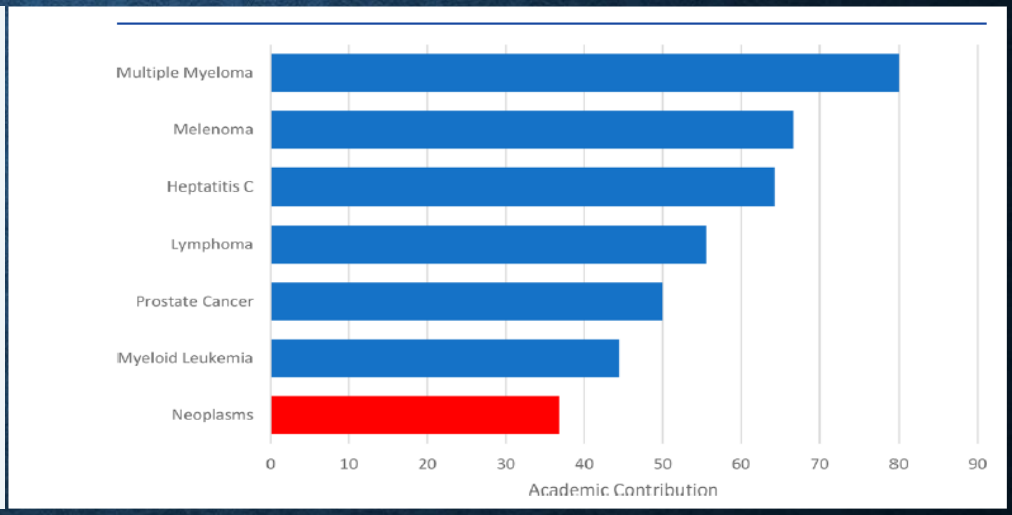
- Upscaling
- Batch to batch consistency & Batch testing
- Stability Testing
- Compatibility Testing
- Good Manufacturing Practice (cGMP)

ACADEMIA IN DRUG DISCOVERY

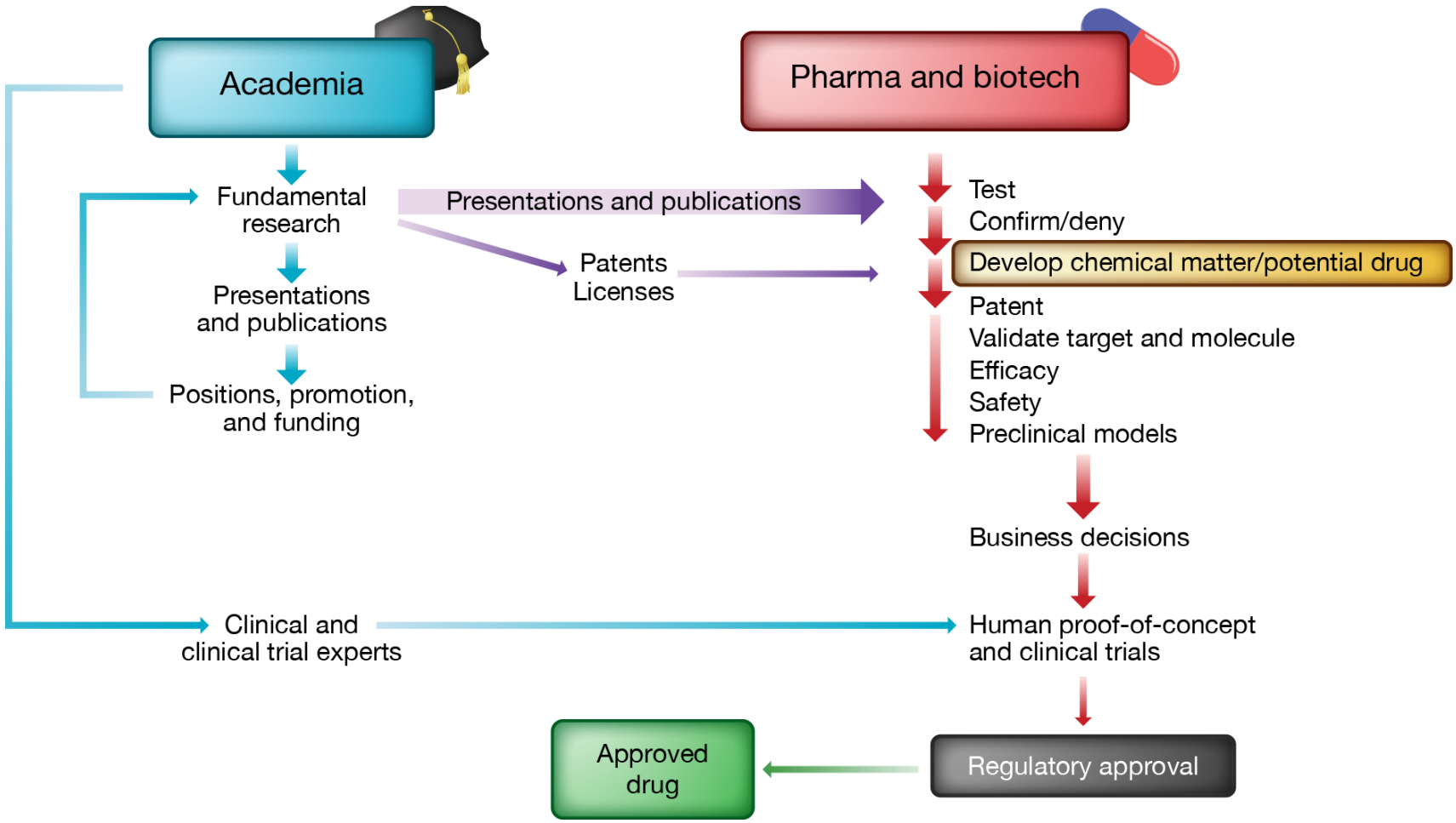
- Big pharma is investing less
  - Consolidation
  - Expense of drug R&D
  - Non-communicable Diseases
  - Employ experienced researchers
- Academia
  - Not training sufficient PhDs
  - Insufficient funds
  - Research potentially too basic -Research not commercially viable
  - Focus on areas with fundings vs areas of need

IMPACT OF FINANCES ON ACADEMIA





Kinch et al, 2020


Academia
Pharma and biotech
Fundamental research
Presentations and publications
Positions, promotion, and funding
Presentations and publications
Patents
Licenses
Test
Confirm/deny
Develop chemical matter/potential drug
Patent
Validate target and molecule
Efficacy
Safety
Preclinical models
Business decisions
Clinical and clinical trial experts
Human proof-of-concept and clinical trials
Regulatory approval
Approved drug

Flier, 2019

THE FUTURE

- Locally produced and tested products
  - Ethics
  - Facilities
- Analytical Chemistry
- Clinical Trials
  - Local clinical trials
  - GCP compliance
  - Clinical pathology, anatomical pathology
- Products aimed at local diseases
  - Vaccines, biologicals and chemicals
  - Local food consumption
  - Antimicrobials use and stewardship
- Evaluate target pathways instead of focusing on NCEs

CAPACITY DEVELOPMENT

- Development researchers and pharmacologists
  - Regulatory science
  - Analytical chemistry
- Advanced models
  - Molecular biology
  - Cloning, CRISPR
  - Biological products vs chemicals
- Pharmaceutical Chemistry
  - Formulation chemistry
  - Clean rooms
  - Pilot production
  - Manufacturing

FACILITIES

- Need to support research
- BSL animal housing facilities
- Analytical chemistry
- Correct MOUs
- Investment

WAY FORWARDS

- Partnerships
  - Generated 50% of all new molecules registered over last 20 years
  - Academia/Research Institutes
    - Evaluates physiological processes (academia) + new molecule libraries
    - Train new academics
    - Correct research environments
  - Industry
    - covers costs of regulatory development
    - Contribute to PhD training/internships
    - Utilize academic PIs

REFERENCES/READING

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