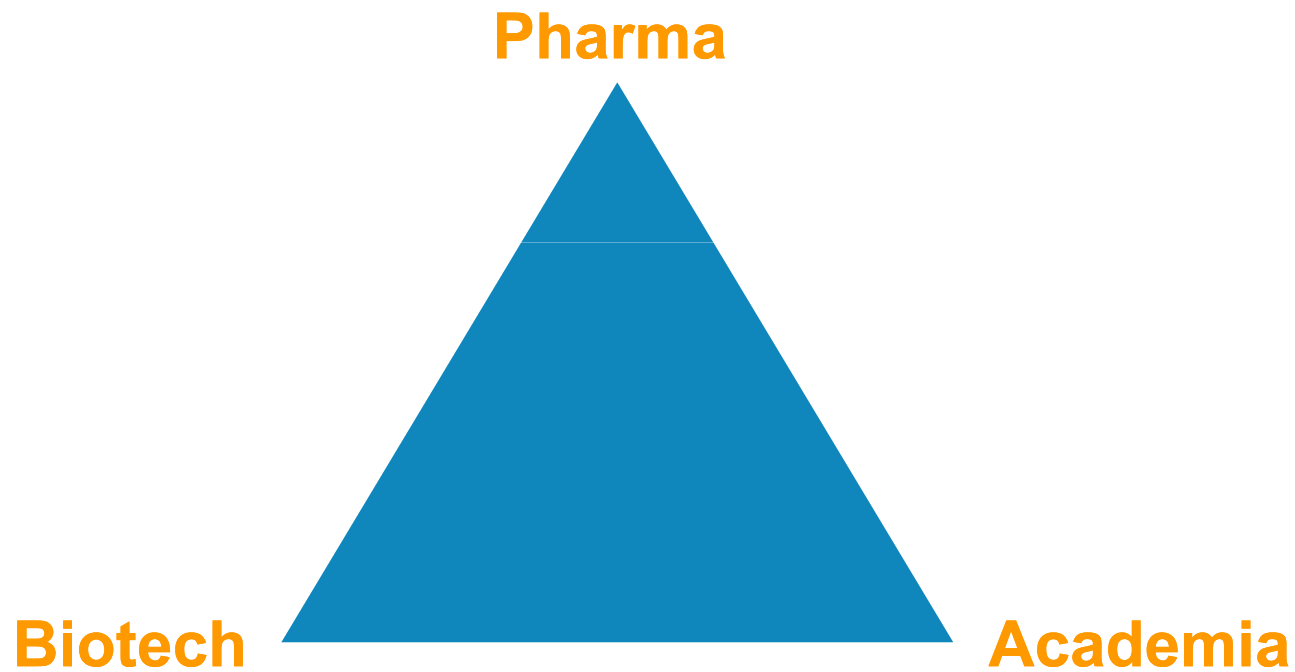


Roles of Chinese CROs in Drug R&D: Pharma, Biotech & Academia

Jinbo Lee, Ph.D.



Pharma, Biotech & Academia in Drug R&D





Historically...

Pharma/Large Biotech

- Target ID/Validation
- Hit generation (HTS, virtual screening, structure-based design)
- Lead optimization
- Preclinical research to IND (DMPK, PD, Tox)
- Clinical trials
- NDA to marketing

of employees: 1,000s to 10,000s

Biotech

- Unique technology platforms, novel targets or biological pathways
- Hit generation
- Lead optimization
- Preclinical research to IND (DMPK, PD, Tox)
- Clinical trials (Phase I, II)
- IPO, Buyout or Partnership

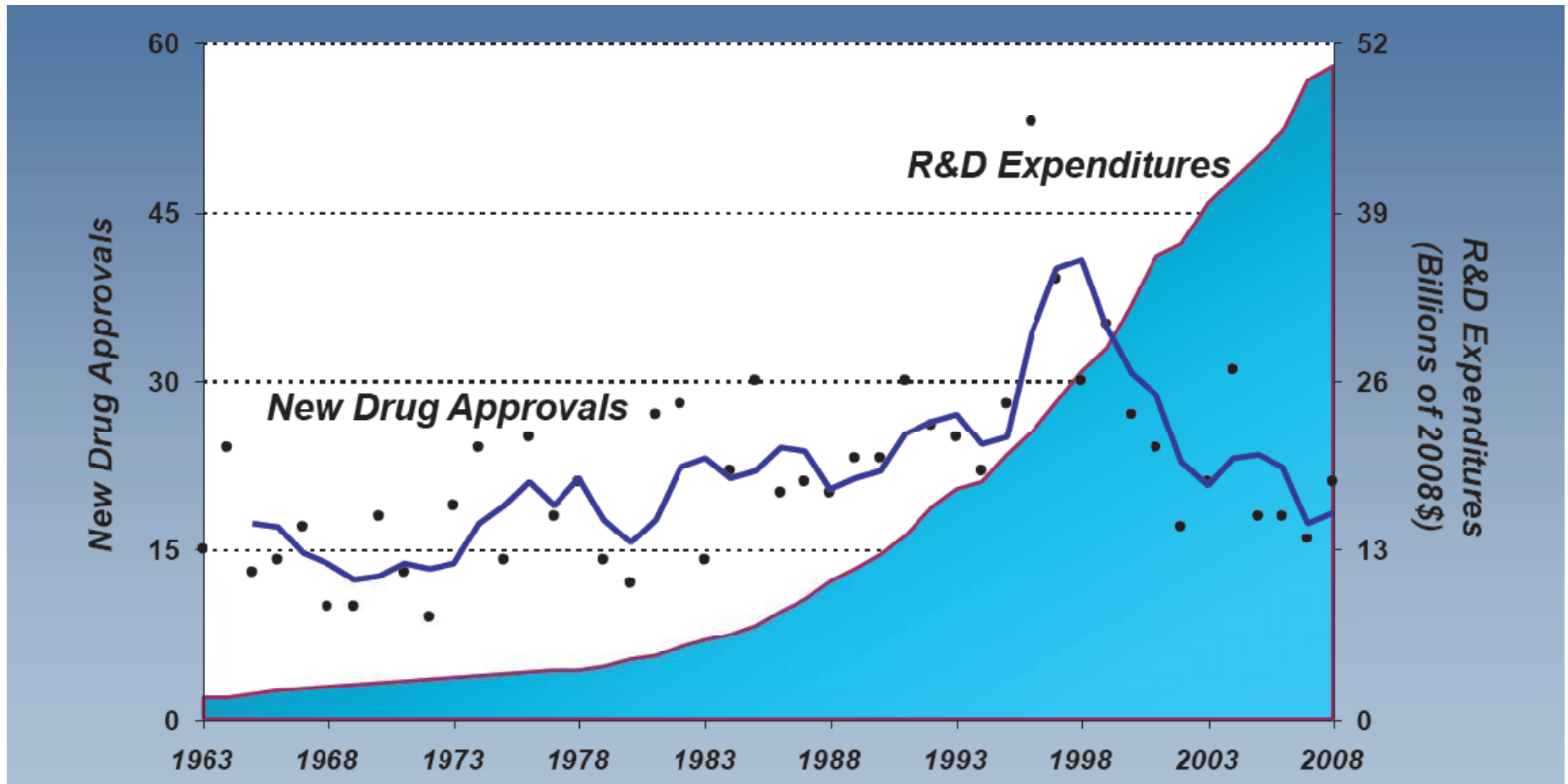
of employees: 30 to 100s

Academia

- Basic research
- Target ID/Validation
- Out-licensing to pharma or form biotech firms



R&D Spending Far Outpace NDAs



Kaitin, *Clin Pharmacol, Ther.* 2010, 87, 356-361.



Strong Needs for Improving Capital Efficiency

- Skyrocketed Pharma R&D expenditure
- Economic Downturn
- Tight VC funding



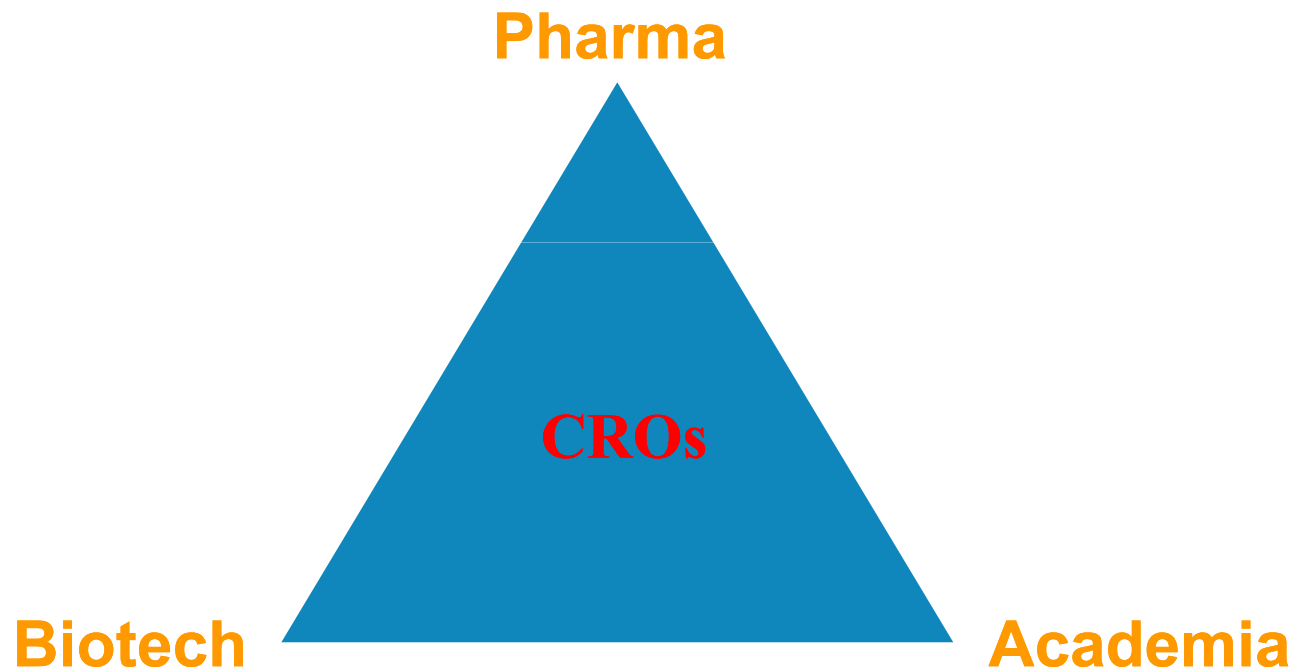
Strong needs for improving

 **Capital efficiency**

 **R&D productivity**



Could CROs be a Contributing Factor?





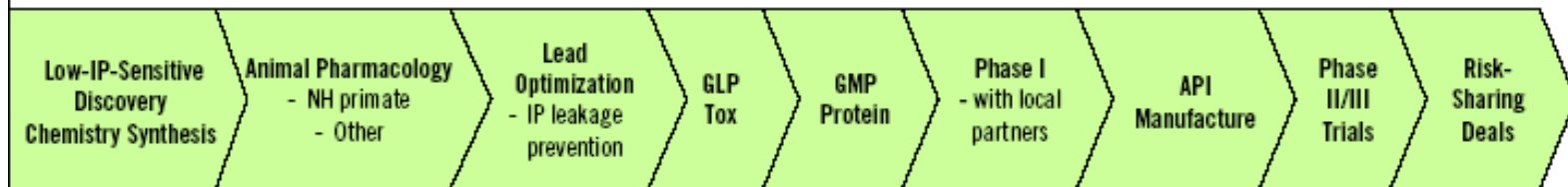
China R&D: Pass and Future

The well known past...



Is evolving rapidly into...

The emerging picture...





Maturing CRO Services in China

- Integrated R&D Services (chemistry, biology & preclinical): *e.g.*, Shanghai Medicilon, Wuxi Apptec, ChemPartner, Sundia, BioDuro
- Chemistry Services: *e.g.*, Acesys Pharmatech & many others
- Biology Services: *e.g.*, GenScript
- Preclinical PD Services: *e.g.*, PharmaLegacy, CrownBio
- GLP Tox Services: *e.g.*, Shanghai Medicilon, Charles River Lab-China, Bridge Laboratories (Pharmaron)
- Clinical Services: *e.g.*, Fountain Medical



Emerging...

Pharma/Large Biotech

- Target ID/Validation
- Hit generation (HTS, virtual screening, structure-based design)
- Lead optimization
- Preclinical research to IND (DMPK, PD, Tox)
- Clinical trials
- NDA to marketing

of employees: 1,000s to 10,000s

Biotech

- Unique technology platforms, novel targets or biological pathways
- Hit generation
- Lead optimization
- Preclinical research to IND (DMPK, PD, Tox)
- Clinical trials (Phase I, II)
- Milestone-based Partnership or Buyout

of employees: 5 to 20
(Virtual companies)

Academia

- Basic research
- Target ID/Validation
- Hit generation
- Lead optimization
- Preclinical research to IND (DMPK, PD, Tox)
- Out-licensing at a later stage with higher valuation



Global Start-ups

- Experienced Core Team
- Novel IP
- Capital Efficiency
- Leverage maturing capabilities of CROs
- Early partnering opportunities