Opportunities and challenges creating novel therapeutics in today’s environment

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Recursion

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The Pharmaceutical Industry as we know it has to change:

R&D returns have fallen to the lowest level in nine years:
- 2010: 10.1%
- 2011: 7.6%
- 2012: 7.3%
- 2013: 4.8%
- 2014: 5.5%
- 2015: 4.2%
- 2016: 4.2%
- 2017: 3.7%
- 2018: 1.9%

The cost to bring an asset to market has increased to record levels in 2018:
- 2010: $1,188m
- 2018: $2,168m

Forecast peak sales per asset have more than halved since 2010:
- 2010: $816m
- 2018: $407m

Deloitte 2019 Global life sciences outlook
Yet money continues to flow into newcos as the market thirsts for innovation

• US healthcare venture fundraising reached a record $9.6B, continuing a four-year upward trend.

• Venture investments increased 50 percent over 2017, setting a record.

• Biopharma dollar volume doubled that of 2017 and was 4x device and Dx/Tools volume in 2018

<table>
<thead>
<tr>
<th>Series A Deals</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
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<tbody>
<tr>
<td><strong>US Deals</strong></td>
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<tr>
<td>Number of Investments</td>
<td>124</td>
<td>135</td>
<td>143</td>
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<tr>
<td>Total Series A Funding ($M)</td>
<td>$2,612</td>
<td>$2,665</td>
<td>$4,166</td>
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<tr>
<td>Corporate Investments (%)</td>
<td>31%</td>
<td>34%</td>
<td>24%</td>
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<td><strong>Europe Deals</strong></td>
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<tr>
<td>Number of Investments</td>
<td>70</td>
<td>42</td>
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<tr>
<td>Total Series A Funding ($M)</td>
<td>$867</td>
<td>$658</td>
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<tr>
<td>Corporate Investments (%)</td>
<td>29%</td>
<td>19%</td>
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Why the continued investment?

- Pharmaceutical companies are faced with pressure to continue organic growth.
- Internal R&D efforts have not yielded enough fuel for the fire.
- Increased reliance on external innovation and earlier partnering
- Venture money (including Pharma Ventures) hopes to capitalize on this thirst by creating new assets.

“We want First in class assets with an established Mechanism of Action”

Challenge: New Target does not always translate into clinically (and commercially) differentiated product

One key is determining this as early as possible in the research program.
What are hot areas trending today?

Oncology, Oncology, Oncology. (has Immunooncology peaked?)

Neuroscience on a big upswing.

Rare Disease

Antifungal.

Platforms to “Drug the Undruggable”

• Gene and Cell Therapy
• Degraders
• synthetic lethality
• protein-protein interactions

Others:
• Fibrotic disease
• Pain

Slowing?
• Microbiome
• Antirheumatics
New targets and programs are great, but are they really addressing the core issue facing the Industry?

Novel agents are certainly needed, but if the path to market for these programs doesn’t change, the current unsustainable model won’t change.

Solutions?

*Increased focus on translational research plans*

*Genetically validated targets through national genomic/phenomic consortia*
  - Amgen acquisition of DeCode Genetics
  - Genomics Medicine Ireland
  - Genomics England
  - Finngen

*Risk Sharing Partnerships and consortia*
  - Pfizer/Lilly anti-NGF
  - Dementia Discovery Fund
  - Accelerating Medicines Partnership

*Artificial Intelligence*
  - Clinical Trial Design
  - Accelerating Research
“Necessity is the mother of invention”

-Unknown