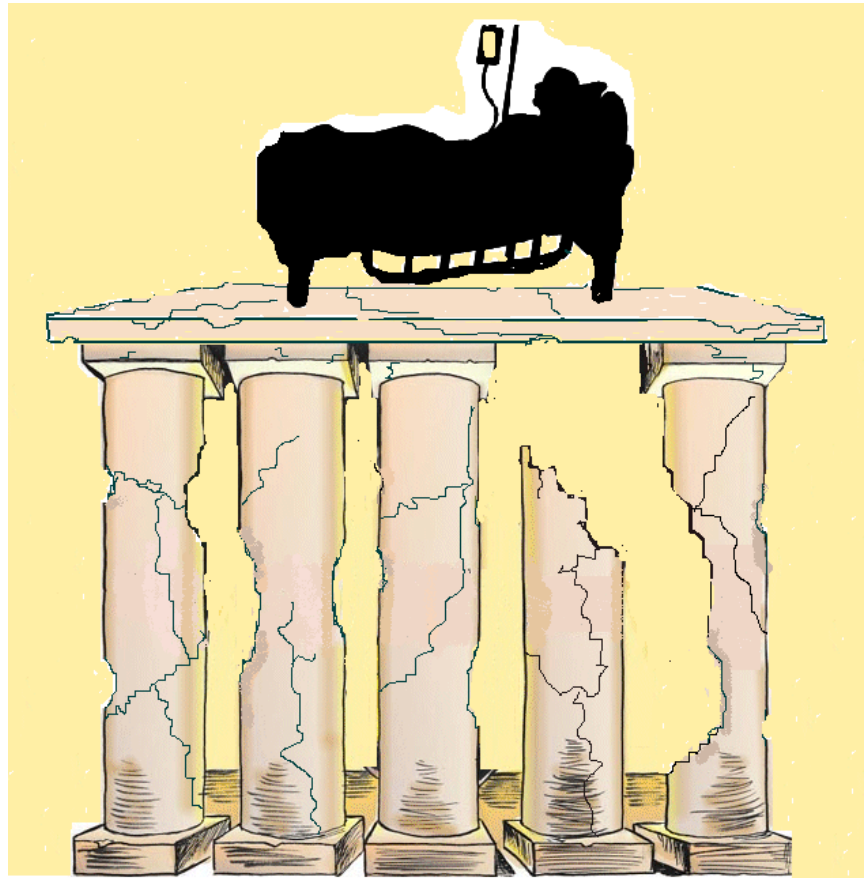


The left side of the slide features several overlapping, semi-transparent shapes in shades of orange and yellow, creating a modern, abstract background for the text.

# Are new antibiotics the solution?

Andreas Hedding, MD, PhD  
Nordic Cluster Medical Lead



**Modern medicine is built on access to effective antibiotics...**

# The antibiotic pipeline has been drying up...



# Antibiotic susceptibility proportions for NDM-1-positive Enterobacteriaceae isolated in the UK and India



	UK (n=37)	Chennai (n=44)	Haryana (n=26)
Imipenem	0%	0%	0%
Meropenem	3%	3%	3%
Piperacillin-taz	0%	0%	0%
Cefotaxime	0%	0%	0%
Ceftazidime	0%	0%	0%
Cefpirome	0%	0%	0%
Aztreonam	11%	0%	8%
Ciprofloxacin	8%	8%	8%
Gentamicin	3%	3%	3%
Tobramycin	0%	0%	0%
Amikacin	0%	0%	0%
Minocycline	0%	0%	0%
<b>Tigecycline</b>	<b>64%</b>	<b>56%</b>	<b>67%</b>
<b>Colistin</b>	<b>89%</b>	<b>94%</b>	<b>100%</b>



The screenshot shows a web browser displaying a Nature journal article. The browser's address bar shows the URL [www.nature.com/nature/journal/v517/n7535/full/nature14098.html](http://www.nature.com/nature/journal/v517/n7535/full/nature14098.html). The page features the Nature logo and navigation links such as Home, News & Comment, Research, and Current Issue. The article title is "A new antibiotic kills pathogens without detectable resistance". The authors listed are Losee L. Ling, Tanja Schneider, Aaron J. Peoples, Amy L. Spoering, Ina Engels, Brian P. Conlon, Anna Mueller, Till F. Schäberle, Dallas E. Hughes, Slava Epstein, Michael Jones, Linos Lazarides, Victoria A. Steadman, Douglas R. Cohen, Cintia R. Felix, K. Ashley Fetterman, William P. Millett, Anthony G. Nitti, Ashley M. Zullo, Chao Chen & Kim Lewis. The article is from Nature, Volume 517, pages 455-459, published online on 07 January 2015. The browser's taskbar at the bottom shows various open applications including Microsoft Word, a file named 'oslo\_5nov15', and a Lync Basic window.

First new antibiotic in 30 y x A new antibiotic kills path x

www.nature.com/nature/journal/v517/n7535/full/nature14098.html

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## A new antibiotic kills pathogens without detectable resistance

Losee L. Ling, Tanja Schneider, Aaron J. Peoples, Amy L. Spoering, Ina Engels, Brian P. Conlon, Anna Mueller, Till F. Schäberle, Dallas E. Hughes, Slava Epstein, Michael Jones, Linos Lazarides, Victoria A. Steadman, Douglas R. Cohen, Cintia R. Felix, K. Ashley Fetterman, William P. Millett, Anthony G. Nitti, Ashley M. Zullo, Chao Chen & Kim Lewis

[Affiliations](#) | [Contributions](#) | [Corresponding author](#)

Nature **517**, 455–459 (22 January 2015) | doi:10.1038/nature14098  
Received 29 July 2014 | Accepted 19 November 2014 | Published online 07 January 2015  
| Corrected online 21 January 2015  
[Erratum \(April 2015\)](#)

**Editor's summary** العربية

Most antibiotics in clinical use were discovered by screening cultivable soil microorganisms, a much depleted resource that has not been adequately replaced by synthetic approaches. Hence the widespre...

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Correspondence  
Drug discovery: Early antibiotic from a cranberry bog  
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Bacteria: Assessing resistance to new antibiotics

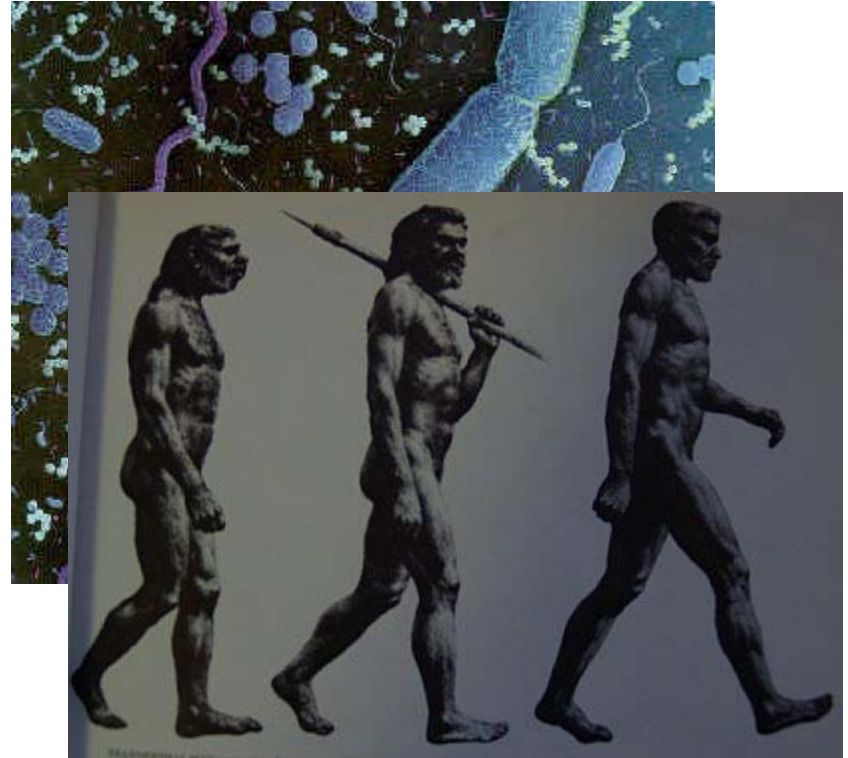
nmicro1614-il.jpg  Show all downloads...

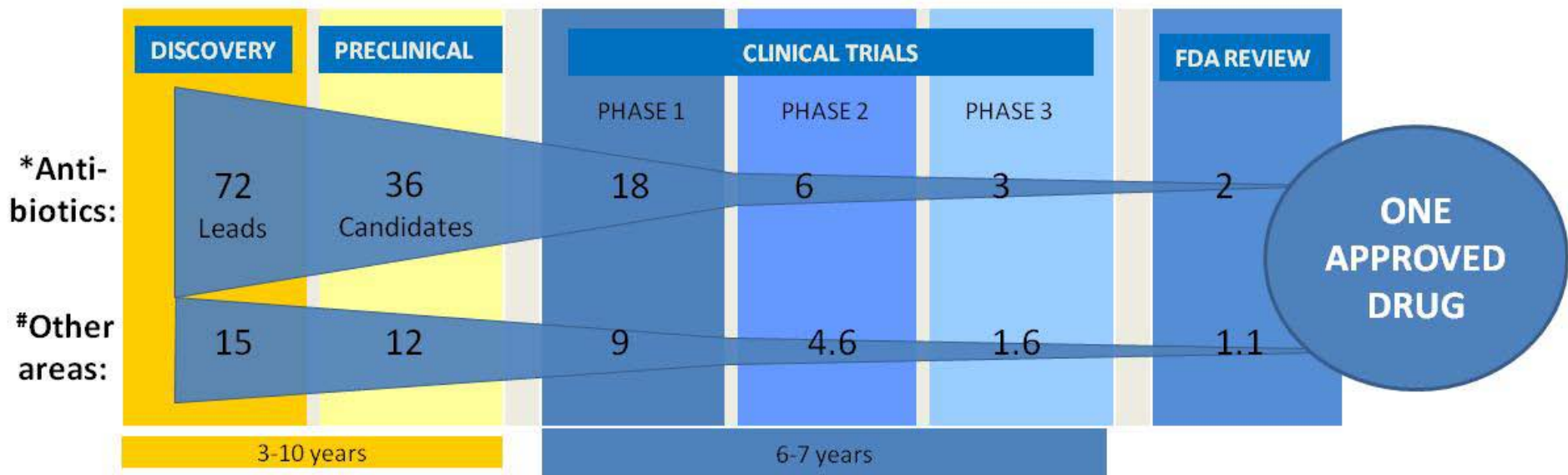
Inbox - Micros... Microsoft Word oslo\_5nov15 Antibiotikaresi... A new antibiot... Lync Basic SV 16:16 2015-09-21

# Why is it so difficult to develop novel antibiotics?



- Business model not appropriate
- Difficult to predict future needs
- Global problem
  - Balance access to medicines with rational use of antibiotics
- **Significant scientific challenges**





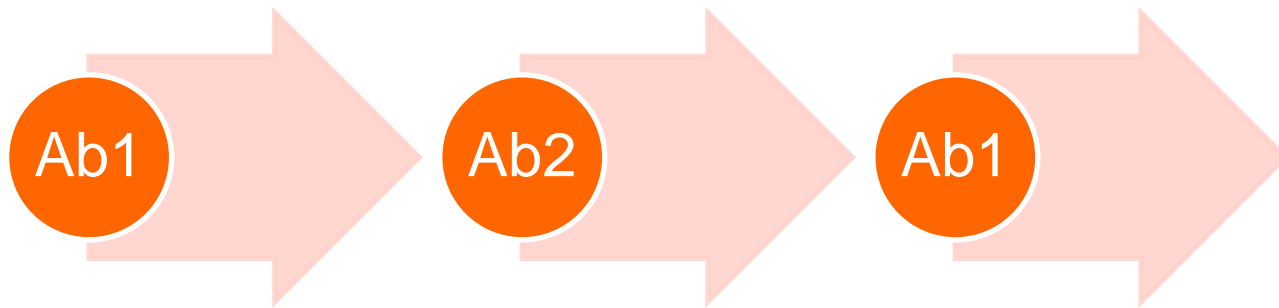
### Other novel antibacterials:

- Antibacterial peptides
    - Often short half-life, making them unsuitable for systemic use
    - Toxic
  - Bacteriophages
  - Small molecules
    - E.g. inhibiting virulence factors (would leave normal flora unharmed), TTS, QS, adhesion etc
  - ?
-



- Dosage based on revisiting pharmacokinetic (pk) and pharmacodynamic (pd) principles
    - Exposure over time
  - Finding the right dose for old antibiotics
    - Obtain exposure-response relationships
    - Re-evaluate registration and indication for available antibiotics
    - Create a mandatory process of re-evaluating indications and dosing, e.g. 5-year intervals
-

- Rotation of one class of antibiotics with one or more different classes exhibiting comparable spectra of activity



- Time needs to be many years (at least 2-3 yrs, probably longer)
- Disappointing results so far; resistance genes seem not to be easily lost
- Necessary to apply when introducing new antibiotics?

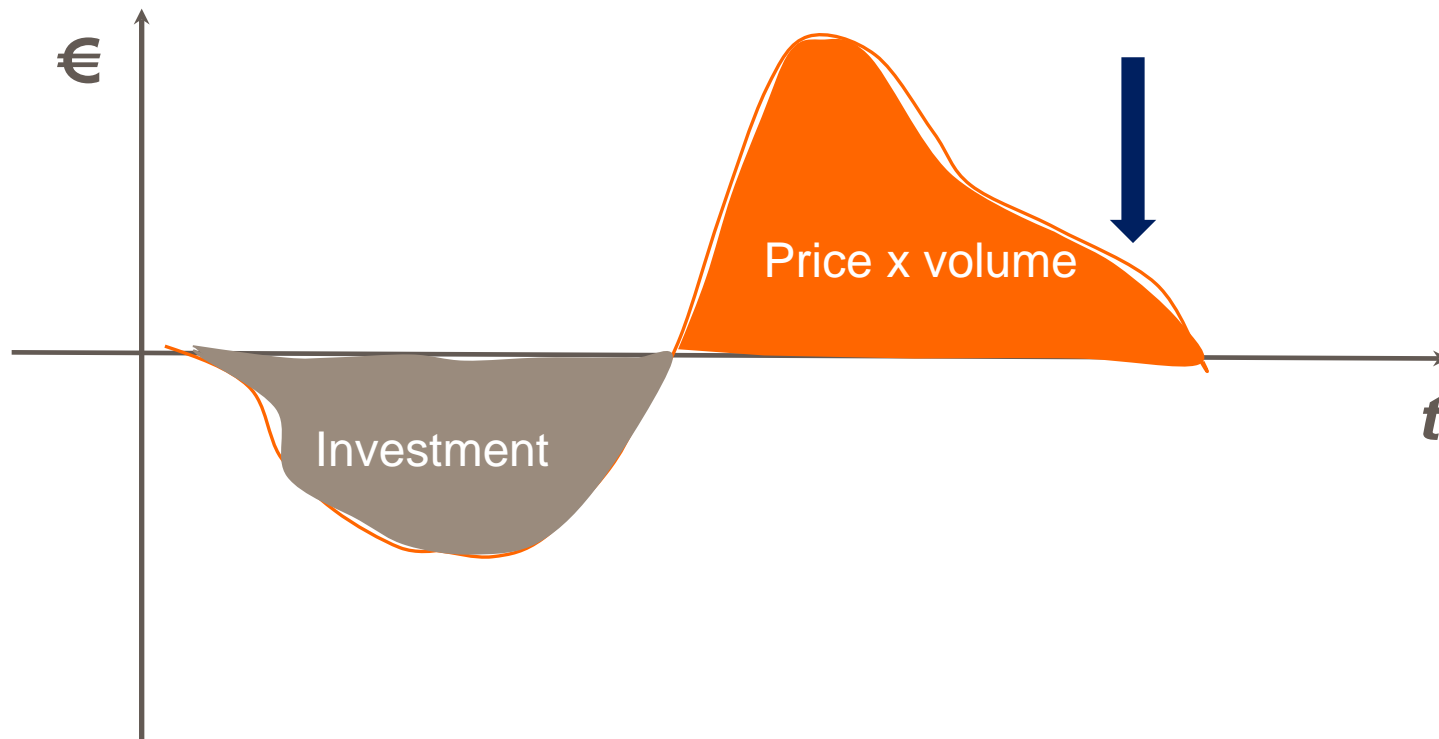
- A sustained, systematic effort of discovery and development – many years
  - Financing mechanisms for clinical trials?
  - A mechanism for prioritizing amongst different antibiotics, diagnostics and other health technologies needs to be based on:
    - Surveillance -> information on global prevalence of resistant pathogens
    - Predictions, modelling and analyses of trends
-

- 
- Regulatory agencies
    - New routes for faster approval
  - Public sector, governments, agencies & legislation
    - PPPs, e.g. IMI
  - Media, international health organisations, NGOs etc
    - Advocacy, stimulate discussion on solutions
  - Academia
    - Research efforts
  - Industry
    - New openness and new ways of working

# Need for new business model



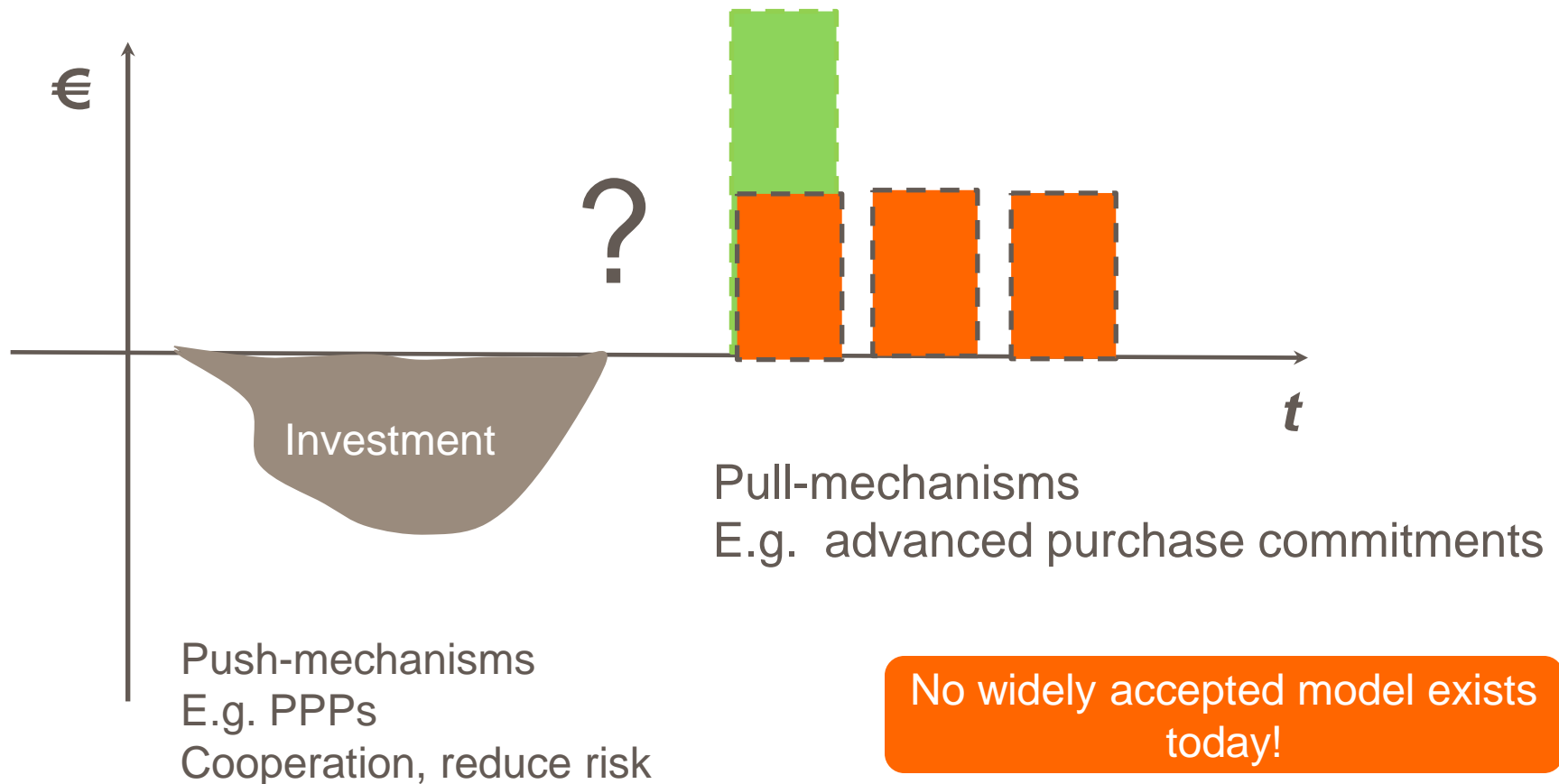
- Traditionally:



# Need for new business model – "de-linkage"



- De-link R&D investments from marketing and sales



# Key strategies to ~~stop~~ manage antibiotic resistance

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- Minimize irrational use of antibiotics
    - Measure resistance and use
    - Promote rational use
    - Animal use
  - Prevent infections and bacterial spread
    - Hospital hygiene
    - Agriculture and animal industry
  - Development of new antibiotics and alternatives, including new diagnostic tools
-

# How shall novel antibiotics be made available?



- In parallel with the process to develop new antibiotics we need mechanisms to make potential new drugs available in a *controlled* manner
- At the same time *access* for those in need must be addressed
- Global problem – needs global solutions!

