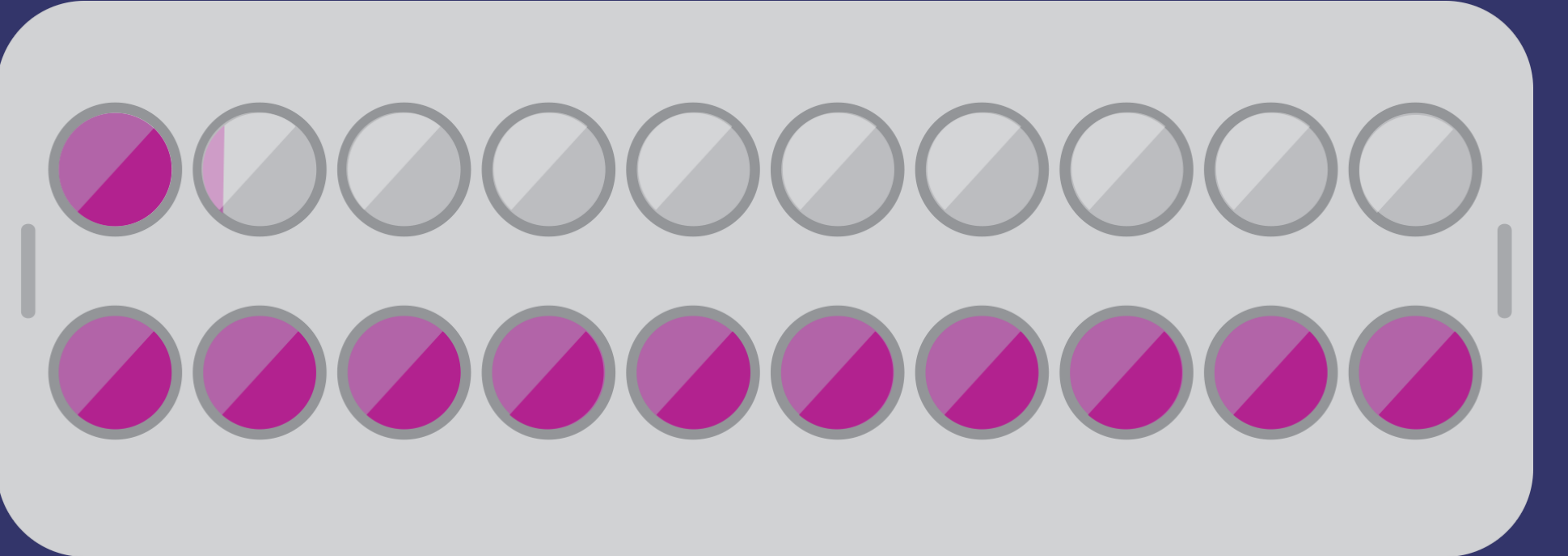




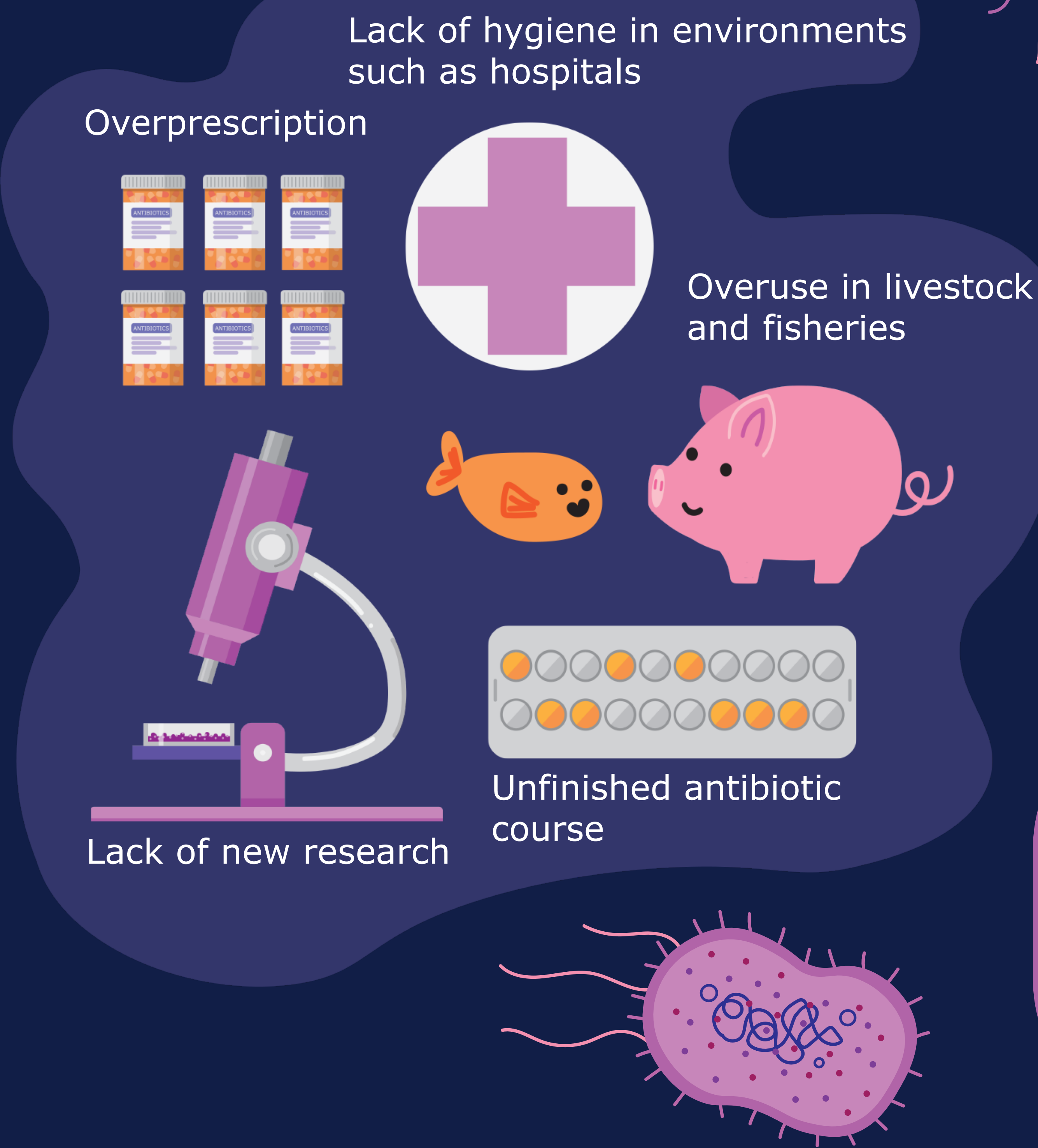
### NUMBER OF ANTIMICROBIAL RESISTANCE DEATHS

2019:1.2 million

2050:10 million



### CAUSES OF ANTIMICROBIAL RESISTANCE



1940-1962  
Golden age  
of antibiotic  
discovery

1900

1920

1940

1960

1980

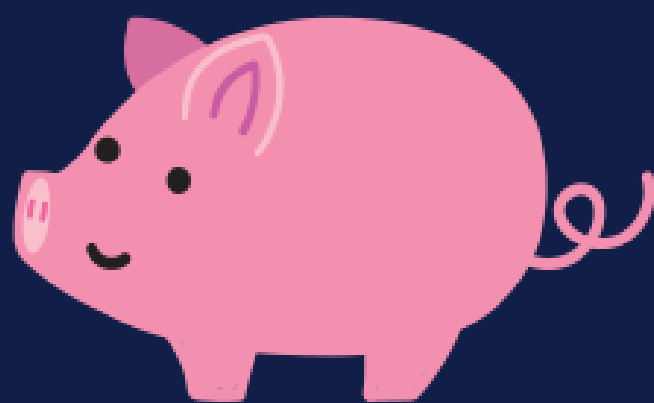
2000

2020

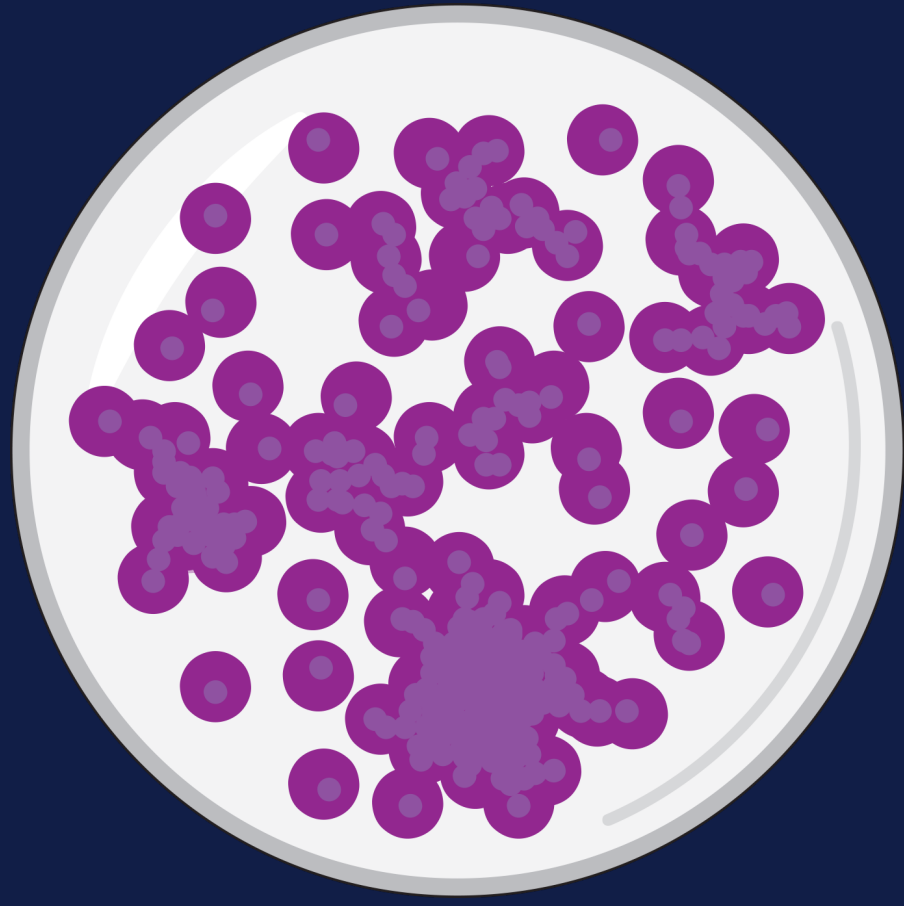
1928  
Alexander Fleming discovers  
penicillin



1953  
European animal feeds first introduce antibiotics



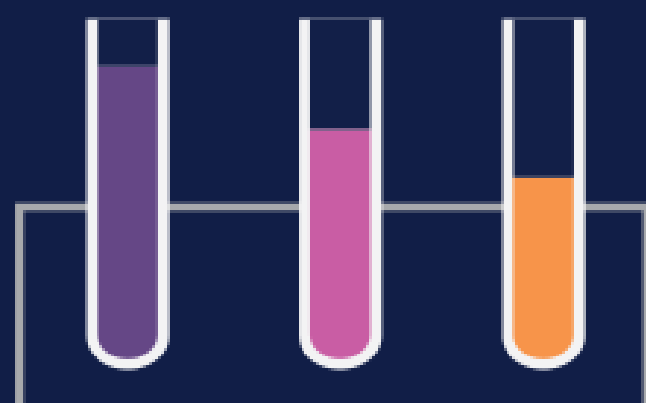
1960  
MRSA first  
discovered



2015  
Resistance to last resort antibiotic colistin identified

2015  
WHO Global Antimicrobial Surveillance System launched

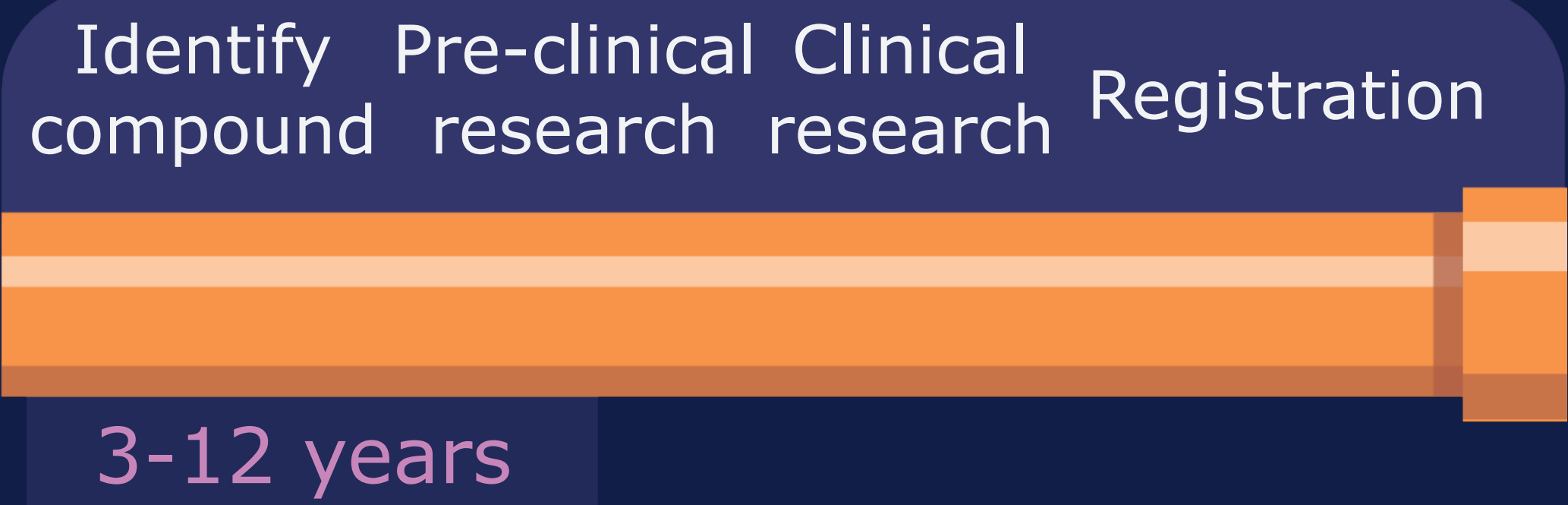
Today  
Further research into new  
drug targets is required



#### de novo drug discovery pipeline



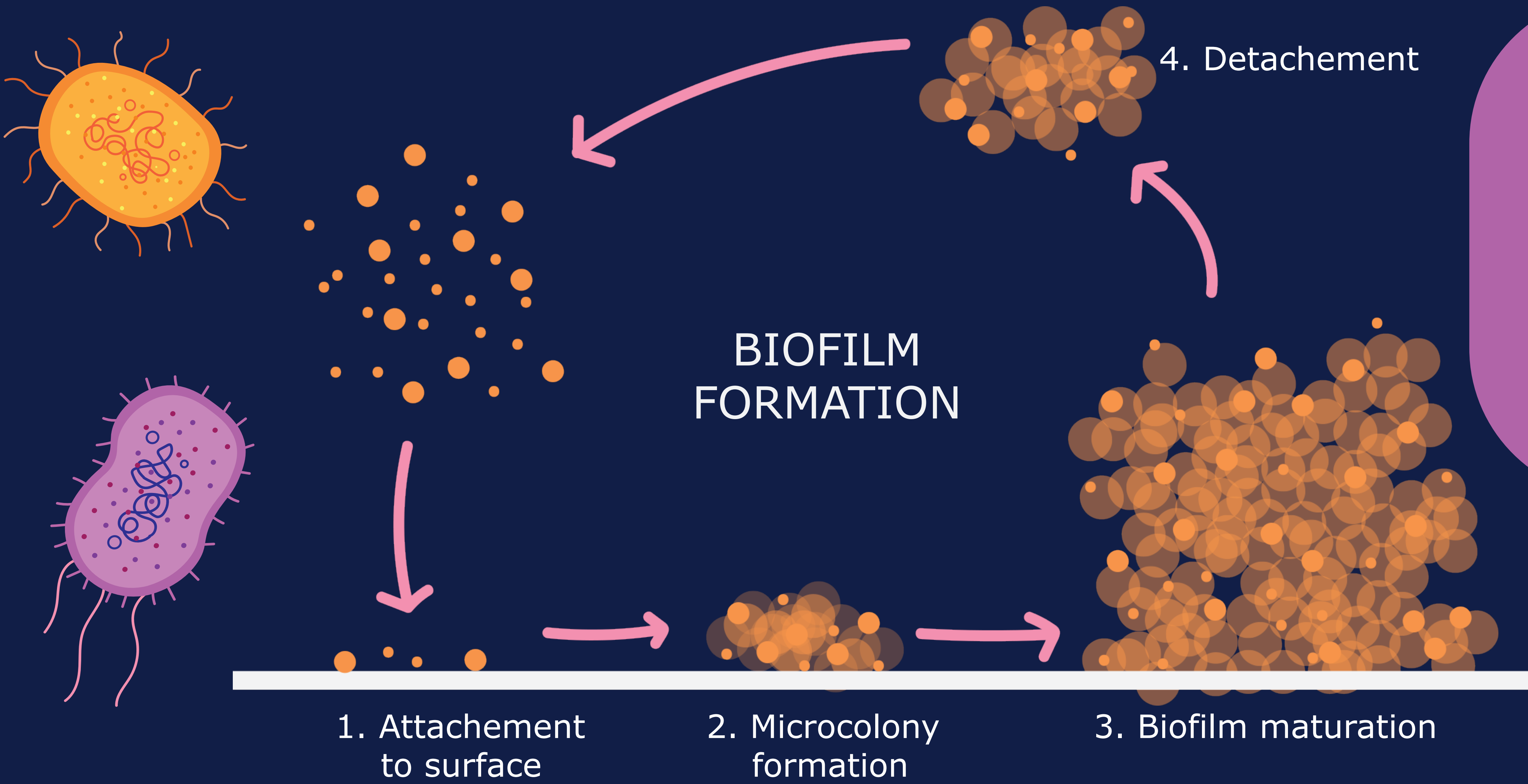
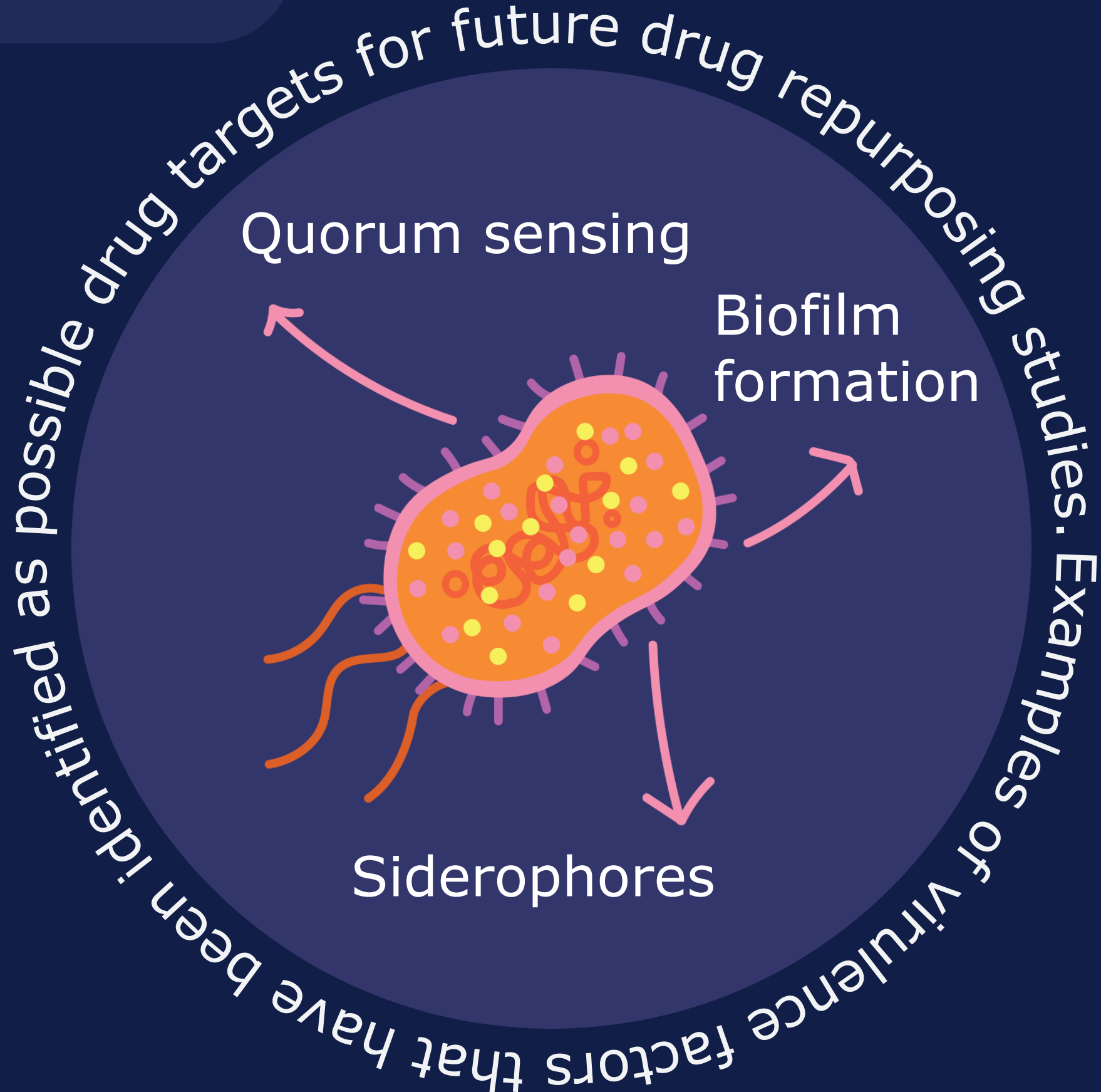
#### Drug repurposing pipeline



-Drug repurposing is an important area of research as it saves both time and money compared to *de novo* drug discovery.

-Virulence factors the bacteria express have been identified as possible drug targets in repurposing studies.

- A virulence factor is a property of bacteria expressed as a response to a challenging environment such as a mammalian host.
- They allow the bacterium to invade the host and cause disease.
- An example of a virulence factor is biofilm formation
- Targeting virulence factors seems to not apply selective pressure on the bacteria and therefore, potentially avoids resistance mechanisms developing.



- A biofilm allows bacteria to live together within a community that protects them by providing resistance to antibiotics, surfactants and phagocytes.
- They can form on human surfaces and on medical surfaces, such as intravenous catheters which can then introduce severe infections within patients
- These features have caused biofilms to be a crucial target in current drug repurposing studies.



#### REFERENCES

BBC news (2022) 'Millions are dying from drug-resistant infections, global report says' available at: <https://www.bbc.co.uk/news/health-60058120> (accessed: 22nd January 2022)

Crouzet M, Le Senchal C, Br  zel VS, et al. (2014) Exploring early steps in biofilm formation: set-up of an experimental system for molecular studies. BMC Microbiol. 14(253) doi:10.1186/s12866-014-0253-z

Genedata (2018) 'High Content Screening for Drug Repurposing: A New Resource' available at: <https://www.genedata.com/news/details/high-content-screening-for-drug-repurposing-a-new-resource> (accessed: 22nd January 2022)

Harkins CP, Pichon B, Doumith M, et al. (2017) 'Methicillin-resistant Staphylococcus aureus emerged long before the introduction of methicillin into clinical practice.' Genome Biol. 18(1):130 doi:10.1186/s13059-017-1252-9

Kirchhelle C, Swann Song: Antibiotic Regulation in British Livestock Production (1953-2006). (2018) Bull Hist Med. 92(2):317-350. doi: 10.1353/bhm.2018.0029

O'Neill J. (2014) 'Antimicrobial Resistance: Tackling a crisis for the health and wealth of nations.' Wellcome trust and HM Government. [https://amr-review.org/sites/default/files/AMR%20Review%20Paper%20-%20Tackling%20a%20crisis%20for%20the%20health%20and%20wealth%20of%20nations\\_1.pdf](https://amr-review.org/sites/default/files/AMR%20Review%20Paper%20-%20Tackling%20a%20crisis%20for%20the%20health%20and%20wealth%20of%20nations_1.pdf)

ReAct (no date) 'History of antibiotic development' available at: <https://www.reactgroup.org/toolbox/understand/antibiotics/development-of-antibiotics-as-medicines/> (accessed: 22nd January 2022)

World Health Organisation (no date) 'Infographic: Causes of antibiotic resistance' available at: <https://www.euro.who.int/en/health-topics/disease-prevention/antimicrobial-resistance/education,-awareness-and-behaviour-change/infographics/infographic-causes-of-antibiotic-resistance> (accessed: 22nd January 2022)

World Health Organisation. 'Global Antimicrobial Resistance and Use Surveillance System (GLASS)' (no date) available at: <https://www.who.int/initiatives/glass> (accessed: 22nd January 2022)