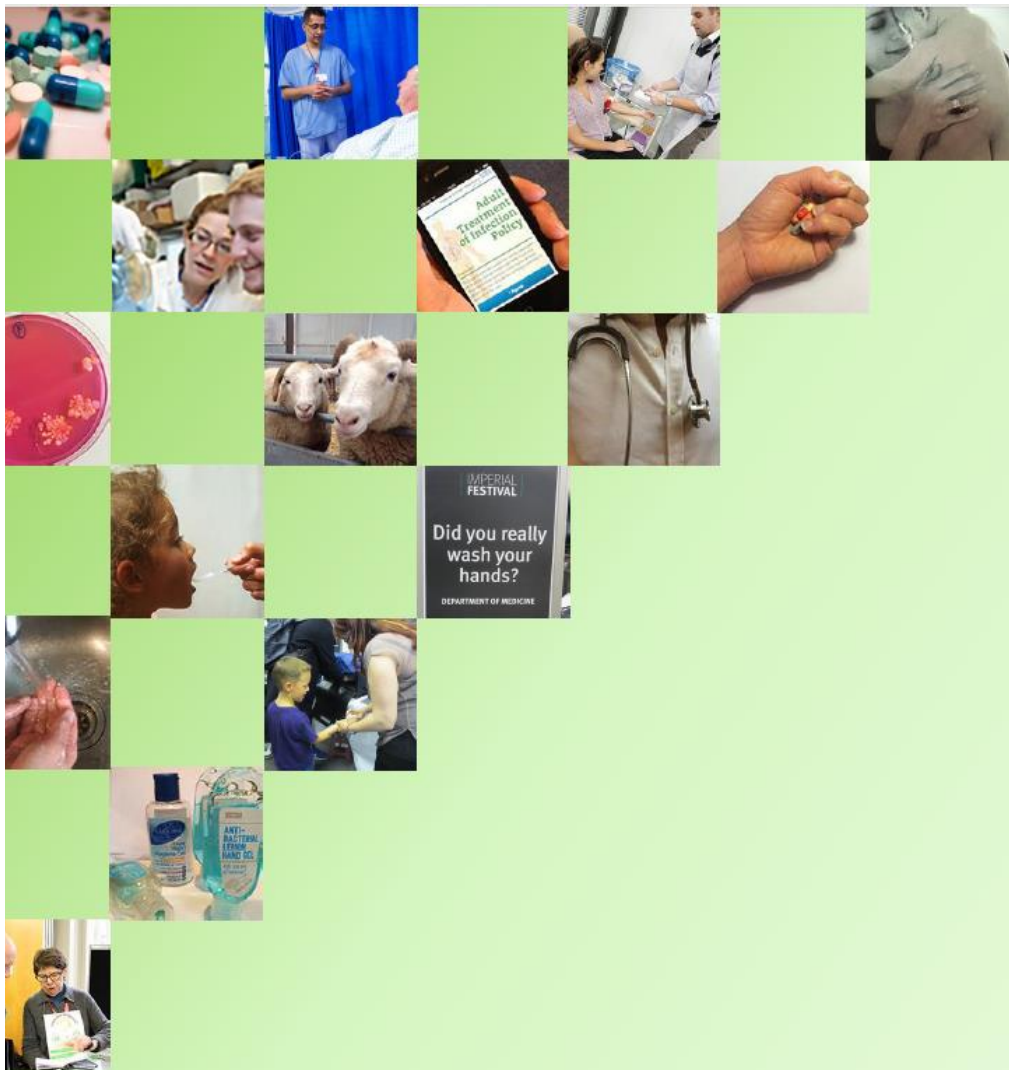


Health Protection Research Unit in Healthcare  
Associated Infections & Antimicrobial Resistance

**NIHR** | National Institute  
for Health Research



Imperial College  
London

Patient and Public Engagement Activity Pack

Antimicrobial Resistance: Modern Medicine Jenga

This pack is designed as a free guide, with printable resources, to allow you to run your own engagement activity about antimicrobial resistance.

The activity aims to educate participants and help them to understand how important antibiotics are in order to carry out routine operations, chemotherapy and other healthcare interventions.

Antibiotic resistance has serious implications at individual as well as global levels that the participants might not be aware of. This activity will highlight these.

### **Crediting the HPRU in HCAI and AMR at Imperial College.**

We would be delighted to hear from you if you choose to use our resources. Please do contact us at [head.ops@imperial.ac.uk](mailto:head.ops@imperial.ac.uk) and tweet pictures of the activity and tag us: @HPRUamr

Artwork by welovesolo.com under Creative Commons (Attribution 3.0)

## Activity Objectives

The objective of the activity is to raise awareness among participants that modern medicine relies heavily on the effective use of antibiotics for healthcare treatments and procedures. Participants will learn that without antibiotics it would not be possible to carry out these treatments. The activity is ideally suited for a Science Fair or Festival, or other public engagement event.

By the end of the activity:

- All participants should understand how antibiotics are the building blocks of modern medicine.
- All participants should understand that without antibiotics common healthcare procedures and treatments would not be possible.

## Background Information

Antibiotics are used to treat infections caused by bacteria. They also underpin much of modern medicine from routine surgery to cancer treatment.

Antibiotics are a family of drugs which work against bacteria. They have been the cornerstone of much of modern medicine, allowing routine surgery to be conducted without the risk of infection and the development of new treatments such as chemotherapy and transplantation which in weakening the immune system rely on antibiotics to stop the patients succumbing to illness. Along with better diets and sanitation, antibiotics are one of the key reasons for the dramatic increase in life-expectancy over the past century.

## Activity Preparation

You will need:

- A set of Jenga blocks- these come in a variety sizes small, medium and giant.
- Printed Jenga block labels of the appropriate size for your blocks (see below).
- Sticky tape or glue to wrap your blocks.
- Scissors.
- Table to display and carry out activity.

Optional:

- Coloured paper—labels below have been designed to be printed on white paper, however if you would like to print on coloured paper, we can provide templates with white backgrounds. Please contact [head.ops@imperial.ac.uk](mailto:head.ops@imperial.ac.uk).

A wide range of suppliers for Jenga can be found on [www.amazon.com](http://www.amazon.com). High street retailers include Argos and WHSmith.

### ON THE DAY OF THE ACTIVITY

- Build your tower and place the antibiotics so that they are supporting the tower on each level.

### Activity in action:

1. Prepare your Jenga blocks by printing the correct label size for your blocks. Cut out the labels and wrap the blocks like small parcels with the text on the long side of the block using your sticky tape or glue to secure the wrapping.
2. Build the Jenga tower with the antibiotics (yellow) supporting each level. Explain to your participants that the tower illustrates how antibiotics underpin modern medicine.
3. Next, ask the participants to carefully remove the antibiotic (yellow) Jenga blocks.
4. Explain to participants:
  - Antibiotics are developed into medicines to kill disease-causing bacteria.
  - Antibiotics have allowed us to effectively treat disease since their discovery in the 1920s.
  - They have prevented us from dying from minor infections and allowed us to develop modern medical procedures including all kinds of surgery and cancer medicine.
5. Encourage participants to remove as many antibiotic Jenga blocks as possible without the tower collapsing.
6. Highlight to your participants that without antibiotics underpinning modern medicine everyday treatments of the kind highlighted on all the other blocks will not be possible.
7. Once the tower has collapsed, rebuild it, encouraging people to help and to see the range of treatments which are supported by antibiotics.
8. Start the game again with your new group.

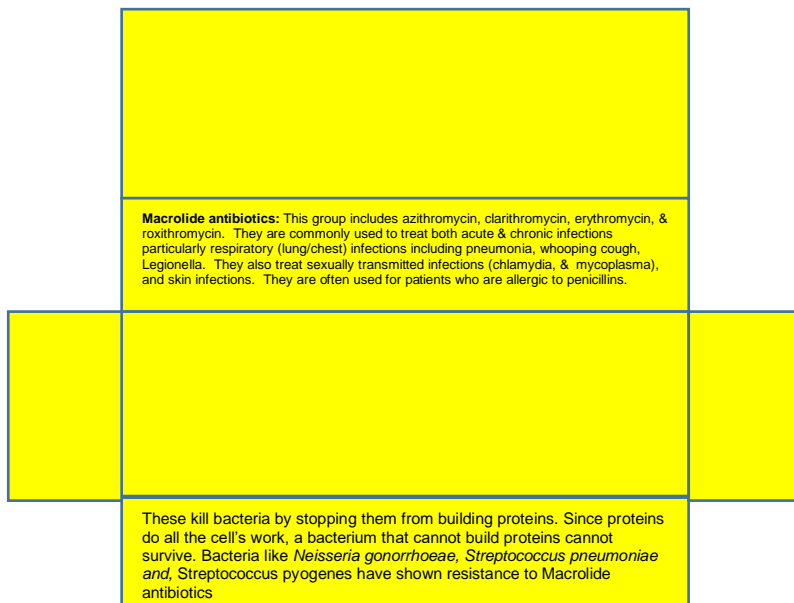
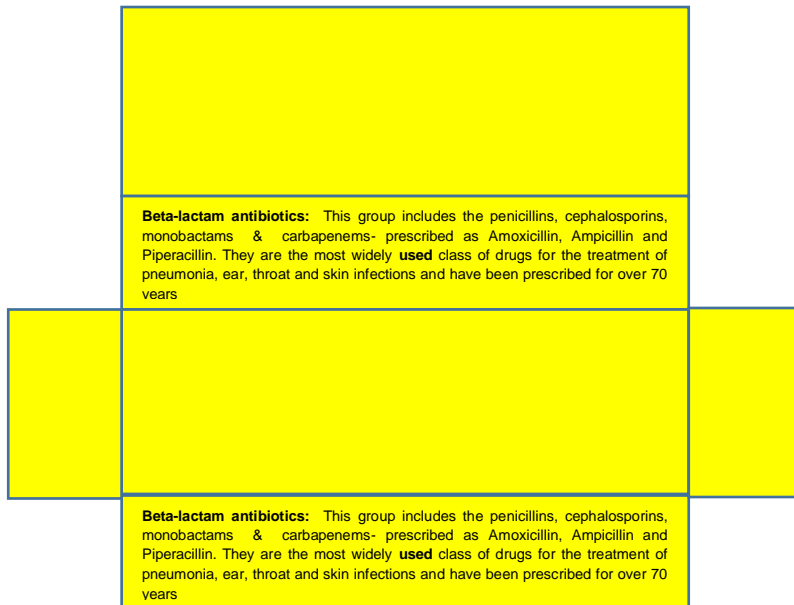


## ANTIBIOTIC JENGA LABELS in yellow and orange

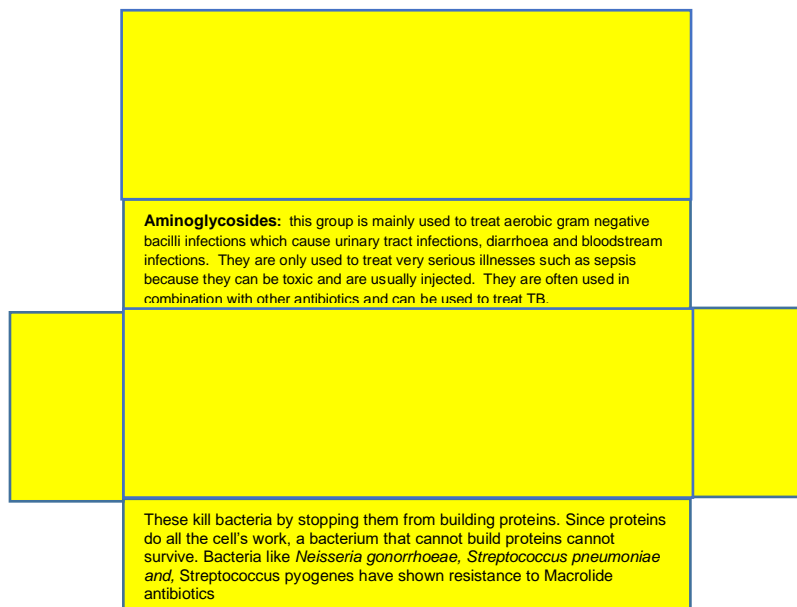
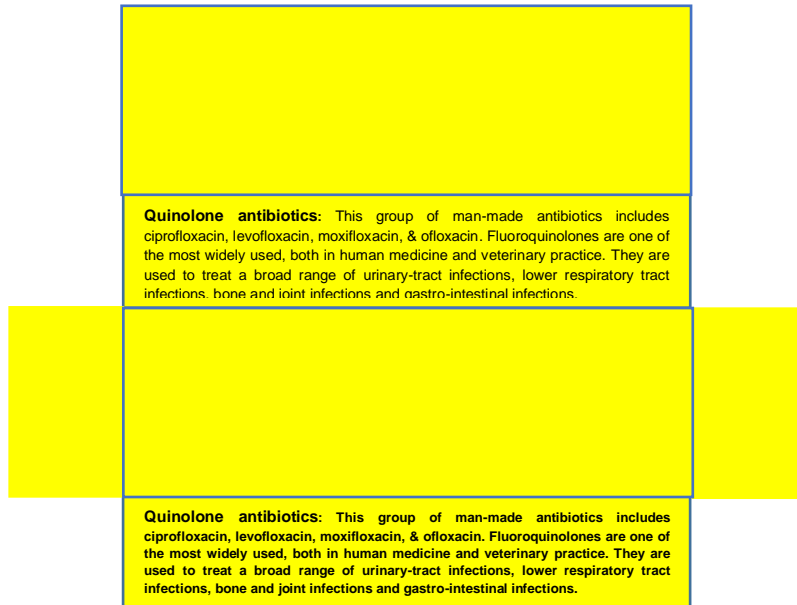
Small Jenga blocks size – 1.5cmx2.5cmx7.5cm

These need to be printed and wrapped around your Jenga blocks with the text appearing on the narrow long side. There are lots of printouts, but you **ONLY** need to print out the sheets for your size of Jenga blocks.

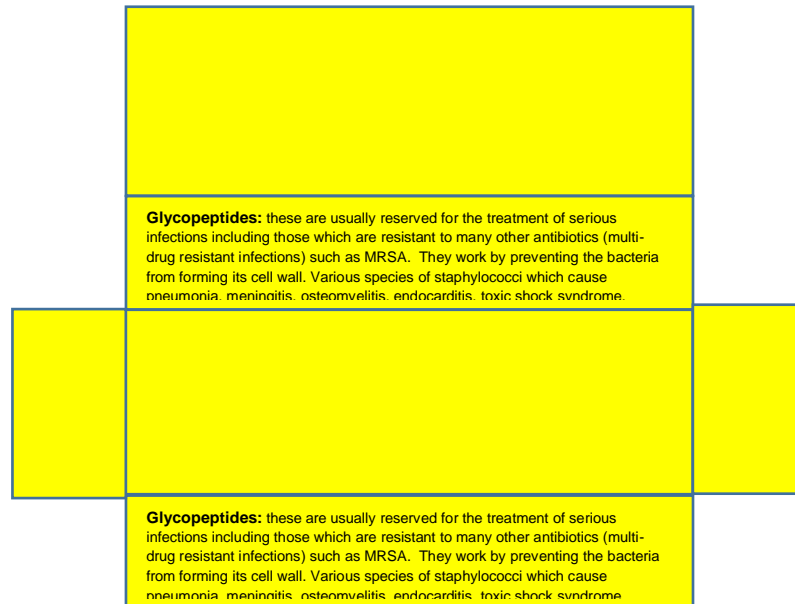
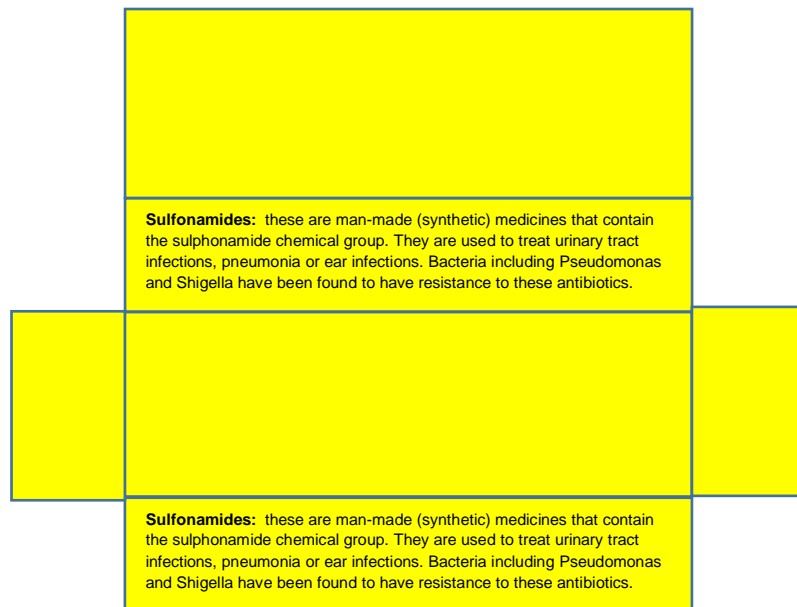
We suggest that you print at least 2 x copies of each sheet of Jenga net.



## ANTIBIOTIC JENGA LABELS FOR SMALL BLOCKS - 1.5cmx2.5cmx7.5cm

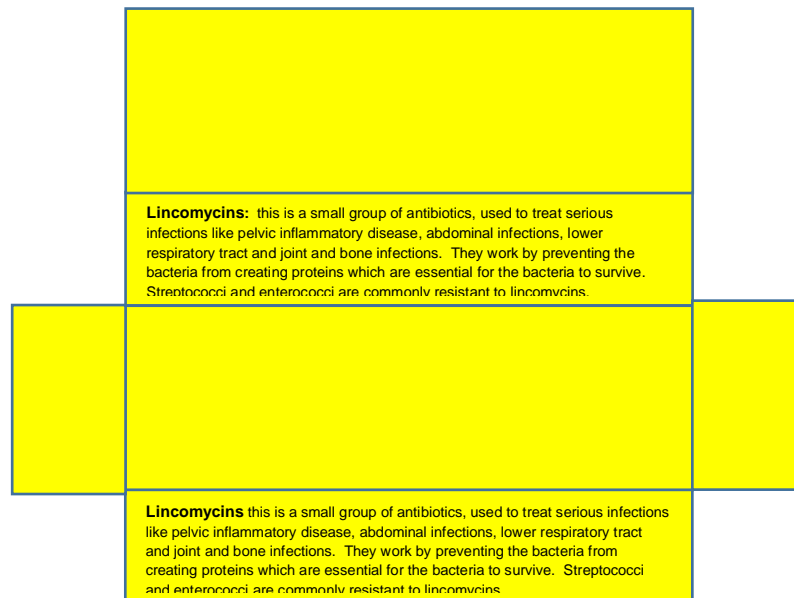
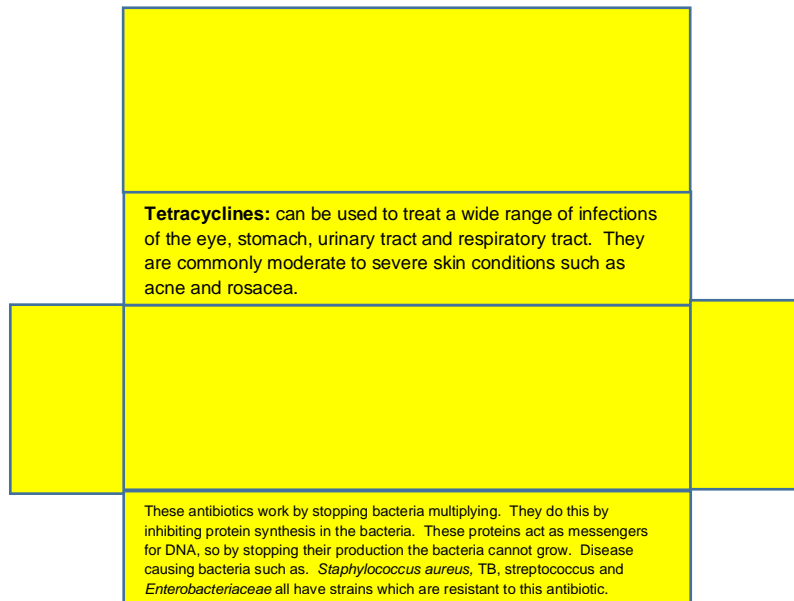


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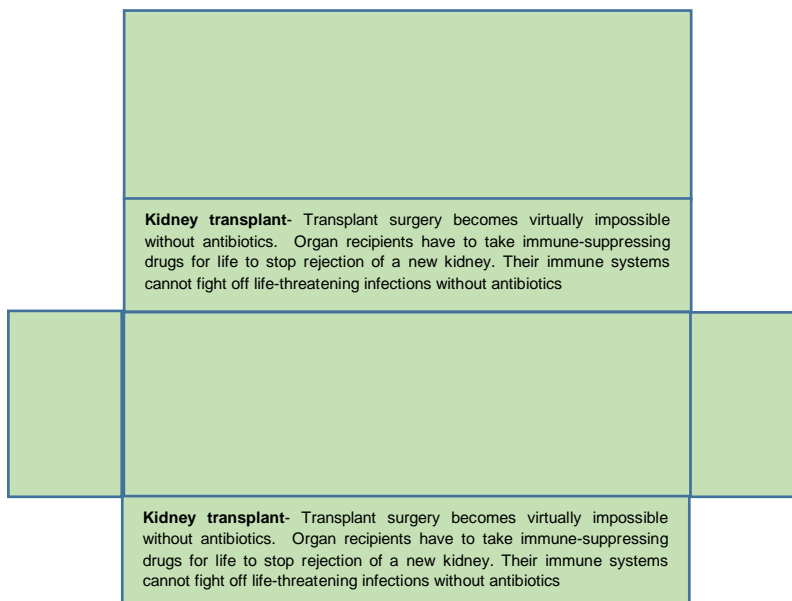
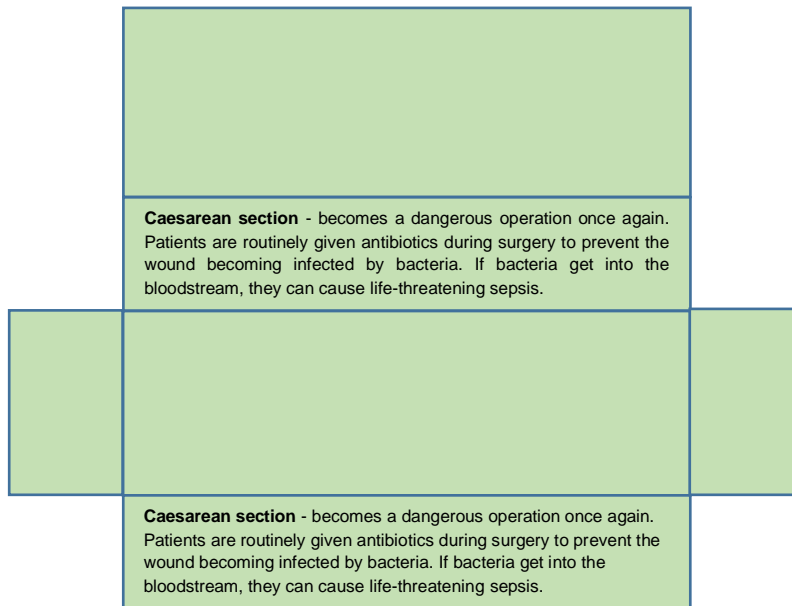


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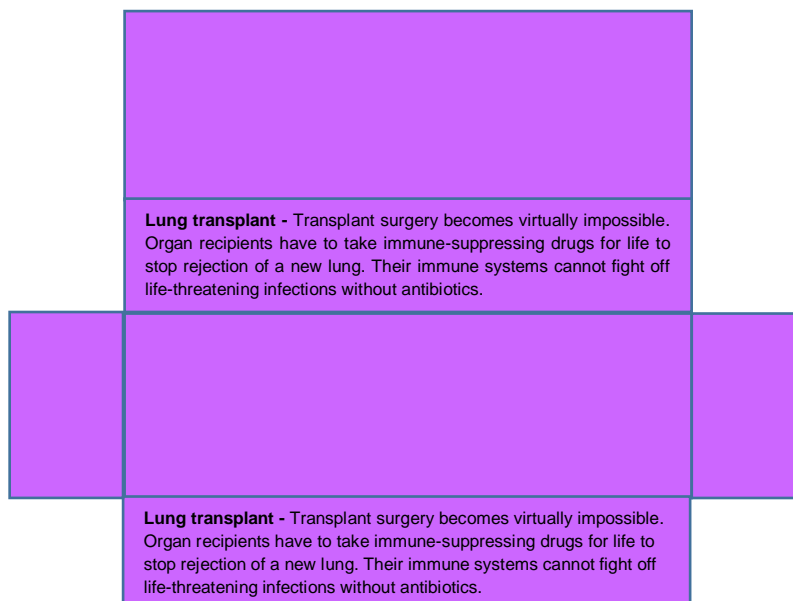
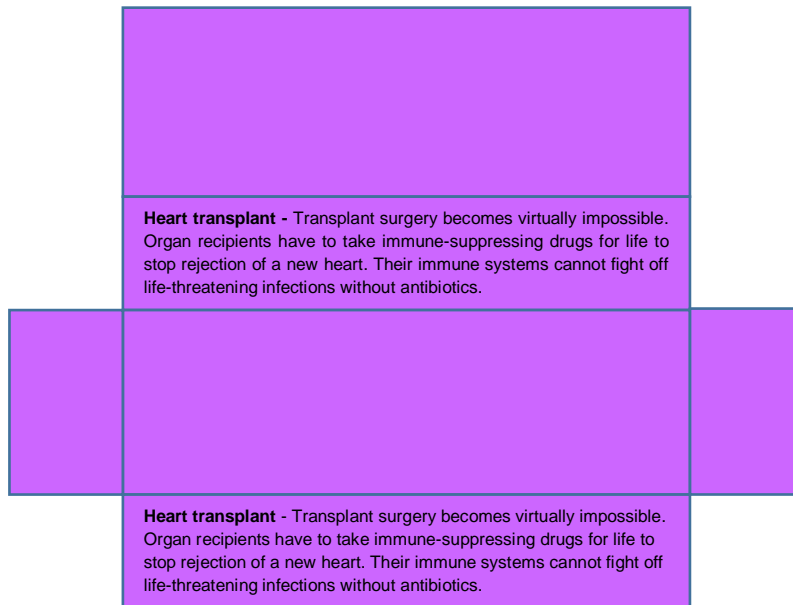
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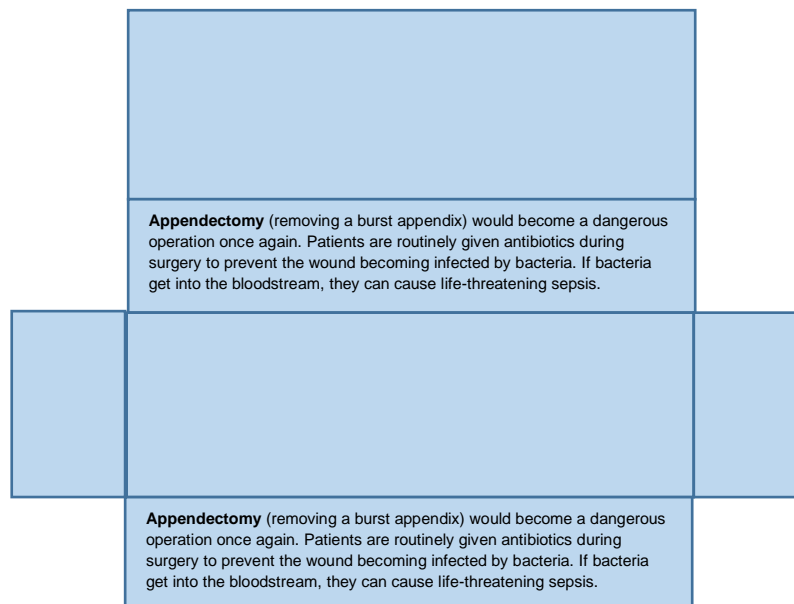
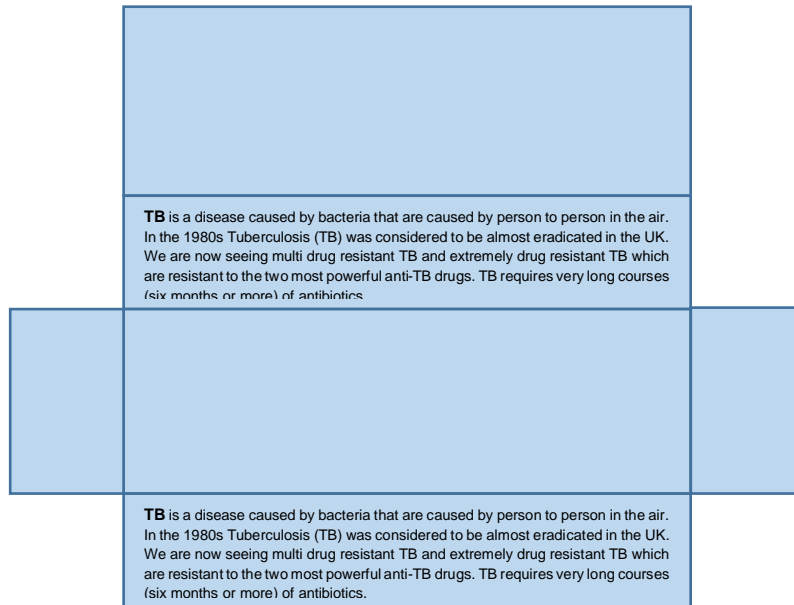
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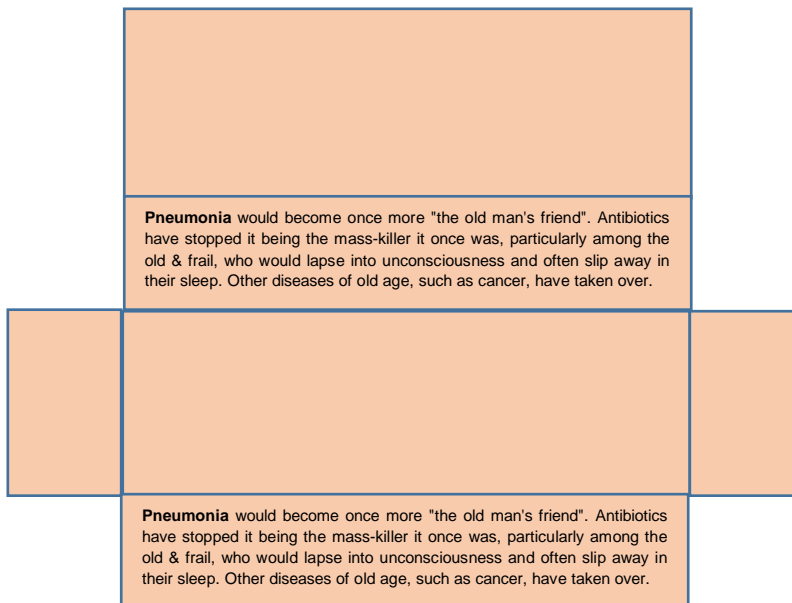
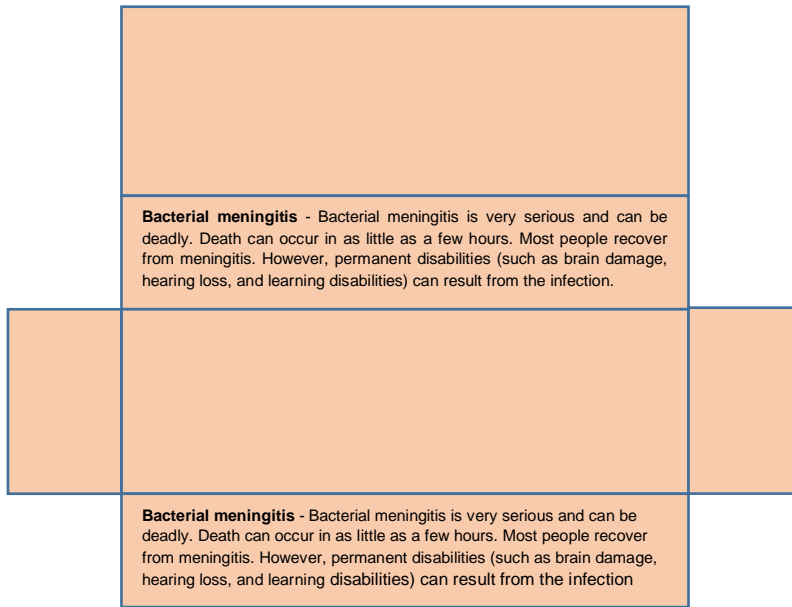
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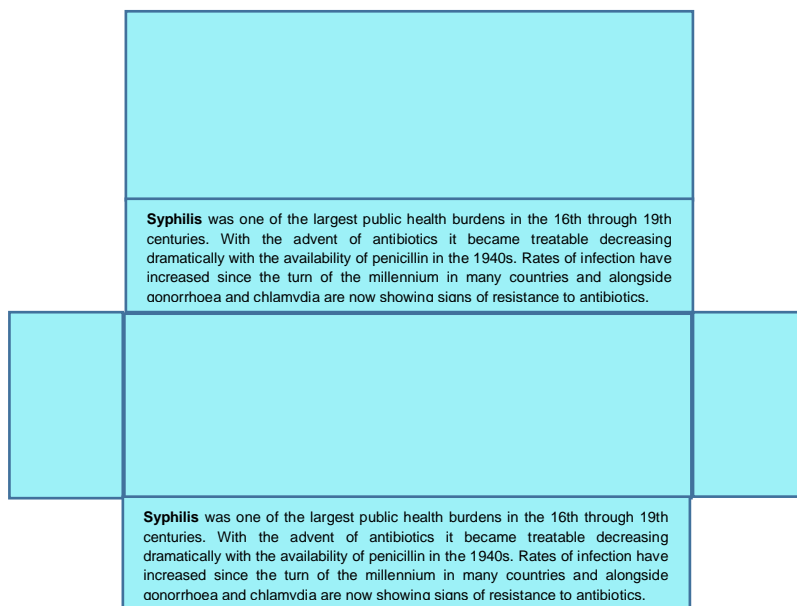
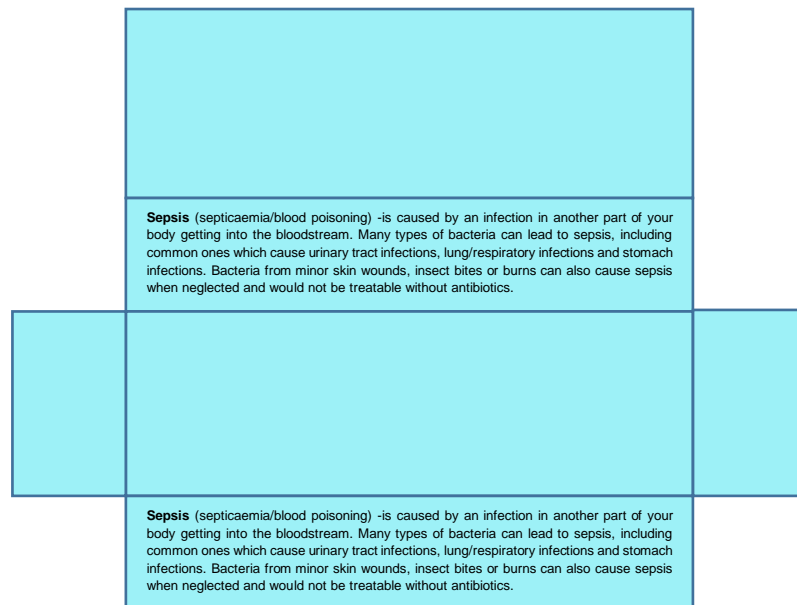
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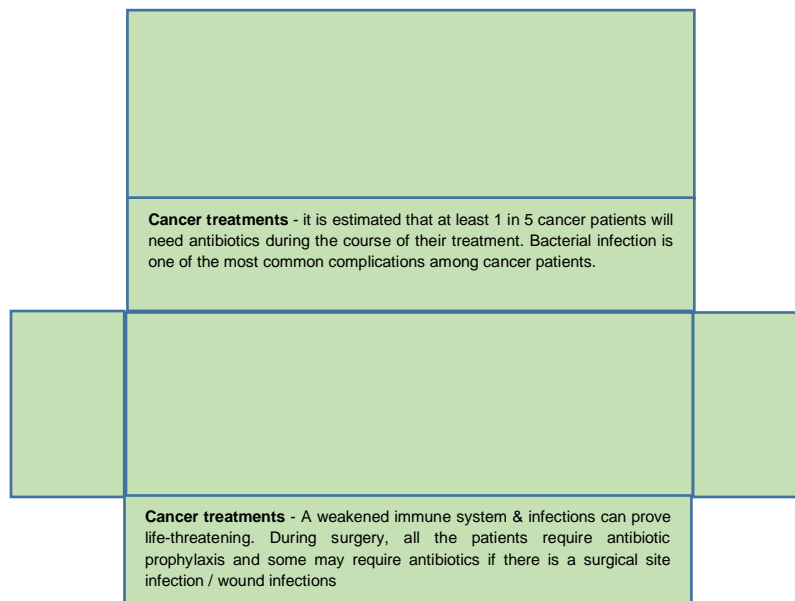
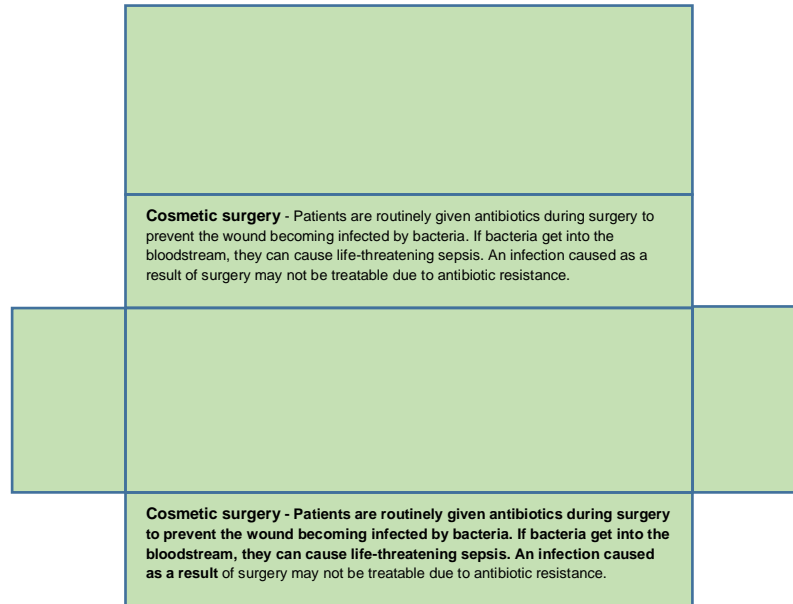
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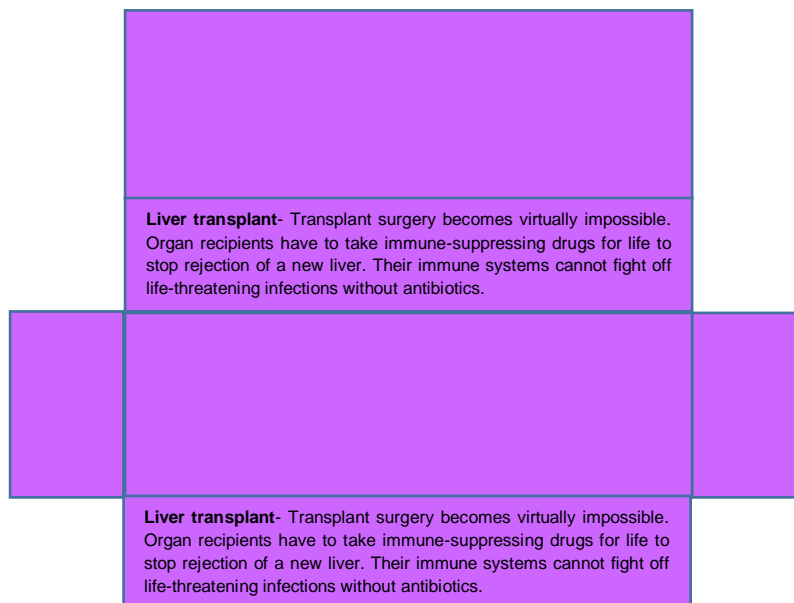
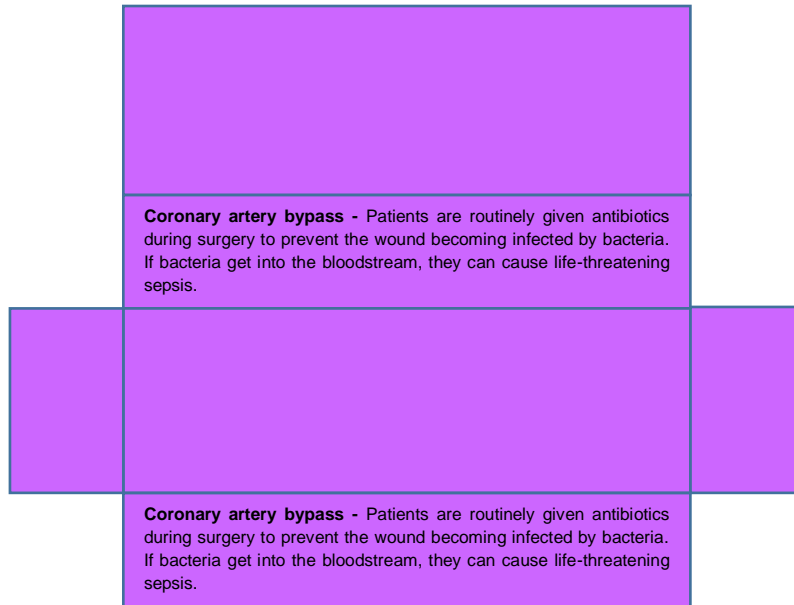
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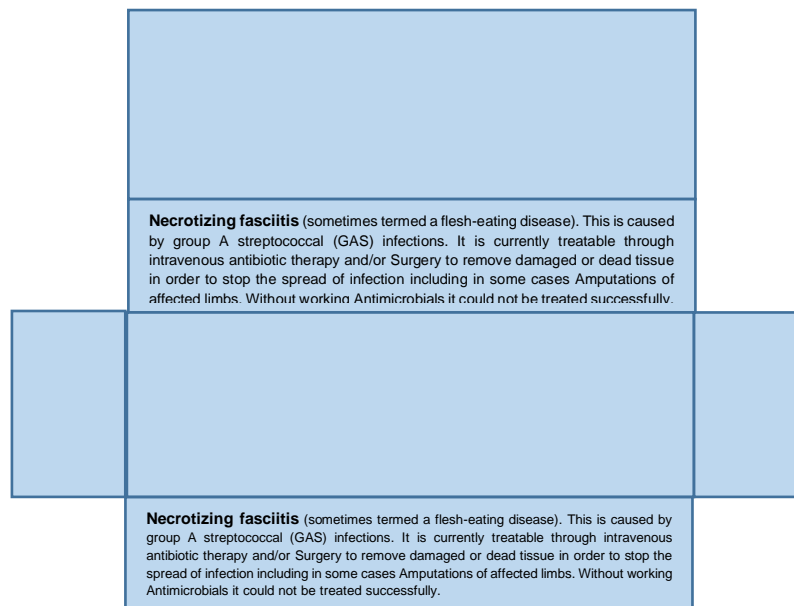
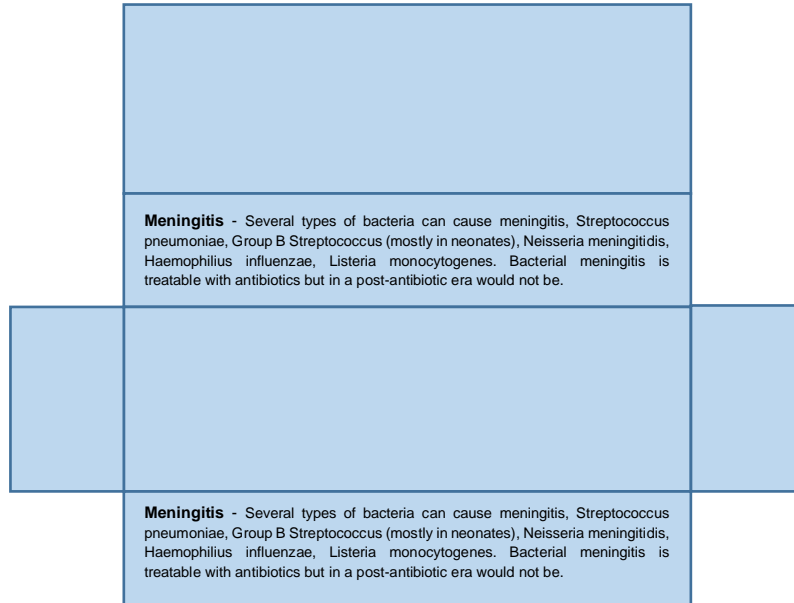
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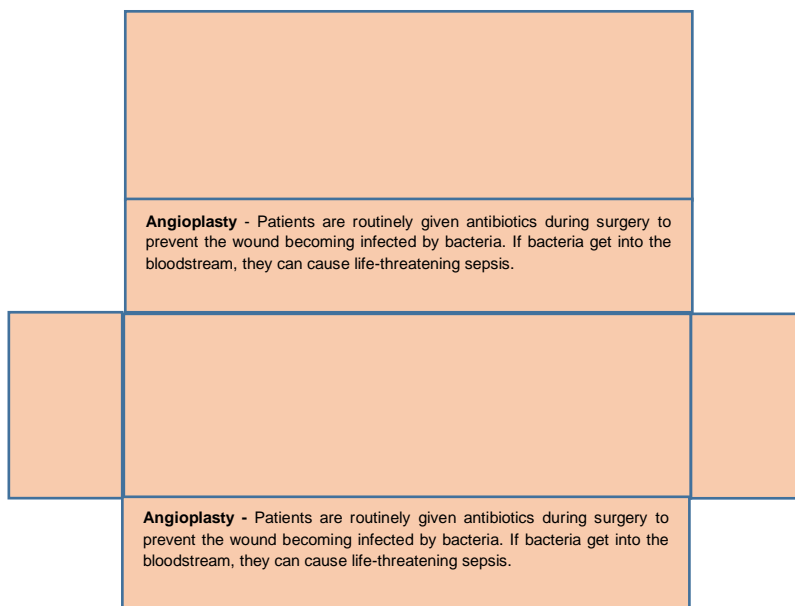
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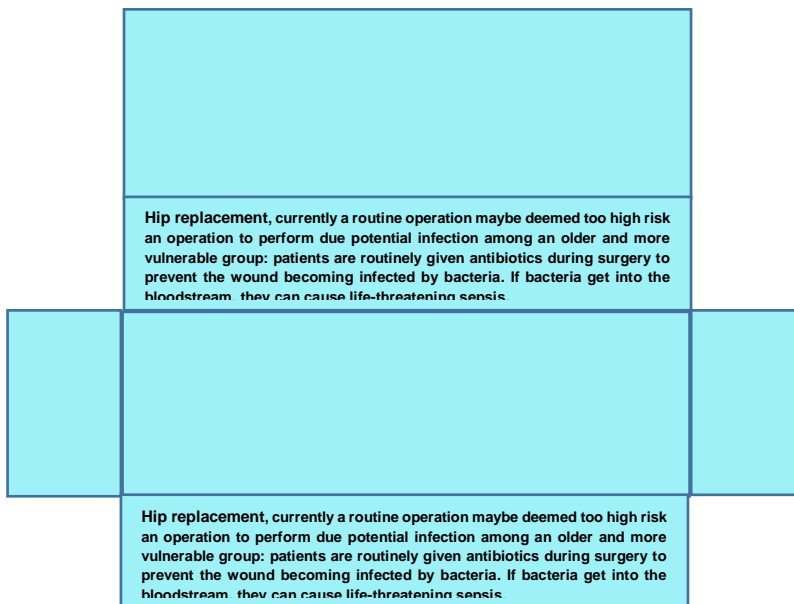
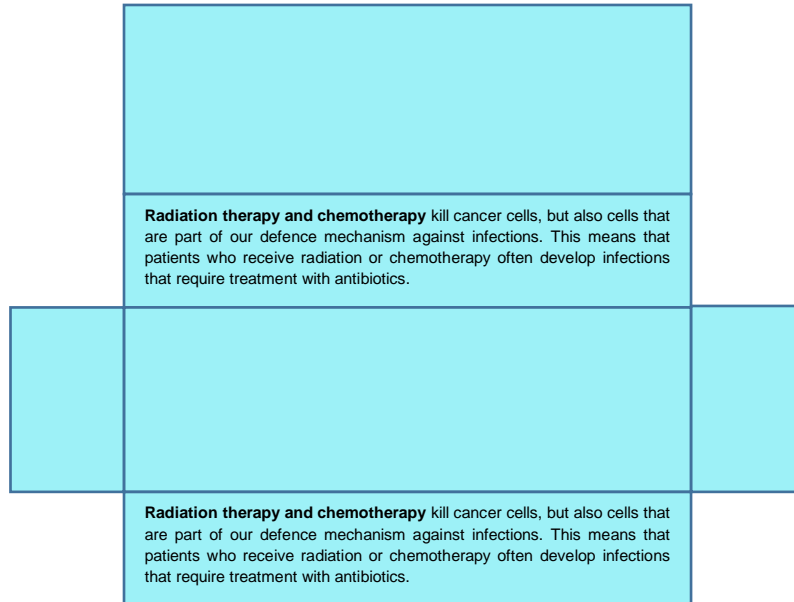
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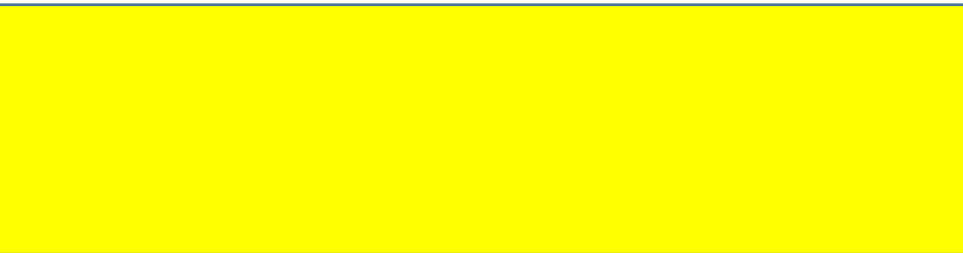
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## ANTIBIOTICS JENGA LABELS FOR MEDIUM SIZED BLOCKS

Medium size blocks - 2.8cmx3.3cmx13cm

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**Beta-lactam antibiotics:** This group includes the penicillins, cephalosporins, monobactams & carbapenems- prescribed as Amoxicillin, Ampicillin and Piperacillin. They are the most widely **used** class of drugs for the treatment of pneumonia, ear, throat and skin infections and have been prescribed for over 70 years.



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**Macrolide antibiotics:** This group includes azithromycin, clarithromycin, erythromycin, & roxithromycin. They are commonly used to treat both acute & chronic infections particularly respiratory (lung/chest) infections including pneumonia, whooping cough, Legionella. They also treat sexually transmitted infections (chlamydia, & mycoplasma), and skin infections. They are often used for patients who are allergic to penicillins.



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**Quinolone antibiotics:** This group of man-made antibiotics includes ciprofloxacin, levofloxacin, moxifloxacin, and ofloxacin. Fluoroquinolones are one of the most widely used, both in human medicine and veterinary practice. They are used to treat a broad range of urinary-tract infections, lower respiratory tract infections, bone and joint infections and gastro-intestinal infections.

They work by breaking the DNA of bacteria when they start copying their DNA which they need to do to reproduce. Quinolones cause the strands to break and then prevent the breaks from being repaired. Without intact DNA, bacteria cannot live or reproduce. Resistance has been observed in bacteria including *Klebsiella pneumoniae*, *E.coli*, *Salmonella* and *Pseudomonas*.

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**Aminoglycosides:** this group is mainly used to treat aerobic gram negative bacilli infections which cause urinary tract infections, diarrhoea and bloodstream infections. They are only used to treat very serious illnesses such as sepsis because they can be toxic and are usually injected. They are often used in combination with other antibiotics and can be used to treat TB.

These antibiotics work by preventing the bacterial protein synthesis. E.coli and Pseudomonas aeruginosa have demonstrated resistance to aminoglycosides.

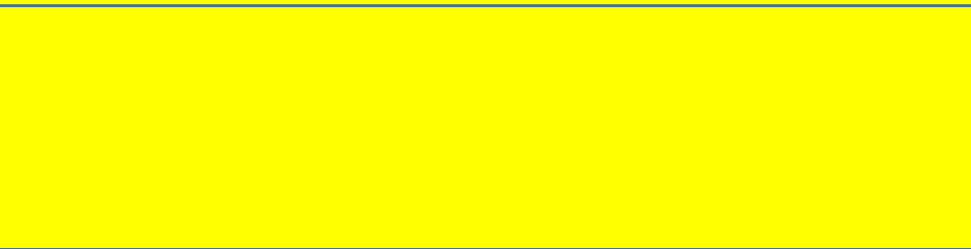
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**Sulfonamides:** these are man-made (synthetic) medicines that contain the sulphonamide chemical group. They are used to treat urinary tract infections, pneumonia or ear infections. Bacteria including Pseudomonas and Shigella have been found to have resistance to these antibiotics.



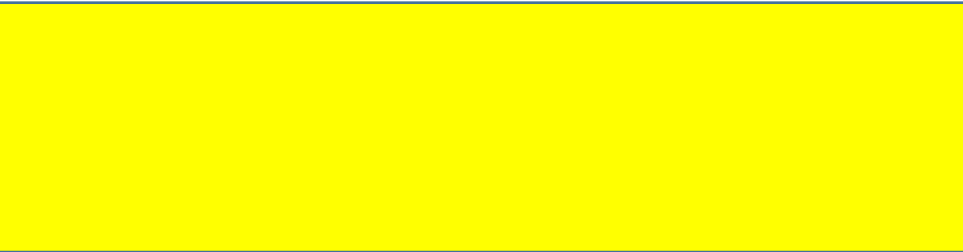
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**Glycopeptides:** these are usually reserved for the treatment of serious infections including those which are resistant to many other antibiotics (multi-drug resistant infections) such as MRSA. They work by preventing the bacteria from forming its cell wall. Various species of staphylococci which cause pneumonia, meningitis, osteomyelitis, endocarditis, toxic shock syndrome, bacteremia, and sepsis.



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**Tetracyclines:** can be used to treat a wide range of infections of the eye, stomach, urinary tract and respiratory tract. They are commonly moderate to severe skin conditions such as acne and rosacea.

These antibiotics work by stopping bacteria multiplying. They do this by inhibiting protein synthesis in the bacteria. These proteins act as messengers for DNA, so by stopping their production the bacteria cannot grow. Disease causing bacteria such as. *Staphylococcus aureus*, TB, streptococcus and Enterobacteriaceae all have strains which are resistant to this antibiotic..

**ANTIBIOTICS JENGA LABELS FOR MEDIUM SIZED BLOCKS**

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**Lincomycins:** this is a small group of antibiotics, used to treat serious infections like pelvic inflammatory disease, abdominal infections, lower respiratory tract and joint and bone infections. They work by preventing the bacteria from creating proteins which are essential for the bacteria to survive. Streptococci and enterococci are commonly resistant to lincomycins.



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**Caesarean section** - becomes a dangerous operation once again. Patients are routinely given antibiotics during surgery to prevent the wound becoming infected by bacteria. If bacteria get into the bloodstream, they can cause life-threatening sepsis.

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**Kidney transplant-** Transplant surgery becomes virtually impossible without antibiotics. Organ recipients have to take immune-suppressing drugs for life to stop rejection of a new kidney. Their immune systems cannot fight off life-threatening infections without antibiotics.

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**Heart transplant** - Transplant surgery becomes virtually impossible. Organ recipients have to take immune-suppressing drugs for life to stop rejection of a new heart. Their immune systems cannot fight off life-threatening infections without antibiotics.

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**Lung transplant** - Transplant surgery becomes virtually impossible. Organ recipients have to take immune-suppressing drugs for life to stop rejection of a new lung. Their immune systems cannot fight off life-threatening infections without antibiotics..



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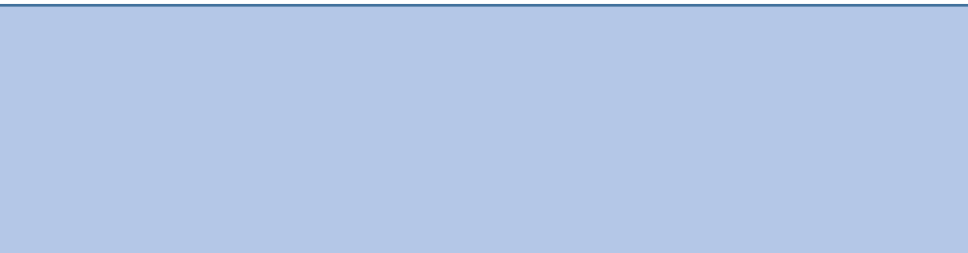
**TB** is a disease caused by bacteria that are caused by person to person in the air. In the 1980s Tuberculosis (TB) was considered to be almost eradicated in the UK. We are now seeing multi drug resistant TB and extremely drug resistant TB which are resistant to the two most powerful anti-TB drugs. TB requires very long courses (six months or more) of antibiotics.

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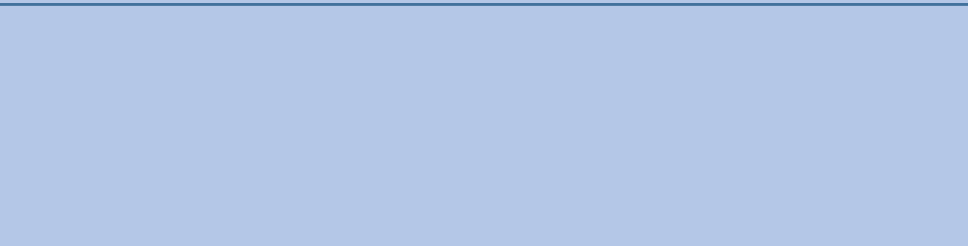


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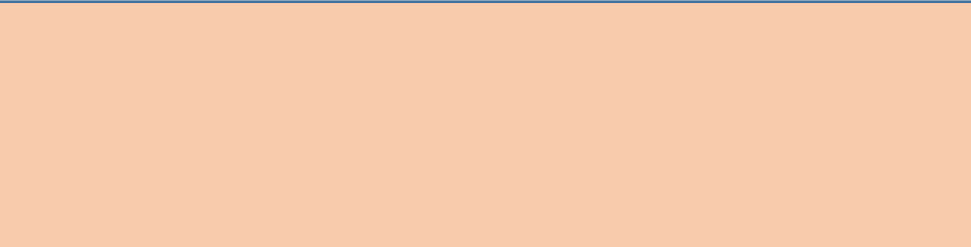
**Appendectomy** (removing a burst appendix) would become a dangerous operation once again. Patients are routinely given antibiotics during surgery to prevent the wound becoming infected by bacteria. If bacteria get into the bloodstream, they can cause life-threatening sepsis.



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**Bacterial meningitis** - Bacterial meningitis is very serious and can be deadly. Death can occur in as little as a few hours. Most people recover from meningitis. However, permanent disabilities (such as brain damage, hearing loss, and learning disabilities) can result from the infection.



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**Pneumonia** would become once more "the old man's friend". Antibiotics have stopped it being the mass-killer it once was, particularly among the old and frail, who would lapse into unconsciousness and often slip away in their sleep. Other diseases of old age, such as cancer, have taken over.



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**Sepsis** (septicaemia/blood poisoning) -is caused by an infection in another part of your body getting into the bloodstream. Many types of bacteria can lead to sepsis, including common ones which cause urinary tract infections, lung/respiratory infections and stomach infections. Bacteria from minor skin wounds, insect bites or burns can also cause sepsis when neglected and would not be treatable without antibiotics.



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**Syphilis** was one of the largest public health burdens in the 16th through 19th centuries. With the advent of antibiotics it became treatable decreasing dramatically with the availability of penicillin in the 1940s. Rates of infection have increased since the turn of the millennium in many countries and alongside gonorrhoea and chlamydia are now showing signs of resistance to antibiotics.



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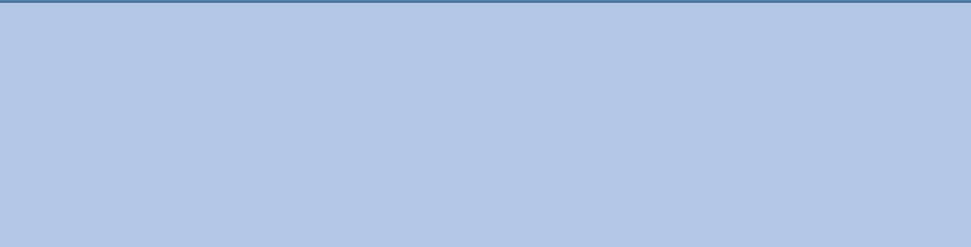
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**Beta-lactam antibiotics:** This group includes the penicillins, cephalosporins, monobactams and carbapenems- prescribed as Amoxicillin, Ampicillin, Piperacillin to name but a few. They are the most widely used class of drugs for the treatment of pneumonia, ear, throat and skin infections and have been prescribed for over 70 years.

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**Macrolide antibiotics: This group includes azithromycin, clarithromycin, erythromycin, and roxithromycin. They are commonly used to treat both acute and chronic infections particularly respiratory (lung/chest) infections including pneumonia, whooping cough, Legionella. They also treat sexually transmitted infections (chlamydia, and mycoplasma), and skin infections. They are often used for patients who are allergic to penicillins.**

**These kill bacteria by stopping them from building proteins. Since proteins do all the cell's work, a bacterium that cannot build proteins cannot survive. Bacteria like Neisseria gonorrhoeae, Streptococcus pneumoniae and, Streptococcus pyogenes have shown resistance to Macrolide antibiotics**

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**Quinolone antibiotics: This group of man-made antibiotics includes ciprofloxacin, levofloxacin, moxifloxacin, and ofloxacin. Fluoroquinolones are one of the most widely used, both in human medicine and veterinary practice. They are used to treat a broad range of urinary-tract infections, lower respiratory tract infections, bone and joint infections and gastro-intestinal infections.**

**They work by breaking the DNA of bacteria when they start copying their DNA which they need to do to reproduce. Quinolones cause the strands to break and then prevent the breaks from being repaired. Without intact DNA, bacteria cannot live or reproduce. Resistance has been observed in bacteria including Klebsiella pneumoniae, E.coli, Salmonella and Pseudomonas**

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**Aminoglycosides: this group is mainly used to treat aerobic gram negative bacilli infections which cause urinary tract infections, diarrhoea and bloodstream infections. They are only used to treat very serious illnesses such as sepsis because they can be toxic and are usually injected. They are often used in combination with other antibiotics and can be used to treat TB.**

**These antibiotics work by preventing the bacterial protein synthesis. E.coli and Pseudomonas aeruginosa have demonstrated resistance to aminoglycosides.**

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**Sulfonamides:** these are man-made (synthetic) medicines that contain the sulphonamide chemical group. They are used to treat urinary tract infections, pneumonia or ear infections. Bacteria including Pseudomonas and Shigella have been found to have resistance to these antibiotics.

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**Glycopeptides: these are usually reserved for the treatment of serious infections including those which are resistant to many other antibiotics (multi-drug resistant infections) such as MRSA. They work by preventing the bacteria from forming its cell wall. Various species of staphylococci which cause pneumonia, meningitis, osteomyelitis, endocarditis, toxic shock syndrome, bacteremia, and sepsis.**

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**Tetracyclines: can be used to treat a wide range of infections of the eye, stomach, urinary tract and respiratory tract. They are commonly moderate to severe skin conditions such as acne and rosacea.**

**These antibiotics work by stopping bacteria multiplying. They do this by inhibiting protein synthesis in the bacteria. These proteins act as messengers for DNA, so by stopping their production the bacteria cannot grow. Disease causing bacteria such as. Staphylococcus aureus, TB, streptococcus and Enterobacteriaceae all have strains which are resistant to this antibiotic.**

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**Lincomycins: this is a small group of antibiotics, used to treat serious infections like pelvic inflammatory disease, abdominal infections, lower respiratory tract and joint and bone infections. They work by preventing the bacteria from creating proteins which are essential for the bacteria to survive. Streptococci and enterococci are commonly resistant to lincomycins.**

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