Paracetamol: Friend or Foe?

Key Stage 4 Programme

Pupil Name	
Handbook Designed by	Dr Kairuo Xu

Timetable and Assignment Submission

Timetable – Tutorials

Tutorial	Date	Time	Location
1	12th Dec 2018	13:30	Kings College London
2	11th Jan 2019	15:00	HGAB Science Room 6
3	18th Jan 2019	15:00	HGAB Science Room 6
4	25th Jan 2019	15:00	HGAB Science Room 6
5	1st Feb 2019	15:00	HGAB Science Room 6
6 (Feedback)	8th Feb 2019	15:00	HGAB Science Room 6
7 (Feedback)	22nd Mar 2019	15:00	HGAB Science Room 6

Timetable – Homework Assignments

Homework Assignment	Description	Due Date
Tutorial 1	Complete Your Medicine Table	11th Jan 2018
Tutorial 2	Understand the Choice of Paracetamol Formulation	18th Jan 2019
Tutorial 3	Calculation of Paracetamol Dosage	25th Jan 2019
Tutorial 4	Independent Research on Paracetamol Metabolism	1st Feb 2019
Tutorial 5	Final Assignment	1st Mar 2019

Assignment Submission – Lateness and Plagiarism

Lateness	
Submission after midnight on 1st March	10 marks deducted
Plagiarism	
Some plagiarism	10 marks deducted
Moderate plagiarism	20 marks deducted
Extreme plagiarism	Automatic fail

Uni Pathways – Pupil Feedback Report

Grade	Marks	Guidance
1st	70+	
2:1	60-69	
2:2	50-59	
3rd	40-49	
Working towards a pass	0-39	
Did not submit	DNS	No assignment received by The Brilliant Club

Lateness	
Any lateness	10 marks deducted
Plagiarism	
Some plagiarism	10 marks deducted
Moderate plagiarism	20 marks deducted
Extreme plagiarism	Automatic fail

Name of PhD Tutor	Dr Kairuo Xu		
Title of Assignment	Paracetamol: Friend or Foe?		
Name of Pupil			
Name of School	Harris Girls' Academy Bromley		
ORIGINAL MARK / 100		FINAL MARK / 100	
DEDUCTED MARKS		FINAL GRADE	

If marks have been deducted (e.g. late submission, plagiarism) the teacher should give an explanation in this section:

Learning Feedback Comment 1 -	
What you did in relation to this Key Learning Priority	How you could improve in the future
Learning Feedback Comment 2 –	
What you did in relation to this Key Learning Priority	How you could improve in the future
Learning Feedback Comment 3 –	
What you did in relation to this Key Learning Priority	How you could improve in the future
Resilience Comment	
How you showed learning resilience during the course	How you could build learning resilience in the future

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Course Rationale

Paracetamol, a common medicine that is used to relief pain and to reduce fever, is one of the most widely used over-the-counter (i.e. no need of prescription) medicine in the world. With the vast number of different brands available on the market, it can be confusing to choose which one is best – is it the most complicated formulation or simply the most expensive one? And to make it even more puzzling, it comes in tablets, capsules, coated pills, dissolvable effervescing tablet, suppositories, patches and many more! It is time to take a pause, and ask, why. Why there are so many different formats for such a simple chemical? And more importantly, how do they work? What happens when you swallow a pill of paracetamol? How is it different from putting a patch on your forehead? What happens once it is inside your body? Does it come with any side effects? With all these queries in mind, this course is here to unravel the mystery of paracetamol. From the formulation to the movement of paracetamol inside body, the life of paracetamol is explained in detail in five university-style tutorials. In addition, through understanding of the common side effects and consequence of overdose, safe and effective usage of paracetamol is emphasised. By the end of this course, students will gain better understanding of the pharmaceutical science behind paracetamol formulation; the knowledge of pharmacokinetics of paracetamol inside human body, as well as the awareness of safely usage of medicines.

In the first tutorial, a general knowledge of medicine will be introduced. Students will discover what medicines are and why do we need them. We will discuss the differences and similarities between drug and medicine and the importance of rational use of medications.

In the second tutorial, we will study different brands of medicines that have paracetamol as the active pharmaceutical ingredient (API). We will discuss the reason behind the vast amount of choices available and how this is linked to the way these medicines are consumed/applied. We will also cover the relationship between medicine administration and medicine absorption.

In tutorial three, we then will move on to the distribution of paracetamol after being absorbed into the bloodstream. We will learn different compartments within the human body that are responsible for paracetamol storage and circulation. We will also discuss the importance of plasma binding and what role does it play in paracetamol distribution. Lastly, we will investigate key factors that can influence paracetamol distribution.

After being distributed across the body, it is time to learn how the medicine gets broken down. In the fourth tutorial, we will study the metabolism of paracetamol. Phase I and Phase II metabolism will be covered, together with the role of P450 enzymes. We will learn the crucial function of liver in paracetamol metabolism and how it is linked to drug excretion. Moreover, we will investigate key factors that can influence paracetamol metabolism.

In the last tutorial we will focus on the final stage, which is the excretion of paracetamol and understand why overdose can happen. Through the investigation of paracetamol overdose and the consequence, rational application of medicine usage will be emphasised. We will also cover the common side effects of paracetamol and discuss how we can ensure safe and effective usage of paracetamol.

Mark Scheme

Skills	1st (70-100)	2:1 (60-69)	2:2 (50-59)
Knowledge and Understanding	· All content included is relevant to the general topic and to the specific question/title · Good understanding of all the relevant topics. · Scientific terms are defined and used accurately throughout · Clear justification on how the content included is related to the specific issues that are the focus of the assignment	· Most of the content included is relevant to the general topic and to the specific question/title · Good understanding of most the relevant topics · Scientific terms are used accurately but not always clearly defined. · Adequate justification on how the content included is related to the specific issues that are the focus of the assignment	· Some of the content included is relevant to the general topic and to the specific question/title · Good understanding on some of the relevant topics but occasional confusion on others. · Scientific terms are used mostly accurately with occasional confusion and often not defined. · Some justification on how the content included is related to the specific issues that are the focus of the assignment
Critical Evaluation/ Problem solving	· Moved beyond description to an assessment of the value or significance of what is described · Evaluative points are consistently explicit/systematic/reasoned/justified · Effective critiques on the reliability of sources provided · Consistently demonstrate clear, analytical and logical steps to solving problems	· Mostly description but some assessment of the value or significance of what is described · Evaluative points are mostly explicit/systematic/reasoned/justified · Some evidence of critiques on the reliability of sources provided · Some examples of solving problems but not consistently clear, analytical and logical	· Only description with minimal assessment of the value or significance of what is described · Evaluative points are at times explicit/systematic/reasoned/justified · Limited evidence of critiques on the reliability of sources provided · Demonstrate clear steps to solving problems but not consistently analytical or logical

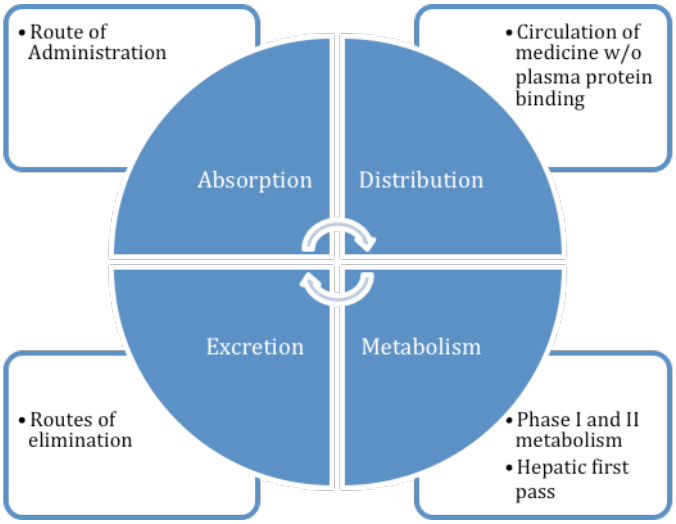
Structure and Presentation	· Ideas are presented in paragraphs and arranged in a logical structure that is appropriate for the assignment · The introduction clearly outlines how the essay/report will deal with the issues · The conclusion summarises all the main points clearly and concisely · All calculations, formulas and methods are clearly structured, clear to follow and correct · Tables and graphs are effectively constructed including appropriate headings, units and scales. · All sources are referenced correctly in an agreed format	· Ideas are presented in paragraphs and arranged in a structure that is mostly appropriate for the assignment · The introduction adequately describes how the essay/report will deal with the issues · The conclusion summarises most of the main points clearly · Calculations, formulas and methods are mostly structured, clear to follow and correct · Most tables and graphs are well constructed · Most sources are referenced correctly in an agreed format	· Ideas are presented in paragraphs and arranged in a structure · The introduction mentions how the essay/report will deal with the issues · The conclusion summarises some of the main points clearly · Calculations, formulas and methods are not always structured, clear to follow and correct. · Some tables and graphs are well constructed but contains some errors · Some sources are referenced correctly in the agreed format with occasional errors

Subject Vocabulary

Word	Definition	In a sentence
Plasma Protein	Also termed blood protein, are proteins found in the blood plasma.	Plasma proteins constitute 6-7% of the blood plasma.
Passive diffusion	The movement of ions and other atomic or molecular substances across cell membranes without need of energy input.	Osmosis is one example of passive diffusion.
Cytochrome P450 enzymes	A selection of enzymes function to metabolise potentially toxic compounds.	Cytochrome P450 enzymes are primarily found in the liver.
Phase I and II metabolisms	Different stages of metabolisms: Phase I is primarily converting hydrophobic molecules to hydrophilic molecules; phase II generally serves as a detoxifying step via conjugation.	Phase I and II metabolisms are important process to metabolically breakdown drug molecules.
Hepatic first pass	The metabolism of drugs in the liver before reaching to systemic circulation.	Hepatic first pass sometimes can be a disadvantage as it reduces the bioavailability of drug.
Pharmacokinetics	The science concerned with the movement of drugs within the body.	There are four stages involved in pharmacokinetics: absorption, distribution, metabolism and excretion.
Active pharmaceutical ingredient	Also known as API, is an ingredient in the drug that is biologically active.	Active pharmaceutical ingredient is the key constituent of a drug.
Excipient	Selection of substances that are formulated alongside the API in drug formulation.	Colouring agent, flavouring agent, bulking agent are all examples of excipients.
Gastro-intestinal tract	Also known as GI tract, which is a series of hollow organs joined in a long, twisting tube form the mouth to the anus.	Mouth, oesophagus, stomach, small intestine, large intestine, and anus are all found in the GI tract.
Volume of distribution	Also known as V_d, is a parameter that relates drug concentration measured in plasma or blood to the amount of drug in the body.	Volume of distribution is an important factor to characterise drug distribution.
Plasma concentration	The concentration of drug in the plasma.	Plasma concentration is an important indicator in calculating drug efficacy.
Prodrug	It is a medication that is only active once it is metabolised inside the body.	Aspirin is one example of a prodrug, once it is metabolised inside the body it converts to salicylate, which is the 'active form' of the drug.
Bioactivation	The process where enzymes acquire the ability to perform their biological function.	Bioactivation is needed to convert prodrug into active drug.

Knowledge Organisers

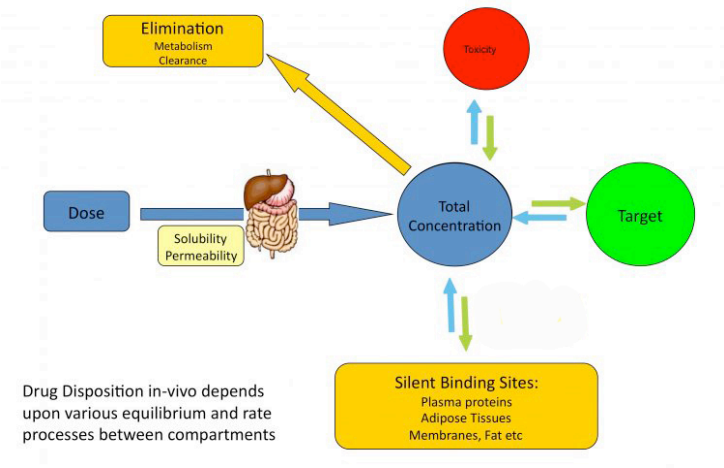
Schematic representation of the life of paracetamol inside body

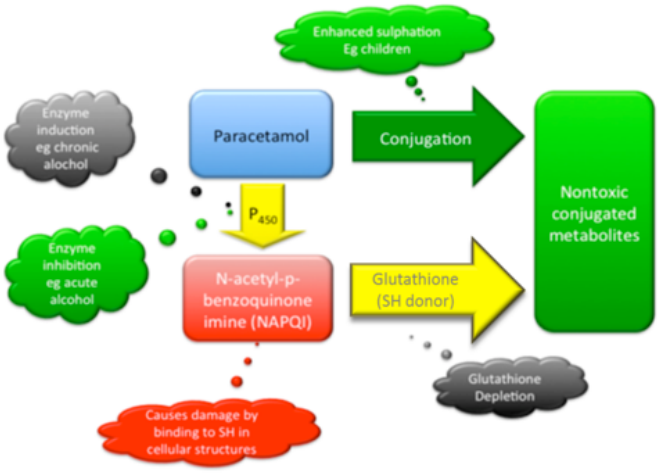


Common type of paracetamol formulation with its route of administration and site of absorption

Type of formulation	Route of administration	Site of absorption
Tablets, capsules, syrup, suspension	Oral	90% via small intestine
Cream, patch, gel	Topical	Capillaries underneath the skin
Suppository	Rectal	Rectum blood vessels
injection	Parenteral	Vein

Schematic representation of paracetamol distribution (left) and metabolism (right).





Glossary of Key Words

Key Vocabulary	
Cytochrome P450 enzymes	Enzymes primarily found in liver which are responsible for metabolise potential toxic substances.
Phase I metabolism	Oxidation, reduction, or hydrolysis of the parent drug, resulting in its conversion to a more polar molecule.
Phase II metabolism	Conjugation reactions that serve as detoxifying step in drug metabolism.
Volume of distribution	The theoretical volume that would be necessary to contain the total amount of an administered drug at the same concentration that it is observed in the blood plasma.
Plasma concentration	The concentration of drug in plasma at a specific time.

Tutorial 1 – What Are Medicines And Why Are They Important?

What is the Purpose of Tutorial 1?

This tutorial will introduce some background knowledge of medicine. We will study what medicines are and why do we need them. We will discuss the differences and similarities between drug and medicine and the importance of rational use of medications.

By the end of this tutorial you should be able to:

- Have a general knowledge of medicines and the important role they play in our lives
- Distinguish between drugs and medicines and know the similarities and differences between these two terms
- Give one example of medicine and able to describe its function
- Understand the importance of rational use of medications

Tutorial 1 Notes

Activity 1 – Post-it!

Medicine ?

- Independent thinking and writing - on the post-it note, write down the things that come to your mind when you hear the word 'medicine'. One word per note
- Knowledge share - once you have finished, come and stick your post-it onto the white sheet

Notes

Plenary: complete the following spider diagram by filling six key facts about medicine

Notes

Activity 2 – Write-Pair-Share

Drug ≟ Medicine

- Are drugs medicine?
- What are the similarities and differences?
- Can you name a drug that is not a medicine?

Notes

Plenary: Sort the drug into the correct categories

Medicinal	Recreational	Illegal

Antibiotics	**Heroin**	**Cocaine**
Cannabis	**LSD**	**Steroids**
Ecstasy	**Alcohol**	**Caffeine**
Nicotine	**Paracetamol**	**Morphine**
Ritalin	**Zantac**	**Ibuprophen**

Notes

Activity 3 – Match-up Exercise - Discover Your Medicine

- Find out information that is written on the medicine packet that is given to you
- Fill out the table with your information

Name	Key ingredient(s)	Uses/effects	Any other information

Notes

Homework 1: Baseline Assignment

Paracetamol, a common medicine that is used to relief pain and reduce fever, is one of the most widely used over-the-counter (i.e. no need of prescription) medicine in the world. Your task is to research and write an essay on paracetamol, including knowledge you have learnt today as well as any other information that you think is useful.

Possible things you could include in your essay, but not limited to:

- A brief introduction on paracetamol, including its uses and effects
- Available medicinal choices and the variety of formulations on the market that contain paracetamol as the API
- How it is discovered, its physical and chemical properties
- Common side effects and adverse reactions

<u>Success criteria</u>

- All content included is relevant to the topic and to the specific question.
- Good understanding of all the knowledge learned in the first tutorial.
- Scientific terms are defined and used accurately throughout.
- Ideas are presented in paragraphs and arranged in a logical structure that is appropriate for the assignment

Tutorial 2 – Paracetamol – Tablet? Capsule? Solution? Or Patch?

What is the Purpose of Tutorial 2?

In this tutorial we will study different brands of medicines that have paracetamol as the active pharmaceutical ingredient (API). We will discuss why there is a variety of choices and how this is linked to the way these medicines are consumed/applied. We will also cover the relationship between medicine administration and medicine absorption.

By the end of this tutorial you should be able to:

- Explain what paracetamol is and what is it used for
- Have a broad knowledge of different brands of medicines that contain paracetamol
- Understand the reason behind medicine formulation
- Understand the relationship between medicine formulation, medicine administration and medicine absorption

Tutorial 2 Notes

Activity 1 – Write-Pair-Share

- Have you used paracetamol or similar brands before?
- What is its use/effect?
- Did it do its job?

Notes

Plenary: Use the key words to fill the blanks

Paracetamol is also called _____. It's typically used to relieve mild or moderate _____, such as headaches, toothache or sprains, and reduce _____ caused by illnesses such as colds and flu.

pain

fever

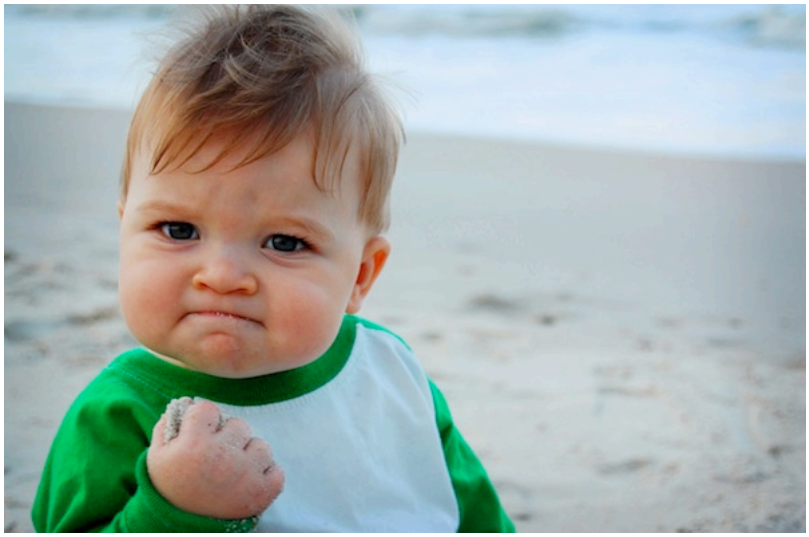
Acetaminophen

Notes

Activity 2 – Group Activity

- You will be divided into two groups. Each group will be *given* a medicine that contains paracetamol
- As a group, you need to come up with an explanation why you think this particular medicine is designed in the specific form given.
- Hints: think about how its effect is achieved by adopting this particular form; subject – who is taking this medicine; cost and other considerations
- You will share your group finding through a nominated person and the answer will be scored

- There will be a prize for the winner group ☺

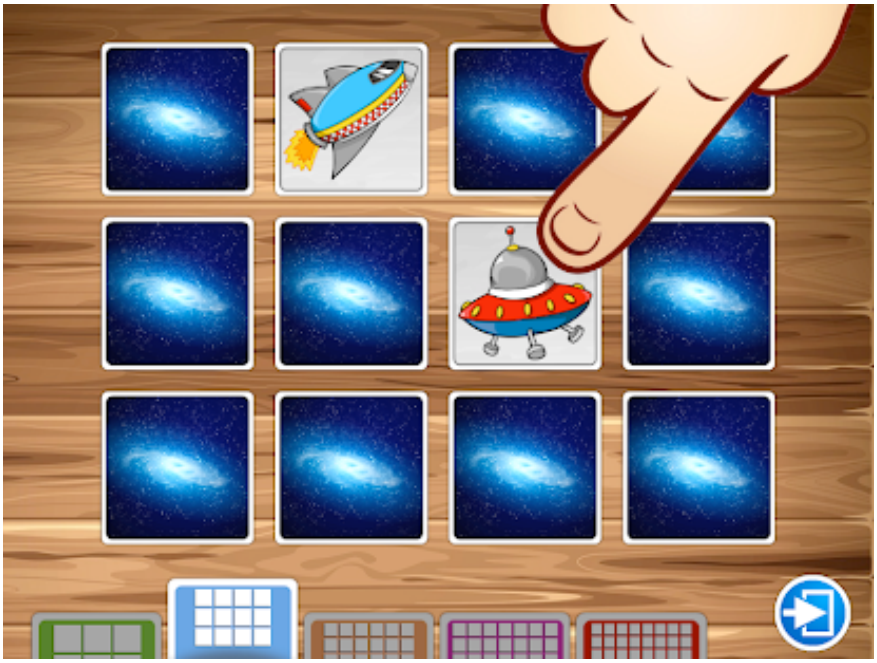


Notes

Key factors influencing the type of medicine formulation

1)
2)
3)
4)
5)
6)

Activity 3 Match-up Exercise – Link Formulation with Routes of Administration and Site of Adsorption



- You will do this exercise as one group
- In front of you there are cards with words written on them. Some are examples of different types of drug formulations, some are different routes of administration, and some are referring to the site of adsorption
- You need to categorise each card and stick them on the white board
- Discussion is allowed
- When time runs up you will have to stop and will be assessed as a whole group

- There will be a prize if you can achieve 80% or above ☺

Notes

Plenary: Write down on your white board, whether the following statement is true or false:

1. The four main site of medicine absorption are oral, topical, rectal and parenteral.
2. The sites of absorption for a parenteral administration include vein, arteries, and capillaries.
3. Suppositories are medicines that insert into the rectum.
4. Large intestine is the main site of absorption for medicines that are taken orally.

Notes

Homework 2: Understand the Choice of Formulation

Today we have discussed some examples of medicine administration and medicine absorption. In reality, there are much wider choices due to the complexity of the nature of chemicals involved, and patients' compliance and abilities. Your homework is to research one route of paracetamol administration that has not been covered in today's lesson. You need to give a brief description, together with a suggested site of adsorption for this route, and a reason why it is formulated to enter the human body via this route of administration.

Tutorial 3 Distribution of Paracetamol – From Blood to Site of Action

What is the Purpose of Tutorial 3?

In this tutorial we will study the distribution of paracetamol after absorption into the bloodstream. We will cover different compartments within the human body that are responsible for paracetamol storage and circulation. We will also discuss the importance of plasma binding and what role does it play in paracetamol distribution. Lastly, we will learn different key factors that can influence paracetamol distribution.

By the end of this tutorial you should be able to:

- Explain what medicine distribution is and why is it important
- Understand different body compartments that are responsible for paracetamol distribution
- Explain the role of plasma protein in the process of paracetamol distribution
- Identify key variables that affect paracetamol distribution
- Calculate volume of distribution

Tutorial 3 Notes

Activity 1 – Write-Pair-Share

Think about the group activity last week, i.e. link difference types of formulations of medicines that contain paracetamol to the routes of administration and site of absorption. In your pair, discuss:

- What happens after paracetamol being absorbed into the bloodstream?
- Does it stay in the blood or is it free to move around, and how?

Notes

Activity 2 Video and Post-it!

Watch the video and write down on the post-it notes any key facts you have learnt from this video

Notes

Activity 3 Case Study - How Much Paracetamol is Needed?

You are asked to calculate how much paracetamol is needed in the following case study by using the following equation

$$Vd = \frac{\text{Total amount of drug in body}}{\text{Plasma concentration of drug}}$$

Patient information

- 60 year old male patient
- 60kg weight, 180cm height
- Headache, otherwise healthy
- No medical history

Plasma concentration

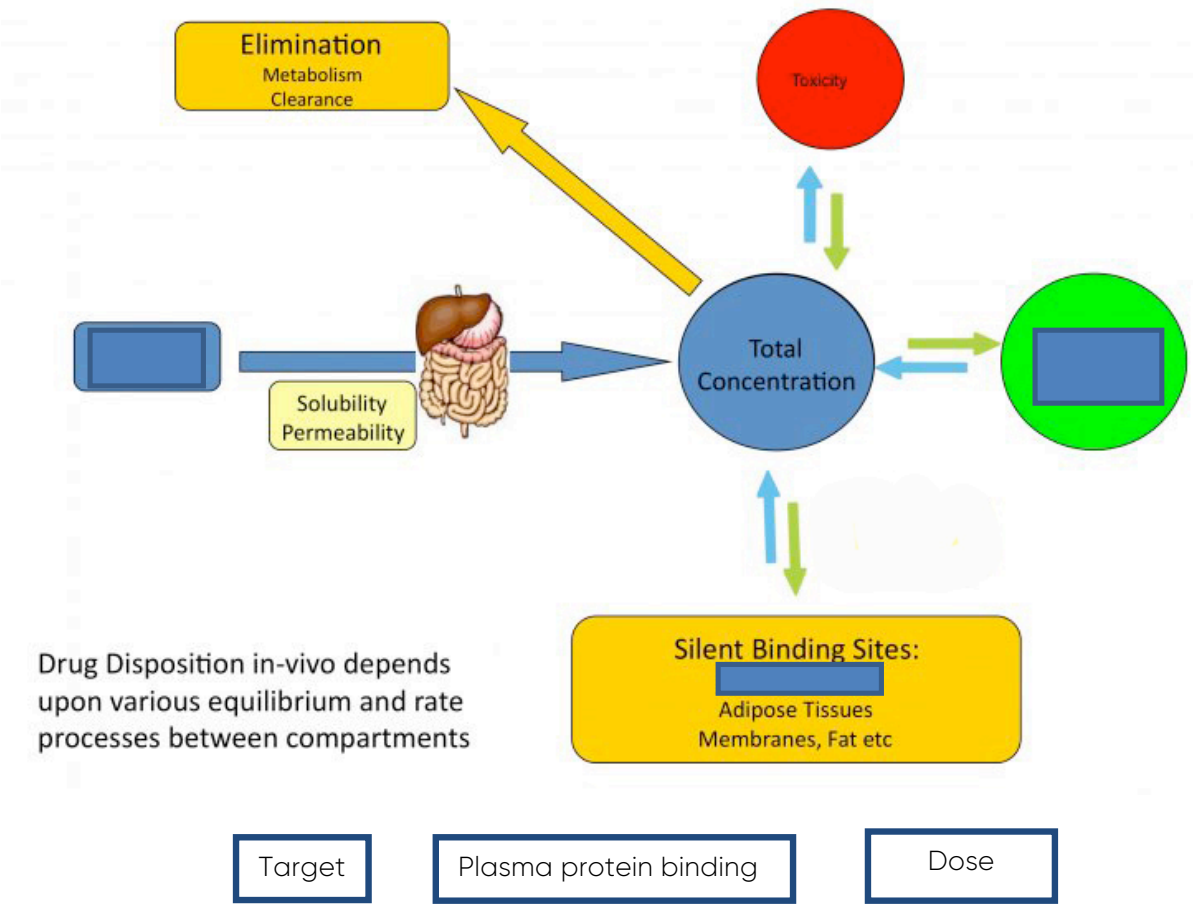
- 20 mg/L

Volume distribution (Vd)

- 0.9L/kg, i.e. 0.9L per kg weight of patient

Notes

Plenary: Fill the blanks in the schematic representation of the distribution of paracetamol

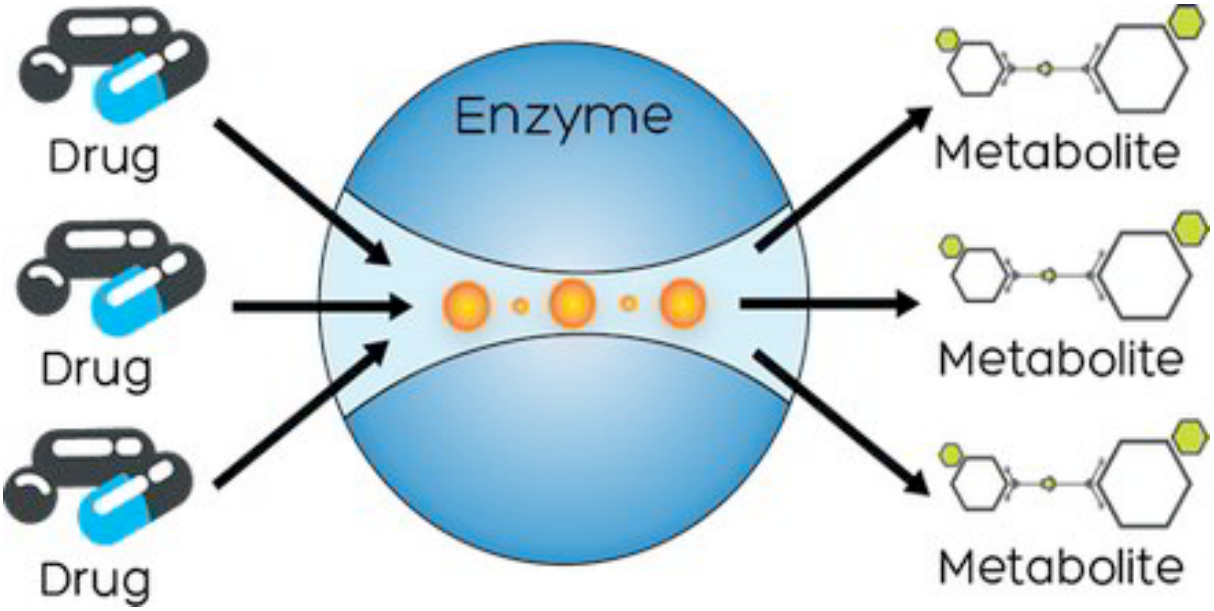


Homework 3: Calculation of Paracetamol Dosage

Question 1
Calculate how much paracetamol is needed in the following case:
Patient is a 35-year-old Female of 55kg weight and 160cm height. No medical history. Plasma concentration needed to achieve in this patient is 15mg/L. The volume distribution of paracetamol is 0.9L/kg.

Question 2
Assess whether the dose is suitable for the following case:
Patient is a 75-year-old male of 70kg weight and 177cm height. Due to patient past medical history of liver disease, the plasma concentration of paracetamol cannot be exceeded over 10mg/L. The patient is given a single dose of paracetamol of 500mg. Please assess whether this dose is safe for this patient.

Tutorial 4 Frontline Protection – Paracetamol Metabolism



What is the Purpose of Tutorial 4?

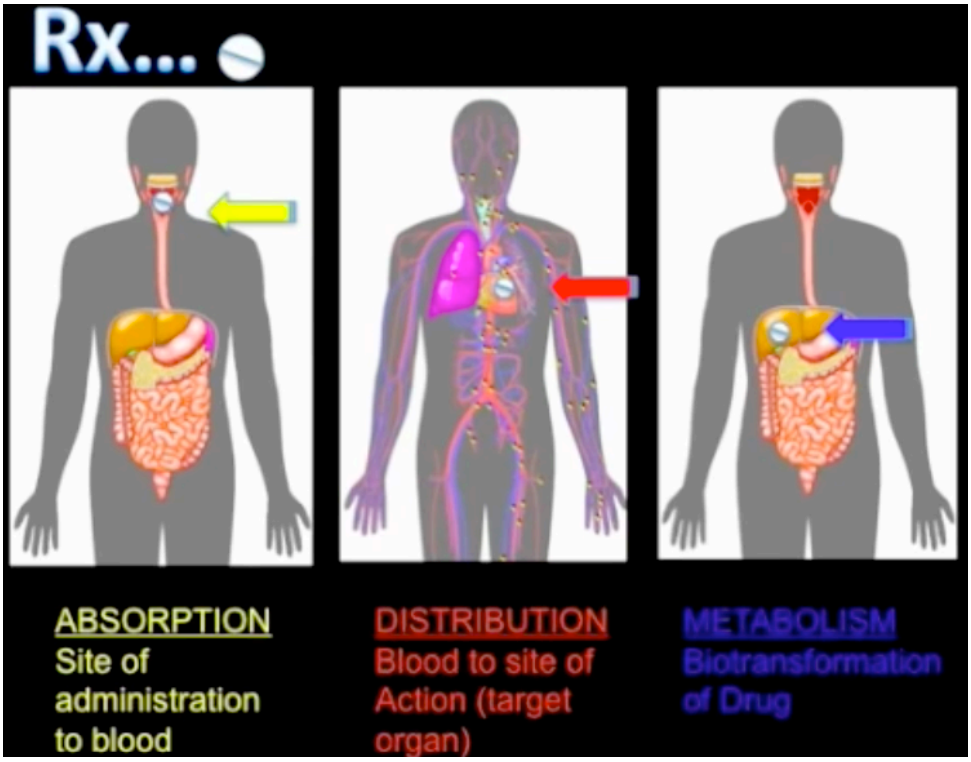
In this tutorial we will study the metabolism of paracetamol. Phase I and Phase II metabolism will be covered, together with the role of P450 enzymes. We will learn the crucial function of liver in paracetamol metabolism and how it is linked with drug excretion. Moreover, we will learn different key factors that can influence paracetamol metabolism.

By the end of this tutorial you should be able to:

- Explain what medicine metabolism is and why is it important
- Understand liver as the key player in paracetamol metabolism
- Explain the transformation of drug molecules
- Identify key variables that affect paracetamol metabolism

Tutorial 4 Notes

Activity 1 – Write-Pair-Share



Think about a time when you took paracetamol …

- Was it useful?
- Did you have to take another pill?
- If so, why?

Notes

Activity 2 Independent Research Time – Paracetamol Metabolism

You will be asked to do research independently, either using the internet, or using text book, on paracetamol metabolism. While studying, please bare the following key words in mind and write down the definitions from your research finding.

Key words	Definitions
P450 Enzymes	
Phase I Metabolism	
Phase II Metabolism	

Prodrug	
Bioactivation	

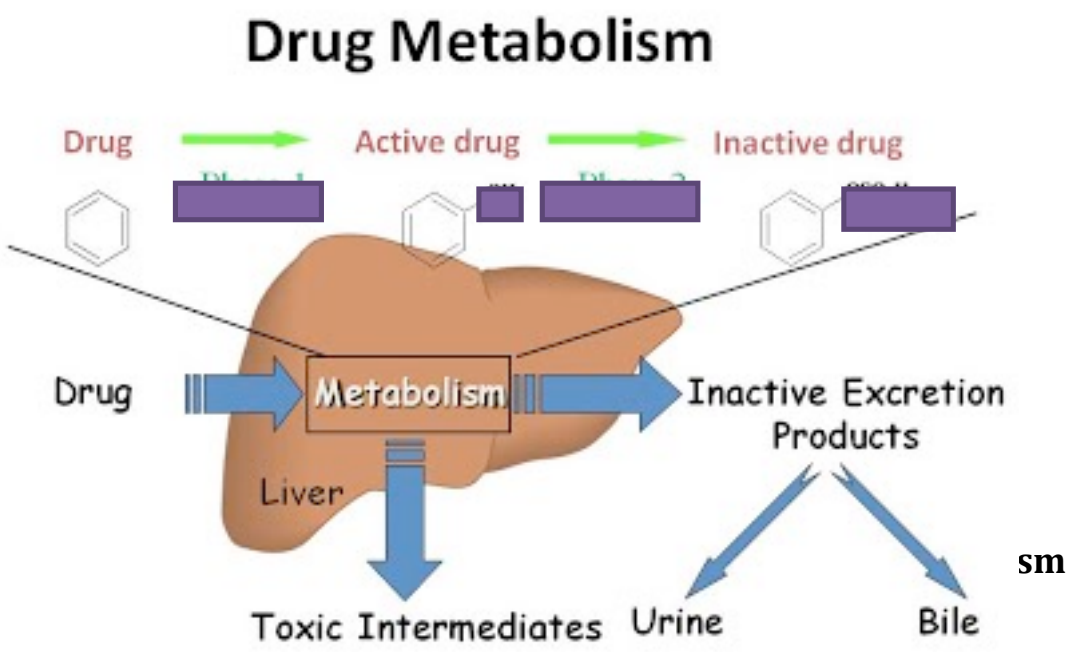
Notes

Activity 3 Video and Check Your Answers

Watch the video and mark your answers from the previous activity

Notes

Homework 4: Complete the flow diagram on paracetamol metabolism



sm

Medicine	Type of Metabolism Involved	Type of Chemical Reactions Involved	Functional Groups Added
Paracetamol			

Useful references

http://www.mcppnet.org/publications/issue06-6.pdf

https://www.youtube.com/watch?v=T_JNwv4hqs

Tutorial 5 When Things Go Wrong … Paracetamol Side effects and Overdose

What is the Purpose of Tutorial 5?

In this tutorial we will study the excretion of paracetamol and understand why overdose can happen. Through the investigation of paracetamol overdose and the consequence, rational application of medicine usage will be emphasised. We will also cover the common side effects of paracetamol and discuss how we can ensure safe and effective usage of paracetamol.

By the end of this tutorial you should be able to:

- Explain what medicine excretion is and why is it important
- Understand how kidney serves as a key player in paracetamol excretion
- Explain what would happen in paracetamol overdose
- Identify common side effects of paracetamol
- Learn safe and effective usage of paracetamol

Tutorial 5 Notes

Activity 1 – Write-Pair-Share

- What happens after paracetamol metabolism?
- Why is excretion important?
- What organ(s) is (are) involved in medicine excretion?

Notes

Activity 2 Group Activity

You will be divided into two groups. One group will research on paracetamol overdose, the other group will research on the common side effects of paracetamol. By the end of this activity, you will need to provide as much information as you can on the topic given to your group. You may use the following format for your group answer:

Our research topic is ...
The reason behind this phenomenon is because ...
To minimise / to prevent this from happening, we should ...

Prize will be given for the best answer ☺

Notes

Homework 5: Final Assignment

Having learnt the knowledge of the pharmaceutical and pharmacokinetics properties of paracetamol so far, your task is to re-write the essay assigned to you in tutorial one, i.e. an essay on paracetamol. Only this time, you are asked to include the following key points:

- Paracetamol formulations that are available on the market,
- Popular routes of administration,
- Main sites of absorption,
- How distribution is carried out,
- How paracetamol is metabolised,
- Via which route of excretion it is passed down and finally,
- How to ensure safe and effective usage of paracetamol.

You should write the essay in the following format that it should include an introduction, main body, and a conclusion. All figures and tables should be clearly illustrated with captions and labels. All quotes should be referenced (see page 46 for more detail).

Success criteria
Please refer to the Mark scheme on P6.

Useful references

https://academic.oup.com/bjaed/article/14/4/153/293533

https://www.sciencedirect.com/science/article/pii/S1366007199800060

https://bpspubs.onlinelibrary.wiley.com/doi/pdf/10.1111/j.1365-2125.1980.tb01812.x

Tutorial 6 – Feedback tutorial

What is the Purpose of Tutorial 6?

- To receive feedback on final assignments.
- To share examples of best practice with the other pupils in your group.
- To write targets for improvement in school lessons.
- To reflect on the programme including what was enjoyed and what was challenging.

Final assignment feedback

What I did well…	What I could have improved on…
•	•
•	•
•	•

My target for future work is…

Tutorial 7 – Feedback tutorial

What is the Purpose of Tutorial 7?

- To receive feedback on final assignments.
- To share examples of best practice with the other pupils in your group.
- To write targets for improvement in school lessons.
- To reflect on the programme including what was enjoyed and what was challenging.

Final assignment feedback

What I did well…	What I could have improved on…
•	•
•	•
•	•

My target for future work is…

Reflecting on Uni Pathways

What did you most enjoy about Uni Pathways?
•   •   •

What did you find challenging about the programme?	How did you overcome these challenges?
• • •	• • •

Appendix 1 – Referencing correctly

When you get to university, you will need to include references in the assignments that you write, so we would like you to start getting into the habit of referencing in your Brilliant Club assignment. This is really important, because it will help you to avoid plagiarism. Plagiarism is when you take someone else's work or ideas and pass them off as your own. Whether plagiarism is deliberate or accidental, the consequences can be severe. In order to avoid losing marks in your final assignment, or even failing, you must be careful to reference your sources correctly.

What is a reference?

A reference is just a note in your assignment which says if you have referred to or been influenced by another source such as book, website or article. For example, if you use the internet to research a particular subject, and you want to include a specific piece of information from this website, you will need to reference it.

Why should I reference?

Referencing is important in your work for the following reasons:

- It gives credit to the authors of any sources you have referred to or been influenced by.
- It supports the arguments you make in your assignments.
- It demonstrates the variety of sources you have used.
- It helps to prevent you losing marks, or failing, due to plagiarism.

When should I use a reference?

You should use a reference when you:

- Quote directly from another source.
- Summarise or rephrase another piece of work.
- Include a specific statistic or fact from a source.

How do I reference?

There are a number of different ways of referencing, and these often vary depending on what subject you are studying. The most important to thing is to be consistent. This means that you need to stick to the same system throughout your whole assignment. Here is a basic system of referencing that you can use, which consists of the following two parts:

1. A marker in your assignment: After you have used a reference in your assignment (you have read something and included it in your work as a quote, or re-written it your own words) you should mark this is in your text with a number, e.g. [1]. The next time you use a reference you should use the next number, e.g. [2].
2. Bibliography: This is just a list of the references you have used in your assignment. In the bibliography, you list your references by the numbers you have used, and include as much information as you have about the reference. The list below gives what should be included for different sources.

    a. Websites – Author (if possible), title of the web page, website address, [date you accessed it, in square brackets].

    E.g. Dan Snow, 'How did so many soldiers survive the trenches?', http://www.bbc.co.uk/guides/z3kgjxs#zg2dtfr [11 July 2014].

    b. Books – Author, date published, title of book (in italics), pages where the information came from.

    E.g. S. Dubner and S. Levitt, (2006) *Freakonomics*, 7-9.

    c. Articles – Author, 'title of the article' (with quotation marks), *where the article comes from* (newspaper, journal etc.), date of the article.

    E.g. Maev Kennedy, 'The lights to go out across the UK to mark First World War's centenary', Guardian, 10 July 2014.

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Paracetamol: Friend or Foe?

Key Stage 4 Programme