

**PRACTICAL MANUAL**

**GENERAL AND PERIPHERAL NERVOUS SYSTEM PHARMACOLOGY PHM 10303**

**Bachelor of Pharmacy with Honours [B.Pharm (Hons)]**

**Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Matric No.: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**LIST OF PRACTICALS**

**GENERAL AND PERIPHERAL NERVOUS SYSTEM PHARMACOLOGY PHM 10303 SEMESTER 1, YEAR 1**

|  |  |  |
| --- | --- | --- |
| **No.** | **Title** | **Page** |
|  | Practical 1: Effects of drugs on the heart | 3 |
|  | Practical Report 1: Effects of drugs on the heart | 4 |
|  | Practical 2: Autonomic drugs: Adrenergic agonist and antagonist | 5 |
|  | Practical Report 2: Autonomic drugs: Adrenergic agonist and antagonist | 6 |

|  |  |
| --- | --- |
| **Practical 1** | **Effects of drugs on the heart** |
| **Objective** | Exercise 1: To measure resting heart rate of frog  Exercise 2: To measure the effect of drugs on the heart rate |
| **Hard- and software** | * A computer system * Chart software * PowerLab * Bridge Pod * Force Transducer * Shielded Lead Wires/Alligator Clips * Mounting stand with micropositioner * Suture thread * Straight pins * Barb-less hook * Eyedropper * Frog Ringer’s solution at room temperature * Acetylcholine (0.1 mg/mL) * Epinephrine (1% solution) * Pilocarpine (2.5% solution) * Atropine sulfate (5% solution) |
| **Procedure (s)** | 1. Open the Microsoft word file ‘Practical 1\_ Effects of Drugs on the Heart Protocol’ 2. Run set up and equipment calibration 3. Run frog dissection procedure 4. Run Exercise 1: Recording baseline heart rate 5. Run Exercise 2: Effects of drugs on the heart rate 6. Analyze the data sets in the Analysis section 7. Fill in Data Notebook 8. Answer Study Questions 9. You may discuss your finding in groups |
| **Report** | 1. Complete the Introduction, Results and Conclusion sections of the Practical Report 1. |
| **References** | 1. LabChart Teaching Suite 2. www.ADInstruments.com (Copyright © 2005 ADInstruments. All rights reserved.) 3. <http://www.sci.utah.edu/~macleod/bioen/be6000/labnotes/l2-frog/l2-frog-comments> 4. [www.austincc.edu/cwayne/2305Labssp08/2305Lab9heartphysiologysu08.doc](http://www.austincc.edu/cwayne/2305Labssp08/2305Lab9heartphysiologysu08.doc) |
| **Notes** | Further reading:   1. https://www.coursehero.com/file/p7h6d9o/As-mentioned-above-acetylcholine-binds-to-muscarinic-Ach-receptors-and/ 2. Brunton L, Knollman B, Hilal-Dandan R. (2017) Goodman & Gilman’s The Pharmacological Basis of Therapeutics. . 13 ed. New York: McGraw-Hill Education. 3. Katzung BG, Trevor AJ. (2015) Basic & Clinical Pharmacology. 13 ed. New York: McGraw Hill. 4. 3. Rang HP, Ritter JM, Flower RJ, Henderson G. (2016) Rang & Dale's Pharmacology. 8 ed. United Kingdom: Elsevier Churchill Livingstone. |

|  |  |
| --- | --- |
| **Name:** | **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** |
| **Matric No.:** | **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** |
| **Date:** | **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** |
| **Practical Report 1: Effects of drugs on the heart** | |
| **Introduction** | |
| Write a paragraph defining sympathomimetic, parasympathomimetic and anticholinergic drugs. What do you expect to learn from this experiment? Briefly describe the techniques you will use to measure the effects of drugs on the heart rate in this experiment. | |
|  | |
| **Results** | |
| **Exercises 2: Effects of drugs on the heart rate**  In the space below, insert a bar graph showing the relative heart rate (% of resting) for the following conditions: acetylcholine, epinephrine, pilocarpine, and atropine followed by acetylcholine. | |
| **Conclusions** | |
| Answer the following questions in complete sentences. | |
| 1) Compare the effect of acetylcholine on cardiac muscle with its effect on skeletal muscle. Can you explain the mechanistic basis for the difference? | |
| 2) Epinephrine mimics the effects of which branch of the autonomic nervous system? | |
|  | |
| **References** | List your reference (s) |
| **Notes** | To what extent were you satisfied with the practice session?   |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | **Very Dissatisfied** | 1 | 2 | 3 | 4 | 5 | **Very Satisfied** | |  |  |  |  |  |  |  | | What is/are improvement (s) that you can suggest for this experiment? | | | | | | | |

|  |  |
| --- | --- |
| **Practical 2** | **Autonomic drugs: Adrenergic agonist and antagonist** |
| **Objective** | To provide students with the knowledge and skills required to learn the concept of receptors and different mechanisms of drug actions |
| **Hard- and software** | * Please bring you own laptop (may use computer at the computer lab). * Internet |
| **Procedure (s)** | 1. Visit the website, <https://www.ncbi.nlm.nih.gov/books/NBK22592/> 2. Make notes as indicated below: 3. Natural ligand 4. β-adrenergic receptor signal-transduction pathway 5. Find other learning material related to β-adrenergic receptor signal transduction mechanism 6. Search for β-adrenergic receptor agonist and antagonist 7. You may discuss your finding in groups |
| **Report** | Practice questions: (Answer ALL questions)   1. Visit the official site of HUSM Formulary here. <http://dformulary.h.usm.my/> 2. Click on the ‘Menu’ and choose ‘Pharmacologic Category’. Click on ‘show’ for Cardiovascular Products and make notes as indicated below:   1. Choose Pharmacological Index such as:   * Vasoconstrictor * Noradrenaline (Norepinephrine) and Dobutamine * b-Adrenoceptor Blocking Agents * Bisoprolol, Sotalol, Propranolol, Atenolol, Carvedilol and Metoprolol   2. Give detail on indications, contra-indications and special precautions for the above drugs.   1. Visit MIMS Online website, <http://www.mims-online.com>. Write notes as necessary on mechanism of action for the above drugs. 2. Draw your own diagram representing the mode of action of β-adrenoceptor agonists and antagonists. 3. Write your answers in the laboratory report. |
| **References** | 1. <https://www.ncbi.nlm.nih.gov/books/NBK22592/> 2. Becker DE. Basic and Clinical Pharmacology of Autonomic Drugs. Anesthesia Progress. 2012;59:159-69. 3. <http://cvpharmacology.com/cardiostimulatory/beta-agonist> 4. <http://cvpharmacology.com/cardioinhibitory/beta-blockers> |
| **Notes** | Further reading:   1. Classification of G-protein coupled receptors (GPCRs), their similarities and differences 2. GPCR signal transduction mechanism 3. Function and significance of GPCRs   Examples of references:   1. <https://www.nature.com/scitable/topicpage/gpcr-14047471> 2. G protein-coupled receptors   <http://www.guidetopharmacology.org/GRAC/FamilyDisplayForward?familyId=694>   1. G-protein Coupled Receptors (take the quiz to test your understanding)   <https://courses.washington.edu/conj/bess/gpcr/gpcr.htm> |

|  |  |
| --- | --- |
| **Name:** | **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** |
| **Matric No.:** | **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** |
| **Date:** | **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** |
| **Practical Report 2: Autonomic drugs: Adrenergic agonist and antagonist** | |
| **Introduction** | |
| Write a paragraph describing the theory of drug receptors, signaling mechanism and second messengers. What do you expect to learn from this experiment? Briefly describe the methods you will use to study adrenergic agonist and antagonist in this lab exercise. | |
|  | |
| **Results** | |
| 1. After visiting <https://www.ncbi.nlm.nih.gov/books/NBK22592/>, make notes as indicated below:  a. Natural ligand  b. β-adrenergic receptor signal-transduction pathway | |
| 2. List your findings on other learning material related to β-adrenergic receptor signal transduction mechanism (eg. textbook, articles, internet). | |
| 3. List β-adrenergic receptor agonist and antagonist. | |
| **Practice questions** | |
| 1. Information from <http://dformulary.h.usm.my/> (indications, contra-indications and special precautions) and [http://www.mims-online.com](http://www.mims-online.com/) (mechanism of action)   |  |  | | --- | --- | | Vasoconstrictor 1: Noradrenaline (Norepinephrine) | | | Indications |  | | Contra-indications |  | | Special precautions |  | | Mechanism of action |  | | Vasoconstrictor 2: Dobutamine | | | Indications |  | | Contra-indications |  | | Special precautions |  | | Mechanism of action |  |  |  |  | | --- | --- | | b-adrenoceptor blocking agents 1: Bisoprolol | | | Indications |  | | Contra-indications |  | | Special precautions |  | | Mechanism of action |  | | b-adrenoceptor blocking agents 2: Sotalol | | | Indications |  | | Contra-indications |  | | Special precautions |  | | Mechanism of action |  | | b-adrenoceptor blocking agents 3: Propranolol | | | Indications |  | | Contra-indications |  | | Special precautions |  | | Mechanism of action |  | | b-adrenoceptor blocking agents 4: Atenolol | | | Indications |  | | Contra-indications |  | | Special precautions |  | | Mechanism of action |  | | b-adrenoceptor blocking agents 5: Carvedilol | | | Indications |  | | Contra-indications |  | | Special precautions |  | | Mechanism of action |  | | b-adrenoceptor blocking agents 6: Metoprolol | | | Indications |  | | Contra-indications |  | | Special precautions |  | | Mechanism of action |  |   2. Draw your own diagram representing the mode of action of β-adrenoceptor agonists and antagonists.  3. Write your answers in the laboratory report. | |
|  | |
| **References** | List your reference (s) |
| **Notes** | To what extent were you satisfied with the practice session?   |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | **Very Dissatisfied** | 1 | 2 | 3 | 4 | 5 | **Very Satisfied** | |  |  |  |  |  |  |  | | What is/are improvement (s) that you can suggest for this experiment? | | | | | | | |