School of Medicine

Graduate Entry year 1 - 2012/13

Renal

## Support Systems Theme

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<https://education.med.imperial.ac.uk>

Renal

Graduate entry - Spring term 2013

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<https://education.med.imperial.ac.uk>

**SOLE FEEDBACK – *Renal***

The following pages provide you with templates on which you can record your thoughts as the course proceeds. At the end of the course you can enter your views onto SOLE. We can only make changes to the course if you give us feedback – if you don’t fill in SOLE we don’t know what works and what doesn’t.

**Please answer all questions by selecting the response which best reflects your view.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree |
| The content of this module is useful. |  |  |  |  |  |
| The support materials available for this module (e.g. handouts, web pages, problem sheets) are helpful. |  |  |  |  |  |
| I receive sufficient feedback and guidance. |  |  |  |  |  |
| Overall, I am satisfied with this module. |  |  |  |  |  |

Please use this box for constructive feedback and suggestions for improvement.

|  |
| --- |
|  |

**SOLE FEEDBACK - INDIVIDUAL LECTURERS**

Please note that for SOLE, a Lecturer’s name will only appear once. This template gives you the opportunity to record your comments about ***each*** lecture in the order of delivery. We can only make changes to the course if you give us feedback on SOLE.

**On the following section, you have an opportunity to record any comments and constructive feedback you have for each lecturer.**

|  | **The lecture(s) are well structured** | **The lecturer explains concepts clearly** | **The lecturer engages well with the students** |
| --- | --- | --- | --- |
| **Lecturer and Lecture Title** | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree |
| Dr Elaine ClutterbuckNa+ and K+ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Dr Ruth TarziRenal anatomy and embryology |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Dr Candice RoufosseRenal Histology |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Dr Anisha TannaRenal blood flow |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Dr Jeremy LevyLone Englishman |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Dr Peter HillAssessing renal function |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Dr Damien AshbyClinical scenarios |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Dr Nish ArulkumaranRenin Angiotensin system |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Dr Ruth TarziDrinking yourself to death |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Dr Doris DoberanzAcid base  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Dr Doris DoberenzAcid base clinical |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Dr Peter HillRenal hypertension |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Dr Peter HillErythropoetin |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Dr Damien AshbyWhen the kidneys are lost |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Dr Jeremy LevyRenal physiology scenarios |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Dr Tom OatesGenetic defects |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Dr Liz LightstoneClinical demo |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Dr Damien AshbyOverview |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Professor Karim MeeranEndocrine functions |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Professor Karim MeeranCalcium & Phosphate |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

| **Lecturer and Lecture Title** | **Please use this box for additional constructive feedback.** |
| --- | --- |
| Dr Elaine ClutterbuckNa+ and K+ |  |
| Dr Ruth TarziRenal anatomy and embryology |  |
| Dr Candice RoufosseRenal Histology |  |
|  Dr Anisha TannaRenal blood flow |  |
| Dr Jeremy LevyLone Englishman |  |
| Dr Peter HillAssessing renal function |  |
| Dr Damien AshbyClinical scenarios |  |
| Dr Nish ArulkumaranRenin Angiotensin system |  |
| Dr Ruth TarziDrinking yourself to death |  |
| Dr Doris DoberanzAcid base  |  |
| Dr Doris DoberenzAcid base clinical |  |
|  Dr Peter HillRenal hypertension |  |
| Dr Peter HillErythropoetin |  |
| Dr Damien AshbyWhen the kidneys are lost |  |
| Dr Jeremy LevyRenal physiology scenarios |  |
| Dr Tom OatesGenetic defects |  |
| Dr Liz LightstoneClinical demo |  |
| Dr Damien AshbyOverview |  |
| Professor Karim MeeranEndocrine functions |  |
| Professor Karim MeeranCalcium & Phosphate |  |

Renal

**INTRODUCTION**

The **Renal** course is taught in the Spring Term of year 1 as part of the Support Systems theme.

### Learning Outcomes

The main goal of this course is to help you develop a sound understanding of how the renal system achieves the vital functions of controlling fluid and electrolyte balance, its role in control of blood pressure and as part of the endocrine system - and how these functions are perturbed in disease. The course has been designed to develop and present core material from a clinical perspective. The primary goal is to equip you with the knowledge base to apply basic renal science to clinical practice in the later years of your course, recognizing that the practice of renal medicine, and fluid and biochemical management in all patients, is integrally related to the physiological processes you will cover over this term. We also hope to instill a finer appreciation of the scientific intricacies of the renal system.

The course is structured in three overlapping themes: Theme one covers functional anatomy, embryology, and histology. In the second theme, the essentials of fluid and electrolyte balance are understood through lectures on physiology and illustrations from clinical pathology. Theme three explores the consequences to normal physiology ‘when things go wrong’ in disease states.

#### At the end of the course, you will be able to

1. Describe the structural organisation of the kidneys and urinary tract at the system and cellular levels.
2. Explain the physiological mechanisms by which the various components of the kidney produce and regulate the composition of urine.
	1. Define Renal Clearance and Glomerular Filtration Rate and explain in principle how these may be measured in patients
3. Understand the principal renal mechanisms responsible for homeostasis of water, electrolytes, pH, glucose and urea in the extracellular fluid.
	1. Appreciate the centrality of water in the control of cell volume, blood pressure and metabolism
	2. Understand the physiological implications of dehydration and how the body responds to it
	3. Understand the physiological implications of water loading states and how the body responds to them
	4. Understand the intracellular and extracellular balance of sodium and potassium ions including how and why the gradients are maintained.
	5. Understand why maintenance of appropriate pH is important physiologically
4. Understand how renal mechanisms contribute to the control of blood pressure.
5. Describe the sites and mechanism of action of the main classes of diuretics.
6. Use the knowledge of kidney function and roles to:
	1. Understand how the body responds to overload and deficiencies of sodium and potassium, including the pathological features found in each situation.
	2. Determine the implications of sodium and potassium abnormalities in a number of different clinical scenarios.
	3. Identify several clinical scenarios in which acid-base balance is disrupted.
	4. Describe how the body deals with acid-base abnormalities in a number of different situations.
7. Outline the principal causes of acute and chronic renal failure.
	1. Show awareness of the clinical features people may develop in acute and renal failure.
	2. Outline the possible ways of managing these patients.
	3. Show awareness of the different modalities of renal replacement therapy.

**COURSE STRUCTURE**

The course is comprised of a series of lectures / tutorials which include 3 sessions devoted to clinical scenarios as well as a discussion with a patient with chronic kidney failure

**ASSESSMENT**

**Formative Assessments**

There are a number of sessions with clinical scenarios which will explore your understanding of the basic principles you have been taught.

**Summative Assessment**

The course will be examined as part of your end of year examinations in the summer of 2011.

**Examples of specimen questions**

Exam questions will be set in standard SBA (single best answer) and EMQ (extended matching question) formats. The SBA and EMQ formats will be well known to you, and further details are provided on the Intranet.

Example questions in the Respiratory guide (from your teaching last term) illustrate how particular forms of SBA and EMQ will be used in assessing your recall and understanding of physiological principles.

TIMETABLE GE Renal – Spring term 2013

Details are correct at the time of going to press. Any amendments will be shown on the intranet.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Date** | **Start** | **End** | **Room** | **Title** | **Lecturer** |
| Thursday 3 Jan | 2:00 PM | 3:00 PM | Wolfson Education Centre LTIII | **1. Sodium and potassium handling** | **Dr Elaine Clutterbuck** |
| Friday 4Jan | 9.30 AM | 10.30 AM | Wolfson Education Centre LTIII | **2. Kidney structure: Anatomy and Embryology** | **Dr Ruth Tarzi** |
| 10.30 AM | 11.15 AM | Wolfson Education Centre LTIII | **3. Renal Histology: Interpreting the renal biopsy** | **Dr Candice Roufosse** |
| Tuesday8 Jan | 2:00 PM | 3:00 PM | Wolfson Education Centre LTIII | **4. Renal blood flow and regulation** | **Dr Anisha Tanna** |
| 3:00 PM | 4:00 PM | Wolfson Education Centre LTIII | **5. The Lone Englishman in the desert** | **Dr Jeremy Levy** |
| Wednesday 9 Jan  | 9:00 AM | 10:00 AM | Wolfson Education Centre LTI | **6. Approaches to assessing renal function** | **Dr Peter Hill** |
| 10:00 AM | 11:00 AM | Wolfson Education Centre LTI | **7. Clinical scenarios (electrolytes)** | **Dr Damien Ashby** |
| Tuesday 15 Jan | 3:00 PM | 4:00 PM | Wolfson Education Centre LTIII | **8. Renin angiotensin system** | **Dr Nish Arulkumaran** |
| 4:00 PM | 5:00 PM | Wolfson Education Centre LTIII | **9. Drinking yourself to death: water loading states** | **Dr Ruth Tarzi** |
| Thursday 31 Jan | 2:00 PM | 3:00 PM | Wolfson Education Centre LTIII  | **10. Acid base balance** | **Dr Doris Doberenz** |
| 3:00 PM | 3:30 PM | Wolfson Education Centre LTIII | **11.. Acid base clinical scenarios**  | **Dr Doris Doberenz** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Fri 1st Feb | 2:00 PM | 2.45PM | Wolfson Education Centre LTIII | **12. Renal hypertension** | **Dr Peter Hill** |
| 2.45 PM | 3.30PM | Wolfson Education Centre LTIII | **13. Erythropoetin** | **Dr Peter Hill** |
| 3.30 PM | 4.30 PM | Woolfson Education Centre LTIII | **14. When the kidneys are lost** | **Dr Damien Ashby** |
| Thursday 7th Feb | 14:00 | 14.30 | Wolfson Education Centre LTIII | **15. Renal physiology scenarios** | **Dr Jeremy Levy** |
| 14:30 | 15:30 | Wolfson Education Centre LTIII | **16. Lessons from genetic defects** | **Dr Tom Oates** |
| Thursday 14th Feb | 3:00 PM | 4:00 PM | Wolfson Education Centre LTIII | **18. Overview of kidney function and dysfunction with respect to learning objectives of the course** | **Dr Damien Ashby** |
| Tuesday 26th Feb | 09:00 AM | 10:00 AM | Wolfson Education Centre LTIII | **17. Clinical demonstration video and meeting a renal patient** | **Dr Liz Lightstone** |
| Friday 1st March | 09:00 AM | 10:00 AM | CXLB-9th floor lecture theatre | **19. Predict the consequences of loss of endocrine functions of the kidney 20. Control of calcium and phosphate: Vitamin D, PTH and the kidney** | **Professor Karim Meeran** |

Learning objectives – GE year 1 Spring term

These session objectives may include tasks you should be able to carry out after you have completed the relevant activity. They provide you with a way to assess how well you are keeping up with the material. Note that they are also provided to the external examiners as a guide to what you should know at the end of the course.

**LECTURES**

**Lecture 1: Sodium and potassium handling**

**Dr Elaine Clutterbuck** (Elaine.clutterbuck@imperial.nhs.uk)

* To understand the factors affecting sodium and potassium balance.
	1. the levels are regulated, and the role of the kidneys
	2. that there is a close relationship between - sodium and water homeostasis, and between potassium and hydrogen ion balance.
* To outline some of the clinical conditions associated with an imbalance of sodium / potassium
	1. their symptoms, signs and immediate management

**Lecture 2: Kidney Structure and Development**

**Dr Ruth Tarzi,** (r.tarzi@imperial.ac.uk)

* To understand the gross anatomy of the kidney
* To be aware of its principal relations to other structures
* To understand the basic structure of the glomerulus at a cellular level
* To appreciate how this structure controls its filtering function
* To know the component parts of the nephron and the basic function of each part
* To be able to outline the embryology of the kidney

**Lecture 3: Illustration of renal anatomy and histology; renal biopsy: how to do and what to look for**

**Dr Candice Roufosse** (Candice.roufosse@imperial.nhs.uk)

* To understand the sampling and handling issues related to taking a medical renal biopsy
* To understand the purpose of the medical renal biopsy
* To be able to recognise in a renal biopsy some of the possible deviations from the norm

**Lecture 4: Renal blood flow and regulation**

**Dr Anisha Tanna,** (a.tanna@imperial.ac.uk)

* To learn about the anatomical and physiological concepts underlying the renal vasculature and perfusion,
* To provide insights into the intrinsing and extrinsic mechanisms involved in regulation of renal blood flow
* To gain understanding on pathophysiology of renal vascular impairmen

**Lecture 5: The lone Englishman lost in the Sahara Desert.**

**Dr Jeremy Levy (**j.levy@imperial.ac.uk)

* To understand how the body handles water and what can go wrong. To understand how to interpret blood results in this context and how disorders of water balance might be managed.
* Much of the body is water. Water allows solutes to remain dissolved, and changes in body water can cause changes in solute concentrations. Physiological processes require tight control of solute concentrations, and hence water distribution is also tightly regulated.
* Control of body water is mainly through the kidneys. The proximal tubule reabsorbs 70% of water filtered together with salt, but cannot change the concentration of urine (iso-osmolar reabsorption). The loop of Henlé in the kidney allows humans to make dilute urine, while the distal tubule and collecting ducts act to make concentrated urine, through the action of ADH (or Vasopressin). Humans can change the concentration of their urine over a very wide range. ADH is the key hormone controlling water balance, but many others affect water homeostasis via actions on salt and water (eg cortisol, thyroxine, atrial natriuretic peptide).
* Excess water leads to solute dilution (eg hyponatraemia) whilst water deprivation leads to solute concentration (eg hypernatraemia). Both theses states can cause severe problems. Both can also be caused by bad doctoring, as well as by hormone dysfunction, drugs, behaviour etc.
* Dehydration (in its true form loss of water only) leads to increased concentration of solutes, and reduction of both extracellular and intracellular volume. Dehydration is a very potent stimulus to ADH release, which should minimise further water loss through the kidneys by increasing the reabsorption of water in the distal tubules – less water is excreted in the urine. If this does not happen and water loss is not corrected, dehydration leads to death. Under- or over-activity of the hormone systems controlling water balance can lead to over or under-hydration, and various electrolyte disturbances. Excess ADH leads to water retention and hyponatraemia, while too little ADH leads to diabetes insipidus and dehydration. The rennin-angiotensin system is also crucial in control of water balance via the effects of angiotensin II and aldosterone on sodium handling and vasoconstriction.
* It is important to identify the cause of disturbance in patients physiology in order that the correct action can be taken to remedy the situation – if water is missing, water needs replacing alone; if salt is lost, salt needs replacing.

**Lecture 6: Approaches to assessing renal function**

**Dr Peter Hill (**peter.hill4@nhs.net**)**

**Lecture 7: Discussion of clinical scenarios**

**Dr Damien Ashby** (d.ashby@imperial.ac.uk)

**Lecture 8: Renin-angiotensin system and control of blood pressure**

**Dr Nish Arulkumaran** (n.arulkumaran@imperial.ac.uk)

* To learn about the blood pressure: what it does to/for the body, how do we measure it
* RAS system - components and roles, therapeutic targets
* Pathopysiology of hypertension and renal involvement

**Lecture 9: Drinking yourself to death: water loading states**

**Dr Ruth Tarzi** (r.tarzi@imperial.ac.uk)

* Understand the principle mechanisms responsible for the homeostasis of serum sodium, osmolality and total body water content.
* Understand the functions of antidiuretic hormone.
* Understand the physiological implications of water loading and how the body responds to it.
* Understand the causes and consequences of pathological water loading states eg syndrome of inappropriate ADH secretion, primary polydipsia, secondary hyperaldosteronism.

**Lecture 10: Acid-Base balance – physiology**

**Dr Doris Doberenz** (doris.doberenz@imperial.nhs.uk)

* Lecture and relevant articles on Blackboard

**Lecture 11: Acid Base Balance – illustrations from the critically ill patient’s physiology**

**Dr Doris Doberenz** (doris.doberenz@imperial.nhs.uk)

* Cases will provided on the day of the lectures.

**Lecture 12: Renal causes of hypertension**

**Dr Peter Hill** (peter.hill4@nhs.net)

**Lecture 13: Erythropoeitin**

**Dr Peter Hill** (peter.hill4@nhs.net)

**Lecture 14: When the kidneys are lost**

**Dr Damien Ashby** (damien.ashby@imperial.nhs.uk)

**Lecture 15: Renal Physiology – clinical scenarios**

**Dr Jeremy Levy** (j.levy@imperial.ac.uk)

* Cases for self-directed learning on the Blackboard

**Lecture 16: Lessons from nature: How genetic defects illustrate the physiology of salt and water balance**

**Dr Nish Arulkumaran** (n.arulkumaran@imperial.ac.uk)

* To understand the principles of the human genome project and how it relates to Mendelian genetic disorders
* To understand how Mendelian disorders can cause disease
* To appreciate how understanding Mendelian disorders can elucidate physiological processes on a molecular level
* To appreciate that Mendelian defects of salt handling can result in high or low blood pressure
* To understand some of the molecular pathophysiology involved and how this relates to commonly used drugs
* To appreciate that genetics is a dynamic area in which much is still to be learned

**Lecture 17: Clinical demonstration : video and meeting with renal patient**

**Dr Liz Lightstone** (l.lightstone@imperial.ac.uk)

* Understand how kidney failure impacts on patients’ lives
* Understand the practicalities involved in dialysis and transplantation

**Lecture 18: Overview of kidney function and dysfunction with respect to learning objectives of the course**

**Dr Damien Ashby** (damien.ashby@imperial.nhs.uk)

**Lecture 19\*: Predict the consequences of loss of endocrine functions of the kidney Professor Karim Meeran** (k.meeran@imperial.ac.uk)

**Lecture 20\*: Control of calcium and phosphate: vitamin D, PTH and the kidney; Professor Karim Meeran** (k.meeran@imperial.ac.uk)

**\* these two lectures will be given in March during the pathology course where they sit more appropriately.**

**CONTACT DETAILS**

Dr Ruth Tarzi, Course Leader:

email: r.tarzi@imperial.ac.uk