BSc GLOBAL HEALTH

YEAR 4 2012–13

HANDBOOK

MODULE 1–INFECTIOUS DISEASES

PLEASE NOTE: THIS IS A DOCUMENT IN PROGRESS AND ANY UPDATES WILL BE INCLUDED IN THE INTRANET VERSION OF THIS DOCUMENT. WE WILL LET YOU KNOW WHEN CHANGES HAVE BEEN MADE.

CONTENTS

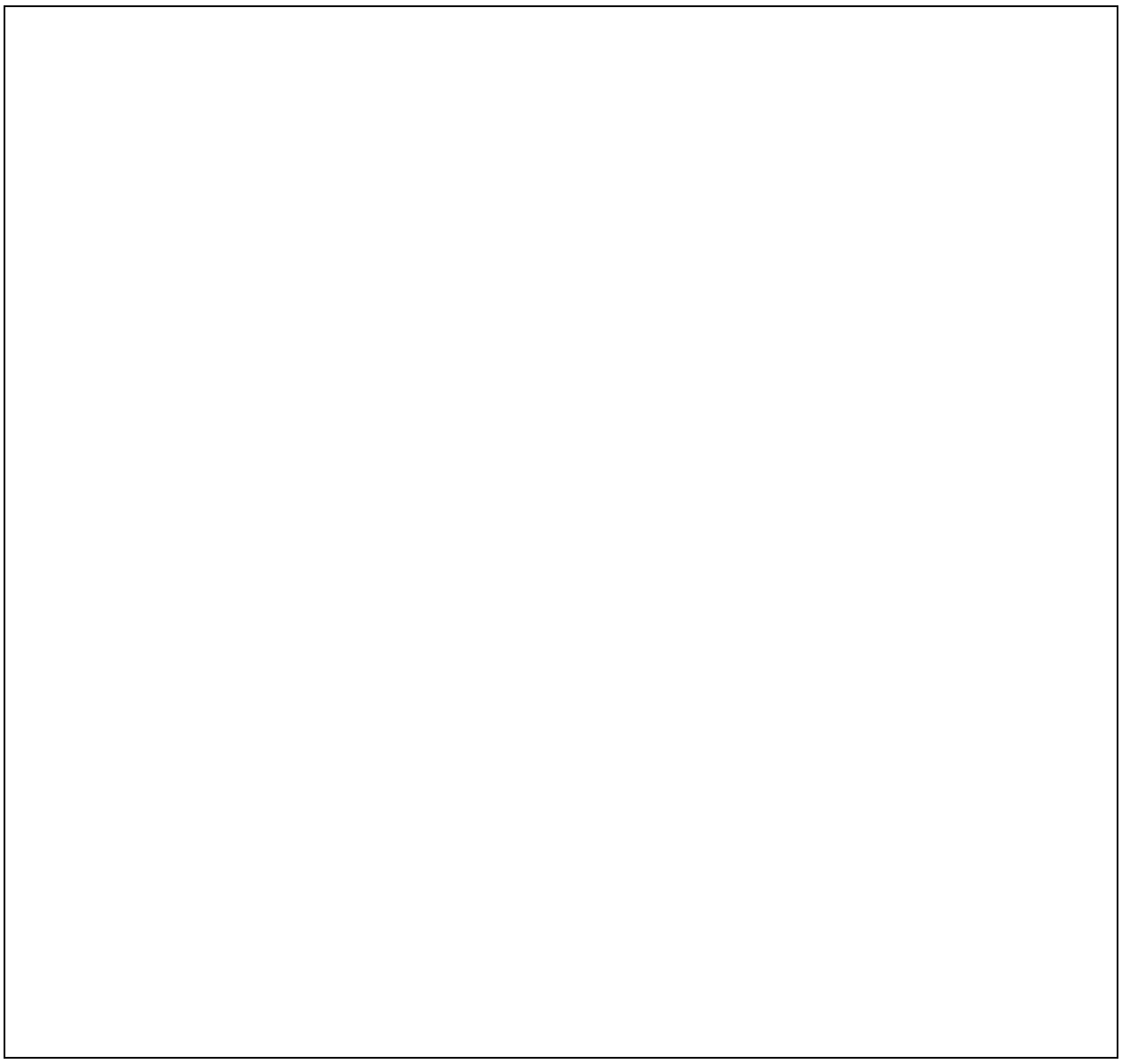
SOLE FEEDBACK

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.

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.



MODULE OUTLINE

BSc in Global Health: Module 1 – Infectious Diseases

Module 1 directors: Graham Cooke and Helen Ward

Key contacts:

Graham Cooke (g.cooke@imperial.ac.uk)

Helen Ward (h.ward@imperial.ac.uk)

Helen King (helen.king@imperial.ac.uk)

Content: This module will provide a broad overview of the challenge posed by infectious diseases to global health. Formal teaching will cover the major diseases faced by the global health community, disease burden and approaches to the control of disease. The course will be structured around different modes of disease transmission to link more clearly with areas of environmental health and health policy later in the course.

In course assessments

There will be two in course assessments within module 1 as outlined below

A. In-Course Assessment 1

Essay on global health topic (5%)

Students will provided with an essay title before end of the first week of the module. The title will be chosen to reflect a major issue on the control of infectious diseases and give the students the opportunity to draw in information from a range of sources, not just taught material in the course. One of the key learning objectives of setting an essay is to give students practice at essay writing, with essays forming a key part of the final examination.

The essay should be no more than **2500 words** long, but there is no minimum word count. The essay should be submitted by **5pm on the 24th October**. Brief individual feedback will be provided to candidates and a more general feedback session may be scheduled if thought helpful.

Please note that it is compulsory to submit each in-course assessment although it is not necessary to pass in order to pass the Part B module.

Please refer to the Year 4 study Guide for the standard marking scheme for in-course assessment essays.

Referencing

You will be required to use Vancouver style referencing. Details are available in the Year 4 BSc course gudie and online:
http://www3.imperial.ac.uk/library/subjectsandsupport/referencemanagement/vancouver

Penalties for late submission

Late submissions will be penalised and lead to loss of marks so candidates are advised to submit before this deadline in case of technical challenges.

5% will be deducted from the awarded mark for assessed work for each day late up to fourteen days after the submission deadline. No mark will be awarded for work submitted more than fourteen days late. Also students who do not submit a document by day 14 may not be allowed to progress to subsequent modules and complete their degree.

Penalties for word count

1% will be deducted from the awarded mark for assessed work for every 1% over the 2500 words limit. With the exception of figure/table legends as well as the reference list, all other text, including the referencing in it, is included in the word count subject to penalty. Please include your total word count on your submission.

Essay submission details

Instructions are available on the Year 4 Intranet https://education.med.imperial.ac.uk/Years/4-1213/instructions.pdf . To submit your assignment you will be required to create a document with the *Template for submission of written course work on Blackboard* available on the intranet, to log into Blackboard http://learn.imperial.ac.uk/ and to select the appropriate BSc Blackboard course to submit your In-course Assessment.

Plagiarism and academic integrity

Please be aware that your coursework submission will be run through plagiarism detection software. Before handing in any course work you will be asked to confirm that the work is your own.

Plagiarism is a form of cheating and is taken extremely seriously by the College. Any suspected cases will be reported directly to the College if proven, disciplinary action will be taken which may lead to the student being asked to withdraw from the College. Please refer to the material from your Plagiarism training session, to the online material available on the ICL website and to the advice contained in the year 4 Course Guide on how to avoid plagiarism. If you have any queries or doubts, please discuss this with a member of staff.

B. In-Course Assessment 2

Critical Appraisal of papers (5%)

There will be a taught session within the module on how to approach critical appraisal of a new paper in a structured way. The second in course assessment will be a critical appraisal project. Candidates will be presented with the first half of a paper including introduction, methods and results. They will be asked to interpret the data and write a brief discussion on the findings. This will provide some preparation for the final exam which has a data handling question.

This format will be similar to Section B of the summative Part B examination Paper for Module 1.

C. Journal Clubs

A journal club is organised for week 4 of the course. Students are encouraged to develop their own journal/reading clubs to support their reading around the course.

Group	Surname	First name	Week 1	Week 2	Week 3	Week 5
A	Arnold	Thomas				
A	Boussabaine	Emaan				
A	de Rosa	Eleanor Jane				
B	Keech	Maximillian Morgan Kinder				
B	Kim	Sung-Hee				
B	Lee	Samuel				
C	Chong	Amelia				
C	Forshaw	Jennifer Anne				
C	Low	Jen Mae				
D	Grahame	Emma				
D	Feyereisen	Laura				
D	McGown	Patrick James				
E	Ologunde	Rele Matthew Adedeji				
E	Patel	Purvi Nimishkumar				
E	Parish	Alvin				
F	Prager	Latreille Gabrielle Mary				

F	Sadasivan	Luvarnia				
F	Stewart	Eleanor Margaret				
G	Wynberg	Elke				
G	Yasin	Maryiam				
G	Zahid	Shereen Sanaa				
H	Karnani	Nisha				
H	Emanuwa	Emudiaga Jonathan Ewan				
H	Lewis	Marissa				
H	Yeats	James				
I	Lee	Yin Yin				
I	Rae	Sophie				
I	Johari	Nur				
I	Ramjan	Rubeena				

Please find the timetable below which has been colour coded to represent the corresponding week

Red – Airborne infectious diseases

Blue - Food and Water borne infectious diseases

Green – Vaccine preventable diseases

Brown – Sexually transmitted diseases

Purple – Vector-borne infectious diseases

Week 1: Food and water borne infectious diseases **(8th-12th October)**

	9.30 – 10.30	10.45 – 11.45	12.00-1.00	Afternoon 2
Monday 8 October November AM: Clinical LT PM: Cockburn LT	***Talk:*** ***Introduction to Module 1*** ***Graham Cooke***	***Introductory lecture:*** ***Tools for the control of infectious diseases*** ***Graham Cooke***	***Introduction to Neglected tropical diseases*** ***Alan Fenwick***	***Eye health and Health System Strengthening in Developing countries*** ***– Caroline Harper CEO of Sight Savers***
Tuesday 9 October AM: Roger Bannister	***Burden of disease*** ***Wendy Harrison***	***Burden of disease (practical)*** ***Wendy Harrison***	***Guinea worm film*** ***Wendy Harrison***	*Death By Water: John Snow & Cholera' a guided walk by Dr Richard Barnett*
Wednesday 10 October AM: Roger Bannister	Discussion on guided walk Kelley Swain			
Thursday 11 October	***Introductory lecture: Diarrhoeal disease*** ***Graham Cooke***	***Introduction to even more neglected tropical diseases*** ***Alan Fenwick***	Mass Treatment and Drug Resistance Prof Joanne Webster	***School health and nutrition: Levelling the playing field*** ***Aulo Gelli***
Friday 12th October Roger Bannister	***Research methods:*** ***Outbreak investigation*** ***Dan Gibbons***	***Lecture: Pathogens and dirty water*** ***Stephen Smith (Env Engineering)***	***Lecture and group discussion : Water, sanitation and health*** ***Mike Templeton (Env Engineering)***	***Introduction to Zoonotic Tropical Diseases*** ***Wendy Harrison***

Week 2: Airborne infectious diseases (15th-19th October)

	9.30 – 10.30	10.45 – 11.45	12.00-1.00	Afternoon 2
Monday 15 October AM: Roger Bannister LT	***The health impact of influenza, and how it might be reduced*** ***Professor Peter Openshaw (9.30-11.00am)***	***How does surveillance and modelling help us control respiratory viruses?*** ***Peter White (11.30-2.00pm)***		
Tuesday 16 October AM: MSc room PM: Anthony Rothschild LT	***Use of ART for prevention in Africa*** ***Sarah Fidler***			***Medical Humanities – Tuberculosis*** ***Kelly Swain*** ***Rothschild LT – 2-4pm***
Wednesday 17 October AM: Cockburn	***Air pollution and Global Health*** ***Majid Ezzati***		***Challenges in paediatric tuberculosis and community control*** ***Beate Kampmann***	
Thursday 18 October Roger Bannister LT	***Latent TB infection; its diagnosis and importance to TB control*** ***Ajit Lalvani***	***Border policy and TB control*** ***Manish Pareek***		***New advances in TB vaccination*** ***Samantha Sampson (Roger Bannister)***
Friday 19 October AM: Roger Bannister	***MDR-TB : a growing challenge to global health – case studies*** ***Graham Cooke and Phillip du Cros (MSF)***		***Childhood pneumonia: the forgotten killer –*** ***Aran Singanayagam***	***Urbanization and infectious disease*** ***Graham Cooke (3pm-4pm – Roger Bannister)***

Week 3: Sexually transmitted/blood borne infectious diseases (22nd-26th October)

	9.30-10.30	10.45-11.45	12.00-1.00	Afternoon 2-4
Monday 22 October AM: MSc room PM: Roger Bannister	***HIV and STIs: the tools for global control*** ***Graham Cooke***	***Biomedical prevention in HIV*** ***Robin Shattock***		***Barriers to HIV testing in the UK and globally*** ***Rahma ElMahdi and Tanvi Rai (Roger Bannister)***
Tuesday 23 October AM: Roger Bannister PM: Hynds lab	***Research methods: Case studies of STI*** ***Helen Ward***		***Syphilis: what do we need to eradicate disease*** ***Craig Tipple***	***Advanced Literature search session*** ***Jackie Cousins (2-3.30pm) (Hynd's Lab)***
Wednesday 24 October AM: Msc Room				Submit ICA 1
Thursday 25 October AM: Peart room	***Lecture: Health Worker Migration*** ***9.30am-10.30am*** ***Mariam Sbaiti***	***Seminar: Health Worker Migration and HIV/AIDS*** ***11.00am-12 noon*** ***Mariam Sbaiti***	***What do we need to do to prevent HBV related disease?*** ***Mark Thurz***	
Friday 26 October AM: Roger Bannister PM: Rothschild	***Video , case study and discussion: Overcoming the barriers to treatment of HIV in Africa (9.30-12.00)*** ***Nathan Ford***		***How to eliminate trachoma by 2020*** ***Anthony Solomon*** ***(LSTHM)***	**Debate: the ethics of International Randomised controlled trials - the SAPIT case** Mariam Sbaiti/ **Dr Wing May Kong** – 2-4.30pm (Rothschild LT)

Week 4: Vaccine preventable disease (29 Oct – 2 Nov)

	9.30 – 10.30	10.45 – 11.45	12.00-1.00	Afternoon 2
Monday 29 October AM: MSc room PM: Cockburn LT	***How do Vaccines Work: Immunology and Maths*** *Basic intro level stuff what's a T cell/ B cell/ Antibody/* *J Tregoning*	***Vaccine preventable diseases 1: The common ones (Describe incidence/ symptoms/ effect of vaccination on diseases in most national schedules incl TB, Tet, Dip, Pert, Hib, Measles, Polio)*** ***Alasdair Bamford***	***Vaccine preventable diseases 2: The other ones (Describe incidence/ symptoms / effect of vaccination on other vaccine treatable diseases incl influenza, VZV, HPV, bacterial pneumonias, Mumps, Rubella, yellow fever, anything else relevant)*** ***Alasdair Bamford***	***Q&As on Part C BSc Projects*** ***Mariam Sbaiti and Helen Ward*** ***(2-3pm – Cockburn LT)***
Tuesday 30 October AM: MSc room PM: Roger Bannister	***What are the new approaches to vaccines*** ***Dr Jamie Mann***			***Medical Humanities – Polio*** ***Kelley Swain (Roger Bannister)***
Wednesday 31 October AM: Cockburn LT	***The big 3: Approaches to control HIV, TB and Malaria*** ***Paul McKay***	***Trust in vaccines*** ***Caitlin Jarret (LSHTM) & Heidi Larson***		
Thursday 1 November AM: MSc room	***What are the other barriers to new vaccines (scientific and geopolitical) cold chain, perception, cost, trials,*** ***J Tregoning***	***The global challenge of HPV and scaling up vaccination*** ***Simon Beddows (HPA)***	***The role of vaccination in the control of flu pandemics*** ***Neil Ferguson***	
Friday 2 November AM: Rothschild LT	***What are the obstacles to elimination of polio?*** ***Tara Mangal***	***Vaccination Journal Club: Moderator*** ***J Tregoning***	***How do we do a clinical vaccine trial*** ***Alethea Cope***	

Week 5: Vector-borne infectious diseases (5-9 November)

	9.30 – 10.30	10.45 – 11.45	12.00-1.00	Afternoon
Monday 5 November AM: MSc room	***Vector borne disease and an introduction to malaria*** ***Graham Cooke***	***A structured approach to critical appraisal of a paper*** ***Graham Cooke***		
Tuesday 6 November AM: MSc room	***Vector control strategies in malaria:*** ***John Marshall***	***Interactive discussion: Should we use GM mosquitos?*** ***John Marshall***	***Can we use existing tools to eradicate malaria?*** ***Maria-Gloria Basanez***	
Wednesday 7 November AM: Cockburn	***Leishmaniasis – principles and unmet needs*** ***Dr Ingrid Muller (9.00am-10.30am)***	***Dengue fever*** ***Abi Culshaw***	***How will the control of infectious disease be improved by genomic analysis?*** ***Christophe Fraser***	
Thursday 8 November Roger Bannister	*Health systems and the barriers to ACT delivery* *Bhargavi Rao*	***Malaria in the UK: where does it come from?*** ***Deidre Hollingsworth (11.00am-12.00am)***		
Friday 9 November MSc room	**In course Assessment: Critical Appraisal Paper –** **(9.00-10.30am)** **Moderator : Graham Cooke**			

LECTURE OUTLINES

WEEK 1

Food and water borne infectious diseases (8-12 October)

Monday 8 October

Tools for the control of Infectious Diseases

Graham Cooke

By the end of this session you should be able to have:

developed a framework to help you understand the common tools that can be employed for the control of infectious disease

Overview

The session will be interactive and seek to develop a framework that the student will be able to apply to a range of infectious diseases. Examples of tools to control specific infectious diseases will be used to illustrate the challenge. The talk is designed to complement later disease specific lectures.

The lecture(s) are well structured					**The lecturer explains concepts clearly**					**The lecturer engages well with the students**				
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□	□	□	□	□	□	□	□	□	□	□

One useful learning point I would like to remember from this session:

Eye health and Health System Strengthening in Developing countries

Caroline Harper (CEO of Sightsavers)

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

Understand what WHO building blocks of health systems are and how they are relevant to eye health

Understand what it means to ‘strengthen the health system’, illustrated by examples from eye health work

Appreciate some of the issues involved with vertical health interventions, and how these can cause problems within health systems (with some examples of how these can be overcome)

Appreciate the role INGOs (and other actors) play in global eye health work

Historically eye services have been seen as the preserve of specialists. Ophthalmologists are seen as a rarified group, mainly practicing in big cities, and with serious shortages in developing countries. This is particularly acute in Africa. Even where national eye care plans exist (which they often don’t), these are typically separate from national health plans and usually unfunded. Eye problems haven’t received high profile, especially with the scourges of HIV/Aids, TB and Malaria attracting all the attention and money. Blindness isn’t seen as a killer. That said, a young child who goes blind typically dies within two years.

Increasingly evidence shows that blindness is a significant cause of poverty (work done by London School of Hygiene and Tropical Medicine), and that interventions to treat blindness are amongst the most cost effective that we have (WHO). Recent research shows that ocular morbidity can be a significant burden on health services, especially as eye health is often not integrated into primary health care. This means people sometimes seek hospital treatment for simple conditions.

So there has been much effort from INGOs and from the professional bodies to raise the profile of eye health, but in so doing it is important to avoid simply creating vertical or parallel systems, especially those which aren’t sustainable – the ubiquitous ‘free eye camps’. There are many charities who send doctors to Africa to provide free operations – and this often leaves mayhem behind for those who have to handle follow up and complications.

This lecture will draw on the work of the INGO Sightsavers, and in particular its journey from being a charity which focused solely on service delivery, to being a development organisation aiming to achieve systemic change. In particular to ensure that its eye health work strengthened and supported existing health systems. Examples will be given of how this was done

There are particular challenges with ‘neglected tropical diseases’ – a range of 7 major diseases (actually there are 17 in all but 7 major ones) which are all treatable with mass chemotherapy via donated drugs, two of which are blinding (onchocerciasis and trachoma). These are now the subject of elimination campaigns – which is of course very exciting, but campaigns like this tend to be focused and vertical, which can be efficient but can also have implications for the wider health system. An example would be attracting health workers away from their normal roles.

This lecture will provide some case studies to illustrate a range of issues and approaches to these problems.

<u>Essential reading</u>

WHO (2007) Everybody business : strengthening health systems to improve health outcomes : WHO’s framework for action.

Basic background reading would be

The Sightsavers website!

<u>Optional reading</u>

ICEH/LSHTM (2012) Eye Health Systems Assessment (EHSA): How to connect eye care with the general health system.

The lecture(s) are well structured					The lecturer explains concepts clearly					The lecturer engages well with the students				
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
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One useful learning point I would like to remember from this session:

Tuesday 9 October

Burden of disease
Wendy Harrison

Learning outcomes

Understand the

- need for objective measure of burden of disease
- most widely used methodology for burden of disease assessment DALY
- limitations of the use of the DALY
- introduction to cost effectiveness
- burden of disease in a wider context

Burden of disease (practical)

An exercise will be undertaken to think about the issues that arise in prioritising health care in resource poor setting which also do have applicability in the developed world too.

The lecture(s) are well structured					The lecturer explains concepts clearly					The lecturer engages well with the students				
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
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One useful learning point I would like to remember from this session:

Thursday 11 October

Diarrhoeal Disease

Graham Cooke

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

- Understand the definitions, aetiology and burden of disease from diarrhoeal disease
- Be familiar with the tools available to control diarrhoeal disease and how they can be used together

The session will be partly interactive and partly lecture based. The burden of diarrhoeal disease will be covered and the tools required to control diarrhoeal disease will be outlined. There will be more detailed discussion of specific interventions which need to be implemented to control diarrhoeal disease and the gaps in current interventions. The talk will provide a basis for understand the lectures on water in the same week.

Essential Reading

Diarrhoea: Why children are still dying and what can be done. WHO/UNICEF Report 2009

Recommended reading

Fontaine O, Kosek M, Bhatnagar S, Boschi-Pinto C, Chan KY, et al. (2009) Setting research priorities to reduce global mortality from childhood diarrhoea by2015. PLoS Med 6(3): e1000041. doi:10.1371/journal.pmed.1000041

Liu, L et al Global, regional, and national causes of child mortality: an updated systematic analysis for 2010 with time trends since 2000. *Lancet* 2012;379:2151–61. doi:10.1016/ S0140-6736(12)60560-1 PMID:22579125

Fischer Walker CL, Perin J, Aryee MJ, Boschi-Pinto C, Black RE. Diarrhea incidence in low- and middle-income countries in 1990 and 2010: a systematic review. *BMC Public Health* 2012;12:220. doi:10.1186/1471-2458- 12-220 PMID:22436130

The lecture(s) are well structured					**The lecturer explains concepts clearly**					**The lecturer engages well with the students**				
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□	□	□	□	□	□	□	□	□	□	□

One useful learning point I would like to remember from this session:

Introduction to neglected tropical diseases
Alan Fenwick

In this lecture the control of the seven most common NTDs will be discussed including the strategies for control (school based vs community drug delivery) the trigger levels to justify Mass drug administration both in schools and in the community, and the possible sources of funding to pay for the distribution of the four drugs needed. The role of the pharmaceutical donations will be put in perspective. Finally health education, training, mapping and monitoring and evaluation will be discussed. The achievements of SCI will be described.
Learning point is the wide distribution of these diseases and how much progress has been made in controlling them over the last decade

More neglected tropical diseases
Alan Fenwick

In this lecture a wide range of lesser known Neglected Tropical Diseases will be described and discussed and the relative importance of these diseases explained.
Learning point is the awareness of the very neglected tropical diseases and what can and cannot be done about them with the drugs at our disposal

Recommended reading

The Schistosomiasis Control Initiative (SCI): rationale, development and implementation from 2002–2008 A Fenwick et al Parasitology. 2009 Nov;136(13):1719-30

Waterborne Infectious Diseases—Could They Be Consigned to History? Alan Fenwick *Science.* 313:1077-1081

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Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
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One useful learning point I would like to remember from this session:

Monitoring, Evaluation and Research for Schistosomiasis control: Mass Treatment and Drug Resistance
Professor Joanne Webster

Recent shifts in global health policy have led to the implementation of mass drug administration (MDA) for schistosomiasis and a range of other neglected tropical diseases (NTDs). As demonstrated in Prof. Alan Fenwick's preceding lectures, the Schistosome Control Initiative (SCI) has successfully delivered 90% of all treatments provided against schistosomiasis across sub-Saharan Africa, and >100 million treatments against other soil transmitted helminths, within its first five years alone. Significant reductions in parasite infection prevalence, intensity, and subsequent morbidity, have been clearly demonstrated. However, intensive and prolonged new selective pressures are being placed on these parasites through such MDA, which may have implications for the long term success of such campaigns. Through the application novel, ethically and epidemiologically robust, molecular and phenotypic tools, we therefore combine complementary monitoring and evaluation studies of how schistosome populations evolve, with the research targeted at the applied issue of identifying parasite genotypes so that any changes in population structures can be monitored, potentially drug-resistant genotypes can be identified, and the selective pressures of chemotherapy can be characterized. The results presented serve to both illustrate the success of current control activities in reducing schistosome-induced morbidity, and to highlight key tools and techniques for continued application within ongoing and future MDA programmes.

Key learning points
Using schistosomiasis mass drug administration (MDA) with praziquanteL (PZQ) as an example:

- The importance of monitoring and evaluation (M&E) in MDA programmes
- The predicted impact of MDA on host-parasite interactions.
- Potential reasons for and against the predicted development and establishment of resistance to PZQ
- The role of population genetic tools and analyses in M&E
- Implications for future schistosomiasis transmission, morbidity and control.

Key papers/suggested reading
Norton, A.J, Gower, C.M., Lamberton, P.H.L., Webster, B. Lwambo, N.J., Blair, L., Fenwick, A. & Webster, J.P. (2010). Genetic Consequences of Mass Human Chemotherapy for Schistosoma mansoni: population structure pre- and post- praziquantel treatment in Tanzania. American Journal of Tropical Medicine and Hygiene. 83 (4), 951–957

Koukounari, A., Donnelly, C. A., Sacko, M., Keita, A., Landoure. A., Dembele. R., Bosque-Oliva, E. C., Gabrielli., A., Gouvras, A., Traore, M., Fenwick, A. & Webster, J. P. (2010). The impact of single versus mixed schistosome species infections on liver, spleen and bladder morbidity within Malian children pre- and post-praziquantel treatment. BMC Infectious Diseases, 10:227

Webster, J.P., Gower, C.M. & Norton, A.J. (2008). Application of evolutionary concepts to predicting and evaluating the impact of mass-chemotherapy schistosomiasis control programmes. Evolutionary Applications. 1, 66-83.

Woolhouse, M.E.J., Webster, J.P., Domingo, E., Charlesworth, B. & Levin, B.R. (2002) Biological and biomedical implications of the coevolution of pathogens and their hosts. Nature Genetics. 32 (4), 569-577.

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One useful learning point I would like to remember from this session:

School health and nutrition: Levelling the playing field

Aulo Gelli

Learning outcomes

- Improved understanding of the links between school health and nutrition and educational outcomes in low and middle income settings
- High-level understanding of some of the key trade-offs involved in the design of school food programmes

Overview

- Access to primary education has improved significantly in many parts of the world. Yet challenges in school access remain, 75 million children of primary school-age, 44 percent of them in sub-Saharan Africa, are not in school and 55 percent of them are girls.
- Poor nutrition and health among schoolchildren contributes to the inefficiency of the educational system. School feeding is a very popular programme that has been used to support the education, health and nutrition of children living in vulnerable food-insecure areas.
- However, school feeding is a complex intervention and designing effective programs requires an evidence base that allows careful trade-offs among targeting approaches, feeding modalities, and costs.
- This session will explore some of the key trade-offs in terms of school feeding programme design, examining links between context, costs and and child health and education outcomes.

Essential reading

Alderman H, Bundy, DAP. School Feeding Programs and Development: Are We Framing the Question Correctly? World Bank Research Observer. Washington, DC: The World Bank, 2011.

Recommended reading

Bundy DAP, Burbano C, Grosh M, Gelli A, Jukes, M and Drake, L. Rethinking School Feeding: Social Safety Nets, Child Development, And the Education Sector. World Bank, 2009

Bundy, DAP (ed.). Rethinking School Health. World Bank, 2011.

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One useful learning point I would like to remember from this session:

Friday 12 October

Research methods: Outbreak investigation
Dan Gibbons

Outline

- Introduce the concepts of outbreaks and epidemics;
- Cover the systems and processes involved in identifying and investigating outbreaks;
- Explore the public health interventions or actions that can be used to control outbreaks.

Learning objectives

- To define an outbreak;
- To understand why outbreaks are investigated;
- To describe how outbreaks are identified;
- To describe the steps in an outbreak investigation;
- To understand the role of public health interventions in outbreak control.

Reading

- Jardine A *et al.* (2011). **An outbreak of *Salmonella typhimurium* 108/170 at a privately catered barbeque at a Sydney sports club**. *Foodborne Pathog Dis.* 2011;8(11):1215-9. Available at: http://www.ncbi.nlm.nih.gov/pubmed/21790276
- Health Protection Agency (2011). **Salmonella – Clinical Information**. Available at: http://www.hpa.org.uk/Topics/InfectiousDiseases/InfectionsAZ/Salmonella/GeneralInformation/salmClinicalinformation/

The lecture(s) are well structured					The lecturer explains concepts clearly					The lecturer engages well with the students				
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
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One useful learning point I would like to remember from this session:

Pathogens and dirty water
Professor Stephen Smith

Professor Smith will present a talk on pathogens and dirty water. This will cover the scale of the global sanitation and water supply situation. The general characteristics and classification of water related infections will be described and examples of each type will be briefly examined. Faecal-oral transmission pathways in relation to the management of pathogen risks associated with recycling sewage sludge from wastewater treatment processes will be considered.

Key learning points

- Basic knowledge of global water supply and sanitation
- Water related disease classification and how these routes are exploited by infectious pathogens
- Control of pathogen infection risks by sewage sludge treatment processes

Optional Reading

Cairncross, S. and Feachem, R. (1993) *Environmental Health Engineering in the Tropics* John Wiley & Sons, Chichester.

Feachem RG *et al*. (1983) *Sanitation and Disease: Health Aspects of Excreta and Wastewater Management.* John Wiley Sons, Chichester.

The lecture(s) are well structured	The lecturer explains concepts clearly	The lecturer engages well with the students

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
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One useful learning point I would like to remember from this session:

Water, sanitation and health
Dr Mike Templeton

This talk will cover low-cost water and sanitation technologies at household level in developing countries, including methods for selecting appropriate technologies to ensure health protection and the basics of their design, construction, and maintenance. Group discussions will consider solutions for specific low-income communities drawn from real case studies.

The key learning points will be

- Be able to describe at least three common methods for treating water at household level in developing countries
- Be able to describe at least three common sanitation technologies at household level in developing countries
- Explain the technical and non-technical factors that must be taken into account when selecting appropriate water and sanitation options

Optional readings

The following websites contain useful information related to this topic:

Wedc.lboro.ac.uk

Lboro.ac.uk/well

who.int/household_water/en

cawst.org/index.php?id=26

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One useful learning point I would like to remember from this session:

Introduction to Zoonotic Tropical Diseases
Wendy Harrison

A brief outline of the session (in bullet point format)

- the inter-relationship between human and animal disease
- importance of epidemiological approaches to effective international disease control
- burden of zoonotic diseases
- approaches to managing human and animal health

Learning outcomes (in bullet point format)

- Understand the value of looking at health and disease in a wider context
- Understand the impact of demographic and socio-economic factors involved in zoonotic disease transmission
- Understand the need for multi-disciplinary approaches to disease control

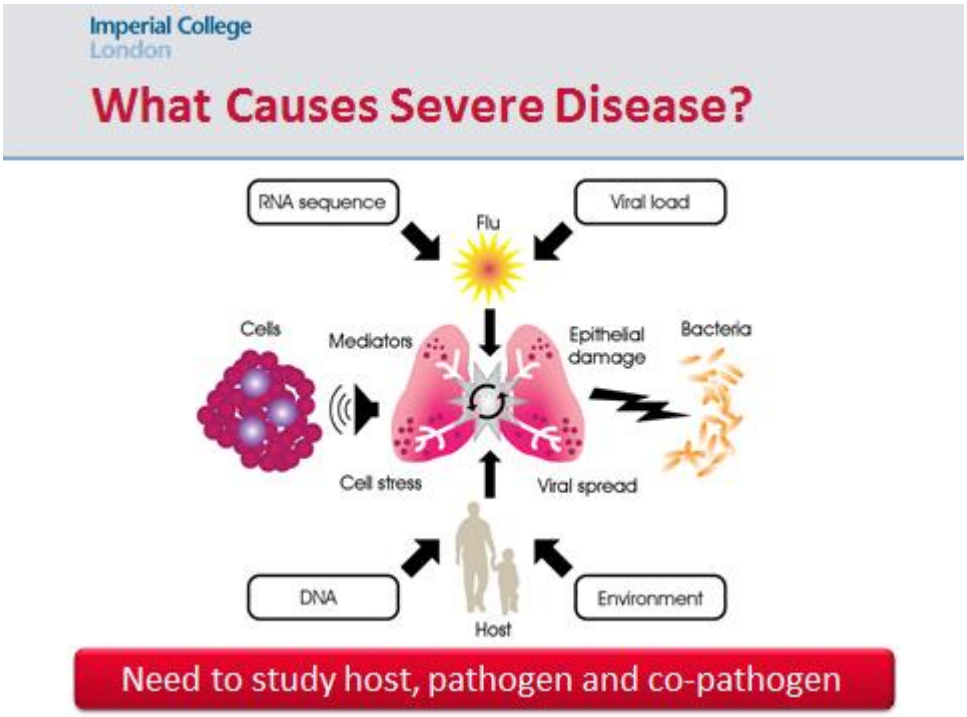
Required readings

Kate E. Jones, Nikkita G. Patel, Marc A. Levy, Adam Storeygard, Deborah Balk, John L. Gittleman4 & Peter Daszak. 2008. Global trends in emerging infectious diseases. Nature Vol 451| 21 February 2008

The Control of Neglected Zoonotic Diseases – A Route out of Poverty. Report of a Joint WHO/DFID-AHP Meeting with the participation of FAO and OIE Geneva, September 2005 http://www.who.int/zoonoses/Report_Sept06.pdf

WEEK 2
Airborne infectious diseases (15–19 October)

Monday 15 October



The health impact of influenza, and how it might be reduced
Peter Openshaw

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

1. Provide a brief description of how the 2009 pandemic evolved

2. Compare the 2009 pandemic with previous influenza pandemics

3. Describe the salient clinical features of pH1N1/09 infection

4. Describe what we currently know about pH1N1 pathogenesis

5. Identify areas that require further investigation and are of future concern

Outline:

- Historical aspects of influenza pandemics
- The timing and course of the 2009-10 influenza pandemic in the UK
- Clinical features of pandemic H1N1/09 infection
- Understanding the pathogenesis of influenza illness
- Public health implications and management
- Current and future treatment/prevention of pH1N1
  Other viruses with pandemic potential

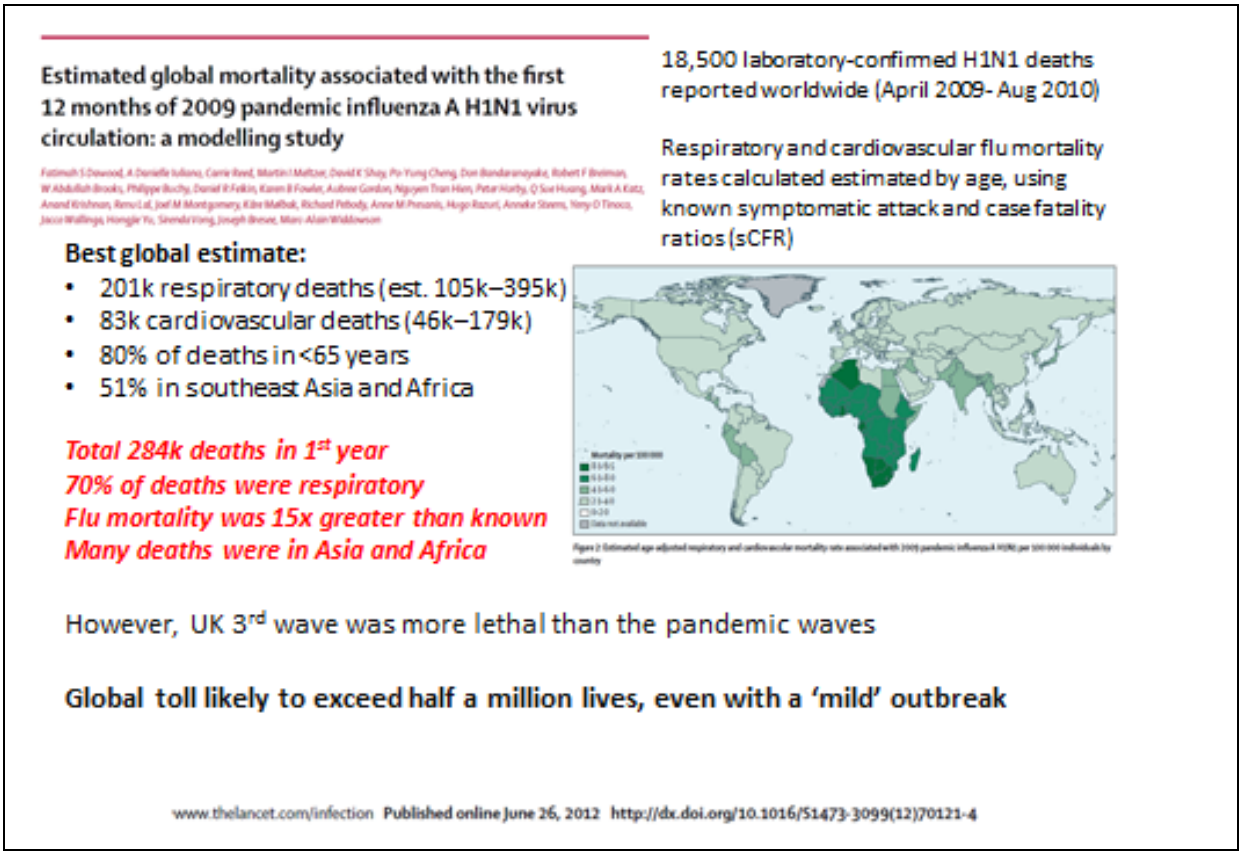
Essential reading
Dawood FS,et al., Lancet Infect Dis. 2012 Sep;12(9):687-95. Estimated global mortality associated with the first 12 months of 2009 pandemic influenza A H1N1 virus circulation: a modelling study. http://www.ncbi.nlm.nih.gov/pubmed/22738893

Recommended reading

Clinical Aspects of Pandemic 2009 Influenza A (H1N1) Virus Infection. Writing Committee of the WHO Consultation on Clinical Aspects of Pandemic (H1N1) 2009 Influenza N Engl J Med 2010; 362:1708-1719 May 6, 2010 http://www.nejm.org/doi/full/10.1056/NEJMra1000449 ;

Optional reading

Everitt AR, Clare S, Pertel T, John SP, Wash RS, Smith SE, Chin CR, Feeley EM, Sims JS, Adams DJ, Wise HM, Kane L, Goulding D, Digard P, Anttila V, Baillie JK, Walsh TS, Hume DA, Palotie A, Xue Y, Colonna V, Tyler-Smith C, Dunning J, Gordon SB; GenISIS Investigators; MOSAIC Investigators, Smyth RL, Openshaw PJ, Dougan G, Brass AL, Kellam P. (2012) IFITM3 restricts the morbidity and mortality associated with influenza. Nature. 484:519-23.doi: 10.1038/nature10921 http://www.nature.com/nature/journal/v484/n7395/full/nature10921.html



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One useful learning point I would like to remember from this session:

Head of the Modelling & Economics Unit, Health Protection Agency, UK
Lecturer in Infectious Disease Epidemiology, Imperial College London, UK

Lecture 1. Introduction to mathematical modelling of infectious diseases
Lecture 2. Modelling the influenza A/H1N1 (2009) pandemic in real time

- Mathematical modelling is increasingly being used to understand infectious disease epidemiology and to plan and evaluate intervention policies. Models are essential to understanding the transmission patterns of infectious diseases because transmission is a complex dynamic process affected by multiple interacting factors. Models enable 'evidence synthesis' – combining data from multiple sources, such as different surveillance systems, and individual scientific studies, to build a 'bigger picture' and improve understanding.
- The first lecture will describe some basic principles of model construction. The second lecture will look at the role of modelling in real-time analysis of the influenza A/H1N1 (2009) pandemic.
- Mathematical modelling played a planned, integral part in the UK response to the 2009 influenza pandemic. Modellers met with government at least once per week throughout the epidemic, and provided guidance for planners based on real-time analysis.
- Staff of the MRC Centre for Outbreak Analysis and Modelling at Imperial College worked with US CDC, the UK Health Protection Agency, the World Health Organisation and the Chinese and Mexican governments to understand the spread of the H1N1 influenza virus. Early work focused on understanding the transmission dynamics of the virus, estimating key epidemiological parameters (such as transmissibility) and predicting the spread of the pandemic. Later work focused on predicting the impact of control policies such as vaccination and school closure and assessing the overall health impact of the pandemic.
- Past influenza pandemics have been very variable and so at the start of a new influenza pandemic there is considerable uncertainty regarding key characteristics of the virus – e.g. infectivity, duration of infection, severity in terms of hospitalisations and deaths, what proportion of the population has prior immunity. Modelling allows scenarios to be examined, where the effect of varying key unknown quantities can be examined. A key strength of modelling is quantification of the extent of the uncertainty regarding the epidemic trajectory and the impact of interventions. Modelling can guide the collection of data by showing the most important 'unknowns' that must be quantified to reduce that uncertainty. As more information becomes available models can be refined.
- Estimating the burden of influenza is challenging: in most cases illness is too mild to prompt care-seeking but nevertheless causes morbidity and reduces economic productivity. Even estimating the burden of severe illness and death is complicated by problems in ascertainment: determining whether someone was severely ill, or died, OF influenza or WITH influenza (i.e. if a coinfection is the major cause of illness or death).
- The lecture will discuss the challenges of real-time outbreak analysis, such as working with ever-changing and incomplete data, and needing to draw preliminary conclusions when underlying uncertainty is huge.
- The lecture will focus on the application of modelling in the UK context, where it was used to synthesise data from different sources to provide situational awareness, guidance for planners, evaluation of the impact of initial 'containment' measures, and to examine intervention policy options such as vaccination strategies.
- UK has several established surveillance systems for general practice, hospital episodes, and mortality, which provide information on the burden of seasonal influenza and other pathogens. In

a pandemic of a new strain of influenza determining its severity is urgent and challenging. During the 2009 influenza pandemic the UK modified some of its existing systems to provide data in real-time, and set up additional systems. General-practice swabbing schemes, which normally operate during the UK's usual 'flu season', were continued throughout the year. New systems for studying the severity of hospitalised cases were implemented. Data on all-cause mortality were analysed in real-time and a system to investigate deaths of hospitalised patients in England that were suspected to be due to pandemic influenza was instituted by the Chief Medical Officer. England set up a unique system for antiviral distribution, the National Pandemic Flu Service, which provided additional community surveillance data. An internet-based cohort study, FluSurvey, was set-up to provide community surveillance and information on care-seeking behaviour. Frequent public opinion surveys were performed. Serological surveys provided estimates of infection attack rates by age and geographic location. Information on the spectrum of disease was obtained by investigation of the first few hundred cases, and the quality-of-life impact assessed using the standardised EQ5D instrument.

Learning outcomes

Lecture 1:

- Why we need models specifically designed for the transmission dynamics of infectious diseases
- Applications of infectious-disease transmission-dynamic models in public health
- Construction of a compartmental model for an acute immunising infectious disease such as influenza, incorporating interventions
- Mathematical formulation of the transmission rate of a directly-transmitted (i.e. person-to-person) infection
- The time-course of an epidemic of an acute immunising infection such as influenza
- The concepts of the basic reproductive number and effective reproductive number and their relation to the epidemic time-course

Lecture 2:

- Applications of transmission-dynamic models in pandemic influenza planning and response
- Challenges of real-time modelling of pandemic influenza
- Trade-off between sensitivity and specificity in data-collection algorithms
- Combining surveillance systems to improve understanding
- The importance of heterogeneity in age-mixing patterns and immunity
- Some key lessons learned from the H1N1 2009 influenza pandemic

Reading

<u>Essential</u>

Van Kerkhove MD, Asikainen T, Becker N, Bjorge S, Desenclos J-C, dos Santos T, Fraser C, Leung GM, Lipstich M, Longini IM, McBryde E, Roth C, Shay DK, Smith D, Wallinga J, White PJ, Ferguson NM, Riley S. [The WHO Informal Network for Mathematical Modelling for Pandemic Influenza H1N1 2009 (Working Group on Data Needs)] Studies needed to address public health challenges of the 2009 H1N1 influenza pandemic: insights from modeling. ***PLoS Medicine*** 2010; 7(6): e1000275. doi:10.1371/journal.pmed.1000275

<u>Optional</u>

Fraser C; Donnelly CA; Cauchemez S; Hanage WP; Van Kerkhove MD; Hollingsworth TD; Griffin J; Baggaley RF; et al. (19 Jun 2009). Pandemic Potential of a Strain of Influenza A (H1N1): Early Findings**.** ***Science***. 324:1557-1561.

Baguelin M, Van Hoek AJ, Jit M, Flasche S, White PJ, Edmunds WJ. Vaccination against pandemic influenza A/H1N1v in England: A real-time economic evaluation. ***Vaccine*** 2010; 28: 2370–2384.

The lecture(s) are well structured					The lecturer explains concepts clearly					The lecturer engages well with the students				
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One useful learning point I would like to remember from this session:

Tuesday 16 October

Use of ART for prevention in Africa
Sarah Fidler

Key learning points

- Cover the effects of using antiretroviral therapy as not only treatment for disease progression but also to prevent transmission of infection
- Treatment of pregnant women to prevent transmission to their babies
- The current treatment guidelines for use of ART in HIV+ infected individuals for their own health benefit- the when to start debate
- ART for prevention of sexual transmission within HIV serodiscordant couples
- Results of the HPTN 052 study
- The role of population level anticipated benefits of global ART for all HIV+
- Anticipated cost and politics of such a program
- Anticipated implementation challenges of such a program
- Trial to investigate if it could work –PopART

The HPTN trial 052 is the key driver of this

http://www.ncbi.nlm.nih.gov/pubmed/21767103

Review articles:

http://www.ncbi.nlm.nih.gov/pubmed/22227585

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One useful learning point I would like to remember from this session:

Wednesday 17 October

Air pollution and global health

Majid Ezzati

Learning objectives:

- To understand the major sources of air pollution in high-income and low/middle-income countries
- To know the environments and places where air pollution levels are the highest
- To understand the main health effects of air pollution
- To know the impacts of air pollution on regional and global burden of disease.

Overview

The health consequences of air pollution are felt across the globe, even in wealthy Western countries where levels of air pollution have dropped markedly since the middle of the 20th century. But the health burden is borne disproportionately by the growing populations of cities in the developing world. This lecture will explore current scientific knowledge about the sources, levels, and health effects of air pollution in different world regions.

Essential Readings

Brauer M, Amann M, Burnett RT, Cohen A, Dentener F, Ezzati M, Henderson SB, Krzyzanowski M, Martin RV, Van Dingenen R, van Donkelaar A, Thurston GD. Exposure assessment for estimation of the global burden of disease attributable to outdoor air pollution. Environmental Science and Technology 2012; 46(2):652-660

Ezzati M. Household energy, indoor air pollution, and health in developing countries. Lancet 2005; 366(9480):104-106

Dionisio KL, Rooney MS, Arku RE, Friedman AB, Hughes AF, Vallarino J, Agyei-Mensah S, Spengler JD, Ezzati M. Within-neighborhood patterns and sources of particle pollution: mobile monitoring and geographic information system analysis in four communities in Accra, Ghana. Environmental Health Perspectives 2010; 118(5):607-613

Suggested Readings

Rehfuess E, Mehta S, Prüss-Ustün A. Assessing household solid fuel use: multiple implications for the Millennium Development Goals. Environmental Health Perspectives 2006;114(3):373-8

Lin HH, Murray MM, Cohen T, Colijn C, Ezzati M. Effects of smoking and solid-fuel use on COPD, lung cancer, and tuberculosis in China: a time-based, multiple-risk-factor modelling study. Lancet 2008; 372(9648):1473-1483

Dionisio KL, Arku RE, Hughes AF, Vallarino J, Carmichael H, Spengler JD, Agyei-Mensah S, Ezzati M. Air pollution in Accra neighborhoods: spatial, socioeconomic, and temporal patterns. Environmental Science and Technology 2010; 44(7):2270–2276

The lecture(s) are well structured					**The lecturer explains concepts clearly**					**The lecturer engages well with the students**				
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One useful learning point I would like to remember from this session:

Thursday 18 October

Border Policy and TB control

Manish Pareek

- The student should understand that the UK has historically had a low burden of TB
- Increases in TB notifications mainly arise due to migration from high burden countries and the reactivation of latent tb infection
- Screening migrants for TB in the UK is focused around the port of arrival and using chest radiographs
- Very few cases of active TB are found through border CXRs
- Screening for latent TB infection is increasingly recognised as a method of TB control

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

- Describe, and give reasons for, the changes in TB epidemiology in the UK over the last two decades.

- Outline the current methods of immigrant screening for TB in the UK
- Discuss the rationale behind screening for latent TB

Overview

Using the UK as an example, the lecture will summarise changes in the burden of tuberculosis, particularly over the last two decades, and the importance that migration from high TB burden regions has played in determining these changes. The lecture will then go on to summarise how countries attempt to screen migrants for tuberculosis, whether these strategies have been successful and, finally, whether policy-makers need to reconsider how screening for TB is undertaken.

Essential reading

Pareek M, Watson JP, Ormerod LP, Kon OM, Woltmann G, White PJ, Abubakar I, Lalvani A. Screening of immigrants in the UK for imported latent tuberculosis: a multicentre cohort study and cost-effectiveness analysis. Lancet Infect Dis. 2011; 11(6):435-44.

Recommended readings

Pareek M, Baussano I, Abubakar I, Dye C, Lalvani A. Evaluation of immigrant tuberculosis screening in industrialized countries, Emerg Inf Dis 2012 [Epub ahead of print].

Pareek M, Bond M, Shorey J, Seneviratne S, Guy M, White P, Lalvani A, Kon OM. Community-based evaluation of immigrant tuberculosis screening using interferon γ release assays and tuberculin skin testing: observational study and economic analysis. Thorax 2012 [Epub ahead of print].

Pareek M, Abubakar I, White PJ, Garnett GP, Lalvani A. Tuberculosis screening of migrants to low-burden nations: insights from evaluation of UK practice. Eur Respir J. 2011; 37(5):1175-82.

The lecture(s) are well structured					**The lecturer explains concepts clearly**					**The lecturer engages well with the students**				
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One useful learning point I would like to remember from this session:

Latent TB infection and global TB control
Ajit Lalvani

What is latent TB? Why is it important? What is being done about it? What should be done about it?

By the end of this session you should be able to know:

- How much of the world's population carries latent TB and which population groups are most affected
- How to diagnose latent TB
- How to decide who needs treatment for latent TB
- How to treat latent TB
- Understand the immunology and biology of latent TB
- What is the future of latent TB in terms of scientific advances and public health impact

Overview

TB remains a public health problem worldwide, in part due to latent TB infection that serves as a global reservoir of potential disease. In the 20th century, the natural history of TB was defined by clinical symptoms, the tuberculin skin test and chest x-ray. The last decade witnessed the invention and application of IFN-γ release assays and newer immunological tools that enabled a re-appraisal of the natural history of TB. This lecture will review the conventional understanding of latent TB and recount how immunology has redefined latent TB as a spectrum of pathogen burden and host immune control. The lecture will conclude with a discussion of recent and future advances in the fields of TB immunology and diagnostics that will improve public health strategies to control TB.

Essential reading

Sridhar S, Pollock K, Lalvani A, Redefining latent tuberculosis, *Future Microbiology* 2011; 6: 1021-35

Recommended reading

Kasprowicz V, Churchyard G, Lawn S, Squire B and Lalvani A, Diagnosing latent tuberculosis in high-risk individuals: rising to the challenge in high-burden areas, *Journal of Infectious Diseases* 2011; 204: 1168-78

Lalvani A, Spotting Latent Infection: The Path to Better Tuberculosis Control, *Thorax* 2003; 58: 916-8

The lecture(s) are well structured					The lecturer explains concepts clearly					The lecturer engages well with the students				
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One useful learning point I would like to remember from this session:

Challenges in paediatric tuberculosis and community control
Beate Kampmann

Outline

- What is special about TB in children?
- Epidemiology- who are our patients?
- Diagnostic challenges:
  - Differences between adults and children
  - New Immunological Tools-how helpful are they?
- Prevention: new TB vaccines on the horizon
  - Community interventions

Learning outcomes

- following the seminar, the students would have gained an understanding of the challenges in childhood TB:
- global childhood TB epidemiology
- understand the role of adults and children in the transmission of tuberculosis
- are familiar with the differences in clinical presentation
  appreciate challenges in diagnosis
- understand better the research agenda in childhood TB
- critically appraise possible community interventions

-

Suggested readings:

Newton SM, Brent AJ, Anderson S, Whittaker E, Kampmann B

Paediatric Tuberculosis

The Lancet Infectious Diseases, August 2008; Vol 8: 498-510

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One useful learning point I would like to remember from this session:

New Advances in TB Vaccination
Samantha Sampson

Learning outcomes

- Outline strengths and weaknesses of current TB vaccine, BCG
- Discuss how new TB vaccine candidates and approaches aim to overcome some of the limitations of BCG

This session will cover:

- Overview of current TB vaccine, BCG – history, how it elicits protection, advantages and limitations
- Overview of alternative approaches and vaccine candidates
- Detailed discussion of 3 new TB vaccine candidates currently undergoing clinical trials

Essential reading

Kaufmann (2011) Fact and Fiction in tuberculosis vaccine research: 10 years later. *Lancet Infect Dis.* 11:633-40

Optional reading

Tchilian *et al*. (2009) Immunogenicity and protective efficacy of prime-boost regimens with recombinant (delta)ureC hly+ Mycobacterium bovis BCG and modified vaccinia virus Ankara expressing M. tuberculosis antigen 85A against murine tuberculosis. *Infect Immun*. 77(2):622-31

Reed *et al* (2009) Defined tuberculosis vaccine, Mtb72F/AS02A, evidence of protection in cynomolgus monkeys. *Proc Natl Acad Sci U S A*. 106(7):2301-6

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One useful learning point I would like to remember from this session:

Friday 19 October

MDR-TB: a growing challenge to global health – case studies
Dr Graham Cooke and Phillip du Cros (MSF)

MDR and XDR-TB are increasingly important challenges to public health. This lecture will outline the current burden of disease, the challenges in both diagnosis and treatment that hamper efforts in control, and explore a broader understanding of what tools can be brought to bear on the epidemic

Key Learning Points

- To understand the global burden of MDR-TB and XDR-TB and the clinical impact of these conditions
- To understand the difficulties in the diagnosis of drug resistance and the challenges in treatment
- To understand the tools that can be used to control the spread of MDR-TB

Barriers to implementation of MDR-TB: challenges in Uzbekistan and Myanmar
Dr Philip du Cros

MSF has been working with the ministry of health to implement drug resistant TB care in Uzbekistan since 2003 and in Myanmar (Burma) since 2009. Using these quite different contexts and TB epidemics, this lecture will highlight common difficulties faced in the scale up of current WHO recommendations to integrate drug resistant TB care within standard TB treatment programmes. This lecture will use a combination of descriptions of individual cases as well as key decision making points within the programmes to highlight both field and global challenges within DR TB programmes. Cases covered will highlight the difficulties of side effect management in resource limited settings, the importance of psychosocial care and the difficulties of HIV and MDR TB co-infection management.

Key Learning Points

- Be able to discuss the main principles involved in setting up a DR TB programme
- Understand the major global constraints to scale up of DR TB treatment
- Understand the main obstacles faced by medics in a programme
- Formulate potential solutions to these obstacles

The lecture(s) are well structured					**The lecturer explains concepts clearly**					**The lecturer engages well with the students**				
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One useful learning point I would like to remember from this session:

Childhood pneumonia: the forgotten killer

Aran Singanayagam

Session Outline is as follows.

1. Childhood pneumonia: Scope of the problem

2. Epidemiology

3. Differences between developing and developed countries with respect to childhood pneumonia

4. WHO Global action plan for prevention and control of childhood pneumonia

5, Interventions to protect children from risk of pneumonia: Breastfeeding, Nutrition, Indoor air pollution, hand-washing

6. Interventions aimed at prevention: Vaccination, HIV prevention and treatment, Zinc supplementation

7. Interventions aimed at treating disease: Community case-management and appropriate administration of antibiotics

8. Discussion of possible essay question.

Recommended reading/references

Rudan I et al Childhood pneumonia and diarrhoea: setting our priorities right. Lancet Infect Dis 2007; 7: 56-61

Principi N et al. Management of severe community-acquired pneumonia of children in developing and developed countries. Thorax 2011; 66: 815-22.

Niessen L et al. Comparative impact assessment of child pneumonia interventions. Bull Health World Organ 2008; 87: 472-80.

Victora C et al. Potential interventions for the prevention of childhood pneumonia in developing countries: improving nutrition. Am J Clin Nutr 1999; 70: 309-20.

World Health Organisation. Global Action Plan for prevention and control of pneumonia (GAPP). 2009. Available online.

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One useful learning point I would like to remember from this session:

WEEK 3

Sexually transmitted/blood borne infectious diseases (22nd-26th October)

Monday 22 October

HIV and STIs: the tools for global control

Graham Cooke

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

- Understand the definitions, aetiology and burden of disease from HIV and other STIs

- Be familiar with the tools available to control HIV and how they could be used together

- Be aware of some of the prioirities for further research

Overview

The session will be partly interactive and partly lecture based. The burden of HIV will be covered and the tools required to control HIV and other STIs will be outlined. There will be more detailed discussion of specific interventions which need to be implemented to control HIV and the gaps in current interventions. The talk will provide a basis for understand the lectures on testing, prevention in the same week, and treatment as prevention that will be a week earlier.

Essential reading

Realising the dream of an AIDS-free generation Lancet Vol 12 September 2012

Recommended reading

HIV prevention transformed: the new prevention research agenda. Lancet Vol 378 July 16 (2011)

Prevention of HIV-1 Infection with Early Antiretroviral therapy Cohen et al NEJM (2011); 365:493-505

Pre-exposure Prophylaxis for HIV- where do we go from here? Cohen, MS NEJM

The lecture(s) are well structured					The lecturer explains concepts clearly					The lecturer engages well with the students				
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One useful learning point I would like to remember from this session:

Biomedical prevention in HIV
Robin Shattock

Learning outcomes

Students should be able to:

- Be able to describe the different approaches to biomedical prevention of HIV infection and their relation to exposure risk
- Articulate the strengths and weakness of different approaches
- Be conversant with results from the following intervention trials CAPRISA 004 microbicide study, IPrex study of PREP, HPTN 052 study of treatment for prevention (T4P) and the RV144 Thai vaccine trial
- Understand the scientific rational behind oral pre-exposure prophylaxis (PrEP) and topical microbicides.
- Be able to discuss issues related to implementation of PrEP, microbicides and T4P
- Be conversant with the current state of HIV vaccine development
- Have a sound understanding of the scientific challenges facing vaccine HIV development
- Anticipated implementation challenges of combined biomedical prevention strategies

Essential reading

Padian NS, Isbell MT, Russell ES, Essex M. The future of HIV prevention. J Acquir Immune Defic Syndr. 2012 Aug 1;60 Suppl 2:S22-6. PubMed PMID: 22772385.

Recommended reading

Dieffenbach CW. Preventing HIV transmission through antiretroviral treatment-mediated virologic suppression: aspects of an emerging scientific agenda. Curr Opin HIV AIDS. 2012 Mar;7(2):106-10. Review. PubMed PMID: 22227584

Vasan S, Michael NL. Improved outlook on HIV-1 prevention and vaccine development. Expert Opin Biol Ther. 2012 Aug;12(8):983-94. Epub 2012 May 15.

PubMed PMID: 22583109.

Shattock RJ, Rosenberg Z. Microbicides: Topical Prevention against HIV. Cold Spring Harb Perspect Med. 2012 Feb;2(2):a007385. PubMed PMID: 22355798; PubMed Central PMCID: PMC3281595.

Antiviral agents and HIV prevention: controversies, conflicts, and consensus. Cohen MS, Muessig KE, Smith MK, Powers KA, Kashuba AD. AIDS. 2012 Aug 24;26(13):1585-98.

Optional reading

Koff WC. HIV vaccine development: challenges and opportunities towards solving the HIV vaccine-neutralizing antibody problem. Vaccine. 2012 Jun

The lecture(s) are well structured					**The lecturer explains concepts clearly**					**The lecturer engages well with the students**				
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One useful learning point I would like to remember from this session:

Structural, Social and Behavioural barriers to the biomedical prevention of HIV transmission

Rahma Elmahdi and Tanvi Rai

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

- Understand that different structural, social and behavioural factors may act as barriers to effective implementation of biomedical prevention interventions
- Understand to what extent these barriers impact on different biomedical interventions through the examples of testing practice and therapy adherence in 'treatment as prevention'
- Assess how these factors may impact on the effective implementation of biomedical prevention interventions
- Explore methods of overcoming these to optimise interventions for the prevention of HIV

In recent years there has been an increased focus on biomedical interventions in global HIV prevention strategies with much research being centred on the use of such interventions to reduce HIV transmission and increased funding being channelled in support of these tools. This focus has in part been due to major advances in antiretroviral technology and innovative applications of these to counter the epidemic. It has also however been encouraged by the relative ease of assessing the

efficacy and effectiveness of biomedical over behavioural tools in intervention programmes and the perceived failings of behavioural interventions in reducing the incidence of HIV early in the epidemic.

It is however becoming increasingly evident that the separation of biomedical interventions from wider structural, social and behavioural factors is impractical, particularly when translating the findings of clinical trials to the implementation of population-wide prevention programmes. **No biomedical intervention is truly non-user dependent and all rely on a number of broader prerequisites for their effective implementation.** These factors must be identified and the extent of their impact on different biomedical intervention programmes assessed in order to optimise HIV prevention programmes.

In this session, we will identify a range of structural, social and behavioural factors which have the potential to impact on the effectiveness of different biomedical interventions. We will also assess how and to what extent they do so by looking at the examples of **testing practice and therapy adherence in treatment as prevention.** Finally, we will explore potential methods of overcoming these barriers in global HIV prevention strategies.

Essential reading

Kagee A, Remien RH, Berkman A, Hoffman S, Campos L, Swartz L. Structural barriers to ART adherence in Southern Africa: Challenges and potential ways forward. Glob Public Health. 2011;6(1):83-97.

Recommended reading

Marks G, Crepaz N, Senterfitt JW, Janssen RS. Meta-analysis of high-risk sexual behavior in persons aware and unaware they are infected with HIV in the United States: implications for HIV prevention programs. J Acquir Immune Defic Syndr. 2005;39(4):446-53.

DeMarco RF, Gallagher D, Bradley-Springer L, Jones SG, Visk J. Recommendations and reality: perceived patient, provider, and policy barriers to implementing routine HIV screening and proposed solutions. Nurs Outlook. 2012 Mar-Apr;60(2):72-80.

Jason R Andrews; Linda-Gail Bekker; Keren Middelkoop; Robin Wood; Rochelle P Walensky Projecting the Benefits of Antiretroviral Therapy for HIV Prevention: The Impact of Population Mobility and Linkage to Care. The Journal of infectious diseases 2012;206(4):543-51.

Optional readings

Gray R, Kigozi G, Kong X, Ssempiija V, Makumbi F, Wattya S, Serwadda D, Nalugoda F, Sewenkambo NK, Wawer MJ. The effectiveness of male circumcision for HIV prevention and effects on risk behaviors in a posttrial follow-up study. AIDS. 2012 Mar 13;26(5):609-15.

Kilian AHD, Gregson S, Ndyanabangi B, Walusaga K, Kipp W, Sahlmuller G, et al. Reductions in risk behaviour provide the most consistent explanation for declining HIV-1 prevalence in Uganda. AIDS. 1999;13(3):391-8.

The lecture(s) are well structured					**The lecturer explains concepts clearly**					**The lecturer engages well with the students**				
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One useful learning point I would like to remember from this session:

Tuesday 23 October

Research methods: Case studies of STI

Helen Ward

Learning outcomes

- what makes an infectious disease a sexually transmitted infection
- how historical developments affect the understanding of different cases
- the advantages of particular research methods (: e.g. clinical, empidemiological, social) and the relevance of mixed research methods

Overview

This session will focus on STI and sex work

Prostitution is often called the oldest profession, but this label has not brought with it much respect or understanding. Below is an outline of the health issues relating to sex work, the role of medical practice in addressing those problems. It draws on material from our research over the past 15 years at the Praed Street Project, a sexual health service for sex workers at St Mary's Hospital. We hope to demonstrate the importance of different research methods (including clinical research, epidemiology, anthropology, social history) and multidisciplinary working. Finally, we will show how sex work provides an excellent example of the potential conflict between a "population" and an "individual" perspective. At times the control of sexually transmitted infection has been viewed as a national population priority, to be achieved through controls directed at individual sex workers, including mandatory examination and detention.

Health issues relating to sex work

Sex workers are at risk of:

- sexually transmitted infections (STI)
- unwanted pregnancy
- violence
- mental health problems
- addiction
- increased mortality

These risks are assumed to be due to their high numbers of sexual partners, they are considered part of a "core group" who maintain STI in the rest of the population.

Our research showed a lower than expected risk of HIV infection (1%), and that infection is associated with drug use and non-commercial sexual contacts. We similarly found an increased risk of gonorrhoea infection, but again not associated with commercial sex. Increased mortality is of great concern, and linked as much to violence and drugs as to STI/HIV. Most of these health issues can be seen as indirectly rather than linked to sex work.

The role of medical practice in these health issues

Historically health "care " for sex workers has been based on the belief that they pose a threat to the rest of the population, and they should therefore be controlled for the good of the public health. For example, the Contagious Diseases Acts of the 1860s led to the forced examination and detention of sex workers working near military bases. Legislation was repealed following strong human rights' opposition, and the realisation that this was not an effective public health measure. In other countries sex workers are still required to register and have regular health checks.

In the 1980s there were renewed calls in the UK to regulate sex workers (reflecting a fear of AIDS), but instead there has been a growth for the first time in the provision of services that explicitly seek to promote the health of sex workers for themselves, not on behalf of their clients.

This has been welcomed by most, but it has led to a new "medicalisation" of sex workers, some of whom do not feel healthy without their monthly check up, despite their safe work practices.

The contribution of different disciplines

Understanding the health problems of sex workers cannot simply be done from the consulting room, although a lot can be gleaned there. For example, the close relationship between the organised sex industry and the drugs trade is not clear from individual sex workers. They may appear as addicts, or women with a drug problem, but it is not always possible to understand the different influences. She may be required to take drugs with clients, or be working to support the drug habit of her lover, or she may keep getting STI from a man who supplies her crack. She may use condoms with all commercial clients, but she regards this man as a "boyfriend" and smoking partner / supplier, and so has unsafe sex.

In this research we have been able to explore health issues from a clinical, epidemiological, social and cultural perspective. We have drawn heavily on history to look at the way society has dealt with sex work, and also worked on health and sex work policy today.

Population versus individual perspectives?

When you see a sex worker who has an STI, including HIV, what is your responsibility? Should you treat her and ignore the fact that she may transmit the infection? Can you pressure her to stop working? If she continues to trade in sex should you inform the local public health authorities or even the police?

Essential reading

Ward H. (1 Aug 2007). **Prevention strategies for sexually transmitted infections: importance of sexual network structure and epidemic phase.** SEXUALLY TRANSMITTED INFECTIONS. 83:I43-I49

Optional reading

Day S. The re-emergence of 'trafficking': sex work between slavery and freedom *Journal of the .Royal Anthropological Institute* 2010; **16***: 816-834*

The lecture(s) are well structured					**The lecturer explains concepts clearly**					**The lecturer engages well with the students**				
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One useful learning point I would like to remember from this session:

The global challenge of Syphilis
Craig Tipple

Overview

Syphilis affects upwards of 11 million people worldwide each year. Although Africa, the Caribbean and China are bearing the brunt of the epidemic, there has been a worrying increase in the number of cases diagnosed in the developed world over the last decade including a 1000% increase in the UK.

The most common syphilis treatment is penicillin, which is most effective when given as an intramuscular injection. It was hoped from clinical trials at the turn of the century that single-dose oral azithromycin would provide a suitable alternative treatment, but resistance to the drug quickly developed and has reached levels of 75-100% in some centres.

A particularly devastating consequence of undiagnosed syphilis in women of childbearing age is congenital disease. This is thought to affect around 500,000 pregnancies a year, of which 60% will have an adverse outcome. The WHO has recognized syphilis as a leading cause of neonatal and intrauterine death and had published a strategy to eradicate the disease, which will require implementation of testing and treating strategies on a large scale. Despite the WHO strategy there has been an explosion in the number of cases of adult and congenital syphilis diagnosed in China over the last 10 years. The cause of this rise is multifactorial and control strategies are hampered by both political and social factors. There also appear to be biological links between syphilis and both HIV acquisition and transmission. This highlights the importance of providing comprehensive sexual health care and avoiding the compartmentalization of services. In Haiti, for example, it is now startling that many children born to HIV-positive mothers are prevented from acquiring HIV only to die late from congenital syphilis.

During this session you will learn:

- An awareness of the global impact of syphilis and how the epidemic differs in the developed and developing worlds
- To appreciate the clinical presentations and course of syphilis
- To understand the interaction between HIV and syphilis on both an individual and population level
- To be familiar with the epidemiology and impact of congenital syphilis
- To be able to discuss strategies for the control of adult and congenital syphilis
- To appreciate the rise and impact of antibiotic resistance in T. pallidum and the impact this has had on control strategies.

Essential reading

Golden M, Marra C, Holmes KK. Update on Syphilis: Resurgence of an old problem. JAMA 2003;290(11):1510-1514

Recommended readings

Schmid G, Stoner B. The need and plan for global elimination of congenital syphilis. Sex trans dis. July supplement. 2007;34:pS5-S10

Peeling R and Maybe D. Avoiding HIV and dying of syphilis. The Lancet 2004. 365:1561-1563

Katz K, Klausner J. Azithromycin resistance in Treponema pallidum. Current opinion in infectious diseases; 21;83-91

Klausner J, Zetola N. Syphilis and HIV infection: An update. CID 2007:44;1222-1228

Tucker J, Chen Xiang-Sheng. Syphilis and social upheaval in China. NEJM 2010; 362:1658-1661

Optional readings

Kamb M, Newman L et al. A roadmap for the global elimination of congenital syphilis. Obstetrics and gynaecology international 2010 p1-6

Lukehart S, Godornes S. Macrolide resistance in Treponema pallidum in the United States and Ireland. NEJM 351;154-158

Mabey D, Peeling R. Syphilis, still a major cause of infant mortality. The Lancet 2011

LaFond R, Lukehart S. Biological Basis for Syphilis. Clin Mic Reviews 2006: 19;29-49

The lecture(s) are well structured					**The lecturer explains concepts clearly**					**The lecturer engages well with the students**				
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One useful learning point I would like to remember from this session:

Wednesday 24 October

Submission of ICA1

Thursday 25 October

Lecture: Globalisation and Health Worker Migration
And Seminar: Health Worker Migration
Mariam Sbaiti

Intended Learning outcomes: by the end of this session you should be able to:

- outline the factors leading to attrition of health workers in the public sector and their migration from poorer to richer countries
- demonstrate an awareness of the variety of data sources on health worker density
- recognise the importance of health human resources as a key determinant of functioning health systems and the impact of critical shortages of health workers
- illustrate policies of active international recruitment of health workers with a country-specific example
- critically discuss a range of strategies for the prevention and mitigation of health worker crises in the context of globalised labour markets of health professionals

Synopsis

In 2006 the WHO dedicated its yearly World Health Report to the question of the health workforce, on one the main building blocks of any health system. Shortages of health workers are one of the main reasons why

This came as recognition of the severity of shortages in health workers in many regions. The Report estimated the work was short of almost 4.3 million doctors, midwives, nurses and support workers. Moreover, 57 countries, mostly in sub-Saharan Africa, have *critical shortages*. The governments of these countries spend, on average, US$ 33 per person per year on health.

In these regions, unplanned or excessive exits of health workers compromises the health system by overwhelming training capacity and threatening workforce stability. This limits advances in health improvement including the attainment of the Millennium Development Goals.

The distribution of health workers globally is another dimension of global health inequalities. Only 4% of health workers work in Sub-Saharan Africa whilst the region accounts for 25% of the global burden of disease (GBD). On the other hand 37% of health workers work in the Americas and the region accounts for only 10% of GBD.

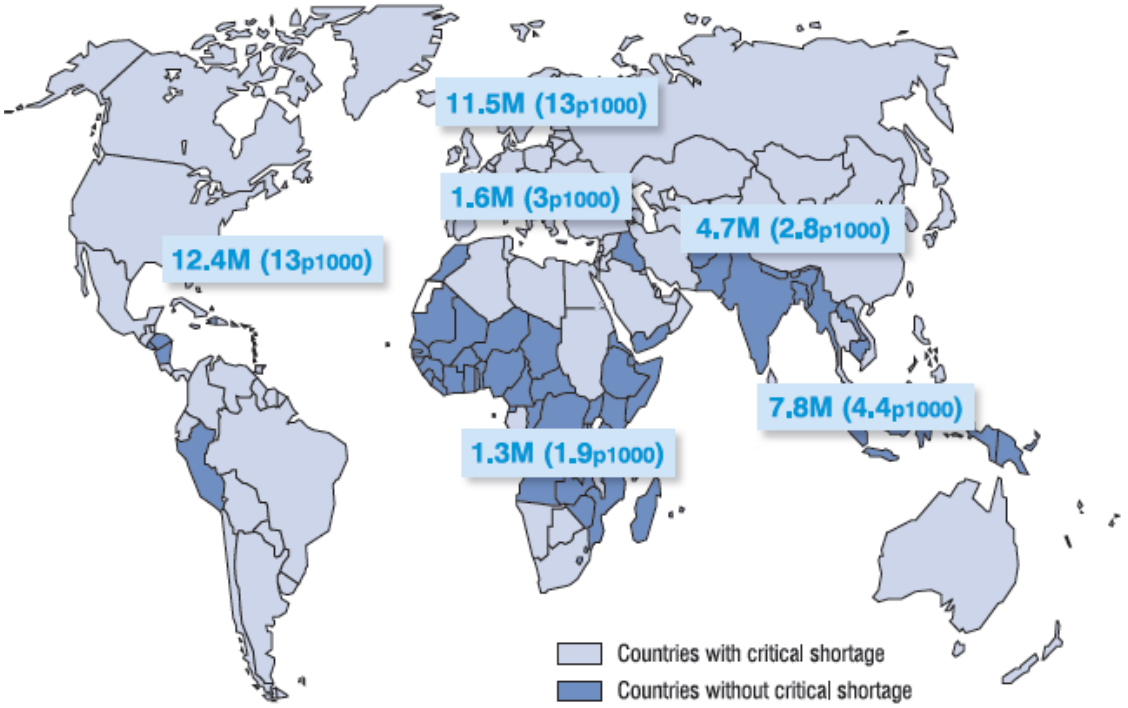

Figure 1: Number of health care workers (density/p 1000 people) in the WHO regions (source WHO 2006)

Who are health workers?

Within a given country it is difficult to distinguish health workers from other members of the population. Indeed, health workers are sometimes defined as all people engaged in actions with the primary intent of enhancing health. This definition includes family caregivers, patient-provider partners, part-time workers, volunteers and community workers. However, in Global health and health systems research, the concept is narrowed down to Health management and

support workers and health care providers in the health industry as well as health care providers in other sectors (e.g. a nurse in a school). For instance volunteers are not counted in the WHR 2006 estimates. Moreover, categories of health workers may not be easily comparable between countries.

What does a country need to prioritise in order to increase health worker numbers and the quality of their training? How do countries develop their workforce? This involves planning and management in the following areas:

- developing training institutions,
- strengthening professional regulation
- revitalizing recruitment

The context of HMW

Shortages of health workers in many countries occur in the context of many other challenges which health systems are facing today meaning there are many other concerns including:

- scaling up interventions to attain the health-related MDGs

- shifting towards community-based and patient-centred care for the treatment of chronic diseases

- tackling the problems posed by disasters and outbreaks

- preserving health services in conflict and post-conflict states

What are the impacts of HWM?

Health system impacts: health and health inequalities

Poorer quality and reduced capacity of training institutions causing a vicious cycle of push factors for health workers.

The critical shortage of Health Workers in certain countries is said to contravene the right to health of its citizens.

Factors affecting Health Worker Migration

Push Factors and Pull Factors

Push factors (and their equivalent pull factors in the receiving country) include: Poor management, lack of equipment and medications, and lack of access to career development.

Certain high-income countries actively recruit health workers in low-income countries. This involves ethical questions regarding the duty of the recruiting countries to the populations who are loosing their health care workers. In some cases (see seminar on case on Philippines), health worker migration is part of a deliberate strategy of the origin country to export human capital and gain through remittances and returning workers.

What high-level agreements have been made so far?

In 2010, the World Health Assembly approved the Global Code of Practice on the International Recruitment of Health Personnel. This is a non-binding code which encourages high-income countries to invest to become more self-sufficient in the training of health workers. High-income countries are also encouraged to assist countries with shortages of health workers to train and replace those lost to migration and to prevent migration by acting on the push factors.

The World Health Organization and the Global Health Workforce Alliance chaired the Second Global Forum on Human Resources for Health in Bangkok, Thailand in 2011.

Developing capacity in health workforce?

What do nation states have to invest in, in order to develop their human resource capacity for health?

1. Training health workers
2. Developing the capacity of existing health workers: improving availability, competence, responsiveness and productivity of the workforce.

Beyond this, governments also need to organise appropriate institutional accreditation and professional regulation. The state needs to intervene to set standards, protect patient safety and ensure quality.

Acting on the push factors to reduce or mitigate their effect.

Other aspects of governance in a health system:

•Decent and timely pay is crucial.

•The way workers are paid (salaried or fee-for-service) has effects on productivity and quality of care that require careful monitoring.

•Financial and non-financial incentives such as study leave or child care (most effective when packaged)

Skilled health workers cannot do their jobs properly in facilities that lack clean water, adequate lighting, heating, vehicles, drugs, working equipment and other supplies.

Essential Reading

Hongoro C and McPake B (2004). How to bridge the gap in human resources for health. Lancet 364:1451-1456.

Mackintosh M, Mensah K, Henry L, Rowson M (2006). Aid, restitution and international fiscal redistribution in health care. Journal of International Development 18:757-770.

Further reading

Bueno de Mesquita J and Gordon M (2005). The International Migration of Health Workers: A Human Rights Perspective. London, Medact. http://www.medact.org/content/Skills%20drain/Bueno%20de%20Mesquita%20and%20Gordon.pdf

Grépin KA. Health Services In Sub-Saharan Africa: HIV Donor Funding Has Both Boosted And Curbed The Delivery Of Different Non-HIV. Health Affairs, 31, no.7 (2012):1406-1414

Mensah K, Mackintosh M, Henry L (2005). The Skills Drain of Health Professionals from Developing Countries: A Framework for Policy Formulation. London, Medact. http://www.medact.org/content/Skills%20drain/Mensah%20et%20al.%202005.pdf

Vujicic M, Weber SE, Nikolic IA, Atun R, Kumar R. An analysis of GAVI, the Global Fund, and World Bank support for human resources for health in developing countries. Health Policy Plan. 2012 Feb 13.

World Health Organization (2006). *World Health Report 2006 – working together for health*. Geneva, WHO. http://www.who.int/whr/2006/en/

The lecture(s) are well structured					**The lecturer explains concepts clearly**					**The lecturer engages well with the students**				
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One useful learning point I would like to remember from this session:

Seminar: Health Worker Migration and HIV/AIDS

Mariam Sbaiti

Information will be provided in the session

The lecture(s) are well structured					The lecturer explains concepts clearly					The lecturer engages well with the students				
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One useful learning point I would like to remember from this session:

What do we need to prevent HBV related disease?
Mark Thurz

Learning outcomes

Understand the clinical outcomes of HBV infection
Understand modes of transmission of HBV
Appreciate methods used to interrupt HBV transmission
Appreciate barriers to achieving effective control of HBV

Overview

I will cover the natural history, epidemiology and burden of disease caused by HBV. The treatment and clinical outcomes of treatment in developed countries will be reviewed. The requirements for controlling the burden of disease will be discussed. The barriers to effective Public Health responses will be discussed.

Essential reading

EASL Clinical practice guidelines on the management of hepatitis B virus infection. Download from www.easl.eu

Recommended reading

Thursz, M. *et al. Nat. Rev. Gastroenterol. Hepatol.* 9, 492–494 (2012); Global eradication of hepatitis B—feasible or fallacy? published online 7 August 2012; doi:10.1038/nrgastro.2012.155

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One useful learning point I would like to remember from this session:

Friday 26 October

Overcoming the barriers to treatment of HIV in Africa

Nathan Ford

Summary
The past decade has seen considerable progress in increasing access to antiretroviral therapy in resource-limited settings. Ten years ago, HIV/AIDS was considered untreatable in resource-limited settings, yet today over 8 million people now receive treatment. Global advocacy helped reduced the cost of treatment, care provision was simplified through a public health approach, and access was expanded through high level political commitment and novel funding mechanisms. The lessons of the past decade can be applied to a range of global health challenges, from non-communicable diseases to surgery. The challenge for the next decade is to further increase access to treatment, while supporting sustained care for those on treatment.

Learning Objectives:

- To develop an awareness of the global impact of HIV/AIDS, and why many have argued for 'AIDS exceptionalism'

- To understand the various political and programmatic barriers that needed to be overcome in order to increase access to HIV treatment in resource-limited settings
- To gain an appreciation of some of the more recent developments that constitute the 'second-wave' of the HIV response
- To reflect on potential lessons for other major global health challenges

Essential reading:

Ford N, Calmy A, Mills E. The first decade of antiretroviral therapy in Africa. Globalization and Health 2011.7:33.

Fauci AS, Folkers GK. Toward an AIDS-free generation. JAMA. 2012 Jul 25;308(4):343-4.

Suggested reading:

Lynch S, Ford N, van Cutsem G, Bygrave H, Janssens B, Decroo T, Andrieux-Meyer I, Roberts T, Balkan S, Casas E, Ferreyra C, Bemelmans M, Cohn J, Kahn P, Goemaere E. Public health. Getting HIV treatment to the most people. Science. 2012 Jul 20;337(6092):298-300.

Schwartländer B, Grubb I, Perriëns J. The 10-year struggle to provide antiretroviral treatment to people with HIV in the developing world. Lancet. 2006 Aug 5;368(9534):541-6

The lecture(s) are well structured					**The lecturer explains concepts clearly**					**The lecturer engages well with the students**				
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One useful learning point I would like to remember from this session:

Debate: the ethics of International Randomised controlled trials - the SAPIT case
Dr Mariam Sbaiti and Dr Wing May Kong

This session will be organised as a group exercise in two parts. First, each group will be given a specific ethical issues underpinning the debate on the SAPIT trial, which they will be asked to present to the rest of the class. In the second section of the session, the students will be reorganized in small discussion panels with one representative from each of the previous research groups, to discuss specific questions on the ethics of clinical research in low/middle-income settings.

Learning outcomes: by the end of this session, the students will be able to:

- Identify the ethical principles underpinning the debate of clinical research in under-resourced settings
- Define the meaning of equipoise
- Understand arguments for and against the setting of clinical trials in low/middle-income settings
- Describe the range of actors/stakeholders involved in this debate and their main arguments
- Identify the main arguments regarding who should be responsible for ensuring that research in developing countries is ethical and why
- Identify the main arguments regarding the existence of differential ethical research standards between countries
- Reflect critically on the implications of these issues for global health research and practice
- Apply research and presentation skills

Scenario:

The date is early March 2010. The article 'Timing of Initiation of Antiretroviral Drugs during Tuberculosis Therapy' has just been published in the New England Journal of Medicine (NEJM 2010 362;8). The class will split into 4 preassigned groups (see below) and will deliver mini-presentations to look further into the ethical aspects of this study.

The mini-presentations should summarise the main aspects underlying the groups point of view. The presentations are 15 minutes and can be in any format: simple powerpoint and verbal delivery are fine. The groups should attempt to meet in advance of the session to plan their strategy and delivery; it will help if the group has read the key references before then, and further reading on clinical trials is encouraged. Be prepared to defend your point of view on the day, and arm yourselves with questions!

Primary source:

Abdool Karim et al. Timing of Initiation of Antiretroviral Drugs during Tuberculosis Therapy. NEJM 2010 362;8.

Reference

The Nuremberg Code (1947). BMJ 1996;313:1448.1. The original document is: Nuremberg Code. In: Trials of War Criminals Before the Nuremberg Military Tribunals Under Control Council Law No. 10, Vol. 2, Nuremberg, October 1946-April 1949. Permissible Medical Experiments on Human Subjects. Washington: United States Government Printing Office (2), 1949:181-182.

Cash R, Wikler D, Saxena A, Capron A. Casebook on ethical issues in international health research. 2009. Available from: http://www.who.int/rpc/publications/ethics_casebook/en/index.html

Benatar SR and Singer PA. Responsibilities in international research: a new look revisited. J Med Ethics 2010;36(4):194-197.

Parker M, Bull S: Ethics in collaborative global health research networks. Clin Ethics 2009;4(4):165-168.

Comments and Responses:

Wilson D NEJM 2010 Feb 25 362(8): 697-70

Boulle et al SAMJ 2010 Prolonged deferral of antiretroviral therapy in the SAPIT trial: Did we need a clinical trial to tell us that this would increase mortality?

Commentary:

Bioethicists Assail Celebrated TB/HIV Treatment Trial Cohen, J. Science Vol 328 14th May 2010-09-10

Blog:

The study that should not have been done

http://www.thehastingscenter.org/Bioethicsforum/Post.aspx?id=4626&blogid=140&blogid=140

The students will debate the ethics of this trial after which they will vote as to whether they believe the trial was ethical or not.

Format of the Session

2.00 Introduction

2.15-2.30 Overview of the study by an Editorial Team (**Group 1**)

Role: You are part of the Editorial Team of a famous medical journal. You are presenting the findings of the SAPIT study to your Team in preparation for the publication of a relatively objective commentary of the study to be inserted in the next issue of your journal. You aim is to focus specifically on:

- What question was the study trying answer?
- Is it a relevant question for Global Health?
- What was the study design and why was the study modified after interim analysis?
- What were the main outcomes and what did the results show?
- Are these relevant results?

Readings: Abdool Karim et al. Timing of Initiation of Antiretroviral Drugs during Tuberculosis Therapy. NEJM 2010 362;8.

2.30-2.45 Presentation of arguments in ethical debate (**Group 2**)

Role: you represent the various Clinical Ethics Committees which approved the SAPIT trial started in 2005. You are having a meeting to reflect as a group on the decisions taken before and during the trial. You are particularly concerned with the meaning of *equipoise*:

- as an ethical concept:
    - where does it come from?

- when does it apply?

- in the context of the recent SAPIT trial
  - was it maintained?
  - could anything have been done differently?

Readings:

The group's own research on the *Declaration of Helsinki*

Abdool Karim et al. Timing of Initiation of Antiretroviral Drugs during Tuberculosis Therapy. NEJM 2010 362;8.

Boulle et al. Prolonged deferral of antiretroviral therapy in the SAPIT trial: did we need a study to tell us that this would increase mortality? http://www.scielo.org.za/scielo.php?pid=S0256-95742010000900012&script=sci_arttext

2.45-3.00 Discussion (all): Why is the Helsinki declaration relevant to global health?

3.00-3.15 Case for the defence: Why the trial was ethical **(Group 3)**

Role: you represent the Global Fund to fight AIDS, TB and Malaria. You have had a video conference between 3 of you based in Geneva (Global Fund Secretariat team) and 4 based in South Africa (members of the Country Coordinating Mechanism). The Global Fund supplied the drugs for the SAPIT study. You are presenting a position statement on whether the Global Fund should have supported this trial.

Readings:

Correspondence NEJM 362;22 2137-2139

Abdool Karim et al. Timing of Initiation of Antiretroviral Drugs during Tuberculosis Therapy. NEJM 2010 362;8

3.15-3.30 Case for the prosecution : why the trial was unethical (**Group 4**)

Role: You are part of the PR team of a civil society organisation campaigning for patients' human rights in South Africa. It represents patient groups and human rights campaigners. You have been invited to a radio show to discuss your opposition to the SAPIT study. Relatives of some of the patients who took part in the study have contacted your organisation recently and taken part in this specific campaign. You will present your evidence as a question and answer interview between the radio journalist and the vice-president of the organisation. (Feel free to be creative in the choice of a relevant name for your organisation).

Reading:

This Study Should Never Have Been Done (Blog). URL: http://www.thehastingscenter.org/Bioethicsforum/Post.aspx?id=4626

Abdool Karim et al. Timing of Initiation of Antiretroviral Drugs during Tuberculosis Therapy. NEJM 2010 362;8

The group's own research on the critique of Randomised Clinical Trials. You may come across this particular paper:

Ashcroft R E. Symposium on evidence based medicine: Current epistemological problems in evidence based medicine. J Med Ethics 2004;30:2 131-135 doi:10.1136/jme.2003.007039

3.30-4.00 Cross-examination and voting

Group Allocations for ICA

MDG	Surname	First name	Email
Group 1	Zahid	Shereen Sanaa	shereen.zahid09@imperial.ac.uk
	Karnani	Nisha	nisha.karnani08@imperial.ac.uk
	Kim	Sung-Hee	sung-hee.kim08@imperial.ac.uk
	Emanuwa	Emudiaga Jonathan Ewan	emudiaga.emanuwa12@imperial.ac.uk
	Patel	Purvi Nimishkumar	purvi.patel09@imperial.ac.uk
	Wynberg	Elke	elke.wynberg09@imperial.ac.uk
	Forshaw	Jennifer Anne	jennifer.forshaw12@imperial.ac.uk
Group 2	McGown	Patrick James	patrick.mcgown09@imperial.ac.uk
	Ramjan	Rubeena	rubeena.ramjan09@imperial.ac.uk
	Chong	Amelia	amelia.chong10@imperial.ac.uk
	Prager	Latreille Gabrielle Mary	latreille.prager09@imperial.ac.uk
	Keech	Maximillian Morgan Kinder	maximillian.keech09@imperial.ac.uk
	de Rosa	Eleanor Jane	eleanor.de-rosa11@imperial.ac.uk
	Stewart	Eleanor Margaret	eleanor.stewart09@imperial.ac.uk

	Lee	Yin Yin	yin.lee09@imperial.ac.uk
	Lewis	Marissa	marissa.lewis09@imperial.ac.uk
	Yeats	James	james.yeats12@imperial.ac.uk
	Grahame	Emma	emma.grahame12@imperial.ac.uk
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	Feyereisen	Laura	laura.feyereisen10@imperial.ac.uk
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	Boussabaine	Emaan	emaan.boussabaine09@imperial.ac.uk
	Rae	Sophie	sophie.rae10@imperial.ac.uk
	Johari	Nur	nur.johari10@imperial.ac.uk
Group 4	Parish	Alvin	alvin.parish08@imperial.ac.uk
	Sadasivan	Luvarnia	luvarnia.sadasivan09@imperial.ac.uk
	Lee	Samuel	samuel.lee09@imperial.ac.uk
	Yasin	Maryiam	maryiam.yasin09@imperial.ac.uk
	Low	Jen Mae	jen.low09@imperial.ac.uk

The lecture(s) are well structured					**The lecturer explains concepts clearly**					**The lecturer engages well with the students**				
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
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One useful learning point I would like to remember from this session:

WEEK 4
Vaccine preventable disease (29 Oct – 2 Nov)

Monday 29 October

How do Vaccines Work: Immunology and Maths

John Tregonning

Learning objectives for Vaccine Week

By the end of this week you will be able to

- Describe the characteristics (incidence and symptoms) of vaccine preventable diseases.
- Describe the vaccines and vaccines schedules routinely used to control infectious diseases in the UK and globally.
- Understand how vaccines control infectious diseases and some of the maths/epidemiology used to describe their efficacy.
- Understand the challenges to new vaccine development
- See how this applies to specific diseases including HPV, influenza and respiratory bacteria

This lecture:

Introduction to the immunological principles of vaccines

Introduction to the epidemiological understanding of how vaccines prevent disease.

Overview of vaccine week**.**

Vaccines are the most cost effective method of preventing infectious disease. The use of vaccines is also the only method that has successfully eradicated a pathogen of man – small pox. They have come a long way from the initial innoculations with material from pox lesions “variolation” via Edward Jenner’s deliberate vaccination and challenge of a child against small pox. Whilst the majority of the vaccines in use today are derived from empirical methods (trial and error), today greater understanding of the immune response is being used to develop new vaccines to the diseases that pose the greatest threat to global health, HIV, TB and malaria. This week of lectures will introduce the principles behind vaccines, some the vaccine preventable diseases and the

schedules used in both UK and global settings. We will then explore the development of new vaccines and the challenges both scientific and societal that limit this. Finally a number of vaccine related case studies will be discussed.

Introduction to vaccines lecture. Vaccines work by essentially tricking the immune response into believing it has previously been exposed to the pathogen/ infectious agent in question. This has two advantages, it increases the speed of the response to the pathogen and it allows the body to prevent infection in the first place. Whilst the innate immune response is important in vaccination, particularly in the recognition of vaccines as foreign and therefore worth responding too, it is the adaptive immune response that is the key target of vaccination. There are 2 elements of the adaptive (memory) immune response that are targeted by vaccines, the humoral (B cell/ antibody) response and the cellular (T cell) response.

The other aspect of vaccination that needs to be understood to put them into a global health context is how they work on a population level. This encompasses concepts such as herd immunity and reduction of carriage.

By the end of this first lecture, you should have an understanding of both the immunology and epidemiology of vaccines which should then put the rest of the week into context.

Essential reading

Nat Immunol. 2011 Jun;12(6):509-17.

Immunological mechanisms of vaccination.

Pulendran B, Ahmed R.

The lecture(s) are well structured					**The lecturer explains concepts clearly**					**The lecturer engages well with the students**				
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
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One useful learning point I would like to remember from this session:

Vaccine preventable diseases (1 and 2)

Alasdair Bamford

Learning outcomes

- Describe the incidence and symptoms diseases that are routinely controlled by vaccines
- Know the schedules that are used to control these diseases in a developed and developing world context, focussing on the EPI
- Explore the factors affecting effective pediatric vaccination

Overview

A large proportion of global mortality and morbidity is a direct result of infectious disease. Many of these diseases are vaccine preventable and vaccination programmes have contributed substantially to dramatic changes in the epidemiology of infectious disease over the last century. In order to understand the use of vaccines, it is necessary to understand the agents against which there are vaccines available. The first of the lectures will focus on infectious agents that are routinely vaccinated against in both a developing and developed world context. The second lecture will look at agents for which there are vaccines, but are not as widely vaccinated against. The lectures will focus on the schedules which are used to vaccinate and the differences between developed and developing world settings. It will also look at success stories in vaccination. As vaccination is routinely delivered in childhood, the lectures will look at the specific factors affecting pediatric vaccination.

The lecture(s) are well structured					**The lecturer explains concepts clearly**					**The lecturer engages well with the students**				
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One useful learning point I would like to remember from this session:

Tuesday 30 October

What are the new approaches to vaccines?
Jamie Mann

Learning outcomes

- Understand the number of different approaches to generate vaccine mediated immunity.
- Recognise the number of different vaccine delivery modalities.
- Be aware of the different ways in which vaccines are generated

Overview

Vaccination is one of the most effective medical interventions used to reduce human morbidity and mortality. Despite the huge success of vaccines, there is a requirement for the development of novel vaccine strategies to combat both infectious diseases for which no vaccine exists and fight against new and emerging infectious agents. Through the design of pioneering vaccine delivery systems, novel immunogen designs and innovative vaccination regimens, substantial in roads have been achieved in combating infectious diseases. Within this presentation, Dr Jamie Mann will introduce you to the plethora of promising vaccine approaches being currently being investigated.

Recommended reading

Woodrow, K., Bennett, K. & Lo. D. (2012). Mucosal Vaccine Design and Delivery. Annual Review of Biomedical Engineering. 14:17–46.

Optional reading

Plotkin S. (2005). Vaccines: past, present and future. Nature Medicine. 11 (4), S5-S11.

The lecture(s) are well structured					**The lecturer explains concepts clearly**					**The lecturer engages well with the students**				
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One useful learning point I would like to remember from this session:

How do we do a clinical vaccine trial
Alethea Cope
TBC

The lecture(s) are well structured					The lecturer explains concepts clearly					The lecturer engages well with the students				
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One useful learning point I would like to remember from this session:

Wednesday 31 October

The big 3: Approaches to control HIV, TB and Malaria
Paul McKay

Learning outcomes

Understand and compare the specific challenges affecting the development of vaccines to control HIV, TB and Malaria.

Describe approaches to overcome these challenges

Describe the outcomes and issues of the efficacy trials for vaccines against these agents

Overview

HIV, TB and malaria are the 3 major causes of death due to infectious disease by a single agent, accounting for approximately 10% of mortality. The development of effective vaccines against these pathogens is therefore a global health priority. Unfortunately, the development of vaccines against these agents has proven to be problematic for a number of reasons. These include antigen selection, immune evasion and serotype diversity of the pathogens. In this lecture, the main features of each of the three pathogens will be re-capped. Then the issues affecting developing vaccines for each pathogen will be discussed, followed by approaches that have been used to overcome these vaccines and some general features. Finally, the future direction of vaccines against these agents will be described.

Recommended readings

1. Philos Trans R Soc Lond B Biol Sci. 2011 Oct 12;366(1579):2806-14. Vaccines against malaria. Hill AV.

2. Immunity. 2010 Oct 29;33(4):567-77. Future vaccination strategies against tuberculosis: thinking outside the box. Kaufmann SH.

3. Curr Opin HIV AIDS. 2010 Sep;5(5):362-7. Is developing an HIV-1 vaccine possible? Haynes BF, Liao HX, Tomaras GD.

The lecture(s) are well structured					**The lecturer explains concepts clearly**					**The lecturer engages well with the students**				
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One useful learning point I would like to remember from this session:

Trust in vaccines
Dr. Heidi Larson (LSHTM) and Caitlin Jarrett

Learning outcomes

- Recognition of public trust as an important factor in the success and sustainability of vaccination campaigns;
- Highlight the range of factors that influence public trust around vaccines and vaccination programmes and how they can interrelate;
- Introduction to how a surveillance tool could be applied to monitor issues of public trust

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

- Appreciate the factors that can prompt, amplify and sustain issues of public trust around vaccines;
- Knowledge of one example of how issues of public trust have impacted on a vaccination campaign.
- Despite the historic success of immunization in reducing the burden of childhood illness and death,
  episodes of public concerns and rumors around vaccines have occurred around the world, spreading
  quickly and sometimes seriously eroding public confidence in immunization and ultimately leading to
  vaccine refusals and disease outbreaks. Although reports of public concerns and questions around the safety and relevance of vaccines have been on the increase, aside from monitoring of adverse events following immunization (AEFI), there is neither a systematic monitoring of broader public vaccine concerns nor a tool to assess risk levels of rumors and concerns to potential program disruptions, vaccine refusals and potential disease outbreaks. Project work is now being undertaken to develop and apply a novel surveillance tool to

identify signals of public distrust and provide risk analysis and guidance to engage the public and support public confidence in immunization programs.

Essential reading

Addressing the vaccine confidence gap
Larson, H.J.; Cooper, L.Z.; Eskola, J.; Katz, S.L.; Ratzan, S.;

Lancet, 2011; 378(9790);526-535.

Recommended reading

Cooper, L.Z.; Larson, H.J.; Katz, S.L.;
Protecting Public Trust in Immunization.
Pediatrics 2008;122;149-153

Larson, H.J.; Heymann, D.L.; Garnett, G.;
Public health response to Influenza A(H1N1) as an opportunity to build public trust.
Journal of the American Medical Association

Optional reading

Eradicating polio: persisting challenges beyond endemic countries

Larson, H.J.; Paterson, P.;

Expert Rev. Vaccines, 2011; 10(12), 1635-1636.

Lessons from polio eradication

Larson, H.J.; Ghinai, I.;

Nature, 2011; 473; 446-7.

The India HPV vaccine suspension
Larson, H.J.; Brocard, P.; Garnett, G.;

Lancet, 2010; 376(9741):572-3.

The lecture(s) are well structured					**The lecturer explains concepts clearly**					**The lecturer engages well with the students**				
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One useful learning point I would like to remember from this session:

Thursday 1 November

What are the other barriers to new vaccines (scientific and geopolitical)
John Tregonning

Overview

Whilst vaccines are potent tools for the control of infectious diseases, they are also victims of their own success. As the incidence of the disease they protect against goes down, fear of getting the disease also decreases and there is a tipping point at which it is apparently safer to not have the vaccine trusting in herd immunity to protect you. They are also one of the few medicines that are proscribed universally regardless of health or disease, with invisible benefit and some side effects – local acute event, driven by the innate immune response to the vaccine components

In addition to public acceptability of vaccines, there are other issues limiting the introduction of new vaccines, these include delivering temperature sensitive medicines to remote inaccessible regions (the cold chain), the cost of development of new vaccines and the general cost-benefit analysis of universal vaccination.

Learning outcome

- Understand some of the broader issues affecting vaccine uptake including delivery, acceptability and economic issues

Essential reading

Philos Trans R Soc Lond B Biol Sci. 2011 Oct 12;366(1579):2827-32

Accelerating introduction of new vaccines: barriers to introduction and lessons learned from the recent Haemophilus influenzae type B vaccine experience

Hajjeh R

The lecture(s) are well structured					**The lecturer explains concepts clearly**					**The lecturer engages well with the students**				
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
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One useful learning point I would like to remember from this session:

The global challenge of HPV and scaling up vaccination
Simon Beddows

By the end of this session the student will have a working knowledge of the:

- Type-specific HPV prevalence and disease burden worldwide
- Efficacy of the current HPV vaccines against vaccine and non-vaccine types
- Heterogeneity of HPV vaccine implementation and predictions for reducing disease burden
- Uncertainty about mechanisms and definitions of vaccine-induced protection
- Need for and composition of next generation HPV vaccines

Cancer of the cervix is the third most common cancer of women and accounts for an estimated 530,000 cervical cancer cases and 275,000 deaths per annum worldwide. Cervical cancer rates are highest in countries that do not have robust national cancer screening programmes. HPV16 and HPV18 are associated with ca. 70% of cervical cancer cases worldwide. The current generation of HPV vaccines have been shown in clinical trials to be highly efficacious at reducing persistent infections and cervical lesions associated with these types. One of the vaccines also targets and is highly efficacious against HPV6 and HPV11 which are associated with the development of genital warts. Closely-related HPV types within the alpha-papillomavirus species groups A9 (HPV16-like: HPV31, HPV33, HPV35, HPV52, HPV58) and A7 (HPV18-like: HPV39, HPV45, HPV59, HPV68) are associated with a further ca. 25% of cervical cancer cases worldwide. The HPV vaccines have been shown to afford some degree of cross-protection against the more closely-related non-vaccine types HPV31, HPV33 and HPV45 but not against HPV52 or HPV58. Neutralizing antibodies against the vaccine types, HPV16 and HPV18, appear to play a significant role in mediating vaccine-induced protection from infection and disease associated with these two HPV types but it is not yet known whether neutralizing antibodies play a significant role in mediating cross-protection against non-vaccine types. Vaccination programmes have recently been implemented in a number of countries, most targeting young girls prior to sexual debut. Some impact on HPV infection has already been reported but it will take some time before robust assessments of vaccine impact on disease burden can be made. The next generation of HPV vaccines designed to extend coverage to other disease-associated HPV types are already in the pipeline.

<u>Essential Reading</u>

Schiller JT, Lowy DR. Vaccines to prevent infections by oncoviruses. Annu Rev Microbiol. 2010;64:23-41. Review. PubMed PMID: 20420520.

<u>Recommended reading</u>

Li N, Franceschi S, Howell-Jones R, Snijders PJ, Clifford GM. Human papillomavirus type distribution in 30,848 invasive cervical cancers worldwide: Variation by geographical region, histological type and year of publication. Int J Cancer. 2011 128(4):927-35. PubMed PMID: 20473886.

Romanowski B. Long term protection against cervical infection with the human papillomavirus: review of currently available vaccines. Hum Vaccin. 2011 7(2):161-9. Review. PubMed PMID: 21307652.

Stanley M. Prospects for new human papillomavirus vaccines. Curr Opin Infect Dis. 2010 23(1):70-5. Review. PubMed PMID: 19926987.

The lecture(s) are well structured					**The lecturer explains concepts clearly**					**The lecturer engages well with the students**				
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
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One useful learning point I would like to remember from this session:

The role of vaccination in the control of flu pandemics

Neil Ferguson

Modelling has become a more prominent tool in planning and response to emerging infectious disease outbreaks generally, and pandemic influenza in particular. This lecture will give the attendee an understanding of:

• the basic principles of epidemic dynamics.

• how seasonal and pandemic influenza differ, and the role of vaccination in the control of both

• pandemic preparedness efforts in the last 6 years.

• the epidemiology and impact of the 2009 H1N1 pandemic and how vaccination was used during that pandemic;

• lessons learned from 2009.

Essential reading

A.S. Monto, Vaccines and Antiviral Drugs in Pandemic Preparedness, Emerg Infect Dis. 2006 January; 12(1): 55–60. – available from http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3291404/pdf/05-1068.pdf

Recommended reading

Ferguson, N.M., D.A. Cummings, C. Fraser, J.C. Cajka, P.C. Cooley and D.S. Burke, Strategies for mitigating an influenza pandemic. Nature, 2006. 442:p. 448-452. (Mitigation modelling – available at http://www.nature.com/nature/journal/v442/n7101/pdf/nature04795.pdf).

SteelFisher, G.K. et al., The Public's Response to the 2009 H1N1 Influenza Pandemic., N Engl J Med 2010; 362:e65 (commentary on 2009 pandemic – available at http://www.nejm.org/doi/pdf/10.1056/NEJMp1005102)

The lecture(s) are well structured					**The lecturer explains concepts clearly**					**The lecturer engages well with the students**				
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
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One useful learning point I would like to remember from this session:

Friday 2 November

Polio eradication
Nicholas Grassly

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

- understand the natural history and pathogenesis of poliovirus infections
- appreciate the epidemiology of polio before and after the introduction of vaccines
- know the properties of the inactivated and live-attenuated vaccines
- understand the major challenges to global eradication including the significance of vaccine-derived polioviruses

Overview

For students in the West, polio is a disease that has been eradicated or nearly so. But for many children in lower-income countries it is a persistent danger. For scientists, it is an interesting virus, whose pathogenesis and response to vaccines remains poorly understood and in public health circles it is a cause celebre in danger of becoming notorious. In this lecture we will discuss the natural history, pathogenesis and epidemiology of poliovirus. We will then examine the inactivated and live-attenuated vaccines before considering the major challenges to eradication.

Essential reading

Bulletin of the WHO Special Issue on Polio Eradication Vol 82 pages 1-80 (2004) available online at www.who.int/bulletin

The lecture(s) are well structured					**The lecturer explains concepts clearly**					**The lecturer engages well with the students**				
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One useful learning point I would like to remember from this session:

To PPV or Not to PPV – evidence for the use of pneumoccal vaccines in children
Journal Club

John Tregonning

Learning outcomes

- Use the literature to evaluate the benefit and costs of specific vaccines
- Understand that vaccination regimes can change over time as understanding improves and epidemiological evidence is assessed.

Overview

Streptococcus pneumoniae is estimated to cause 1.6 million deaths globally each year with children and the elderly primarily affected. There are over 90 serotypes but only a relatively small proportion cause serious infections. Two different types of pneumococcal vaccine are utilized, polysaccharide vaccines in the form of the pneumococcal 23-valent polysaccharide vaccine (PPV23) and glycoconjugate vaccines that are currently a 10-valent (PCV10) and a 13-valent (PCV13) formulation. Pneumococcal glycoconjugate vaccines are now widely used in infant immunization particularly for those at increased risk of pneumococcal infection. However, the use of polysaccharide vaccines, has in recent years become a topic of much debate, especially for use in children. In this journal club we will discuss the evidence for their use and the arguments for changing or maintaining immunisation schedules as they stand.

The session will take the following format:

1. Introduction to the topic by moderator

2. Splitting into small groups to prepare presentations on specific papers

3. Feedback on each paper by small groups

4. General Discussion of papers

Topics to consider – efficacy of PCV/ PPV vaccine, "off-target" effects of vaccines, hyporesponsiveness, what is the best way forward

Essential reading

This review provides an overview and background to the whole topic:

Use of pneumococcal polysaccharide vaccine in children: what is the evidence? Curr Opin Infect Dis. 2012 Jun;25(3):292-303. Borrow R, Heath PT, Siegrist CA.

The following papers will be under discussion by small groups:

Efficacy of nine-valent pneumococcal conjugate vaccine against pneumonia and invasive pneumococcal disease in The Gambia: randomised, double-blind, placebo-controlled trial. Cutts FT et al. Lancet. 2005;365(9465):1139-46.

Burden of disease caused by Streptococcus pneumoniae in children younger than 5 years: global estimates. O'Brien KL et al Lancet. 2009;374(9693):893-902.

Repeat revaccination with 23-valent pneumococcal polysaccharide vaccine among adults aged 55-74 years living in Alaska: no evidence of hyporesponsiveness. Hammitt LL, Bulkow LR, Singleton RJ, et al. Vaccine 2011; 29:2287–2295.

Hyporesponsiveness to re-challenge dose following pneumococcal polysaccharide vaccine at 12 months of age, a randomized controlled trial. Vaccine 2010; 28:3341–3349. Russell FM, Carapetis JR, Balloch A, et al.

A randomized study comparing combined pneumococcal conjugate and polysaccharide vaccination schedules in adults. Lazarus R, Clutterbuck E, Yu LM, et al. Clin Infect Dis 2011; 52:736–742.

Herd immunity and serotype replacement 4 years after seven-valent pneumococcal conjugate vaccination in England and Wales: an observational cohort study. Miller E, Andrews NJ, Waight PA, et al. Lancet Infect Dis 2011; 11:760–768.

The lecture(s) are well structured					**The lecturer explains concepts clearly**					**The lecturer engages well with the students**				
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One useful learning point I would like to remember from this session:

WEEK 5

Vector–borne infectious diseases (5–9 November)

Monday 5 November

Vector borne disease and an introduction to malaria

Graham Cooke

Vector By the end of this session you should be able to:

- Understand the definitions, aetiology and burden of disease from vector borne disease
- Be familiar with the tools available to control malaria and how they could be used together
- Be aware of some of the prioirities for further research in malaria

Overview

The session will be partly interactive and partly lecture based. The burden of malaria will be covered and the tools required to control malaria and other vector borne diseases will be outlined. There will be more detailed discussion of specific interventions which need to be implemented to control malaria and the gaps in current interventions. The talk will provide a basis for understanding the lectures on malaria and other vector borne diseases in the same week.

Essential reading

Malaria: control *vs* elimination *vs* eradication Lancet (2011)

Recommended reading

First Results of Phase 3 Trial of RTS,S/AS01 Malaria Vaccine in African Children . The RTS,S clinical trials partnership. NEJM 2011; 365: 1863-1875

Global malaria mortality between 1980 and 2010: a systematic analysis Murray et al Lancet 2010

Lancet's Malarial elimination Series

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One useful learning point I would like to remember from this session:

Tuesday 6th November

Vector control strategies in malaria
Interactive discussion: Should we use GM mosquitoes?
Dr John Marshall

Brief overview of topics
1. Vector control strategies for malaria

Pros and cons (including acceptability in the field) of traditional methods of vector control

- Habitat control (removal of stagnant water – draining swamps, removing old tires, etc. – as successfully used in the southern US)
- Insecticides (indoor residual spraying of walls, impregnated bednets, spraying of breeding sites)
- Mosquito larvicides
- Release of mosquito predators (mosquitofish)
- Sterile insect technique (release of irradiated sterile males, India controversy)

Recent advances in vector control

- Spraying feeding sites with toxic sugar bait
- Release of genetically sterile males (late-acting sterility, genetic sexing, more efficient than radiation)
- Infection of mosquitoes with a Wolbachia bacterium (life-shortening, reduced Dengue viral load, reduced biting ability)

- Selfish genetic element carrying malaria-refractory gene (transposable elements, homing endonuclease genes, disease-refractory genes)

Present and future challenges for mosquito control

- Currently-used control methods seem inadequate to break the malaria transmission cycle in endemic parts of Africa
- Mosquitoes are developing resistance to insecticides
- Control methods could select for mosquito feeding behaviors that are less likely to encounter the intervention
- Controlling one vector species may leave a vacant niche for another to take up
- Genetic technologies encounter large regulatory hurdles
- Climate change is expected to affect mosquito population sizes

2. Interactive discussion: Should we use GM mosquitoes?

Distinction between GM mosquito strategies

- Population suppression (reducing population size, self-limiting)
- Population replacement (spreading a malaria-refractory gene into a mosquito population, could spread across national borders)

Risk/benefit analysis

- What are the potential risks? Do these differ from other strategies?
- What are the potential benefits? Do these outweigh the risks?

Ethical issues

- How do the fundamental principles of medical ethics apply to GM mosquitoes (beneficence, non-malificence, autonomy, justice)?
- Are there intrinsic ethical issues specific to genetic engineering?

Public attitudes

- What would the UK public think about GM mosquitoes?
- Is it possible to accurately gauge public attitudes in Africa in the absence of widespread education on the concept of the gene?
- Is public acceptance necessary?

Regulatory issues

- Would it be possible to gain approval for a GM sterile release?
- Would it be possible to gain international approval for GM mosquitoes that would spread across borders?

Key learning points

- Standard vector control measures (e.g. habitat control, use of insecticides) have been successful at achieving vector control in many parts of the world; however they have been unable to break the transmission cycle in endemic parts of Africa
- Recent developments in vector control (e.g. use of toxic sugar bait, release of genetically sterile males, malaria-refractory genes) offer hope to contribute to future integrated vector control strategies
- Despite this, vector control faces several challenges, such as development of insecticide resistance, adaptation of mosquito feeding behavior, and regulatory hurdles faced by genetic control strategies

Recommended readings

- Ecology: A prerequisite for malaria elimination and eradication (PLoS Medicine): http://www.plosmedicine.org/article/info%3Adoi%2F10.1371%2Fjournal.pmed.1000303
- Integrated vector management for malaria control (Malaria Journal): http://www.malariajournal.com/content/7/S1/S4
- Malaria control with transgenic mosquitoes (PLoS Medicine): http://www.plosmedicine.org/article/info:doi/10.1371/journal.pmed.1000020

Lecture notes:
I will update these prior to the lecture at this website:
http://www.its.caltech.edu/~johnmm/VectorControlLectureMarshall.pdf

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One useful learning point I would like to remember from this session:

Can we use existing tools to eliminate malaria?
Professor María-Gloria Basáñez

Over the past years, *Plasmodium falciparum* malaria has declined substantially in some sub-Saharan African (SSA) settings. These declines have been associated with an increased distribution of long-lasting insecticidal nets (LLINs), and the switch to artemisinin-based combination therapies (ACT). Whilst this pattern is encouraging, there remain many countries in Africa that continue to have a high burden of disease and in which malaria remains a leading cause of mortality in children under five years of age. Therefore, control of the disease, and ultimately elimination of the parasite from the continent, remain major public health goals. However, Africa poses the biggest challenge to a global eradication initiative, given the heterogeneous yet ubiquitous nature of *P. falciparum* transmission across much of the continent, and the local variation in the major *Anopheles* vector populations that sustain transmission (chiefly *An. gambiae s.l.* and *An. funestus*). Compared to the past malaria eradication campaigns of the 1950s, additional tools are now available which, combined with sustained policy commitment, may make local elimination achievable in some settings and can aid to markedly reduce malaria prevalence in others. These include: new LLINs (which have increased killing effects on the vectors compared to traditional nets and are more durable); ACTs (which, through their gametocytocidal effect, can reduce transmission from humans to vectors); and a pre-erythrocytic malaria vaccine, RTS,S (which could soon contribute to elimination programmes). Mathematical models provide tools with which to explore the expected impact of different interventions against malaria, both individually and in combination, on a range of programme endpoints. In this lecture, we will review the biology and epidemiology of malaria, and introduce the notion of mathematical models to describe its prevalence in humans and vectors. We will discuss how modelling can help explore the potential of current control tools to reduce parasite prevalence to a low level (below a threshold of 1% prevalence) exemplified by six well-characterized transmission sites which represent the full range of transmission intensity–vector species combinations and seasonality patterns most commonly observed across SSA.

Key learning points

Using *P. falciparum* malaria as an example:

- The global distribution of malaria and its anopheline vectors
- The triangle of transmission: the parasite, the mosquito vector and the human host
- A range of control measures aimed to interrupt the triangle of transmission: antiparasitic and antivectorial measures
- The role of mathematical models to inform control programmes
- Implications for the feasibility of control and elimination of falciparum malaria from SSA

Key papers/suggested reading

Griffin JT, Hollingsworth D, Okell LC, Churcher TS, White M, Hinsley W, Bousema T, Drakeley CJ, Ferguson MN, Basáñez MG & Ghani AC (2010). Reducing *Plasmodium falciparum* malaria transmission in Africa: a model-based evaluation of intervention strategies. *PLoS Med* 7, e1000324.

Churcher TS, Dawes EJ, Sinden RE, Christophides G, Koella J & Basáñez MG (2010). Population biology of malaria within the mosquito: density-dependent processes and potential implications for transmission-blocking interventions. *Malar J* 9, 311.

Okell LC, Drakeley CJ, Bousema T, Whitty CJ & Ghani AC (2008). Modelling the impact of artemisinin combination therapy and long-acting treatments on malaria transmission intensity. *PLoS Med* 5: e226.

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One useful learning point I would like to remember from this session:

How to eliminate trachoma by 2020
Anthony Solomon

Session outcomes

By the end of this session, participants will have an understanding of the global target to eliminate trachoma as a public health problem by the year 2020 and an understanding of the SAFE strategy to be used to achieve that goal

Overview of session

- A brief history
- Epidemiology
- Clinical features
- Strategy for elimination by 2020: the “SAFE strategy”

Essential reading

Trachoma. Mabey DC, Solomon AW, Foster A. Lancet. 2003 Jul 19;362(9379):223-9.

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One useful learning point I would like to remember from this session:

Wednesday 7 November

Leishmaniases: principles and unmet needs
Dr Ingrid Müller

Infections with protozoan parasites inflict an immense toll on the developing world; they are major causes of morbidity and mortality and impede economic development. Leishmaniases are vector-borne diseases, the parasites are transmitted by bites of blood feeding female sand flies. Infection can cause different disease manifestations in humans, ranging from the relatively benign self-healing cutaneous form through the disseminated and diffuse cutaneous, to the most severe visceral leishmaniasis. The leishmaniases belong to the most neglected diseases, yet they occur in five continents and are endemic in almost all tropical and subtropical areas. The rising incidence of leishmaniases around the world is an increasing concern for many countries and there is evidence that urbanization, deforestation, agricultural development and human immunodeficiency virus all contribute to increased transmission and disease spread.

The lecture will cover the following

- The parasite and its vector
- Epidemiology
- Overview of the a complex spectrum of clinical manifestations of leishmaniases; Leishmania-HIV coinfections:
- Problems in diagnosis and treatment

Key learning points

- understand what a “neglected tropical disease” is
- understand the need to raise awareness of these devastating diseases
- appreciate the global burden and the difficulties in disease control
- appreciate the need to develop better intervention strategies

Recommended Reading

den Boer et al. “Leishmaniasis impact and treatment access”. Clinical Microbiology and Infection, 2011; **17**:1471-77

Alvar et al. “Leishmaniasis worldwide and global estimates of its incidence.” PLoSOne, May 2012, vol 7, issue 5, e35671

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One useful learning point I would like to remember from this session:

Dengue Virus infection and Immunopathogenic disease
Abi Culshaw

By the end of this session you should understand the following concepts:

Dengue virus is an important global pathogen causing significant medical, social and economic burden.

Dengue virus infection is a multi-faceted disease that has several outcomes of varying severity.

Whilst risks factors associated with severe dengue disease are incompletely understood, several lines of evidence suggest that it may in part be mediated by immunopathogenesis.

Several issues have hindered the search for an effective dengue virus vaccine; these include the lack of a good animal model of infection and the need for a vaccine to be equally protective against all 4 circulating dengue virus serotypes.

Overview

Dengue virus is a mosquito-borne pathogen endemic to tropical and sub-tropical regions of the world. 2.5 billion people, or 40% of the world's population, live in areas where there is a risk of dengue transmission. The World Health Organization (WHO) estimates that 50 to 100 million infections occur yearly. Around 500,000 of these infections result in the severe form of disease, dengue haemorrhagic fever (DHF) and an estimated 22,000 people, mostly children, die.

The majority of dengue virus infections are clinically inapparent, although some may cause an undifferentiated fever. Most clinically apparent infections result in dengue fever (DF), a febrile illness accompanied by nonspecific symptoms including headache, retroorbital pain, myalgia and haemorrhagic manifestations. A minority of patients develop DHF, a more severe form of dengue disease, whose hallmark is plasma leakage leading to intravascular volume loss and circulatory insufficiency. In very severe cases patients develop dengue shock syndrome (DSS).

Dengue virus circulates as four closely related serotypes and whilst infection with any one serotype confers long-lived immunity to that particular subtype it does not prevent the other three from causing an infection. There is, in fact, epidemiological evidence to suggest that secondary infections with heterologous dengue virus strains are more likely to result in severe disease. This may mean that previously acquired immunity to one dengue virus strain may actually have a detrimental effect during a secondary infection.

This potential for immune-mediated pathogenesis has hindered the development of an effective dengue virus vaccine. Such a prophylaxis would have to be equally efficient at preventing infection with all four dengue virus serotypes to avoid the possibility that immunity elicited might exacerbate any acquired infections. The lack of a good animal model of infection has also hampered efforts to develop a dengue virus vaccine. However, given the success of vaccines developed against closely related viruses such as polio and the ability of the body to produce long-lived serotype specific immunity it is highly possible that in the future an effective dengue virus vaccine will be developed.

Essential reading

Murphy BR and Whitehead SS, Immune responses to dengue virus and prospects for a vaccine. Annu. Rev. Immunol. 2011. 29:587–619.

Recommended reading

Kyle JL and Harris E, Global Spread and Persistence of Dengue. Annu. Rev. Microbiol. 2008. 62:71–92.

Halstead SB, Controversies in dengue pathogenesis. Paediatrics and International Child Health. 2012. 32:5-9.

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One useful learning point I would like to remember from this session:

How will the control of infectious disease be improved by genomic analysis?
Christophe Fraser

Costs of sequencing DNA are dropping dramatically. Next generation sequencing technologies have caused a step-change in sequencing speed and cost, far faster than predicted by 'Moore's law'.

In this lecture I will give a brief overview of some of the ways DNA sequencing of pathogens can be put to use to improve clinical practice and to improve public health policy.

I will then explore two examples in detail to illustrate quite different uses of genomic technology.

In the first example, I will highlight how genomic analysis contributed to a rapid analysis and understanding of the rate of spread of the newly emergent H1N1pdm 'swine flu' virus in 2009. In particular I will demonstrate that genetic analysis, allied with other epidemiological investigations, helped establish within days of the first cases being detected that the outbreak was far larger than appeared (with 10s of thousands likely infected), and therefore that the virus was far less virulent than initial surveillance focused on serious cases indicated.

In the second example, I will show how genomics of bacteria have helped map out the epidemic of a particular multi-drug lineage of the global pathogen *Streptococcus pneumoniae* that emerged in the 1970s. I will show how genomic analysis provided insight into the geography of the epidemic, its dynamics, and perhaps most surprisingly on the extraordinarily dynamic nature of the genome itself in the face of selection pressures exerted by new vaccines and antibiotics introduced in the last twenty years. While much of this had been gleaned from epidemiology and conventional genetics, genomics offers much greater resolution, and most importantly highlights the speed and simultaneousness of bacterial evolution. This new understanding needs to be taken into account in the next few years, as efforts to reduce global pediatric mortality associated with this major pathogen are stepped up.

Finally, I will highlight what I think are some of the main obstacles to putting genomic data to good use, namely the problems in bio-informatics, and in linkage of genomic data to other clinical meta-data.

Key take-home lessons:

- an understanding of the different uses of genomic data
- a broad understanding of how genomics and epidemiology are linked
- an understanding of why it is important to link clinical and genomic data, and the challenges involved.

References

Köser CU, et al. (2012) Routine Use of Microbial Whole Genome Sequencing in Diagnostic and Public Health Microbiology. PLoS Pathogens 8(8): e1002824. doi:10.1371/journal.ppat.1002824

Gardy, JL et al, Whole-Genome Sequencing and Social-Network Analysis of a Tuberculosis Outbreak. N Engl J Med 2011; 364:730-739

Fraser C et al, Pandemic Potential of a Strain of Influenza A (H1N1): Early Findings, Science 2009, Vol. 324 no. 5934 pp. 1557-1561. DOI: 10.1126/science.1176062

Croucher et al, Rapid Pneumococcal Evolution in Response to Clinical Interventions. Science 2011. Vol. 331 no. 6016 pp. 430-434. DOI: 10.1126/science.1198545.

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One useful learning point I would like to remember from this session:

Thursday 8 November

Barriers to effectiveness: Artemisinin Combination Therapies (ACTs) and the health system

Dr Bhargavi Rao

Learning outcomes

- Malaria is both treatable and preventable: but delays in treatment can lead to severe disease and death
- Malaria is not vaccine preventable and so potentially easy to re-introduce i.e. Malaria control requires integration into a health system to treat and maintain reductions in disease and transmission.

- Health system factors believed to limit capacity for large-scale use of ACTs and reduce potential effectiveness
  "…consensus …health systems too fragile and fragmented to deliver the volume and quality of services…" *Lancet 2004*

- Timely access to quality, diagnostic-led care remains the goal to realising the potential effectiveness of highly efficacious treatments such as ACTs

Overview

Over recent years a number of countries in Africa have begun the first phase of malaria elimination programs via scaling-up of existing interventions. The success of national malaria control strategies is increasingly recognised to be handicapped by the capacity of the health system to deliver interventions, such as first-line treatment Artemisinin Combination Therapies (ACTs) at the required levels of coverage and quality. From a public health perspective the key to reducing malaria mortality is to ensure diagnosis-led, first-line treatment in a timely fashion, before infections progress to a severe state. As global health funding slows, it is critical to better understand how to deliver a proven intervention most effectively through an existing system, and where the barriers are to an intervention achieving its predicted potential.

Suggested reading

1. Littrell M, Gatakaa H, Evance I, Poyer S, Njogu J, Solomon T, et al. Monitoring fever treatment behaviour and equitable access to effective medicines in the context of initiatives to improve ACT access: baseline results and implications for programming in six African countries. *Malar J*. **10**: 327.
2. Stratton, L.*, et al.* (2008) The persistent problem of malaria: addressing the fundamental causes of a global killer. *Soc Sci Med* 67, 854-862
3. Chuma, J.*, et al.* (2010) Barriers to prompt and effective malaria treatment among the poorest population in Kenya. *Malar J* 9, 144
4. Sabot, O.J.*, et al.* (2009) Piloting the global subsidy: the impact of subsidized artemisinin-based combination therapies distributed through private drug shops in rural Tanzania. *PLoS One* 4, e6857
5. Unger JP et al.(2006) Can malaria be controlled where basic health services are not used?. *TMIH.* 11: 314-322
6. Tanner M , L.C.a.L.N. (1993) From the efficacy of disease control tools to community effectiveness. Case studies from the biomedical and health systems research activities of the Swiss Tropical Institute in Africa. . *Transactions of the Royal Society of Tropical Medicine* 87, 518-523

Malaria in the UK: Where does it come from?

Dr Deidre Hollingsworth

Learning outcomes

- There are around 2000 cases of malaria in the UK, almost exclusively acquired abroad

- An increasing proportion of these are due to infection with the more dangerous Plasmodium falciparum.
- Malaria transmission is highly heterogeneous, as are travel patterns for UK residents, but high risk groups can be identified.
- Prophylaxis and preventative measures are effective – the vast majority of travellers do not acquire malaria

Overview

Plasmodium vivax malaria was common in the central and southern UK in the 1500s-1800s, but there are now only a handful of cases acquired in the UK due to the absence of the vector and limited opportunities for transmission [1]. However, the UK has one of the highest rates of imported malaria among non-endemic countries, with around 2000 cases per year resulting in 5 to 16 deaths [2]. Whilst there has been a decrease in imported malaria cases in the UK since 2000, an increasing proportion of cases are attributable to *Plasmodium falciparum* rather than *Plasmodium vivax* [2]. This is of concern because *P. falciparum* is associated with severe symptoms and mortality [3-4]. We will discuss which groups of travellers are at most risk, whether through poor risk behaviour, high transmission rates in their area of travel, or long duration of stay.

1. Lindsay, S.W., et al., *Assessing the future threat from vivax malaria in the United Kingdom using two markedly different modelling approaches.* Malar J, 2010. **9**: p. 70.

2. Smith, A.D., et al., *Imported malaria and high risk groups: observational study using UK surveillance data 1987-2006.* BMJ, 2008. **337**: p. a120.

3. Phillips, A., et al., *Risk factors for severe disease in adults with falciparum malaria.* Clin Infect Dis, 2009. **48**(7): p. 871-8.

4. Ladhani, S., et al., *Imported malaria in children: a review of clinical studies.* Lancet Infect Dis, 2007. **7**(5): p. 349-57.

Essential reading

Smith, A.D., et al., *Imported malaria and high risk groups: observational study using UK surveillance data 1987-2006.* BMJ, 2008. **337**: p. a120.

Recommended reading

Lindsay, S.W., et al., Assessing the future threat from vivax malaria in the United Kingdom using two markedly different modelling approaches. Malar J, 2010. **9**: p. 70.

Phillips, A., et al., Risk factors for severe disease in adults with falciparum malaria. Clin Infect Dis, 2009. **48**(7): p. 871-8.

Ladhani, S., et al., Imported malaria in children: a review of clinical studies. Lancet Infect Dis, 2007. **7**(5): p. 349-57.

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One useful learning point I would like to remember from this session:

Friday 9 November

In course Assessment: Critical Appraisal Paper
Moderator: Graham Cooke

BIOGRAPHIES

Dr Alasdair Bamford

Alasdair Bamford is a National Institute of Health Research (NIHR) Research Training Fellow and paediatrician specialising in infectious disease and immunology. His main areas of research include paediatric HIV immunology, pneumococcal immunity, vaccinology, tuberculosis diagnostics, and international child health.

He is currently completing a PhD project, investigating the effect of T cell dysfunction on B cell memory in HIV infected children, specifically in relation to responses to pneumococcal conjugate vaccine. He is author of the UK guidelines on immunisation of HIV infected children and has also worked as a paediatric advisor to the EPICS trial, a collaboration between the London School of Economics and the London School of Tropical Medicine. This large scale clinical trial is investigating the potential impact of a variety of public health interventions on the mortality of children under 5 in Guinea Bissau, West Africa.

Professor María-Gloria Basáñez.

María-Gloria did her MSc at the Liverpool School of Tropical Medicine and her PhD at Imperial College on the mathematical epidemiology of river blindness. After working at Oxford University from 1996 to 2000, she moved back to Imperial where she organised the MSc in Modern Epidemiology for 7 years and established her own research group. From river blindness (a vector-borne helminthiases), she started working on other vector-borne infections (malaria) and other helminthic diseases, as well as on other causes of infectious blindness (trachoma). María-Gloria was promoted to a Chair in Neglected Tropical Diseases in 2011.

Simon Beddows

After gaining a PhD from Imperial College, London in 1998 I spent some time in the USA during my post-doctoral studies at the University of Texas South-Western Medical Center, Dallas and Weill Medical College of Cornell University, New York. My interests at this time were principally focussed on understanding HIV envelope antigenicity. I returned to the UK in 2005 to take up a staff scientist position at the Health Protection Agency. My current interests include assessing the impact of the current generation of HPV vaccines on infection and cervical disease and understanding vaccine-induced antibody specificity.

Dr Graham Cooke

Graham Cooke is a clinician scientist based within the Division of Infectious Diseases at the Wright-Fleming Institute. He trained in General Medicine and Infectious Diseases, working in Oxford, London and South Africa. His doctoral research focussed on human genetics of tuberculosis, HIV and malaria, using genome wide approaches to identify novel targets for intervention that form part of his current research activity. From 2006-2008 he was based at the Africa Centre for Health and Population Studies in KwaZulu-Natal investigating the clinical and public health aspects of HIV/TB care and treatment and he remains a collaborator there. His current work is focussed on the prevention and treatment of co-infection with a particular emphasis on HIV and issues relevant to resource-poor settings.

Dr Abi Culshaw

Dr Abigail Culshaw – Abigail completed her PhD at Oxford University, looking at CD8+ T cells during HIV infection, at the end of 2011. Since then she has been working as a post-doctoral research associate in Prof. Gavin Screaton's lab at Imperial College where her focus has switch to dengue virus infection.

Dr Philipp Du Cros

Originally from Perth, Australia, Philipp is an infectious diseases specialist with a masters in clinical epidemiology. First working with Medecins San Frontieres/ Doctors without borders in MSF in 1999 in Burmese refugee camps in Thailand, he has worked in Tajikistan, Uzbekistan, Malaysia, Myanmar, India, Nigeria, Uganda, Tanzania and Zimbabwe on HIV and tuberculosis programmes. He is

currently the head of the Manson Unit, a specialised medical support unit to MSF field programmes based in London.

Red Elmahdi

Research Postgraduate in the department of infectious disease epidemiology, Imperial College London School of Public Health. Red's research is centred on improved HIV testing as a tool for the reduction of HIV transmission in the UK and barriers to routine screening.

Professor Alan Fenwick

Professor Alan Fenwick is Director of the Schistosomiasis Control Initiative which has assisted 12 countries in sub Saharan Africa to establish control programmes against schistosomiasis, soil transmitted helminths and other neglected tropical and parasitic diseases. Professor Fenwick has many years experience in the African environment having lived and worked in Tanzania Sudan and Egypt. Since returning to UK and joining Imperial College in 2002 he has championed the cause of increased recognition of the burden of and raising funding for Neglected Tropical Diseases so that treatments can be made available to poor rural populations. SCI currently arranges for the treatment of over 50 million individuals every year with deworming chemotherapy.

Dr Nathan Ford

Nathan Ford is currently has worked with Médecins Sans Frontières (MSF) since 1998, and is currently the medical co-ordinator for MSF's International office in Geneva. He holds a degree in Microbiology and Virology (Warwick) a Masters in Public Health and Epidemiology (Cape Town) and a PhD in Clinical Epidemiology (Vancouver). Areas of concern include evidence-based humanitarian action, and simplification and adaptation of medical care in resource-limited settings.

Aulo Gelli

Aulo works as a research fellow at the Partnership for Child development where he is the deputy director of the Home Grown School Feeding programme. His experience has focuses on the monitoring and evaluation of school feeding programmes in low-income countries, and particularly on understanding the costs and benefits of school feeding.

Professor Nicholas Grassly

I am an epidemiologist with an interest in infectious diseases and the role of vaccines and drug treatment in their prevention. I head the Vaccine Epidemiology research group within the Department of Infectious Disease Epidemiology at Imperial College London.

I began my research career working on HIV and other sexually transmitted infection, when I was responsible for the UNAIDS epidemiology reference group at Imperial (led by Prof Geoff Garnett). I became a Royal Society University Research Fellow in 2004.

Since that time I have worked extensively on poliovirus, identifying failure of the oral vaccine in India as a major challenge to global eradication. This work has led to clinical trials that aim to improve mucosal immunity and limit vaccine failure, which I am currently pursuing in collaboration with colleagues at the Christian Medical College in Vellore. I am also interested in improving strategies for the mass distribution of azithromycin that aim to reduce transmission of Chlamydia trachomatis and eliminate blindness due to this pathogen. For more details of the current research interests of my group, please click on the link above.

Dr Caroline Harper

Dr Caroline Harper graduated in Physics from Bristol University in 1981, and went on to Churchill College, Cambridge to do a PhD in Energy Studies. Before joining Sightsavers she worked in the gas industry, heading up a company selling gas and electricity to homes and businesses and trading gas on the spot market.

She was awarded the OBE for services to the gas industry in 2000. The business she ran was sold for around £120 million in 2002, and Dr Harper then set up her own interim management business, specialising in turning around ailing companies and mergers and acquisitions.

Dr Harper joined Sightsavers in 2005 after travelling extensively in Africa and South America, where the poverty she saw motivated her to move to the international development sector. Having blindness in the family, the mission of Sightsavers has personal resonance for her

Professor Neil Ferguson

Neil Ferguson is founding director of the MRC Centre for Outbreak Analysis and Modelling and Head of the Department of Infectious Disease Epidemiology at Imperial College London. He uses mathematical and statistical models to investigate the processes shaping infectious disease pathogenesis, evolution and transmission. In addition to some basic theoretical work, Professor Ferguson's research has applied models to study the transmission and control of influenza, SARS, BSE/vCJD, HIV, dengue, foot-and-mouth disease and bioterrorist threats. Prof Ferguson sits on multiple UK government scientific advisory bodies, and also advises the US government, the World Health Organisation and the European Union on pandemic planning and infectious disease modelling. Recently he was heavily involved in providing real-time analysis and scientific advice during the 2009 H1N1 pandemic.

http://www1.imperial.ac.uk/medicine/people/neil.ferguson/

Professor Christophe Fraser
Professor Christophe Fraser is currently Chair of Theoretical Epidemiology and Royal Society University Research Fellow at Imperial College London. He trained in theoretical particle physics, obtaining his PhD in 1997, and shifted areas to infectious disease epidemiology from 1998, training under Roy Anderson. He has been based at Imperial College since 2000.

Professor Fraser leads the evolutionary epidemiology group, which works on developing theory, on integrating data, and on developing applications for public health.

They take a unified view of the epidemiology and evolution of pathogens, driven by complex underlying patterns of host-host, host-pathogen and pathogen-pathogen interactions that require careful disentangling. They use a spectrum of tools ranging from simple mathematical models to complex computer simulations, usually interacting with microbiologists, basic medical scientists and public health professionals.

They are affiliated to the MRC Centre for Outbreak Analysis, and in that context work on applied epidemic modelling.

Current topics of interest for the research group include: HIV Virulence; HIV Epidemiology; Bacterial Phylodynamics; Influenza Epidemiology; Outbreak Analysis.

Dr Deirdre Hollingsworth
Deirdre Hollingsworth is an infectious disease epidemiologist who uses mathematical models to inform the design of effective public health control policies. She has worked on the role of travel advisories and restrictions on the spread of SARS and influenza, HIV transmission and HIV evolution. The main focus of her research is the role of human movement patterns and local elimination or eradication of malaria.

Dr Wendy Harrison
Wendy Harrison joined the Schistosomiasis Control Initiative as Managing Director in April 2009 from the Comparative Medicine and Biology Unit at GlaxoSmithKline. Wendy has a particular interest in integrated multi-disciplinary approaches to public health in developing countries with a focus on capitalizing on potential synergies between human and animal health programs. She is the PI on a $1.5 million grant from the Bill and Melinda Gates Foundation to assess the potential for the inclusion of treatment of the taeniosis/cysticercosis, a human tapeworm transmitted though pigs.

Caitlin Jarrett, LSHTM

Recent Master of Public Health graduate from Imperial College (2011). Previously worked as a Clinical Trials Officer for the NIHR Mental Health Research Network and Research Assistant for the NTW Mental Health Trust.

Professor Beate Kampmann

Her main areas of research are Paediatric Tuberculosis, including HIV-co-infection as well as age-related immune responses to infections and vaccination.

Since July 2010, she heads the Vaccinology theme at the MRC-The Gambia www.mrc.gm, where she leads the work under the platforms of tuberculosis, infant immunology and molecular diagnostics within the core goal of the unit to improve maternal & child health in West-Africa.

Vaccinology research unites the work in her laboratories at Imperial College and in The Gambia, establishing an “Open lab” approach.

Professor Kampmann’s research has a strong translational element and is facilitated by her close involvement with the clinical services for children with infectious diseases at Imperial NHS Healthcare Trust, where she is an active member of the paediatric consultant team.

Professor Ajit Lalvani

Professor Lalvani qualified in medicine from the Universities of Oxford and London and trained in internal medicine and infectious diseases in London, Cambridge, Oxford and Basel. After his doctoral thesis as MRC Clinical Training Fellow at the Weatherall Institute of Molecular Medicine at Oxford he became Clinical Lecturer in the Nuffield Department of Medicine, John Radcliffe Hospital, Oxford and has been a Wellcome Senior Research Fellow and Consultant Physician since 2001. His research has shaped TB control policy internationally and provided fundamental insights into immunity to intracellular pathogens and the action of TB and malaria vaccines. The NICE-endorsed interferon-gamma release assay (ELISpot-IGRA, T-SPOT.TB) which he invented and validated is the first advance in diagnosis of latent TB in 100-years and forms the basis of new national guidelines for TB screening and prevention throughout the world. He has raised over £15 million in research grants, published over 100 papers with over 4,500 citations in the scientific literature and received several awards in recognition of his contribution to global tuberculosis control, including the Scientific Prize of the International Union against Tuberculosis and Lung Disease and the Royal College of Physicians Weber-Parkes Medal. Since his recruitment from Oxford to Imperial College London in 2007, he founded and directs the Tuberculosis Research Unit, a multi-disciplinary research group comprising 20 investigators that probes a broad spectrum of fundamental questions in tuberculosis from immunology and microbiology to epidemiology, public health and policy.

Dr. Heidi Larson

Dr. Larson previously headed Global Communication for Immunization at UNICEF and Chaired the Advocacy Task Force for the Global Alliance for Vaccines and Immunization (GAVI). Her research specializes in the analysis and evaluation of health and development programmes with particular attention to social and political factors which can affect policies and programmes. Her particular focus is on risk and rumour management in health programmes and technologies, especially vaccines - from clinical trials to delivery - and building public trust.

Dr. Jamie Mann

Dr Jamie Mann is a postdoctoral research scientist working within the Mucosal Infection and Immunity group, headed by Prof Robin Shattock. Dr Mann completed his PhD in the department of Immunology at the University of Strathclyde in “Oral vaccine delivery systems”. In 2005, Dr Mann moved to London to work for Dr Paul McKay, Prof Martin Cranage and Prof Robin Shattock designing vaccine delivery strategies with an emphasis on mucosal targeting technologies. In 2011, Dr Mann moved to Imperial College where he has been investigating DNA vaccination against HIV-1 infection.

Dr John Marshall

John Marshall is a research associate in the Department of Infectious Disease Epidemiology. He completed a PhD in mathematical biology on the use of GM mosquitoes to control malaria. Since then, he has conducted a public attitude survey on the perspectives of people in Mali to GM mosquitoes, and completed a postdoc at Caltech designing novel gene drive systems for spreading antimalarial genes into mosquito populations. Recently, he joined the malaria research group at Imperial College, and is conducting surveys of human movement patterns of relevance to malaria transmission in Mali.

Dr. Paul McKay

Dr Paul F. McKay is a Senior Researcher Fellow in the Department of Medicine at St. Mary’s Campus, Imperial. His primary research centers on the development of new vaccine candidates, the optimization of immunization regimens and the assessment of potential vaccine efficacy, with a particular focus on the generation of vaccine-induced immunity at the surface and within mucosal tissue. Paul was awarded a B.Sc. (Hons) in Biochemistry from Imperial College, then a M.Sc. in Medical Immunology from The Royal Postgraduate Medical School (now the Hammersmith Campus of Imperial College, London) and finally a Ph.D. in Molecular Immunology, also from Imperial College. He then spent four years at Harvard Medical School and the Beth Israel Deaconess Medical Centre in Boston, USA, in Professor Norman Letvin’s laboratory working on the characterization of T cell responses to various vaccine modalities and the analysis, development and optimization of DNA prime and recombinant vector boost HIV vaccine candidates. He returned to the UK to work at St. George’s, University of London before returning to Imperial College.

Dr Ingrid Muller

Ingrid Müller is Reader in Immunology in the Department of Medicine, Section of Immunology at St. Mary’s Campus. Her main research interest is the understanding host-parasite interactions and of the mechanisms leading to persistent chronic leishmaniasis or to control of disease and immunity to reinfection. She worked for some time in Brazil and is collaborating with researchers in Brazil, Spain, Germany and Ethiopia.

Ingrid Müller studied Biology at the Free University in Berlin, Germany, undertook a PhD at the Max-Planck-Institute for Immunobiology in Freiburg, Germany with Stefan Kaufmann, investigating the role of T cell subsets in mycobacteria infections. She then joint the Immunology Research and Training Centre of the World Health Organisation at the Institute of Biochemistry of the University of Lausanne in Switzerland and started to work on leishmaniasis. From there she moved to the US and held the post of Assistant Professor in the Department of Biology at the University of Notre Dame and from there she moved to Imperial College London.

Professor Peter Openshaw

Peter Openshaw works immune-mediated lung disease, especially that caused by respiratory syncytial virus (RSV) and influenza. His work is focussed discovering links between viral infections and wheezing disorders. His research interests include T cell mediated immunopathology, innate immunity, neonatal immunology and immunoregulation.

He trained in respiratory medicine and is a consultant physician at St Mary's Hospital, Paddington. He studied immunology at NIMR, Mill Hill (1985-88) and became the founding Director of Imperial's Centre for Respiratory Infection (CRI) in 2008, bringing together many of Imperial College's established leaders and groups with expertise in molecular, cellular, animal and human studies of respiratory infections.

During the 2009 flu pandemic he was part of the Flu-CIN collaboration and leads the MOSAIC consortium, studying causes of severe influenza in hospitalised patients. He is also investigating the effects of RSV infection in adult volunteers.

He is a member of the flu and RSV subcommittees of JCVI and Vice-President of the European Scientific Working Group on Influenza (ESWI).

Dr Manish Pareek
Manish Pareek graduated from the University of Birmingham with Honours in Medicine and undertook general medical training before embarking on a specialist training programme in Infectious Diseases and General Medicine. At present he is a Clinical Research Fellow funded by the Medical Research Council and jointly affiliated to the Department of Infectious Disease Epidemiology and the Tuberculosis Research Unit – both at Imperial College London. His primary research interests are: tuberculosis, migration, health policy, modelling and health economics.

Tanvi Rai

Research Postgraduate in the department of infectious disease epidemiology, Imperial College London School of Public Health. Tanvi's research is centred on the impact of migration on HIV risk and the determinants and patterns of HIV-relevant behaviour among migrant workers and their families in India.

Dr. Samantha Sampson

I obtained my PhD from the University of Stellenbosch, Cape Town South Africa; this work focused in the phenotypic consequences of genetic diversity in clinical isolates of *Mycobacterium tuberculosis*. Upon completion of my studies, I moved to the Harvard School of Public Health in Boston, USA, where I worked on TB vaccine development. In 2006, I was awarded a Wellcome Trust fellowship, and moved to Imperial College London. I continue to research several aspects of TB host-pathogen interactions.

Dr. Mariam Sbaiti
Mariam graduated in Medicine at King's College London in 2006. She holds an intercalated BSc in Medical Sciences and International Health from UCL. After completing her Foundation training, she

worked as a Trust Grade in Sexual Health & HIV at 56 Dean Street (Chelsea & Westminster). She is currently completing a Public Health & Policy MSc at the London School for Hygiene & Tropical Medicine and is a Global health Teaching Fellow at Imperial College

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Professor Robin Shattock

Robin Shattock is a professor of Mucosal Infection and Immunity at Imperial College, London. The main focus of his research is the investigation of the mechanisms of mucosal HIV transmission and development of novel preventative vaccines.

Anthony Solomon (LSTHM)

I am a Wellcome Trust Intermediate Fellow at the London School of Hygiene & Tropical Medicine, and an Honorary Consultant Physician at the Hospital for Tropical Diseases

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Professor Stephen Smith
Stephen R. Smith is Professor of Bioresource Systems in the Department of Civil and Environmental Engineering at Imperial College London. Professor Smith has 25 years of experience investigating the treatment and agronomic properties of sludges and organic wastes recycled to land and their environmental impact, including nutrients, potentially toxic elements, organic contaminants and pathogens. Professor Smith has worked overseas on the problems of sewage sludge disposal and recycling on farmland in warm climates, notably in Egypt where he was a consultant to WRc on the Cairo Sludge Disposal Study funded by the European Investment Bank and sponsored by the Cairo Wastewater Organisation. He is Senior Technical Adviser to a Smart Water Fund project in collaboration with the Department of Biotechnology and Environmental Biology, Royal Melbourne Institute of Technology (RMIT) on a project evaluating the pathogen risk and nutrient status of air-dried and stored biosolids in Victoria, Australia.

Dr Mike Templeton
Dr. Mike Templeton is a chartered civil engineer and Senior Lecturer in Public Health Engineering in the Department of Civil and Environmental Engineering at Imperial College London. He holds a Bachelor's degree in Engineering Science and a PhD in Civil-Environmental Engineering, both from the University of Toronto. His research areas include innovative water treatment technologies for water supply and irrigation, emerging chemical and microbiological contaminants in water, and water supply and sanitation in low-income countries. Dr Templeton is the Chair of the Water Supply and Quality Technical Panel of the Chartered Institution of Water and Environmental Management and a member of the Water Expert Panel of the Institution of Civil Engineers.

Professor Mark R Thursz

Mark Thursz is Professor of Hepatology at Imperial College and consultant in Hepatology at St Mary's Hospital, London. His clinical interests are in viral hepatitis, alcoholic liver disease and fatty liver disease. He is currently interested in developing programmes for treatment of chronic hepatitis B infection in resource poor settings to reduce the risk of hepatocellular carcinoma.

Professor Thursz' research interests are focussed on the natural history of viral hepatitis and fatty liver disease and the factors which determine chronic infection and progressive liver disease. He has a special interest in the genetic determinants of disease outcomes using genetic association and genome wide scanning to identify causative variants.

Professor Thursz is chief investigator on two multi-centre trials: The warfarin anticoagulation for liver fibrosis in patients transplanted for hepatitis C (WAFT-C) trial and the steroids or pentoxifylline for alcoholic hepatitis (STOPAH) trial.

Professor Thursz is a former secretary of the British Association for Study of the Liver (BASL) and is currently Secretary-General of the European Association for Study of the Liver.

Dr Craig Tipple
Dr Craig Tipple is a clinical research fellow in Genitourinary and HIV medicine at Imperial College London. He is currently investigation treatment responses in patients with early syphilis being treated with standard antibiotic therapies. He is also interested in antibiotic resistance in T. pallidum (the cause of syphilis) and published the first UK data demonstrating high level macrolide resistance.

Dr. John Tregonning
Dr John Tregoning moved to Imperial College as a non-clinical lecturer in 2010. His research work focusses on pre-clinical vaccine development, with a focus on respiratory infections and mechanisms to vaccinate infants. Prior to his current position, he developed a tetanus vaccine expressed in GM tobacco plants.

Professor Joanne Webster

As a Royal Society URF (2000-2010), Joanne moved from Oxford University to Imperial College in 2003 to take up a Readership in Parasitic Diseases and the Directorship of Monitoring, Evaluation and Research for the newly founded Schistosomiasis Control Initiative (SCI; see schisto.org). In 2006 she was promoted to a personal Chair in Parasitic Disease Epidemiology.

Dr Peter White

Dr Peter White is Head of the Modelling & Economics Unit at the Health Protection Agency (HPA). He has a part-time position in the MRC Centre for Outbreak Analysis & Modelling, which is part of the Department of Infectious Disease Epidemiology at Imperial College London.

The HPA conducts infectious disease surveillance, provides specialist and reference microbiology and microbial epidemiology, coordinates the investigation and cause of national and uncommon outbreaks, advises the UK government on the risks posed by various infections, and responds to international health alerts. The Modelling & Economics Unit has a broad range of interests in infectious diseases. Dr White's personal research interests include mathematical modelling of the epidemiology of sexually transmitted infections (including HIV), TB, and influenza, and the impact of health-care interventions.

Dr White was a member of the UK government's Scientific Advisory Group for Emergencies (SAGE) for the influenza A/H1N1 2009 pandemic, which has recently been stood down. He is a member of the UK government's Scientific Pandemic Influenza advisory committee SPI-M modelling subcommittee, as well as the WHO Informal Network for Mathematical Modelling of H1N1 and ECDC H1N1 Modelling Working Group.

Dr White studied biochemistry at Cambridge University, then went to Oxford University for his MSc, before studying for his PhD at Stirling University. He joined the Department of Infectious Disease Epidemiology at Imperial College London in 2002. From 2005 – 2007 he was Coordinator of the UNAIDS Reference Group for Estimates, Modelling & Projections at Imperial College London. He took up his position at the Health Protection Agency in April 2009.
