ORANGUTAN CONSERVANCY

ORANGUTAN VETERINARY ADVISORY GROUP WORKSHOP 2014 REPORT

Photos provided by Winny Pramesyswari, Arga, Ayu Budi Handayani and Raffaella Commitante
Orangutan Conservancy Veterinary Workshop logo courtesy Amy Burgess

Prepared with participants of the Orangutan Conservancy 2014 Orangutan Veterinary Advisory Group (OVAG) Workshop, Jogjakarta, Indonesia June 21-26, 2014
R. Commitante, S. Unwin (Editors). Orangutan Conservancy (OC). 2014.
Orangutan Conservancy 2014 Orangutan Veterinary Advisory Group Workshop Report.

Additional copies of the *Orangutan Conservancy 2014 Veterinary Advisory Group Workshop Report* and previous years' reports can be ordered through the Orangutan Conservancy, P.O. Box 513, 5001Wilshire Blvd., #112, Los Angeles, California, 90036, USA., or go to our website at www.orangutan.com

Orangutan Conservancy 2014 Orangutan Veterinary Advisory Group (OVAG) Workshop

June 21-26, 2014

Universitas Gadjah Mada, Facultas Kedoktoran Hewan, Jogjakarta, Indonesia

Participating Organizations (26):

Orangutan Conservancy, United States
Chester Zoo / NEZS, United Kingdom
Liverpool School of Tropical Medicine, United Kingdom
Faculty of Veterinary Medicine, Gadjah Mada University, Jogjakarta, Indonesia
Sumatran Orangutan Conservation Programme (SOCP), Medan, Indonesia
Borneo Orangutan Survival Foundation, Nyaru Menteng, Palangkaraya, Central Kalimantan, Indonesia
Borneo Orangutan Survival Foundation, Samboja Lestari, Samboja, East Kalimantan, Indonesia
Borneo Orangutan Survival Foundation, HQ, Bogor, Indonesia
PT Rhoi, BOSF, Indonesia
Orangutan Foundation United Kingdon (OFUK) Central Kalimantan, Indonesia
International Animal Rescue, Indonesia
ABAXIS Europe, Germany
Jogja Wildlife Center, Jogjakarta, Indonesia
Frankfurt Zoological Society/Jambi SOCP Orangutan Release Site, Sumatra, Indonesia
Sepilok Orangutan Sanctuary, Sabak, East Malaysia
Center for Orangutan Protection (COP), Indonesia
Vesswic, Sumatera, Indonesia
Orangutan Information Center, Aceh, Sumatera, Indonesia
Tasikoki Wildlife Rescue Center (PPST), North Sulawesi, Indonesia
Aspinal Foundation – Indonesia Program
Fort Wayne Children's Zoo
Fort Worth Zoo
Animal Sanctuary Trust Indonesia
Vier Pfoten, Austria
Semarang Zoo
Gunung Merapi National Park Bureau

Supporting Organizations:

Orangutan Conservancy, United States
Chester Zoo/ NEZS, United Kingdom
The Orangutan Project (TOP) Australia
ABAXIS, Germany
Fort Wayne Children's Zoo

Hosted By:

Faculty of Veterinary Medicine, Gadjah Mada University, Jogjakarta, Indonesia

ORANGUTAN CONSERVANCY

ORANGUTAN VETERINARY ADVISORY GROUP WORKSHOP

2014 REPORT

TABLE OF CONTENTS

ORANGUTAN CONSERVANCY

ORANGUTAN VETERINARY ADVISORY GROUP WORKSHOP

2014 REPORT

Section 1

Executive Summary

The Orangutan Conservancy/Orangutan Veterinary Advisory Group **(OC/OVAG)** held its 6th workshop in its new permanent location, Jogjakarta, Indonesia. This new home allows for the long term collaboration between Universitas Gadjah Mada (UGM) and its Facultas Kedoktoran Hewan (Department of Veterinary Medicine), Chester Zoo, Liverpool University (England) and Orangutan Conservancy (USA). This new collaboration will enable OC/OVAG and UGM to partner with universities and zoos internationally to share and increase knowledge, the exchange of vet staffs and further educational experiences on a much wider level. This was something covered in last year's 2013 executive summary and it is coming to fruition. As has been stated in many of the previous reports, veterinarians and staff that have joined our group over the years, collectively care for the largest captive population of orangutans in the world. They do not lack skill or commitment but they do face ongoing difficult challenges such as being short of medicine, equipment, money, space, support staff, current resources and time.

The Orangutan Conservancy is committed to continuing to stage the Orangutan Conservancy /Orangutan Veterinary Advisory Group (OC/OVAG) Workshops. The 2014 annual workshop was held in Jogjakarta, Indonesia took place June 21 – 26. The workshops, inaugurated in 2009 in Borneo, gather together veterinary teams and staff working in both Indonesia and Malaysia, giving them a rare opportunity to share and hone skills, discuss issues and ideas, and renew friendships that could someday mean the difference between life and death for endangered apes in Southeast Asia.

As the only great apes found in Asia, orangutans continue to remain in severe crisis. Their natural range is limited to the islands of Borneo and Sumatra, with these areas continuing to decrease in size and quality. With loss of forest due to oil palm conversion, coal production, gold extraction and of course logging (just to list a few), more than 80 percent of the orangutans' habitat has been destroyed over the last 20 years, and estimates show that approximately only **40,000** orangutans are thought to exist. The continuing decline of orangutan numbers in the wild may signal the potential loss of a valuable species.

Now, more than ever, it is imperative that we work together as an international community to prevent the only great ape found outside of Africa from disappearing. By continuing to broaden our collaborations both in situ and beyond, OC/OVAG members and affiliates hope to be able to contribute to orangutan species longevity and well-being.

The 2014 OC /OVAG Workshop continued to focus on the issues relating to orangutan releases (primarily health issues regarding pre and post released individuals), with particular interest on wild animal welfare and ethics issues pertaining to both released, soon to be released and un-releasable orangutans. A special DNA workshop was also held by UGM faculty, allowing for OC/OVAG members to better understand the extraction process. We also continued our ongoing work with parasites and other illnesses and diseases. During the 2014 OC/OVAG Veterinary Workshop, veterinarians continued to present case studies (this year focusing on welfare issues), working in groups in break outs sessions (again focused on welfare issues), attended sessions led by UGM faculty and OC/OVAG members and facilitators.

Before our 2014 workshop officially began, an all-day Orangutan Symposium organized by UGM Veterinary faculty staff and students was held. The symposium featured the orangutan work being done by alumni of UGM (all are OC/OVAG members). This was truly exciting because it allowed for faculty to see how far their students have gone and for new students to see how far they can go!!! The symposium was graciously opened by Dr. drh. Indarjulianto Soedarmanto, Vice Dean of the Veterinary faculty at UGM.

New this year was the addition of a scientific writing component. Publishing the case studies that OC/OVAG vets have handled over the years is important in the sharing of valuable information on a wider scale. We hope to work on writing skills throughout this coming year toward the goal of OC/OVAG vets publishing in a variety of journals.

The 2014 OC /OVAG Workshop was sponsored by the Orangutan Conservancy (USA), Chester Zoo/ NEZS (United Kingdom), The Orangutan Project (TOP – Australia), Fort Worth Children's Zoo(USA) , Abaxis (Europe), and of course, Universitas Gadjah Mada (Indonesia).

The 2014 OC/OVAG Workshop, included 44 veterinarians, and others working closely with orangutans and other wildlife participated. Participants varied from orangutan rescue and rehabilitation vets, to zoo vets, national park employees, Department of Forestry employee vets, orangutan researchers, University faculty and others from Indonesia, Malaysia, the United States, the United Kingdom, Indonesia, Malaysia, and Germany.

Because OC/OVAG veterinary staff are at the frontline of addressing the welfare and conservation needs of ill or injured orangutans and other wildlife, enhancing their knowledge and skills through the 2015 OVAG CPD (Continuing Professional Development) opportunities will help them to ensure the best outcome for each individual animal. The program will provide expert clinical technique demonstration, written materials in primate medicine and wildlife disease surveillance and analysis. Primate medicine experts, university representatives, part of the finance and the venues are already organized. The goal will be measured by expert evaluation of participants' clinical techniques onsite and testing of knowledge before and after training using ROI (Return On Investment) protocols. An evaluation report will be completed by the end of 2015, to include data from 2011-2015. This project will help form the basis of a university certified post graduate course in conservation medicine at Gadjah Mada University in Indonesia, specifically, and conservation medicine in general, based on OC/OVAG and Chester Zoo materials and involving OC/OVAG animal health participants in collaboration with relevant zoo and university veterinary, animal husbandry and conservation science colleagues. This goal builds upon OC/OVAG delegates who are already engaged in management roles in various conservation organizations and occasional tutoring or lecturing at veterinary colleges and courses in universities. Presentation of potential conservation medicine programs or input to relevant universities is expected by the end of 2015, with memorandums of understanding with specific universities and course development by mid-2016.

OC/OVAG veterinarians and scientists are a major force in shaping conservation medicine work across Indonesia and Malaysia. OC/OVAG will provide expert training on relevant disease investigation techniques and an appreciation of conservation management on a global scale which will result in an increase in the number of wild orangutans able to be SUITABLY released through immediate and appropriate medical and rehabilitation care. Impact will be measured by the quality of healthcare assessed within the centers the candidates are employed via annual assessments and 2-3 yearly on-site inspections.

Though the 2014 OC/OVAG Workshop (as with all the previous workshops) was designed and facilitated by Dr. Steve Unwin of the Chester Zoo, in partnership with Dr. Raffaella Commitante of Orangutan Conservancy, OC/OVAG's success is reliant on its participants. The 2015 OVAG workshop will be run by OVAG an organizing committee whose members have formerly been delegates only. The 2015 workshop will include a larger component of conservation management, and incorporate project management and decision makers as participants. Support will be provided to the organizing committee by the current facilitators. Success will be measured by delegate and committee feedback, and evaluated using the same ROI measures used in previous years, in a report published by October 2015.

Organizing Committee for 2015:


drh. Ricko Jaya


drh. Yenny S. Jaya


drh. CitraKasih Nente


drh. Fransiska Sulistyo

This new team will work together throughout the year, keeping up contact with the other OC/OVAG members, to lead the 2015 workshop (which will be held again in Jogjakarta, Indonesia with UGM in the first week of June 2015).

The OC/OVAG Workshops will continue to help build a community of veterinary healthcare experts that stands strongest when it stands together. **Together we can do anything!**

Raffaella Commitante, B.F.A., M.A., PhD
Steve Unwin, B.Sc., B.V.Sc., M.R.C.V.S

The OC/OVAG Committee:


Steve Unwin


Anta Rosetyadewi


Fransiska Sulistyo


Sumita Sugnaseelan


Raffaella Commitante

ORANGUTAN CONSERVANCY

ORANGUTAN VETERINARY ADVISORY GROUP WORKSHOP

2014 REPORT

Feedback From Delegates:

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
New Knowledge: Did I gain useful knowledge?	26	4	0	0	0
New Ideas: Did I gain new ideas that will improve the way I do my job?	15	15	0	0	0
Applying the learning: Will I use the information?	17	13	0	0	0
Applying the learning: Have I been shown how to impart this knowledge to colleagues and managers?	7	22	1	0	0
Effect on results: Do I think the ideas and information provided at this workshop will improve the way I do my job?	15	15	0	0	0
Effect on results: Do I think the ideas and information provided at this workshop will improve the health of the animals under my care?	13	17	0	0	0

Best things comments	Responses from organisers
Information sharing x6	
Brainstorming about the issues x2	
More perspective in solving cases. This is awesome	
New network, new knowledge (thanks for the PCR)	
Please continue holding the meeting every year	We will
Everything is fine and very good workshop	
Teamwork. Risk analysis. Case studies	
Many new topics covered and redressed with a good span of viewpoints x2	
The large group discussions are excellent. Steve and Raffaella's group management style are outstanding. I like the way Steve introduces a session and sets clear expectations	
It feels like a family gathering - a family helping each other x2	
Best experts in OU I have ever seen	
Keep on good work! Really love this workshop!!	
Actually, this year is more memorable than before. Somehow it feels like family. I feel more comfortable to speak. That's fancy I think	
Empowering Indonesian vets and supporting them to grow. Practical reviews and discussing difficult topics	
1. Group work. 2. Starting topic early in the week then follow-up/ extra material later in the week. 3. Not doing the same things we have covered before - taking it further.	
It is good to know we are not alone in this field. We might not agree to all things or how we run things but we do always have room for discussion :-)	
Good workshop to learn about how to deal with an Outbreak situation at the centre.	
Case study, scientific writing, PCR, parasites x2	
Excellent collaboration. Great passion and motivation	

Things to improve comments	
Topic suggestion: Metabolic diseases.	Noted
More practical sessions x6	Absolutely. Owing to the set up this year, we were restricted to the number of practical sessions we could do, but we will do more of them in 2015.
Specific techniques for diagnosing diseases	Noted
Too much information. More time for discussion for better understanding x2 (depending on audience participation!)	
More streaming to address the different levels of experience x3	This takes a lot of facilitation, but the new structure for 2015 will allow this to happen
Encourage travel to each other's sanctuaries. I was surprised how few participants had been to other centres.	Most of the meetings have been held at orangutan centres. We want to carry this on in future as it does help with comparing techniques. This also requires management involvement (see below)
Continue to use OVAG for policy statements that the participants can take back to their administrators	
Less sitting more workshop movement	
Force the audience to do the job (scientific writing, epidemiology material) is best way. Next year invite vets from other Indonesian zoos to come, because the zoos aren't very good.	We do invite vets from many Indonesian zoos each year. We would welcome suggestions on how to encourage them more.
Emergency Aid session x2	Noted
Public speaking session	Noted
Would like to see standard forms or protocols that could be used by all centres that are based on new scientific information.	As we have now delivered basic material, we will be looking at developing this sort of database. This will also need management involvement, to help look at IT solutions, as there are a number available, not all expensive.
Session: Managing interaction between human and macaques in the workplace.	Noted
Really like the group work but may be good for people to work with vets from other centres so we get a range of experience and knowledge in each group (rather than groups based on where people work)	Excellent idea. The reasoning behind putting people together form the same organisations was to make each session bespoke for their own situation, but definitely agree that it is worth moving people round through the week.
Bahasa translation on slides	Definitely - we have done this in the past and just didn't get to it this year. Sorry
Suggest conference with specific theme each time	This is a good idea - perhaps for the more advanced, to concentrate on, or maybe a workshop within a workshop.

The serious class session better to have in the morning when we are still fresh, and not right after lunch time - that's a sleeping time.	Indeed
I hope more delegates will share case studies in future.	As do we
Even though will not be easy, please invite the management, and any decision makers, and arrange the agenda accordingly	Set for 2015. Note we last did this in 2011 with some success. We hope the management will form their own group as well. OVAG will need to provide pure animal health support as well as management support into the future.

How will I use the information I have gained comments	
Implementing the information and new knowledge in every day work for the sake of the orangutan x2	
Inform to my manager, Improve the husbandry etc for the animals under my care x7	
I am going to assess what I have done for my animals, evaluate it and make it better, using all information that I got at this OVAG.	
Transfer the information to others x8	
I now have a much better understanding of issues and methods used by orangutan vets across centres.	
I have a much clearer vision of how North American Zoos and orangutan SSP can support the efforts of in situ conservation and rehabilitation	
Collaborate with other institutions to share the knowledge	
Will try to apply disease risk analysis in the centre	

ORANGUTAN CONSERVANCY

ORANGUTAN VETERINARY ADVISORY GROUP WORKSHOP

2014 REPORT

June 21-26 , 2014

Workshop Budget

ITEM	**UNIT COST (US Dollar)**	**TOTAL (US Dollar)**
Airfare (International) (including all taxes and visa fees)	333.60 1,503.00 1,433.71 1,433.71 1,433.71	$6,137.73
Airfare (Domestic) (including all taxes and fees)	$ various amounts depending on starting city	$ 3,514.72
Accommodation – Jogjakarta Hotel	$ 40 x 25 x 7 nights	$ 7,000
Ground Transportation	$ various	$ 300
Expenses	$ various	$2,700
TOTAL		**$ 19.652,45**

ORANGUTAN CONSERVANCY

ORANGUTAN VETERINARY ADVISORY GROUP WORKSHOP

2014 REPORT

Section 2

Letter of Invitation:

May 23, 2014

RE: **Orangutan Conservancy / Orangutan Veterinary Advisory Group Workshop 2014**

Orangutan Conservancy / Lokakarya Kommunitas Dokter Herwan Orangutan 2014

To Whom It May Concern:

This letter shall serve as an invitation to attend the Orangutan Conservancy/Orangutan Veterinary Advisory Group (OC/OVAG) Workshop 2014 sponsored by the Orangutan Conservancy (OC), a United States not-for-profit organization, with cooperation from Chester Zoo (a zoological park in The United Kingdom) and in collaboration with the Faculty of Veterinary Medicine of Universitas Gadjah Mada (UGM).

The workshop will be held at Faculty of Veterinary Medicine, UGM and the LPP Convention Hotel, Jl. Demangan Baru 8, Yogyakarta.

Contact information for OC/OVAG: Raffaella Commitante (rcommitante@gmail.com). Contact information for Chester Zoo: Steve Unwin (s.unwin@chesterzoo.org). Contact information for OC/OVAG Jogjakarta: Fransiska Sulistyo (sulistyo.fransiska@gmail.com). Contact information for UGM, Vice Dean: DR. Indar (indarjuliantos@yahoo.com).

This, our sixth workshop, will continue to bring together experts working closely with orangutans in Indonesia and Malaysia and in the international community to allow for the sharing of information and expertise, and the creation of long lasting friendships and contacts. It will be held:

June 21 – June 26, 2014
(arrival on the 20th and departure on the 27th)

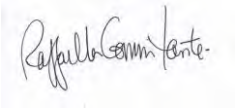
OC/OVAG and UGM would like to extend an invitation to the person/s listed below to attend this international workshop.

Steve Unwin and Claire Parry

We thank you for your participation in allowing your staff to attend.

Accommodation information will be sent directly to participants.

Respectfully,



Raffaella Commitante, PhD
Director
Orangutan Conservancy/Orangutan Veterinary Advisory Group

ORANGUTAN CONSERVANCY

ORANGUTAN VETERINARY ADVISORY GROUP WORKSHOP

2014 REPORT

AGENDA

Friday June 20
Delegate Arrival

Saturday June 21 - UGM
Orangutan Symposium
"Orangutan Rescue and Conservation Through Role of Veterinary Medicine"
Anniversary of the Faculty of Veterinary Medicine - UGM

8:00	Opening Ceremony for the OC/OVAG and UGM Joint Symposium on the Role of the Veterinarian in Orangutan Conservation
9:00	First Group of Speakers: Raffaella Commitante (OC/OVAG), Fransiska Sulistyo (BOSF), Dr. drh. Wishnu (UGM Faculty). Moderator: Dr. drh. Hery Wijayanto
11:00	Second Group of Speakers – Case studies from UGM alumni vets working in orangutan rehabilitation. drh. Winda (Independent Vet), drh. Arga (BOSF) , drh. Ikshan (SOCP) , drh. Ayu (IAR), drh. Agnes (BOSF). Moderator: Dr. drh. Indarjuliyanto (Vice Dean)
13:00-14:00	Lunch/Casual discussions
14:00	Third Group of Speakers: drh. Citrakasih Nente (PV), drh. Fransiska Sulistyo (BOSF), Steve Unwin (Chester Zoo/OVAG). Moderator: Dr. drh. Esti
3:30	Back to Hotel - Most
4:00	OVAG Steering Committee meeting with Vice Dean Indarjuliyanto (Raffaella, Steve, Citra, Siska, Yenny and Ricko)
7:30	Dinner

Sunday June 22 – At Hotel

8:00 Welcome to participants by Steve Unwin, Raffaella Commitante

9:00 Introduction, Review of Materials and Ice Breaker – working together – ALL

10:30 Coffee Break/Casual Discussions

11:00 Evaluation session and Group Teams – Steve Unwin

11:30 Husbandry for Unreleaseable Orangutans – concerns of Delegates – Claire Perry (Chester Zoo) and Yenny Jaya (SOCP)

13:00 Lunch/casual discussions

14:00 Disease Surveillance Protocols, Disease Risk Ana;ysis, Techniques, Diagnostic Options – Steve Unwin (Chester Zoo) and Siska Sulistyo (BOSF)

16:00 Coffee Break/Casual Discussions

16:30 The ABC's of Emergency Medicine (Breakout Scenarios for Teams) – Steve Unwin

19:30 Dinner

Monday June 23 – At UGM

08:00 Scientific Writing – Peer Review Process – Presenting your work - Steve, Raffaella

10:30 Coffee Break/Casual Discussions

11:00 Case Studies - All

13:00 Lunch/Casual Discussions

14:00 Introduction to Epidemiology Part 1 – Steve Unwin

16:00 Coffee Break/Casual Discussions

16:35 Group Discussion Focus: Post Graduate Opportunities, Writing Skills, Further Development of OC/OVAG Materials - All

19:30 Dinner

Tuesday, June 24 – At UGM

8:00 Parasite Lab – Wendi Bailey

10:30 Break/casual discussions

11:00 PCR and DNA extraction and Analysis – UGM staff

13:00 Lunch/casual discussions

14:00 Free time spent exploring Jogjakarta

19:00 Dinner - out

Wednesday, June 25 – at Hotel

8:00 OC/OVAG Resource Center Development - Steve

9:00 Husbandry and Enrichment – Claire and Yenny

10:30 Break/casual discussions

11:00 Group Scenarios – All

12:00 Case Studies - All

13:00 Lunch/casual discussions

14:00 Wild Animal Welfare – Raffaella

16:00 Review of parasitology Information – Wendi Bailey

17:00 Great Ape Reintroduction Workshop Proceedings – Steve Unwin

19:00 Dinner

Thursday, June 26 – at Hotel

8:00 Ethics Group Scenarios - All

10:00 Euthanasia Discussion - All

10:30 Break/casual discussions

11:00 Publishing Review

12:00 Group Review of Scenarios - All

13:00 Lunch/casual discussions / Group Photo

14:00 Review of POST IT WALL Questions / Quiz / Evaluation

15:00 Microscope Calibration Session – Wendi Bailey

15:30 Coffee break/Casual Discussions

16:00 Review of Air Sacculitis, Other Orangutan Illnesses – Steve unwin

18:30 Wrap Up/2015 Workshop – Steve Unwin, Raffaella Commitante

19:00 Closing Dinner

ORANGUTAN CONSERVANCY

ORANGUTAN VETERINARY ADVISORY GROUP WORKSHOP

2014 REPORT

Delegate Contact list

	Name	Email	ORG
1	drh. Agnes	agnes@orangutan.or.id	Samboja/Borneo Orangutan Survival Foundation
2	Dr. Aldrianto Priadjati	aldrianto2005@yahoo.com	BOSF - PT Rhoi
3	drh. Andita Septiandini	asti.vet@gmail.com	Animal Sanctuary Trust Indonesia
4	drh. Arga Sawung Kusuma	arga@orangutan.or.id	Nyaru Menteng/BOSF
5	drh. Ayu Budi Handayani	handayaniayubudi@gmail.com	International Animal rescue (IAR)
6	drh. Bambang Setyawan	senyumlangit@yahoo.com	Orangutan Foundation - United Kingdom (OF-UK)
7	Barbel Koehler	BaerbelKoehler@abaxis.de	ABAXIS, Germany
8	Ben Buckley (researcher)		Nyaru Menteng/BOSF
9	Christine Nelson	christinenelson@uwalumni.com	IAR
10	drh. CitraKasih Nente	citrakasih@gmail.com	Vier Pfoten (Austria)/Samboja
11	Claire Parry (zoo keeper)	c.parry@chesterzoo.org	Chester Zoo, United Kingdom
12	Dana Meida		Universitas Gadjah Mada (UGM)
13	Deden Nur Sidik	sidik.deden@yahoo.co.id	Universitas Gadjah Mada (UGM)
14	Dhani Suryawan		Gunung Merapi National Park, Jogjakarta
15	drh Dian Tresno Wikati	budhe_ppsj@yahoo.com	Tasikoki, Sulawesi
16	drh. Dwi Wahyuni	dwiwahyuniskh@gmail.com	Jogja Orangutan Centre
17	drh. Fransiska Sulistyo	sulistyo.fransiska@gmail.com	BOSF Bogor
18	drh. Hendrik Tri Setiawan	drh.hendrik@gmail.com	Semarang Zoo, Indonesia
19	Dr. drh Hery Wijayanto	herykh@ugm.ac.id	Universitas Gadjah Mada (UGM)
20	drh. Ikhsani Surya Hidayat	xsn.day@yahoo.com	Sumatra Orangutan Conservation Program (SOCP)
21	drh. Imam Arifin	imam@cop.or.id	Center for Orangutan Protection (COP)
22	Dr. drh Indarjulianto Soedarmanto	indarjuliantos@yahoo.com	UGM - Vice Dean Veterinary Faculty

23	Joe Smith (zoo veterinarian)	vet@kidszoo.org	Fort Wayne Children's Zoo, Indiana USA
24	drh. Laura Benedict	lorzbenedict@hotmail.com	Sepilok Rehabilitation Center, Malaysia
25	Nancy Lung (zoo veterinarian)	NLung@fortworthzoo.org	Fort Worth Zoo, Texas USA
26	Dr. Raffaella Commitante	rcommitante@gmail.com	Orangutan Conservancy, USA
27	drh Ricko Jaya	rickojaya@gmail.com	Orangutan Information Center, ACEH
28	Riefky Pradipta		UGM
29	Rosalie Dench (veterinarian)	rosalie.dench@gmail.com>	Nyaru Menteng/BOSF
30	drh Rosa Rika W	sha_12024@yahoo.co.id	BKSDA/ACEH
31	Sabrina Wahyu Warhani		UGM
32	Setyo Yudhanto		UGM
33	Steve Unwin (Lead Veterinarian)	s.unwin@chesterzoo.org	Chester Zoo, United Kingdom
34	drh. Tiara Debby Carinda	debbycarinda@yahoo.com	COP
35	Dr. drh Tri Wahyu Pangestiningsih	wahyuwijayanto@yahoo.com	UGM
36	Wahid Adi Wibowo		Gunung Merapi National Park
37	Dr. Wendi Bailey	jwbailey@liverpool.ac.uk	Liverpool School of Tropical Medicine, UK
38	drh. Winda Titi Pratiwi	wynd4_tp@yahoo.com	Independent Vet, Indonesia
39	drh Winny Pramesywari	win.pramesywari@gmail.com	The Aspinall Foundation -Indonesia Program
40	drh. Yenny Saraswati Jaya	yenny.jaya@gmail.com	SOCP
41	drh. Yumni Khairina Ghassani	yumni.khairina.ghassani@gmail.com	Frankfurt Zoological Society/Jambi

ORANGUTAN CONSERVANCY

ORANGUTAN VETERINARY ADVISORY GROUP WORKSHOP

2014 REPORT

Section 3

Proceedings of the OC/OVAG 2014 WORKSHOP – Are available electronically with all presentations and teaching materials on request. Complete proceedings are always given to each delegate including all past workshop reports at the end of the workshop

OPENING DAY

Day 1 (June 21, 2014)

The Orangutan Symposium to feature "Orangutan Rescue and Conservation Through Role of Veterinary Medicine" as part of the Anniversary of the Faculty of Veterinary Medicine celebrations - organized and sponsored by Universitas Gadjah Mada and its Faculty of Veterinary Medicine (UGM). Several alumni of UGM (all members of OC/OVAG) presented facets of their work. The symposium was facilitated by the Vice Dean Dr. drh Indarjulianto Soedarmanto and moderated by OC/OVAG members and UGM faculty, Dr. drh Hery Wijayanto and Dr. drh Tri Wahyu Pangestiningsih. The symposium was officially opened by a traditional dancer.

Day 2 (June 22, 2014)

Welcome speech by Steve Unwin (in Bahasa Indonesia) reviewing what will be covered in this year's workshop.

Announcement to group to turn in case studies and brief communications before presenting - Citra

Review of pre-printed OVAG workshop materials:

1. Agenda
2. RSPO Hand out
3. Epidemiology PowerPoint
4. Translocation Disease Risk Analysis
5. Two validated assessments for pain in dogs and cats (create a similar assessments for orang-utans)

Adoption of a Post it board: for questions and or concerns or statements which were reviewed and discussed by all at end of the workshop.

Ice breaker activity: the long straw – working together exercise. Participants broke up into several groups with each group given a long, light weight tube. The exercise involved the group working together to lower and raise the tubing while attempting to keep the tubing level.

Group Introductions – Everyone introduced themselves (particularly important as we add new members) and they each responded to the question: What do you hope to get from this group?

Participants were also asked to think about one word that they felt sums up their experience with OC/OVAG. Responses were filmed in both Bahasa and English for production of the yearly short film edited and produced by Steve Unwin.

Review: Within the OC/OVAG Workshops:

All ideas are valid

Discussions are recorded visibly

Everyone participates

Participants listen to each other

Participants treat each other with respect

Time frames are observed

At the completion of this year's workshop, participants will gain an understanding of:

Husbandry and welfare aspects of animals that cannot be released

Colleague's clinical and practical issues and hopefully ways to assist them

Through our OC/OVAG meetings we hope and expect to:

Increase links between OC/OVAG and universities. Be as inclusive as possible to help all to improve the health, wellbeing and conservation of wildlife.

Review of videos from 2012 and 2013 produced and edited by Steve Unwin.

Administration of review quiz 1 – Steve (see appendix I)

Husbandry issues: **Sumatra and Borneo orangutans at Chester Zoo - Claire**

Housed at Chester Zoo are: Puluh – flanged male, Subis – female (has had 4 offspring), Emma – Subis' sister (there was some trouble regarding her offspring which was dealt with by mixing experienced Bornean mothers with inexperienced Sumatran mothers), Indah – 7 year old, Kirana – 6 years old, Tripa (male – mother was Emma), and Tuti (female - mother was Subis). Babies were born in 2012.

Questions posed: How is this social group's working achieved?

Answer: By providing the right environment which includes suitable space which provides adequate height and width for individuals. Ensuring there is opportunity to use all of the areas within the enclosure. Keep animals in suitable numbers and species specific social groupings. Providing opportunity to perform full repertoire of natural behaviors. Include a complex environment.

Keeping plants inside and outside of exhibit area is a real challenge – plants should be resilient

Inside plants do not fare well at all as they are manipulated by the orangutans.

The tunnelling features inside the exhibit double as transport cages as they can be dropped out of the main tunnels and can be moved. Some are crush tunnels for medical procedures.

Translocation – Utara grew up at Chester and was translocated to Sweden at age 9 – micro-chipping is only done for translocations. All necessary health checks are performed while an orangutan is under anaesthetic before shipping. Keepers accompany orangutans and stay to minimize stress (as having a familiar person is comforting and stress reducing).

Chester Zoo has a completely hands off policy.

Feeding strategy:

7:30-14:00 1st and 2nd feeding mix of seasonal food and veggies

13:00-15:00 Midday feed

15:00-17:00 Late pm feed mixes, grain, nuts, raisins, primate pellet

Food is fed out in various ways and at height whenever possible and novel foods are sometimes added

Enrichment: focus on environment as a whole

Constant: plants, telegraph poles (these give orangutans a really large viewing and moving space), strapping, and wood bark.

Periodic: windows, interaction with other species (for mixed exhibits).

Novel: browse, fire hoses), ice blocks, hessian sacks

Orangutans should have as natural a life as possible in captivity.

Husbandry Access:

Chester does not have a formalized training program. Is training of animals needed? No – Chester Zoo wants orangutans to behave as natural as possible. Keepers and vets do develop a relationship with the orang-utans in their care, but they feel it may intrude on an orangutan's life if they do too much. The focus is on having a close relationship with animals without too much interference. Chester Zoo aims to provide everything that orangutans need to live a happy and productive life.

Improvements in Care **Yenny – SOCP**

Two new programs are in the works for SOCP:

1. Genetics of orangutans on Sumatra: preparing phylogenetic trees to determine if there are sub species similar to what has occurred in Borneo. Current Sumatran orangutan populations are separated by Lake Toba (due to Toba eruptions) making this possible.

2. Orangutan Haven for unreleaseable orangutans: The number of orangutans in the SOCP Center has seen no indication of decline. There was a slight decrease in 2007 but now illegal logging has started again. This not only has increased the number of orang-utans needing to be released but also those that can never be released for a variety of reasons.

SOCP currently has several orangutans that can never be released. Leuser is an older blind male (he was shot by air rifle pellets multiple times), Tila, a female with human Hep B virus, and Deknong, a chronically arthritic male who may have contracted leprosy. Leuser is kept with another blind orang-utan female, Gober, who has cataracts. They are housed together as 'enrichment' for each other. They unexpectedly mated and Gober gave birth to fraternal twins! One infant is male and the other is female.

In 2012, Gober underwent cataract surgery performed by an ophthalmologist from East Kalimantan. The lenses replaced were human. Gober can now see short distances only (about 5 meters), she cannot see long distances. There is a possibility she can be released to the Jantho Release site.

Tests for Deknong: LGL samples. Femoral: test revealed leprosy.

Tests for Tila: Human hepatitis B, she is overweight and not very active.

There is also a zoo reared orangutan at Medan Zoo that potentially will be released.

Orangutan Haven will be built on land which has already been purchased and is about 15 minutes from the SOCP quarantine. Building concept and licencing is still in process. It will encompass 42 acres which includes a 20 acre island for the orangutans. The rest of the area will be for education. There will also be 4 man-made islands surrounded by water moats. Each orangutan will be on one island. There will be a track and viewing platform for visitors. Sleeping cages will be built on each island.

The objective of Orangutan Haven is to provide a high quality long term environment for unreleasable orangutans. Visitors will be allowed to visit so that the public can become informed about wild orangutans and other species in their natural habitat. Visitors can be educated about species and habitat conservation, the environment and sustainable development which will improve awareness on the water catchment area for Medan.

Group Discussion:

Winny: In Jambi there are two orang-utans which have tested positive for leprosy.

Arga: Nyaru Menteng also has orangutans which have tested positive for human hep B. Has Tila been rechecked? Yes, every year she is tested and results are always positive for HBsAg, anti-Hbs, and anti-Hbc .

Arga: NM has treated an orangutan with a vitamin routine was tested again and HBsAg read negative. Now they will test again to double check HBV DNA. Eijkman Lab has information about Hep B testing.

Citra: There is an alternative to obtain hep B vitamins in humans. There are human staffs who take vitamins which may decrease HBsAg antibody but it can finally emerge.

Yenny: Tila has been tested several times and in different ways but there was never any change.

Citra: Leprosy drugs can be obtained along with TB medication. Contact the health centers for treatment.

Yenny: There are health centers that take patients but will not give drugs.

Rosalie: M. leprae is usually found from culture and can be seen in a slide.

Yenny: Yes, culture from LGL. Femoral. At the moment the orangutan has received treatment for 6 months.

Arga to Claire: in NM there was a case of a female (Suja) who gave birth to a child, but did not take care of her. She only fed the infant 2-3 times a day. The vets took the baby, weighed it, gave it formula milk and returned it to the mother. Suja did not change. This feeding was kept up for 3 weeks. Infant's condition worsened so it was taken away from the mother. It has been a month and the infant has recovered. Could it be returned to the mother?

Claire: From Chester Zoo perspective, very difficult to hand rear infant orangutan. Reintroducing baby to mother at Chester has never been done. It is almost impossible.

Nancy: Agreed with Claire. However, in US there are protocols for when a female is pregnant: they begin training her to give up baby to keepers if she is not caring for it. They also train to present baby to be fed with milk by staff, so infant can stay with mother.

Steve: This can be further discussed in the ethics portion of the workshop, and, there were be follow up sessions from Yenny and Claire.

DISEASE RISK ANALYSIS (DRA) **Steve, Chester Zoo**

1. Big Concepts and Risky principles
   Understanding the basic principles of disease ecology and 'One Health'
   Being able to link the principles with the work veterinarians do each day to help provide them with disease management possibilities
   Utilize the IUCN Manual for Wildlife Disease Risk Analysis/World Organization for Animal Health (OIE) and other resources to improve the clinical work provided by veterinarians
2. Disease Risk Analysis (DRA) back to basics
   Understanding what risk is and the ways risk analysis can help manage disease
   Accurately identifying the main pathogens of concern for orangutan projects
   Produce a basic 'rough' semi quantitative risk assessment
3. Field sampling for great ape pathogens
   Being able to identify the correct sampling methods for main pathogens of concern
   Being able to correctly identify pathogens of concern from test result/morphology/host clinical signs
4. Risk mitigation via disease risk analysis
   Successfully utilizing the tools and materials provided to produce a specified risk analysis process for each orang-utan project, as the basis of a complete preventative health program.

Manual for Wildlife Disease Risk Analysis/OIE –given digitally to all participants as we must integrate the OC/OVAG program with the latest successful measures for wildlife health!

A new article will be published on DRA in November written by Richard M. Jakob-Hoff, Stuart C. MacDiarmid, Caroline Lees, Philip S. Miller, Dominic Travis, and Richard Kock. A meeting about DRA will be held soon and Steve will present at that meeting on DRA.

As the world population increases, we must consider the disease risks that will come along with this increase and the provisions needed.

What is the value of wildlife?
Economic value
- Food and materials
- Recreation and tourism

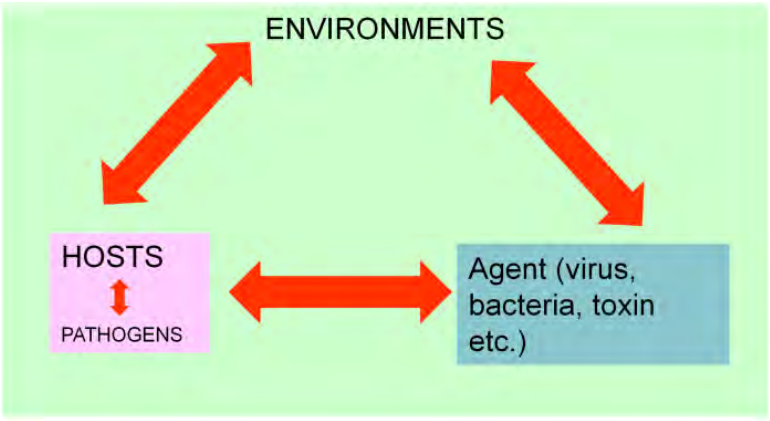
Culture and Aesthetic value
Ecological And Environment Values
- Stable environments
- Ecological services

OIE guidelines only access the risk of disease from wild populations towards humans and domestic animals.

The relative importance of each of these values differs among societies, but all are true for all societies

Economic value can be very high, or higher than agriculture in some countries. Much of the world's human population depends, in part, on wild captured terrestrial animals and fish for dietary protein. The many different populations of many different species of wild animals are required components of stable ecosystems. Thus, one major socioeconomic value of wildlife is its role as participants in ecosystem function and provision of ecosystem services such as clean air and water, fertile soil and ecological materials cycling (carbon, nitrogen, phosphorus etc.) When diseases in wild animals occur in ways that have an important negative impact on wild animal populations, this can in turn have important and negative socioeconomic outcomes for people living in the affected areas.

What is disease ecology?



Ecology is the study of the interactions of organisms with each other and their environments. Disease ecology is just a branch of ecology which studies the interactions among pathogens, the animals they infect, and their shared environment.

Whenever we attempt to manage human and animal diseases, to reduce their socioeconomic or ecological impacts, we do so by trying to manipulate aspects of the ecology of those diseases. Thus, disease ecology is the branch of science that is most important to people responsible for disease management or control. This triangle depicts the three key factors that determine whether or not diseases will occur and what the various effects of a disease occurrence might be. When we consider the ecology of a disease, we consider all of the factors that cause an animal to become diseased or not. These factors include such elements as the life cycle of the pathogen: how and where it lives, how it is transmitted among host species and under what circumstances, whether there are reservoirs of the pathogen in the environment, the susceptibility

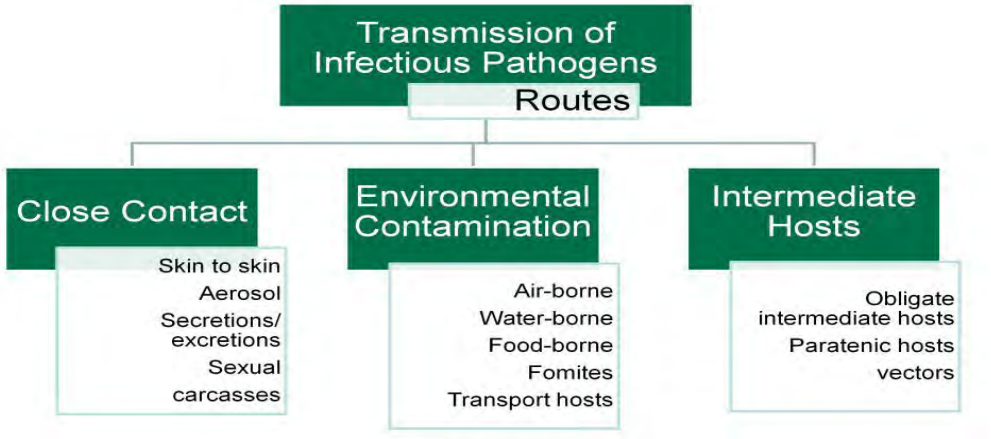
of individual host animals to the pathogen, the effect of the pathogen at various different levels of biological organization such as the individual animal, populations of one animal species, or communities of several different species or whole ecological systems. These ecological factors are particularly important when considering pathogens in wild animals. The ecology of pathogens in wildlife often is more complicated than is the case for pathogens that affect only domestic animals or only people. Any programme to control a pathogen that infects wildlife must be designed with a full knowledge of the ecology of that pathogen and the circumstances under which it will cause disease.

Source of Disease/Transmission/Host

Understanding how pathogens are transmitted among hosts often is essential to programs that seek to control or reduce zoonotic diseases or diseases shared between wild and domestic animals. Pathogen transmission can be very complicated. There are three broad, general routes by which pathogens can be transmitted among hosts:

- close contact
- environmental contamination
- intermediate hosts.

Each of these broad categories includes many different routes of transmission:



For example, transmission of dermatophyte fungi ('ringworm') or of mange mites (e.g. *Sarcoptes*) is commonly, perhaps exclusively, by skin-to-skin contact. On the other hand, bovine tuberculosis can be transmitted by several different routes, such as aerosols, excretion of inflammatory exudate, contact with carcasses of infected animals, or via fomites and food. Avian cholera and avian influenza often are transmitted through water. *Trichinella* and *Anasakis* nematodes are transmitted through food. Mosquitoes can serve as transport hosts for avian pox virus, and as true biological vectors for viruses such as yellow fever virus which undergoes development in the mosquito. The life cycle of many parasitic helminths include intermediate hosts and some include paratenic hosts which are not required in the life cycle but often are

important in pathogen transmission. To manage any infectious disease, it is essential to know very precisely how it is transmitted. These routes of transmission also are the mechanisms by which infectious pathogens maintain themselves and persist in animal and human populations, and they are the mechanisms by which pathogens in wild animals can infect domestic animals and people. Since wild animals are the source, or reservoir, for so many important zoonotic pathogens, one important aspect of pathogen transmission is to consider the different ways in which wild animals can be the source of zoonotic infections for people. Pathogens can be transmitted from wild animals to humans by all of the routes of transmission just reviewed. However, zoonotic pathogen transmission also can be looked at in another way.

Why we have outbreaks? TED talks - videos on HIV www.globalviral.org and www.ted.com
Emerging Infectious Disease database: http://www.zoonosis.ac.uk/EID2/ passcode: !&EID123

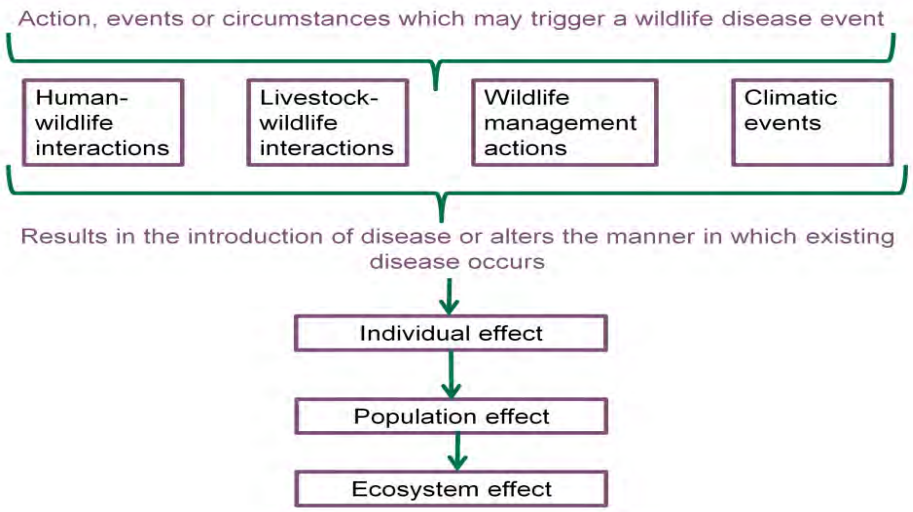
What is the human Emerging Infectious disease situation?
There are 1,407 known infectious pathogens worldwide, 58% (800) of which are zoonotic. From 1940 to 2004 there have been 335 emerging diseases (25% of known pathogens), 60% are zoonotic (202 pathogens)and 43% are from wildlife (144 pathogens).

A major concern to human societies around the world is the recent increase in the number of important human and animal diseases, particularly infectious diseases. Previously unknown pathogens have caused previously un-recognized diseases, and the harm caused by some well-known pathogens has increased as well. These new or newly-important diseases have come to be called 'emerging diseases' or 'emerging and re-emerging diseases.' An 'emerging disease' generally is defined as a disease due to:

1) a new pathogen resulting from the evolution or change of an existing pathogenic agent, or
2) a known pathogen spreading to a new geographic area or population, or increasing in prevalence, or
3) a previously unrecognized pathogen or disease diagnosed for the first time and which has a significant impact on animal or human health.

The term ‘emerging disease’ can be applied to diseases that affect people or to diseases that affect animals, and also plants. Many important emerging diseases are associated with pathogens which can infect many different host species and cause disease in wild animals, domestic animals and people. A recent study of human infectious diseases determined that

there are approximately 1,407 human infectious pathogens world-wide. Of these, 800, or 58%, are zoonotic pathogens transmitted to people from animals. Another recent study identified 335 human infectious diseases that emerged in just the past six decades. This represents 25% of all known human infectious diseases. Of these 355 recently emerged human diseases, 202 (60%) are caused by zoonotic pathogens and 144 (43%) are caused by pathogens for which the main source is wild animals. The rate of disease emergence has increased during the previous six decades. The majority of emerging human diseases in the past six decades have been zoonotic and the predominant source of these zoonotic pathogens has been wild animals. Thus wild animal pathogens have added major new burdens of disease to people and, although fewer data are available, wild animals also have been important sources of diseases affecting domestic animals. Example is the article: Human Infection with MERS Coronavirus after exposure to infected camels Saudi Arabia, 2013 (multiple authors).



Individual effect

Conspicuous illness or death OR

Subtle effects e.g reduction in immune function, impaired reproduction, subtle behavior changes or decreased growth rate

Population effect

Changes in birth rates, fertility, death rates, immigration and emigration

Ecosystem effect

Changes in community composition (competitors, predators, prey), productivity and stability

The growing scientific understanding of the driving forces of disease emergence has resulted in a new way of thinking about health management at all levels, from local to global. In this new view, it is recognized that there are many interconnections among the health of people, of domestic and wild animals and of the environment or ecosystem. It is not

possible to manage disease and achieve health in any one of these sectors in isolation. Instead, disease management and health achievement must be approached by seeking relevant information and control points in all sectors, simultaneously. This will require a whole new level of interchange of information, coordination of policies and programs, and collaborative management among authorities responsible for domestic animal health, wildlife health, human health and environmental and ecological health. This new paradigm for managing health and disease has come to be called the 'One World, One Health' approach, so named at a conference organized by the Wildlife Conservation Society in September 2004. It now is strongly supported by international bodies such as the OIE, the WHO, FAO and other United Nations organizations, and by the World Bank. It also is supported by many countries as a basis for national health management. In the One World, One Health concept, disease prevention, surveillance, response and management are integrated across all relevant government units and social institutions. Such integration is entirely new to most governments and health management organizations, and successful implementation of the One World, One Health model will require creative new policies and a new high degree of day-to-day collaboration and communication among agencies which previously may have interacted very little.

Wildlife disease prevention, surveillance, response and management will be key components of health management in the One World, One Health model. This is one important reason that the OIE has placed a renewed emphasis on surveillance for, and reporting of, pathogens and important epidemiological events that occur in wild animals.
Some specific examples of actions, events or circumstances which may trigger a wildlife disease event:

1. Human-wildlife interaction: Did human pregnancy testing contribute to the global amphibian decline?
   1934 – African clawed frog *Xenopus laevis* Pregnant woman urine stimulated ovulation – basis of human pregnancy test. These frogs were shipped worldwide.
   Asymptomatic carrier of *Batrachochyytrium dendrobatidis*, Chytrid fungus
   Hypothesis that Mass extinction of amphibians due to this spread
   Weldon *et al* 2004, Skerratt 2007, Walker *et al* 2008

Human-wildlife interactions can occur through hunting or harvesting, construction of roads, habitat modification, ecotourism, animal movement, including global trade of animals and animal parts and pollution.

2. Livestock – wildlife interactions: How pain relief for cattle increased the risk to people from rabies
   Diclofenac (NSAID) used for pain relief in India, Pakistan and Nepal – animals allowed to die naturally following Hindu beliefs

Vultures scavenged the carcasses – Diclofenac residues in cattle highly toxic to vultures – up to 99% mortality

Rapid severe decline in vultures favored an increase in packs of rabies-carrying feral dogs scavenging on the cattle carcasses

The number of cases of rabies in people due to dog bites has since increased

Oaks *et al* 2004, Sharp 2006, Markandya *et al* 2008

This can occur through direct or indirect contact, erection of fences, use of pesticides or of veterinary drugs.

3. Wildife management:

North American crayfish *Pacifastacus leniusculus* subclinically carry a fungus *Apanomyces astaci*

These apparently healthy crayfish were translocated and released onto European crayfisheries in the 1970s

Native crayfish species were susceptible to the fungus, eliminating over 80% of the population since the 1970s

Holdich and Reeve 1991, Alderman 19996, Daszak *et al* 2000

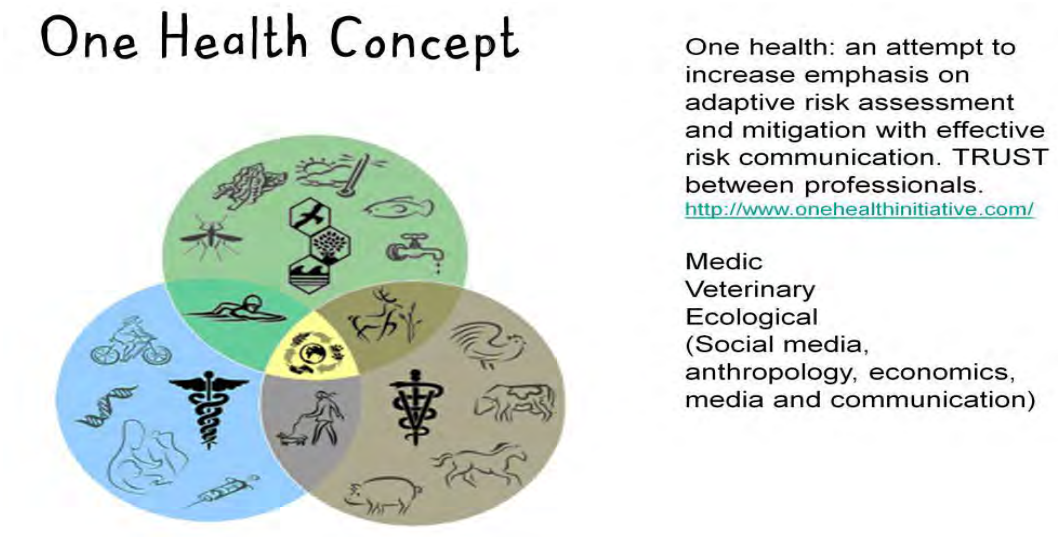
Wildlife management actions may include animal movements, reintroductions, veterinary treatments, vaccination, fencing (ex. creation of a wildlife reserve). Consideration for potential disease risk in all wildlife management situations.

4. Climactic events:

Impact of climate change on sheep parasites in northern Island (McMahon *et al* 2012)

Mosquito-borne malaria and El Nino in South America (WHO 2000)

Plant diseases favoured by drought – drought reduces the breakdown of plant residues – so more pathogens survive season to season (Murray *et al* 2006)



Contacts in the area:

Acting Regional Representative for Asia and the Pacific:
Dr Tomoko Ishibashi
Food Science Building 5F
The University of Tokyo
1-1-1 Yayoi, Bunkyo-ku, Tokyo,
113-8657, Japan
Tel: +81-3-5805-1931
Fax: +81-3-5805-1934
E-mail: rr.asiapacific@oie.int

OIE Sub-Regional Representative for South-East Asia:
Dr Ronello Abila
c/o Department of Livestock Development,
69/1 Phaya Thai Road, Ratchathewi 10400,
Bangkok, THAILAND
Tel. +66 2 653 48 64
Fax +66 2 653 49 04
E-mail: srr.seasia@oie.int

www.OIE.int

The WAHID Interface provides access to all data held within OIE's new World Animal Health Information System (WAHIS).

Information by country/ territory

Disease Information

Sanitary information comparison between countries/ territories

Control Measures

Dr Karim Ben Jebara, Head, Animal Health Information Department, OIE.

OIE provides:

Information about a specified country, including exceptional disease event reports, animal health status, veterinary services, population, vaccination, etc.

Disease Information - Information about a particular disease, including global disease distribution maps, outbreaks maps, lists of countries indicating their sanitary statuses, etc.

Sanitary information comparison between countries/ territories - Compare the animal health situation of two countries for trade purposes. This identifies which diseases may pose a hazard for countries importing animals or animal products from another country

Control Measures - Lists and maps of the prophylactic and control measures used by countries and by disease.

Preventing human to animal disease spread:

Pre-employment screening for diseases of concern

Immunization of humans / disease prophylaxis prior to animal contact (ex. rabies)

Staff training as to what high risk activities are and how to minimize risk (based on transmission routes)

Biosecurity protocols:

Change into uniform at work!

Special case – hand raising - best to pick a care giver that has no contact with the animals already in your area, and who has their own uniform so it isn't confused with other employees. Not always practical as may also need someone who knows what they are doing.

Biosecurity needs to be considered in all situations where humans come into contact with wildlife – ex. Ecotourism.

Minimizing disease risk while animals are still in captivity:

Pest control

Correct animal handling to minimize injuries and potential disease spread

Pre-import health screening of animals for diseases of concern

Quarantine (length of time must be discussed!)

Good occupational hygiene and good environmental hygiene and design

Hazard Reduction:

Pathogens can grow and multiply; and infection could be caused by exposure to only a few microorganisms. There are two main approaches that can be utilized for the control of infection:

The basic control principles of **good occupational hygiene** (Checklist 1) should be applied in **all** situations. The principles of **good environmental hygiene and design** (Checklist 2) to stop or limit the growth of pathogens in the workplace should also be applied.

CHECKLIST 1: GOOD OCCUPATIONAL HYGIENE: BASIC CONTROLS

Wash hands (and arms if necessary) before eating, drinking, smoking, using the telephone, taking medication, applying make-up, inserting contact lenses.

Cover all new and existing cuts and grazes with waterproof dressings and/or gloves before starting work. If cuts and grazes occur, wash immediately with soap and running water and apply a waterproof dressing.

Take rest breaks and meal breaks away from the main work area.

Wear appropriate protective clothing to stop personal contamination, ex. waterproof/water-resistant protective clothing, plastic aprons, gloves, rubber boots/disposable overshoes.

Avoid hand-mouth or hand-eye contact – don't put pens/pencils in mouths.

Dispose of all contaminated waste safely.

CHECKLIST 2: GOOD ENVIRONMENTAL HYGIENE AND DESIGN

Use equipment that is easy to clean and decontaminate. Clean all work surfaces/work areas regularly.

Ensure, where possible, that the workplace and its services, ex. water systems,, are designed to be safe to use and easy to clean and decontaminate.

Control pests, ex. rats, insects within the workplace.

Supplementary controls

If the work activity could result in a skin piercing/cutting injury, the risk of puncture wounds, cuts or grazes should be controlled by avoiding the use of sharp objects, ex. needles, glass, metal, knives etc. If this is not possible, safe working practices for handling and disposal of sharps will be used and appropriate protective equipment provided.

If the work activity could result in the splashing of any body fluid, the eyes and mouth will be protected with a visor or goggles/safety glasses and a mask.

If work activity could generate aerosols of either dust or liquid, take steps to avoid their generation, by: altering the work activity, ex. using a vacuum rather than a brush to clean a dusty workplace; If this is not possible, appropriate respiratory protective equipment should be used.

The numbers of hazards to consider are numerous. Hazards can hit at several points along the reintroduction pathway. Some hazards are unknown at the outset of the reintroduction process and difficult to detect. It may be years before a disease outbreak is noticed.

There is unlikely to e a single health and pathogen screening protocol for any given species, as wildlife disease is a dynamic process with new and emergent diseases hard to predict, and risk assessments are influenced by the characteristics of different sources and release sites. Furthermore, test procedures continue to be refined, both improving test validity and increasing the number of different tests.

(Ewen *et al* 2012 *Reintroduction Biology: Integrating Science and Management)*

DRA is a multi-discipline process. It may not be suitable for every situation. Remember, those who put **all** their efforts into the process become bureaucrats. Never underestimate your clinical experience, adaptability and common sense as an animal health professional…so use these processes in light of that knowledge, and guaranteed they will become even more useful!

DRA Review:

Risk

Risk is usually defined as the chance of encountering some form of harm, loss or damage. For this reason it has two components:

1. The likelihood, or probability, of something happening and, if it does happen,
2. The consequences of the deleterious activity.

Because of the element of chance, we can never predict exactly what will happen but, through an appropriate process, we can estimate the probability of any particular outcome occurring (Brückner et al 2010).

Risk Analysis

"*Risk analysis* is a formal procedure for estimating the likelihood and consequences of adverse effects occurring in a specific population, taking into consideration exposure to potential *hazard*s and the nature of their effects" (Thrusfield 2007). It is a tool for decision makers to insert science into policy.

Disease

At the most basic level, disease is defined as any impairment of the normal structural or physiological state of an organism. The manifestation of disease is often complex and may include responses to environmental factors such as food availability, exposure to toxins, climate change, infectious agents, inherent or congenital defects, or a combination of these factors (Wobeser 1997).

Three important epidemiological concepts of disease to keep in mind are:

1. Disease never occurs randomly
2. All diseases are multi-factorial and
3. Disease is always a result of an interaction between three main factors: pathogenic agent, host and environment.

First Group Exercise: ALL

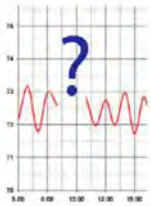
Filling in the table below for each center. Review of the 'What to do in a disease outbreak at your centre' workbook was used for assistance. Questions reviewed: Where did you have trouble? Highlighting these areas of uncertainty is a primary function of a disease risk analysis.

Hazard	Likelihood	x	Consequence	=	Risk
Ebola					
Mycobacterium tuberculosis complex					
Respiratory Syncytial Virus (mention chimps)					
Diabetes					

Remember: Risk analysis is a tool to provide evidence for decision making under uncertainty. There is often a large degree of uncertainty in deciding what is going to be a problem disease for the animals, and what may not be. Often information on disease risk and population health is scanty at best. By working through a risk analysis process, the aim is not only to highlight what we do know, or strongly suspect, but also where we need to focus our research efforts, to find out what we don't know. Risk analysis is a formal procedure for estimating the likelihood and consequences of adverse effects occurring in a specific population, taking into consideration exposure to potential hazards and the nature of their effects. This includes the management (usually reduction) of the likelihood of exposure.

Science based

Succession planning



Data gaps

Cost benefit

Risk analysis:

Adds science to policy decision making

Transparent method to organize, assess and study a problem/question/issue

Allows successful project succession planning

Increases communication

Multidisciplinary Stakeholders

Identifies data gaps and research needs

Finding out what is important, may not be the most obvious thing……so what process do we use to decide what is the most important?

Objectivity

It is often said that *risk analysis* is an 'objective' process. The reality is that in disease risk analyses there are often so few data available that the analyst begins, unconsciously, to substitute value judgments for facts. Indeed, in assessing the consequences of disease introduction a degree of subjectivity is almost unavoidable. Risk analyses are seldom truly objective and for this reason *transparency* in declaring all assumptions made is essential (MacDiarmid 2001).

Proportionality

Actions taken to prevent or minimize disease risks to wildlife populations or biodiversity conservation must be in proportion to the likely consequences of disease entry. For instance, a *risk analysis* may conclude that there is a significant likelihood that an introduction of animals into a new area would introduce a particular disease agent.

However, if there are other, unmanaged movements of animals, people or their chattels into the same area, the application of risk mitigation measures to the planned introduction may not be warranted.

Worthington and MacDiarmid (2011) pointed out that it is important to consider this issue of proportionality in an analysis of the disease risks posed by the importation of non-human primates into zoos. As an example they considered a situation where there is some likelihood of an imported primate carrying a disease that is equally likely to be carried by a human. It would not be justified to impose stringent measures on the importation of a few primates when there are no meaningful preventive measures that could be applied to the hundreds of thousands of humans who enter the country each year. In this situation, the imposition of risk mitigation measures to the primate importation would do nothing to significantly reduce the biosecurity risk to the importing country. (However, the manager of the zoo might well impose measures to reduce risks to other animals in the zoo.)

Acceptable risk

The *risk communication* process is essential in helping decision makers to deal with one of the most difficult problems encountered during the *risk analysis* process; namely, determining what constitutes an 'acceptable risk' (MacDiarmid and Pharo 2003).

Zero risk is seldom, if ever, attainable and some degree of risk is unavoidable. For this reason, deciding whether or not a particular risk is acceptable is generally a societal or political decision because the benefits of a particular activity for one stakeholder group may have adverse consequences for another (MacDiarmid and Pharo 2003, Thrusfield 2007).

For example, when considering the disease risks to an unspoiled *ecosystem* posed by the construction of a road, risks considered acceptable by a government agency tasked with economic development may be quite unacceptable to the government agency tasked with wildlife conservation. Similarly, the disease risks posed by relocation of wild animals into a conservation reserve may be acceptable to those ecologists concerned with maintenance of a genetically diverse population of endangered animals but be considered unacceptable to neighboring farmers or ranchers concerned with the health of their livestock.

An example of an acceptable disease risk may be the translocation of kiwi harboring a low number of coccidian intestinal parasites providing other, specified, health indicators (e.g. body condition, behavior, haematology parameters etc.) are within the range considered healthy for the species.

The 'precautionary principle'

In situations where there is significant scientific *uncertainty* regarding a risk and its consequences, such as a cause-and-effect relationship not being fully established, the 'precautionary principle' may be invoked. This principle holds that the implementation of preventive measures can be justified even in the absence of such a risk.

This precautionary approach has a useful protective effect as the initial response to a new potential threat and may be an appropriate reaction to complex problems such as loss of biodiversity, where more formal *risk analysis* may not be adequate (Thrusfield 2007).

Assumptions

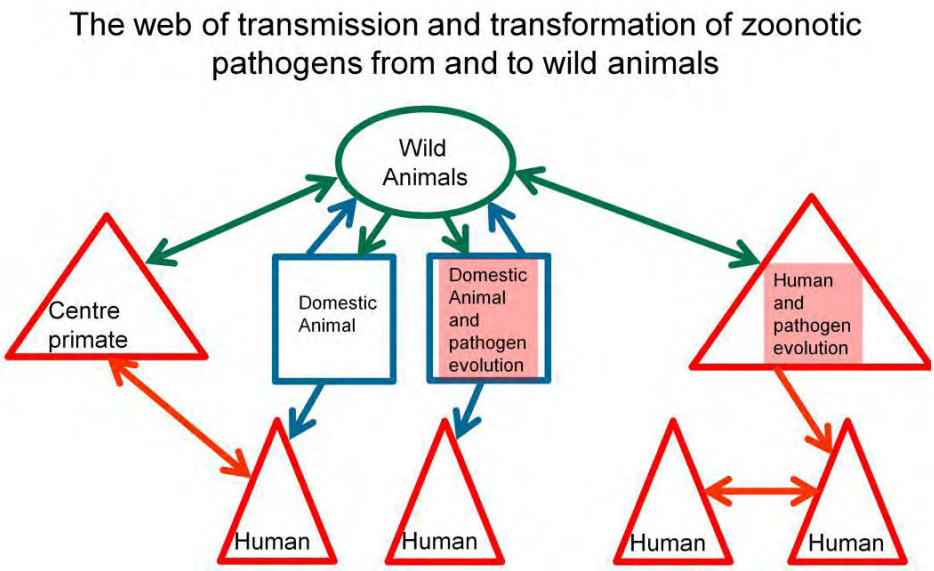
A *risk assessment* may sometimes be criticised because some of its inputs are based on assumptions. However, all decision-making is based on assumptions, and *uncertainty* and subjectivity do not mean that valid conclusions cannot be drawn. Even though many of the inputs of a *risk assessment* are surrounded by *uncertainty*, one may be able to have confidence that the 'true risk' is unlikely to exceed the estimate resulting from a careful and conservative analysis (MacDiarmid 2001).

Things we do every day….

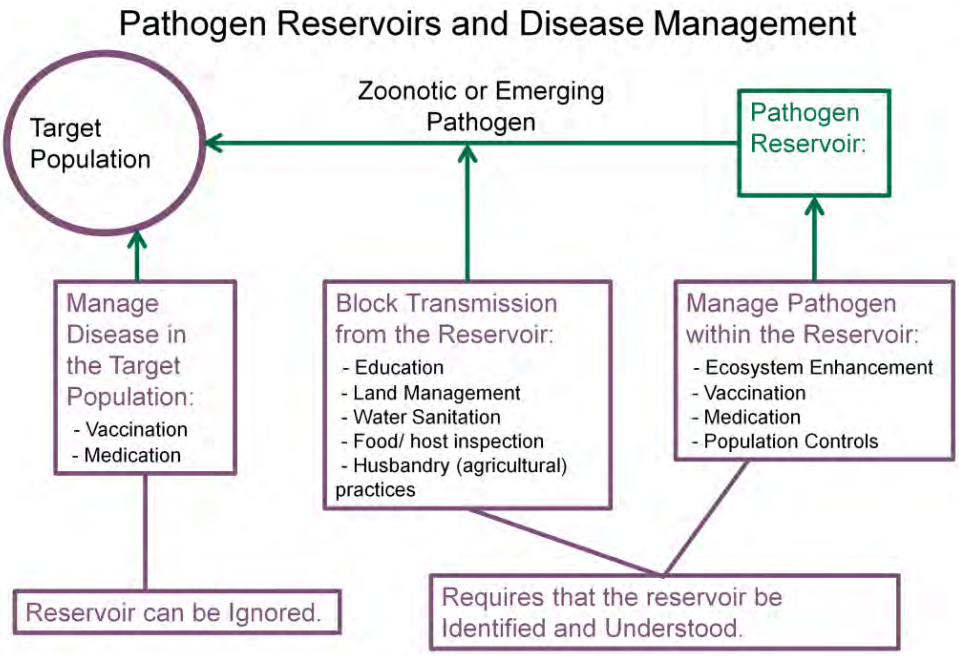
- Visual representation of plans
- Identify relationships not immediately obvious
- Identify critical control points for management
- Identify areas of uncertainty
- Management tools:
  - Release Program
  - Animal Translocation
  - Animal center operations
  - Disease focus
  - Area focus

The diagram below tries to show the various relationships that can exist among wild animals, domestic animals and humans through which zoonotic pathogens from wild animals can be transmitted to humans. – Pathogens from wild animals may be transmitted directly to people. Examples are *Brucella, Leptospira* and plague (*Yersinia pestis*) – Pathogens from wild animals may be transmitted to domestic animals, which then become the source of infection for people. Examples are Nipah virus (from bats to pigs to people) and bovine tuberculosis (from wild animals to domestic animals to people). Pathogens from wild animals may be transmitted to domestic animals, undergo genetic changes in the domestic animal population, and then the genetically altered pathogen can be transmitted from domestic animals to people. An example is Highly Pathogenic H5N1 avian influenza virus which entered domestic poultry populations as a low pathogenicity strain from wild birds, developed into a highly pathogenic strain in domestic poultry and has been transmitted to people from domestic poultry. – Pathogens may be transmitted from wild animals directly to humans, but then undergo genetic modifications within human populations that result in a new human pathogen which is maintained in human populations, is readily transmitted from person to person and no longer requires the original wild animal source to persist and continue

to cause disease. Examples are HIV-AIDS, human pathogens derived from viruses in primate populations, and measles virus, a human pathogen very close to rinderpest virus and which became established in people through transmission from cattle, probably during the time when cattle were first domesticated.



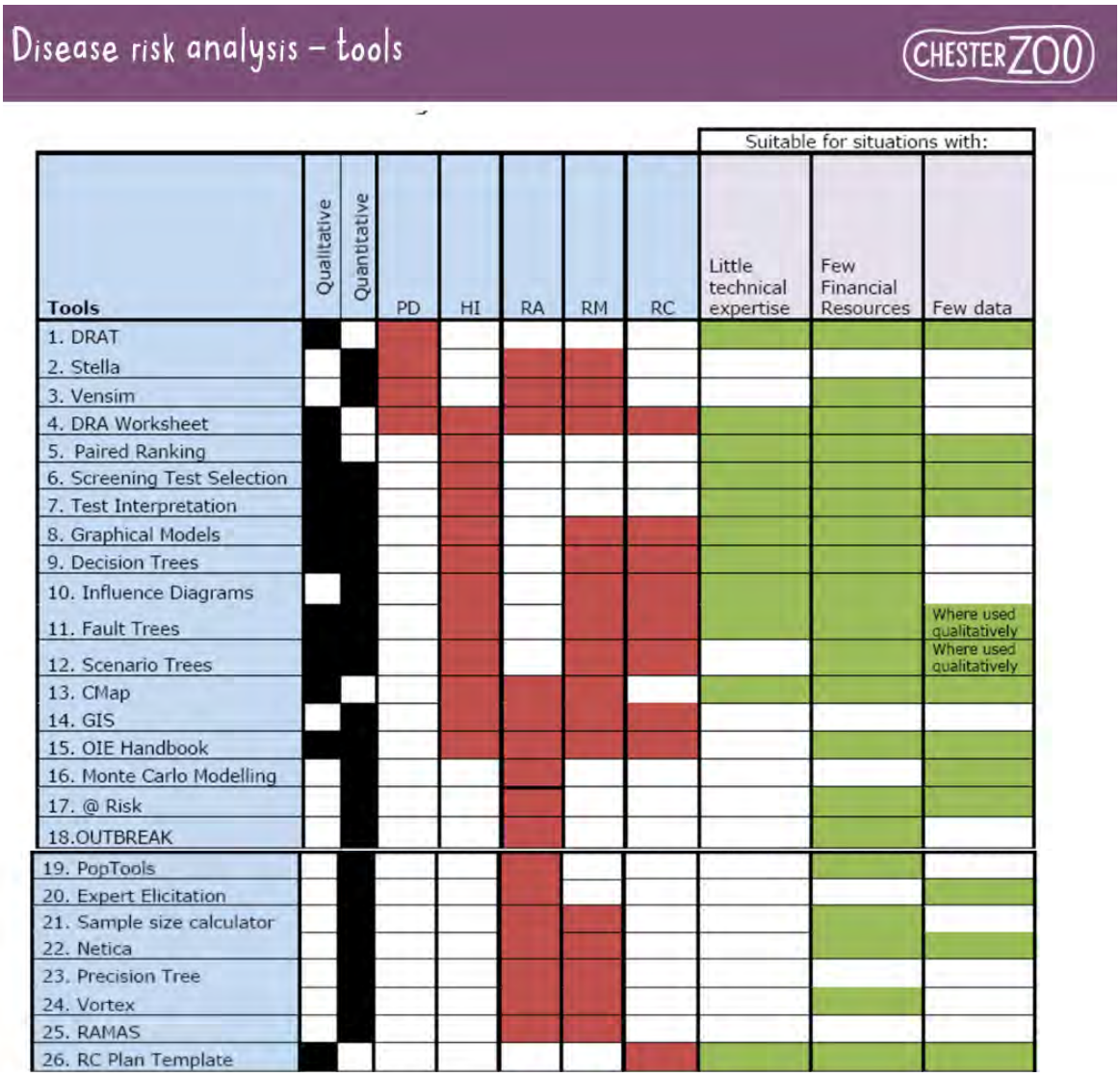
Some disease control programmes focus on the target population, with vaccination or pharmaceutical treatment of the target population as the methods of choice. If this is the case, then it is not important to know the reservoir of the pathogen for people or even to know the principal routes of transmission. However, when control programmes are focused on preventing transmission of pathogens from the reservoir to the target population, or on controlling the pathogen within the reservoir, then a very precise understanding of the reservoir of the pathogen for the target population is required.



No single person or organization can conduct an analysis process successfully in isolation. Collaboration is essential.

This diagram below highlights the main steps in producing an effective collaborative team. In each of the group discussions and activities at this workshop, consider how often you achieve the 'performing' stage.

Group discussion



How do we access risk?

Risk communication

The risk communication step asks "Who has an interest in, who has knowledge of value to, and who can influence implementation of recommendations arising from the DRA?" Risk communication is the practice of continuous communication between interested stakeholders and experts and, as depicted in the figure , runs throughout the DRA process. Its purpose is to engage with a wide group of experts and stakeholders to maximise the quality of the analysis and the probability that recommendations arising will be implemented. It is also essential to determine the level of risk that is acceptable to stakeholders. (See 'Problem Description' below). Effective communication involves both listening and speaking. The messages heard are influenced both by the content and the manner in which this is delivered and received. While it is beyond the scope of this *Manual* to review the

theory and methods of effective communication, some familiarity with this topic is recommended. A useful resource relevant to this text is Jacobson (2009) *Communication skills for conservation professionals.*

Stakeholder and expert identification

The first step in developing a *risk communication*s strategy is the identification of stakeholders, experts and key decision makers associated with the issues to be considered. These are identified by answering the questions "who has an interest in, and who has knowledge of value to, the DRA topic" and "who may have influence to support or block recommendations resulting from the analysis?" Where communication between relevant experts and stakeholders can be facilitated, opportunities can arise to share information and gain insights that might not otherwise be possible. As all wildlife DRA scenarios attract interest from a range of people this applies whether the *risk analysis* is conducted by a single individual or a group. An example of a stakeholder and expert list developed for a DRA focussed on Tasmanian devils is provided in Table 2. While it is not always possible to involve a wide range of experts and stakeholders, consideration of who could potentially assist and who might be impacted by the results will be of value in framing the DRA report and its recommendations in a manner appropriate to the audience.

Communications strategy and plan

Following the identification of appropriate stakeholders and experts it is useful to develop a communications strategy and plan. This is a helpful tool for thinking through the communication issues associated with a wildlife DRA. It is useful to map this out at the start of each *risk analysis* and to continually update it as needed. The communication plan is developed in consultation with the stakeholders and experts and should include what information they may be able to provide, what information they are interested in receiving, how frequently and in what form it should be delivered. An example taken from the same Tasmanian devil DRA is provided in Table 3. Once the list of stakeholders has been completed the names of specific individuals and their contact details can be added.

The following chart was used in Group discussions: Who has an interest in risk communication? Who has knowledge of its value? And who can influence implementation of recommendations arising from the DRA.

Group role	Stakeholder/ expert	Information needs	Communication method	When	Responsibility
Operational/ Implimentation					
Governance					
Compliance, auditing and monitoring					
Public					

Some helpful questions to ask (review):

What is the nature of the problem? What are the management goals and decisions needed and how will the risk analysis help? What is the ecological level of concern (population, community, and ecosystem)? Are there any policy or regulation considerations? What precedents are set by similar DRA's and previous decisions? What is the cultural and political history and current context of the problem as represented through the eyes and values of different stakeholders? What resources (ex. personnel, time, and money) are needed and available? What level of risk is acceptable? What documents or data exist to describe the state of knowledge of the program?

Hazard identification:

Categories of consequences associated with animal health hazards (Council of Canadian Academies 2011)

Tools that can help:
DRA worksheet
Paired ranking
Graphical models
Decision trees
Influence diagrams
Fault trees
Scenerio trees
Cmap
GIS
OIE handbook

Below are a variety of African Great Ape examples:

TABLE 1. Viral diversity described for African wild great apes

Viral family/genus	Tested species[a]	Positive species	Closest human counterpart	Cross-species transmission	Possible recombination/ reassortment	Mode of transmission[b]	Transmission/ directionality[c]	Veterinary relevance	Medical relevance	Reference[d]
Adenoviridae/ Mastadenovirus	Ptv, Pts, Gg, Gb	Ptv, Pts, Gg, Gb	HAdV-A to F	Yes	Yes	Faecal–oral, respiratory	Ape to human, human to ape	Unknown	Yes	[24,54]
Anelloviridae/ Alphatorquevirus	Pts	Pts	TTV	Yes	Yes	Sexual, blood	–	Unknown	Unknown	[55]
Circoviridae/Circovirus	Ptt, Pts	Ptt, Pts	Not found in humans[e]	Yes	Yes	Faecal–oral	None	Unknown	Unknown	[56]
Cyclovirus	Ptt, Pts	Pts	*Cyclovirus* 7, 13-16	Yes	Yes	Unknown	None	Unknown	Unknown	[56]
Filoviridae/Ebolavirus	Ptt, Gg	Ptt, Gg	EBOV	Yes	Yes	Body fluids, blood	Ape to human	Yes	Yes	[10,57]
Hepadnaviridae/ Orthohepadnavirus	Pte, Ptt, Pts, Gg	Pte, Ptt, Pts, Gg	HBV	Yes	Yes	Sexual, blood–blood	Human to ape	Unknown	Yes	[58,59]
Herpesviridae/ Lymphocryptovirus	Ptv, Ptt, Gg	Ptv, Ptt, Gg	EBV	Yes	Unknown	Contact, saliva	None	Unknown	Yes	[60]
Cytomegalovirus	Ptv, Gg	Ptv, Gg	HCMV	Yes	Unknown	Contact, urine, saliva	None	Unknown	Yes	[45]
Paramyxoviridae/ Metapneumovirus	Ptv, Pts, Gb	Ptv, Pts, Gb	HMPV	Yes	No	Respiratory droplets	Human to ape	Yes	Yes	[19,39]
Pneumovirus	Ptv	Ptv	HRSV	Yes	No	Respiratory droplets	Human to ape	Yes	Yes	[19]
Parvoviridae/Bocavirus	Ptt, Gg	Ptt, Gg	HBoV	Yes	Yes	Faecal–oral	None	Unknown	Unknown	[61]
Picornaviridae/ Enterovirus	Ptt, Gg	Ptt	EV70, EV76	Yes	Yes	Respiratory, oral droplets	Unknown	Unknown	Yes	[62]
Polyomaviridae/ Polyomavirus	Ptv, Pts, Gg	Ptv, Pts, Gg	MCPV	Unknown	Yes	Unknown	None	Unknown	Yes	[63,64]
Retroviridae/Lentivirus	Ptv, Pte, Ptt, Pts, Pp, Gg	Pte, Ptt, Pts, Gg	HIV-1	Yes	Yes	Sexual, blood–blood	Ape to human	Yes	Yes	[8,65]
Deltaretrovirus	Ptv	Ptv	HTLV-1	Yes	Undear	Sexual, maternal–neonatal	Ape to human	Unknown	Yes	[36]
Spumavirus (SFV)	Ptv, Pte, Ptt, Pts, Pp, Gg	Ptv, Pte, Ptt, Pts, Pp, Gg	Not found in humans	Yes	Yes	Blood–blood, biting	Ape to human	Unknown	Unknown	[50]
Unassigned (ChiSCV)	Ptt, Pts	Ptt, Pts	ND	ND	Unknown	Unknown	None	Unknown	Unknown	[66]

ChiSCV, Chimpanzee stool-associated circular virus; EBOV, Ebola virus; EBV, Epstein–Barr virus; EV, enterovirus; Gb, *Gorilla beringei*; Gg, *Gorilla gorilla*; HAdV, human adenovirus; HBoV, human bocavirus; HBV, hepatitis B virus; HCMV, human cytomegalovirus; HIV, human immunodeficiency virus; HMPV, human metapneumovirus; HRSV, human respiratory syncytial virus; HTLV, human T-cell lymphotropic virus; MCPV, Merkel cell polyomavirus; ND, not determined; Pp, *Pan paniscus*; Pte, *Pan troglodytes ellioti*; Pts, *Pan troglodytes schweinfurthii*; Ptt, *Pan troglodytes troglodytes*; Ptv, *Pan troglodytes verus*; SFV, simian foamy virus; TTV, transfusion-transmitted virus; Unknown, either not tested or situation not clear.

[a]Tests might have consisted of family-level tests. For example, viruses belonging to the family *Circoviridae* were all identified with the same PCR system. No cross-check for the absence of cycloviruses with a specific system was performed.

[b]Classical modes of transmission are given according to viralzone.expasy.org; all viruses may also be transmitted during the butchering of infected great apes.

[c]Evidence was based on the following: (i) differences in prevalence in humans and great apes infected with closely related viruses unambiguously pointed at one being the reservoir for the infection of the other; (ii) genetic diversities of great ape (or human) strains were fully encompassed within those of human (or great ape) strains; (iii) recombinant forms of great ape and human strains were detected (where viruses exhibit host specificity). Co-speciation patterns within the course of hominid evolution were not considered.

[d]Only a few selected references per viral genus are given; either recent, comprehensive reviews or the most recent article published in the field. This table should not be considered to be comprehensive.

[e]Circoviruses are found in humans but are thought to derive from pig (*Sus scrofa*) meat consumption.

Table 1 – Cases of death among wild gorilla and chimpanzees

Year	Disease	Species/no. of dead apes	Country	Source	References
From 1968 on	Polio (s), respiratory and gastro-intestinal diseases	Chimpanzee	Tanzania	Possibly humans	Goodall (1983)
1988	Measles (s)	Gorilla/6	Rwanda	Possibly humans	Ferber (2000)
1992	Ebola (s)	Chimpanzee/8	Côte d'Ivoire	Unknown	Formenty et al. (1999)
1994	Ebola (1p, 11s)	Chimpanzee/12	Côte d'Ivoire	Possibly red colobus and other sources?	Formenty et al. (1999), Le Guenno et al. (1999), and Wyers et al. (1999)
1996	Ebola (p)	Chimpanzee/1	Gabon	Unknown, secondary transmission from chimpanzees to humans	Georges et al. (1999)
1996	Respiratory disease (s)	Chimpanzee/11	Gombe/Tanzania	Possibly humans	Ferber (2000)
1996	Scabies (p)	Gorilla	Different areas	Possibly humans	Kalema-Zikusoka et al. (2002)
1993–2003	Ebola (p)	Gorilla, Chimpanzee, Humans	Gabon, Republic of Congo	Unknown	Walsh et al. (2003), Leroy et al. (2004), and Rouquet et al. (2005)
2001/2002	Anthrax (p)	Chimpanzee/6	Côte d'Ivoire	Unknown	Leendertz et al. (2004a)
2004/2005	Anthrax (p)	Chimpanzee/3 Gorilla/1	Cameroon	Unknown	Leendertz et al. (submitted for publication)

Pathogens: (s) = suspected and (p) = proven to be responsible for the disease observed.

Leendertz et al 2006

Viruses:

Non lethal	Lethal
Retroviruses	Filoviruses
STLV	Ebola
SFV	SIV
HBV	Polio (?)
Adenoviruses	Measles (?)
Heresvirues	RSV, HMPV
Polyomaviruses	
Parvoviruses	
TT-Viruses	

Pandemic human viruses cause decline of endangered great apes:

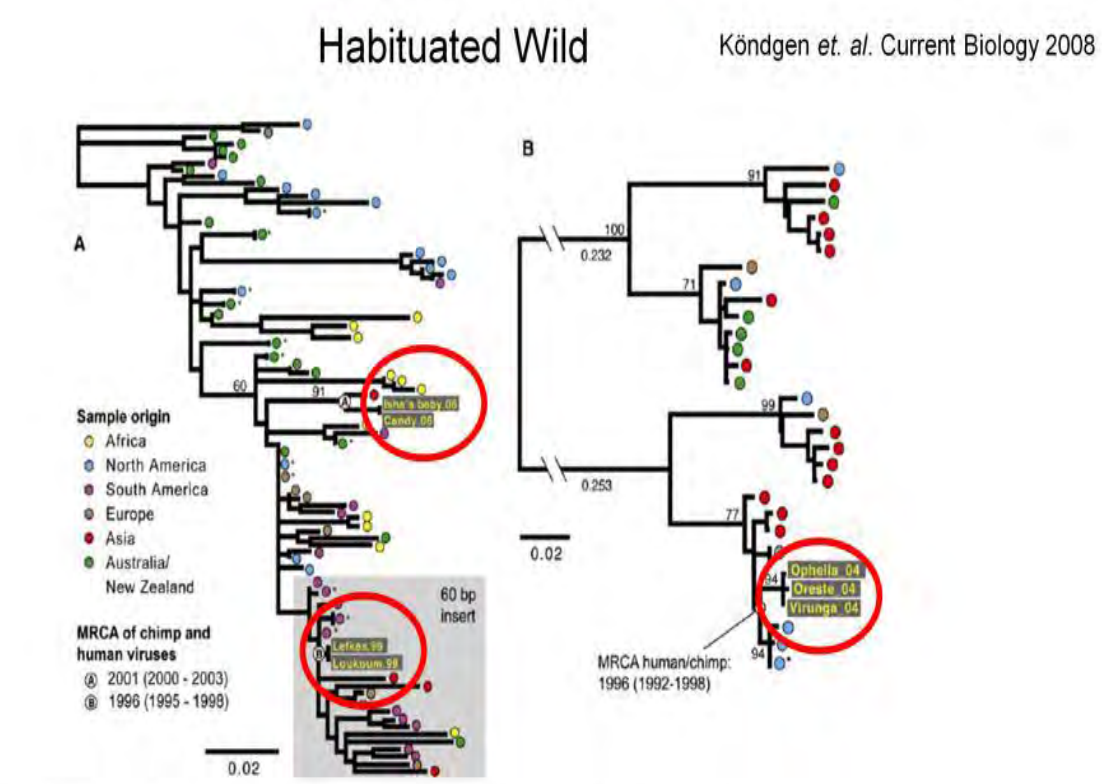
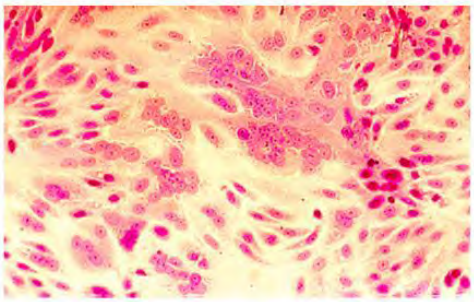


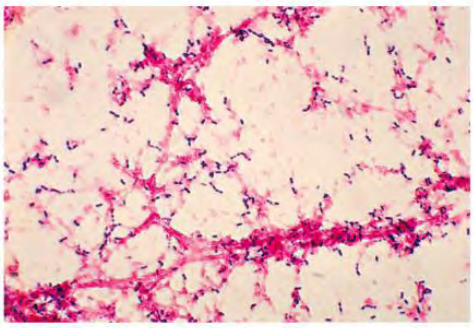
Figure 1. Phylogenetic Position of HRSV and HMPV Amplified from Chimpanzees Relative to Human Viruses Sampled Worldwide

Respiratory diseases:

Date	Community	Symptoms	Morbidity	Mortality	Causative pathogen
March 1999	North	Respiratory	32 (all)	8/32	*Streptococcus pneumoniae* (a), RSV B
March – December 2001	Middle	Chronic respiratory	1/12	1/12	Non detected
March 2004	South	Respiratory	41 (all)	9/41	*S. pneumoniae* (b), *Pasteurella multocida*, HMPV Haemophilus influenzae
August 2005	South	Respiratory	32 (all)	2/32	RSV B
February 2006	South	Respiratory	34 (all)	1/34	*S. pneumoniae* (b) RSV B
February 2006	East	Respiratory	?	3/?	*S. pneumoniae* (a) RSV B

Chi *et al.* 2007, J. Bact.; Köndgen *et al.* 2008, Curr. Biol.





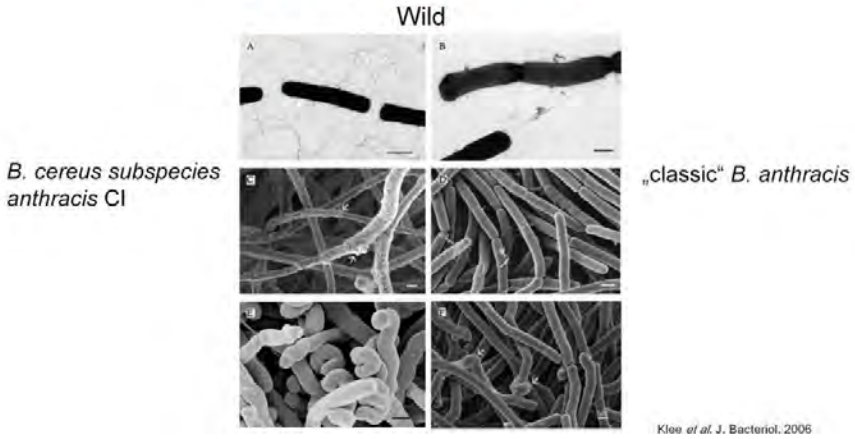
Unwin et al J Zoo Wild Med 2011

Presentation and Management of a Severe Respiratory Tract Infection of Human Respiratory Syncitial Virus (RSV) and *Streptococcus pneumoniae* in a single group of 30 Chimpanzees

Bacteria:

Non Lethal	Lethal
Many	Anthrax (caution – diagnostic!)
	TB
	S. pneumonia
	P. multocida

New anthrax in wild great apes in Cote d'Ivoire and Cameroon:



New M. tuberculosis complex in wild chimps in Cote d'Ivoire"

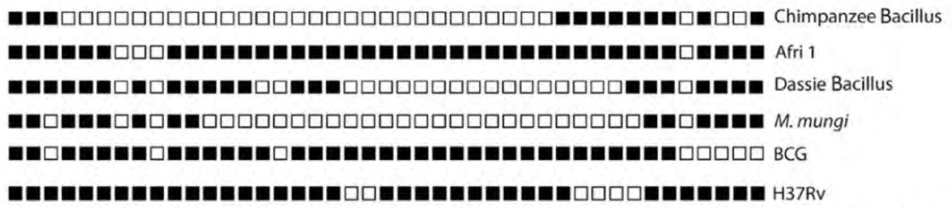
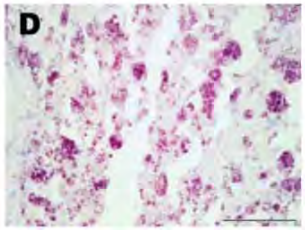


Figure 3. Comparison of the spoligotype of the *Mycobacterium tuberculosis* complex chimpanzee strain isolated from an adult female chimpanzee that was found dead in Taï National Park, Côte d'Ivoire, on August 5, 2009 (Chimpanzee Bacillus), with the Afri 1 spoligotype found in the most closely related human strain and the Dassie Bacillus and *M. mungi* spoligotypes described in (*12*). Spoligotypes are also shown for *M. bovis* strain BCG and human lineage 4 strain H37Rv.



Coscolla *et al.* EID. 2013

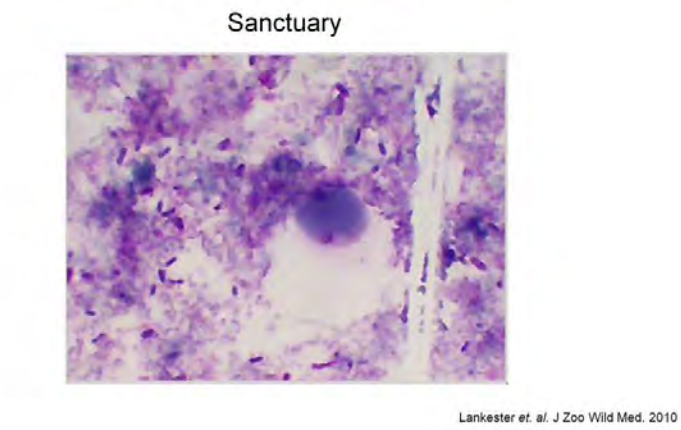
Brucellosis: Found to be a pathogen in gorillas and chimpanzees in Europe in 2013-2014 (lethal). The implications are unclear. Issues of cross reactivity with other pathogens. There are early indications of multiple primate species carrier status.

Parasites:

Protozoa	Nematoda
Plasmodium – Blood	Strongyloides fuelleborni
Cryptosporidium sp. – GIT	Ternidens deminutus
Giardia sp. – GIT	Oesophagostomum stephanostomum
Troglodytella sp. – GIT	Oesophagostomum spp.
	Necator americanus
Cestoda	Necator spp.
Beretiella sp.	Tricuris sp.
	Capillaria sp.
	Enterobius sp.

Trematoda
Dicrocoelium sp.

Dientameoba fragilis in a western lowland gorilla (Gorilla gorilla gorilla)



Lankester *et. al.* J Zoo Wild Med. 2010

Valid risk assessments are:

- Based on a specific question
- Transparent
- Fully disclose the assumptions made
- Include a discussion of the factors that add to the uncertainty surrounding conclusions

Release Assessment: describe the biological pathways necessary for the hazard to be introduced into the area or population under consideration. List the relevant biological, ecological or geographical factors considered and the assumptions made.

Still a risk? Then…

Exposure Assessment: describe the likelihood that the susceptible animals(s) will come into contact with the hazard in a manner in which transmission may potentially occur. Again, list the relevant biological, ecological or geographical factors considered and the assumptions made.

Still a risk? Then…

Consequence Assessment: identify the biological, environment and economic consequences associated with the entry, establishment or spread hazard, together with an estimate of their likely magnitude and likelihood of occurrence.

Still a risk? Then…

Risk Estimation: summarize above. This is a requirement before embarking on risk management strategies.

Finding the right tool

Locating an appropriate tool for a specific scenario requires an understanding of what the tool will be required to do, some knowledge of the range of options available, and of any limitations in the areas of funding, data or expertise, that might constrain your choice.

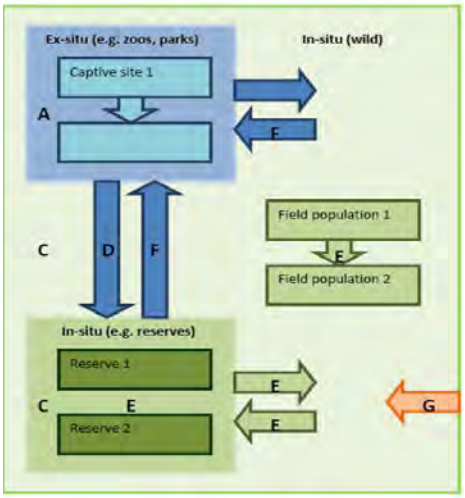
The tools matrix that follows below shows you a list of tools available to help with that DRA step or steps. This provides some additional direction on each tool's utility in different situations, with respect to data availability, resourcing and expertise. Once you have identified a short-list of potential tools, you can use the final part of this section, the Tools Introductions, to access further information about each tool, its availability and application.

The chart below, guides you through these steps graphically, from three different starting positions:

One for those who have already identified the stage in the DRA process that they are interested in;

One for those who have a DRA question in mind but have not yet identified the relevant stage or stages of the process, and

One for those who have a wildlife disease scenario but have not yet formulated a clear DRA question.



Tissue sampling:

Frozen (ex. In liquid nitrogen) IMPORTANT:cold chain must be maintained!and/or in RNAlater
Advantage: cold chain can be interrupted for some time
Disadvantage: expensive
Always preserve several aliquots!
Analyses: mainly PCR (viruses, bacteria, parasites)
10% buffered formalin (for histopathology) (from Robert Koch Institut)

Preservation and storage of samples in RNAlater

Mix sample and RNAlater well. Store preserved smaples at RT or 4 degrees C (refridgerate) for 24 hours! Afterwards freeze or store samples at 4 degrees C. If there is no cooling available: storage at RT for up to 7 days without sample degradation is possible. Sample transport at RT is okay. (manufacter: Ambion, Apllied Biosystems; www.appliedbiosystems.com)

Post mortem:

Sample as many organs as possible, but always try to get samples of: spleen, lung, liver, lymphnode, heart, blood – sufficient to diagnose many pathogens using PCR.

Blood samples:

Frozen (whole blood, buffy coat, serum) – Cold chain must be maintained.
Dried (ex. Guthrie filter paper) – Must be kept and stored dry (ex. Silica gel)
(plus some drops of blood in RNAlater - Cold chain can be interrupted.
Always in several aliquots!
Anaylses: PCR (virues, bacteria, blood parasites) Seriology
For microscopy (blood parasites, haematology): blood smears

Swab samples:

Frozen (ex. In liquid nitrogen) – Cold chain must be maintained.
In RNAlater – Cold chain can be interrupted.
Analyses: PCR (mainly respiratory viruses, bacteria)
For bacterial cultures: various special media (ex. STGG)

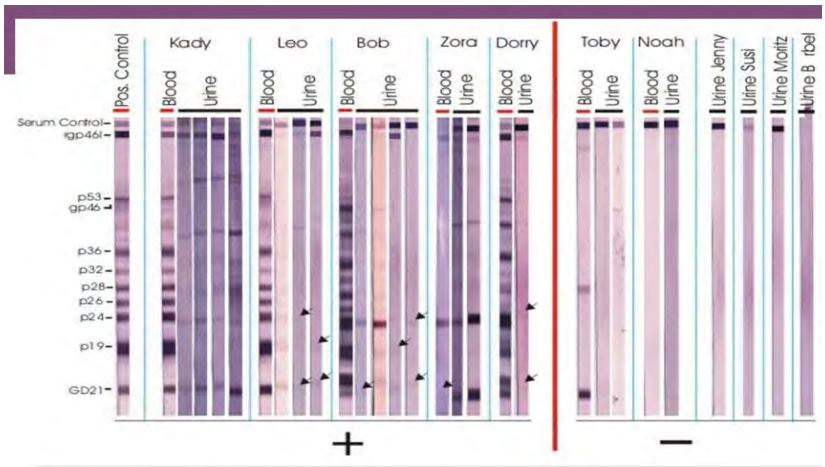
Faecal samples:

Frozen (ex. In liquid nitrogen) – Cold chain must be maintained and/or in RNAlater (1:2; mix/shake well!)
Always in several aliquots.
Analyses: PCR (viruses, bacteria, parasites)
For coprology: ex. 10% formalin, ethanol, SAF

Urine samples:

Frozen (ex. In liquid nitrogen) – Cold chain must be maintained and/or Dried (ex. Guthrie filter paper).
Always in several aliquots

Analyses: PCR (viruses, bacteria, parasites) Antibody detection (ex. STLV) basic urinalysis



STLV-1 positive urine samples:
two envelope antigens (rgp46-I and GD21)
and
one core protein (p24, p19, p28 or p51)

Fruit wadges (Machat):

Frozen (ex. In liquid nitrogen) – Cold chain must be maintained
RNAlater – Cold chain can be interrupted
Analyses: PCR (respiratory viruses, bacteria)
For bacterial cultures: various special media

Where should analyses be done?

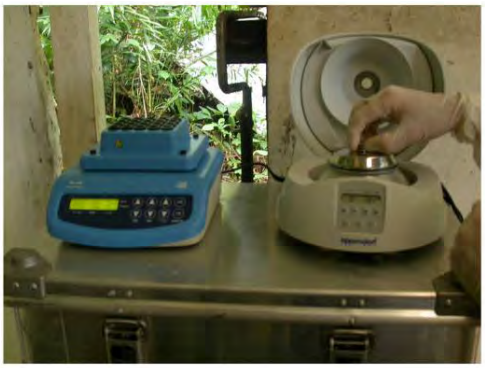
On site – depending on facilities –what can each center cover?

Within country – depending on facilities – what is covered – what is sensitivity/specificity?

Outside country – what is covered - what is sensitivity/specificity?

Or a mix of the above

DNA extraction



Saliva, Washing up liquid, ice cold vodka

Extraction of DNA

With a few simple bits and pieces found about the home, you can extract and have a look at DNA1. The method explained below is a home-science experiment that has its basis in the 'Marmur' preparation used by biotechnology laboratories the world over. So it can be done safely. DNA can be extracted from fruit and vegetables like peas, broccoli, onions and even kiwi fruit (in fact any living organism - but human DNA extraction is probably the most useful.

To extract DNA at home the following will is needed:

Saline solution (a glass of salty water) in a clean glass 1 tsp (5ml) washing-up liquid/detergent, 3 tsp (15ml) tap water, a clean teaspoon, a bottle of ice-cold alcohol (gin or vodka work, as many people keep these in the freezer). However, any alcohol will do, such as rubbing alcohol. A glob full of spit.

Method

Swill out mouth with the saline solution for about 30 seconds. This is to collect the DNA contained in saliva, and around the walls of cheeks. DNA can also extracted from blood, hair, skin or even semen, but the techniques for obtaining these types of samples are more difficult to do at home without more complex equipment. Spit the contents into a glass containing a mix of three teaspoons of water and one teaspoon of washing-up liquid/detergent. This will transfer the DNA from cheek cells into the solution. Stir this mix slowly and gently ('mechanical agitation') for a couple of minutes. During this process it is necessary to break up tissue (in this case, cheek cells) mechanically, and then to degrade both the cell membranes and those surrounding the nuclei - releasing the DNA contained within them. Pour (slowly!) some of the ice-cold alcohol carefully down the inside of the glass, allowing it to settle on top of the solution. DNA is insoluble in cold alcohol and while there will be a few bubbles, the other compounds in the mixture will dissolve, and the DNA will separate from the other ingredients. Leave it for about two to three minutes for this to happen. If done correctly, a spindly white substance will form, maybe clumps of it if you are really careful, forming on top of the salt/detergent mixture. Be patient - it will happen slowly. The resulting 'goo' is unique to each individual; it is DNA! To investigate further, take a thin, long tool like a kebab skewer or firm plastic straw. Stick the utensil in the ‘goo’ and twist it slowly, the DNA strands will wrap around it. This must be done *very* carefully as the DNA is extremely fragile. Once you have DNA strands out you can view them under a microscope. Try staining the DNA to make it easier to look at under the microscope, or you could even test its acidity with some natural pH indicators like beetroot and red cabbage. Whatever you do though, make sure you dispose of the results properly.

Electrphoresis and evaluation of results:

OVAG (same for PASA vets) could become good emergency contacts for wild great ape projects (necropsy training).

The problem: Few field sites working with wild great apes have veterinary infrastructure.
The need: In country vets who can do necropsies and help to investigate and help in outbreaks or individual cases.

What to do: train vets who are interested / provide start up material / emergency contact list

Sampling:

Serologic (antibody) Tests	Usefulness in wildlife	Sensitivity
Competitive inhibition ELISA	High	High
Protein A or G ELISA	High	Moderate
Virus neutralisation	High	Moderate
Haemagglutination inhibition	High	Moderate
Complement fixation	High	Moderate
Agar gel immunodiffusion	High	Low
Direct immunofluorescence	High	Moderate
Indirect antibody ELISA	Low	High
Indirect immunofluorescence	Low	High
Western blot	Low	Moderate

Agent or antigen detection tests	Usefulness in wildlife	Sensitivity
Taqman/real-time PCR	High	High
Bacterial or fungal culture	High	Moderate
Virus isolation	High	Moderate
Necropsy/biopsy/cytology	High	Variable
Conventional PCR for agent DNA	High*	High
Conventional PCR for agent RNA	High*	High
Direct antigen capture ELISA	Moderate	High

*If positive results confirmed

CBSG Disease Risk Analysis toolkit and beginners guide to RT PCR (see pendrive)

The following article titles opened for discussion (what do you think?):

Drug-Resistant Human *Staphylococcus aureus* in Sanctuary Apes Poses a Threat to Endangered Great Ape Populations

Ebola In Orangutans

Human Disease Dictates Wild Bonobo Distribution

DRA helps answer questions about emerging or re-emerging diseases especially zoonotics.

TED talk on epidemiology: Ben Goldacre …medical decisions cannot be made without the full information.

Group Anaesthetic Exercise – All
Four teams with four different scenarios involving infant and adult orangutans under anaesthetic for health checks.

Ex.: Team Wigley Scenario: (Siska lead, Agra, Rosa, Laura, Hendrik, Agnes with Steve and Wendi as observers)

An adult female orangutan was brought in from the wild for a first time health check. Halfway through the procedure the female awakens (because not enough drug was administered) – more drug was administered based on weight, and then during the next few minutes her heart rate drops to 20, it then increases eventually to 40, but the female stops breathing. CPR is administered but female dies and aborts infant she was carrying unbeknownst the vet team.



Day 2

Review of the publication process - Guidelines for a Brief Communication - Steve

Guidelines for brief communications for Journal of Zoo And Wildlife Medicine:

PURPOSE: To provide substantive information on research observations or clinical cases that involves a single animal and/or reports of common medical/surgical conditions in new species. Brief Communications differ from full papers in scope and completeness, but not in quality of information. Reports involving single animals and common medical conditions, even if the conditions are being described for the first time in a particular species, should be presented as Brief Communications unless a full Case Report can be clearly justified. Cases involving multiple individuals or descriptions of new medical/surgical conditions or techniques are more appropriately presented as Case Reports.

FORMAT: Brief Communications should include a title page (with author's names, addresses, etc. presented in the usual style), an abstract (in the usual style) on a separate page with key words, and the narrative, which should begin on a new page. The only headings should be "BRIEF COMMUNICATION," located at the beginning of the narrative, and "LITERATURE CITED," which should be at the beginning of a new page.

LENGTH: not more than 1500 words (not including the abstract)

ABSTRACT: 100-150 words or less (not part of the 1500 word total)

TEXT/PAGE LENGTH: not more than 1500 words (excluding abstract); not more than 6 pages, single sided, double spaced, size 12 type, and with margins as described in Instructions to Authors.

ILLUSTRATIONS: not more than two (either table and/or figure).

REFERENCES: Maximum of 10-12.

AUTHOR RESPONSIBILITY: the author must make it clear that the material being submitted should be treated and reviewed as a Brief Communication.

REVIEW PROCESS: Sent to an Associate Editor who will assign one or more additional reviewers.

Breakout Group Exercise

The Basic Question	Examples of ways in which it might be assessed
1. Do I Know What I‟m Doing?	Have I drawn up a plan (a protocol) for what I intend to do? Do the proposed studies cover all the criticisms likely to be made? Are the statistical methods valid?
2. Do my proposed experiments meet accepted ethical standards?	If my experiments involve human beings or animals, do they meet acceptable standards? Could my work adversely affect the environment or the place where I am doing field work?
3. What practical and political considerations need to be addressed?	Is publication of my work likely to break any official secrecy regulations? Could publications invalidate a later acceptance by a more prestigious journal?
4. How will I record the work as it proceeds?	How will I record what I read? How will I record what I do? How will I ensure that my records are complete? How will I ensure that I can access the records again when I or others need them?

What message do I want to convey?

Which format is most appropriate for my message?

Who will be interested in my message?

Where should this paper be published?

Note down veterinary situations that you know of in your Sanctuary (and beyond) that you think would make a good scientific paper. For each idea, note down whether it should be a journal article, a conference presentation, a poster, a general media bulletin etc, or a combination.

Presenting Visually – what to do and what not to do

Media Choices for Oral Work - Steve

1. Your audience should be listening
2. It should be visually appealing but you should not be able to get all the information from the slide
3. Presenter should not read off the slide word for word – what is the point of presenting if the slide 'says it all" –
4. There are many different things to use to engage the audience
    a. Flip charts to keep audience eyes in different places to prevent people disengaging
5. Include videos if possible

TED Videos reviewed for the following questions:
(even though these talks are about AIDS, a very serious topic, presentations should always try to end on a positive note)

1. What is the story?
2. What three points did you learn?
3. Who is the audience?
4. What are your thoughts on the style?
5. Was the audience appropriate?
6. What did you like or dislike about the talk?

1. Nathan Wolfe

AIDS may date back to Congo as far back as the 1950's and 1950s – what is the earlier interface between animal and humans regarding viruses? – Viral chatter – who has the most contact with animals where transference could occur? - Especially among bushmeat hunters – after 10 years of research – new viruses were found (in the same group as HIV – retroviruses) – in the past these new viruses may have gone extinct but in the modern world with logging roads and such – this is no longer the case. Work needs to spread to other viral hot spots around the world – the dominant life forms that exist – we know almost nothing about.

2. Annie Lennox

The SING Campaign – Treatment Action Campaign – helping women, especially those that are dealing with AIDS – stigma issues – SING – a voice for women and children with AIDS/HIV. Ended with a positive story – of healing and life – The story of Avilile

Question for group: how effective were both presentations? Did they get their point across?

Group discussion:

Ayu: on Wolffe: how the viruses can spread On Lennox: awareness and what is happening in South Africa

Barbel: felt second presentation kept the interest longer
Ricko – first presentation was better
Hery: first is for a more specific scientific audience – second was more for a broader public audience – more emotional – both were effective – but for different audiences

Three points learned from Nathan Wolfe:

1. New vetro viruses being discovered
2. Collecting of blood samples
3. Viruses are on the move
4. Not blaming the hunters
5. Investigating viruses as early as possible

What about presentation style?

The PowerPoint controversy

Design of a scientific talk: deductive organizations start with your conclusion or solution – then back it up with evidence

The power tool – introduction (conclusion/solution? Main points-how you got to your conclusion/supporting evidence

Trial run – with colleagues/ someone unfamiliar with the subject (get rest from presentation/handout material)

Large print

Charts need to be clear concise and easy to comprehend

A PowerPoint can take something that is very engaging into something that no one cares about

Guidelines for Alternative Slide Design (Based on Alley and Neeley, 2005; Atkinson, 2005)

The Basic Question	Examples of ways in which it might be assessed
The Basic Question	Examples of ways in which it might be assessed
Style	State each slide‟s main assertion in a sentence headline (If you can‟t phrase an assertion, omit the slide). On every slide, include supporting evidence presented in a visual way (image, graph, table etc.). Avoid bullet lists and merely decorative images, including Powerpoint background art Include visually orientated „mapping slides‟ to keep audience orientated.
Layout	Limit blocks of text, including headlines, to one or two lines. Left-justify the headline in the slide‟s upper left corner. Limit lists to two, three, or (rarely) four items. Instead of bullets and sub-bullets, use vertical white space and indention to indicate seperations and subordinate points Present listed items in parallel grammatical construction. Avoid sub-lists if possible. Be generous with white space.
Topography	Use the bold version of a sans serif typeface such as arial, Helvetica, or Comic Sans MS. Choose an appropriate type size for the room, generally 32-44 points for slide title, 28-32 points for slide headlines, 18-28 points for body text, and 14 points for reference listings. Avoid any text in all capital letters
Timing	Limit number of slides so that at least 1 minute can be spent on each. In a longer presentation (such as a 1-hour seminar) spend even more time per slide

Group activity - Create text in a manner that would be effective in a power point presentation – review and make corrections on certain texts

<u>Case Studies:</u>

Air rifle modification as dart gun – step by step instructions Ricko, Orangutan Information Center, ACEH

Most times these types of guns come from abroad and the customs fees are sometimes more than the gun itself – locally purchased air rifles can be modified to work as a dart gun. Ricko prepared a step by step instructional video for this (given to delegates digitally). Possibility of an on sight demonstration next year**.**

Physical therapy with non human primates Barbel Koehler, ABAXIS

Barbel has experience as a physical therapist and took a refresher course when she wanted to work with an individual at Nyaru Menteng (NM) that was moving very poorly. The female orangutan (Inka) had recurring

malaria as well as some other issues (high fever, blindness, deafness, limited movement). Barbel set up a physical therapy program and showed the staff how to exercise Inka's hands and feet so therapy could be on going. Inka received treatment twice each day – morning and then afternoons (at the same time each day). Barbel took some additional training and returned to NM to continue the therapy using a physical therapy ball. The challenge was to try to get her to stand up…she still gets seizures (and is treated for epilepsy) but is moving better.

Yenny has a similar case in Sumatra…they have been doing similar therapy – but it is a lengthy process.

Different ethical dilemma scenarios were given out to the participants to review for discussion.

First known case of rabies in orangutan **Arga, BOSF,Nyaru Menteng**

Rabies was found in Chris John (a confiscated 9 month old orangutan). Many adults and children played with him before his confiscation. People who had him said they found him after his mother hit by car. This may or may not be true. In addition to people contact, many dogs and pigs also played with him. At confiscation, he had a fever, then became very inactive, but was still eating. Everything appeared normal with his medical tests and with his blood and fecal results. After 5 days his condition worsened, he became restless, was screaming, and banging his head. As there was no obvious cause, the vets administered broad treatment for the fever, etc,. His condition worsened and he became very violent to the point of hurting himself.

At first, the vet team thought that it was his individual personality and so they gave him many enrichment items to bite so he would focus on that. Further testing showed only increased white blood cells.

They diagnosed meningitis and tetanus and administered meds but had to keep him sedated because he was so wild. The sedation calmed him down and treatment was continued and he was given and oxygen.

However, he continued to deteriorate, and lost consciousness. He stopped breathing and died. The necropsy showed no clinical signs of disease. His brain was also opened and that was when they saw massive inflammation. The organ samples were sent to a laboratory and the results came back positive for rabies. Rabies is a fatal disease and a zoonotic. There is no information on rabies in orangutans. Rabies can only be diagnosed by laboratory analysis of secretions and/or biological fluids. For post-mortums: the brain tissue is needed (hippocampus). All orangutans that came in contact with Chris John were put in quarantine for 6

months for observation. After 6 months, they were all negative for rabies. All humans who had contact with him were vaccinated for Rabies.

It is not standard for center workers to be vaccinated for rabies – but Siska will be sure that happens in future (at least at BOSF locations) as it does seem to be endemic to the area. The government has been made aware of the case, and will be contacting the humans in the area where the orangutan was confiscated.

Lunch

Epidemiology **Steve Unwin, Chester Zoo, UK, Marie McIntyre, Institute of Infection and Global Health, University of Liverpool, UK**

What is epidemiology & how can it help field conservation efforts?

How can epidemiology help field conservation projects achieve their aims?

Can't assess true impact of disease without considering at population as opposed to individual level; important for resource allocation of treatment and research towards prevention e.g. Malaria Vs malnutrition

Examining disease in populations helps to diagnose ailments when individual clinical signs are not obvious or the cause is unknown e.g. highlighting subclinical carriers in a population as a source of disease

Examining behaviour & inter-relationships between disease & a population (acquisition of information on its ecology & natural history) may aid discovery of disease causes e.g. Refer to disease ecology notes

Prevention of disease us better than cure; epidemiology is all about planning, monitoring & assessment to aid preventative measures

Basic concepts

Prevalence (or prevalence proportion) = Cases/Total population

Incidence (rate) = New cases (in specified time-period)/Total population

Risk factor - variable whose presence/absence influences disease/exposure

Hypothesis - proposed explanation for a phenomenon, must be testable *e.g. that the likelihood of an Orangutan being ill is related to his eating guavas.*

When something goes from epidemic to endemic – how does this change management?

Incidence: Is a RATE The number of individuals who fall ill with a certain disease during a defined time period (often 1 year), divided by the total population. For example, the incidence of TB in Cameroon may be 50 per 100 000' – or this can be shown as a percentage. Cumulative incidence refers to incidence over a longer time period – ex. – 60% of children under 5 years old contract malaria, but we do not know exactly how the incidence has varied over these years. INCIDENCE OVER TIME Prevalence is the product of incidence and duration **at a specific time** – ex. – the prevalence of HIV infection in several African countries is above 20 per 100 in a population. Prevalence is a more interesting measure for chronic or protracted diseases, as it will give some indication of the risk of exposure to others in the population. So, a person or animal who falls ill adds 1 to the incidence of the disease. It will also add 1 to the prevalence for the duration of its disease, until it either recovers or dies. If the average daily incidence of a disease is I and the average duration is D Days, then the average prevalence P will be: P=I x D – prevalence is the product of incidence and duration. When comparing the incidence or prevalence of a disease between 2 populations, you must take into account the size of the groups – the denominator. For example, 3 cases of TB in a local village would give a high local incidence for that village, but may not affect the figure for national incidence very much. This concept becomes very important when trying to compare different areas on a map of disease incidence. If you don't know the denominator (population size) then you should not use the term 'incidence' at all, and refer simply to the number of cases.

What is epidemiology - it's all about groups…

All individuals share some characteristics with others (age, sex, diet, behaviour, exposure)

By looking at groups can we learn more than by looking at an individual?

For infectious diseases, what characteristic is different between group A (diseased), compared to group B (no disease)

1. First, epidemiology is descriptive (which individuals, when, where, why?)

2. Then, try to undertake quantitative investigation

3. Finally, turn knowledge into preventative medicine

Epidemiology is largely a matter of perspective. Epidemiology is about putting animals into groups – the study of disease in populations. They are all individuals, and no two patients are ever exactly alike. However, there are a number of characteristics that can be used to group animals. They are either male or female, they are of a certain age, they are from a certain geographical region etc, and they share these characteristics. Epidemiology identifies such groups, ignoring the uniqueness of its members, and tries to determine whether this division of animals into groups tells us something more than we could have learned by merely observing each animal separately. Since epidemiology is a branch of medicine, our interest is usually to describe, analyse or understand patterns of disease in such groups.

The most common situation occurs when we find one group of animals who are ill with some disease, and another group of individuals (often within the same group!) who are not. What is the difference between these groups? Is there some characteristic that seems to differ between them?

Good epidemiological investigation uses a series of steps…

Epidemiological outbreak investigation steps:

1. Prepare for field work
2. Establish the existence of an outbreak
3. Verify the diagnosis
4. Construct a working case definition
5. Find cases systematically and record information
6. Perform descriptive epidemiology
7. Develop hypotheses
8. Evaluate hypotheses epidemiologically
9. As necessary, reconsider, refine, and re-evaluate hypotheses
10. Compare & reconcile with laboratory & environmental studies
11. Implement control and prevention measures
12. Initiate or maintain surveillance
13. Communicate findings

1. Prepare for field work

In previous similar outbreaks, what have been the sources, modes of transmission, and risk factors for the disease?

Assemble useful references (journal articles/ sample questionnaires)

What are your objectives?

What will you do first, second, and third?

Who is involved (working group)?

a. field staff, volunteers, vet, lab. staff, analyst??

What's your communication strategy?

2. Establish the existence of an outbreak

Outbreak/Epidemic - occurrence of more cases of disease than expected in a given area/amongst a specific host group over a particular time-period (i.e. 3/**20** in 10 days)

Cluster - aggregation of cases in a given area over a particular time-period (don't know whether this is normal) (i.e. 3/**??** In 10 days)

a. How many cases are there normally?

b. Have population husbandry practices changed?
    i. reporting procedures/ increased awareness/ improvements in diagnostics

c. Have new animals been introduced?

3. Verify the diagnosis

Important to:

- ensure disease is properly identified (for control measures)
- rule out laboratory error as basis for increased cases
- Review clinical findings & laboratory results

1. Is there an obvious common characteristic amongst cases that fits with the diagnosis?
    - exposures e.g. diet, introduced animal proximity
2. Summarise clinical features using frequency distributions. Are they consistent with the diagnosis?
    - Is the incubation period correct?
    - Does the number of new cases fit with this pathogenic agent?

4. Construct a working case definition

Clinical criteria (objective measures) e.g.

d. fever ≥ 40°C (101°F)
e. three or more loose bowel movements per day
f. ataxia severe enough to limit usual activities.

Restrictions by time, place, host (must be consistent) e.g.

g. time (onset of illness within the past 10 days)
h. place (resident in over-lapping territories)

i. host (same species?, same age group?, same sex?)

Case definition must not include exposure/ risk factor being investigated e.g.

j. Has had clinical criteria & illness within last 10 days (but not be limited to a certain territory or to having a certain risk factor)

Diagnoses may be uncertain so use…

k. Confirmed (lab. verification), Probable (no/pending confirmation), Possible/Suspect (confirmation not possible)

5. Find cases systematically and record information

- Passive surveillance
  - Waiting for clinical case reports (either from the population you care for, or additional populations - e-mail OVAG colleagues
- Active surveillance
  - Actively investigating populations to look for cases

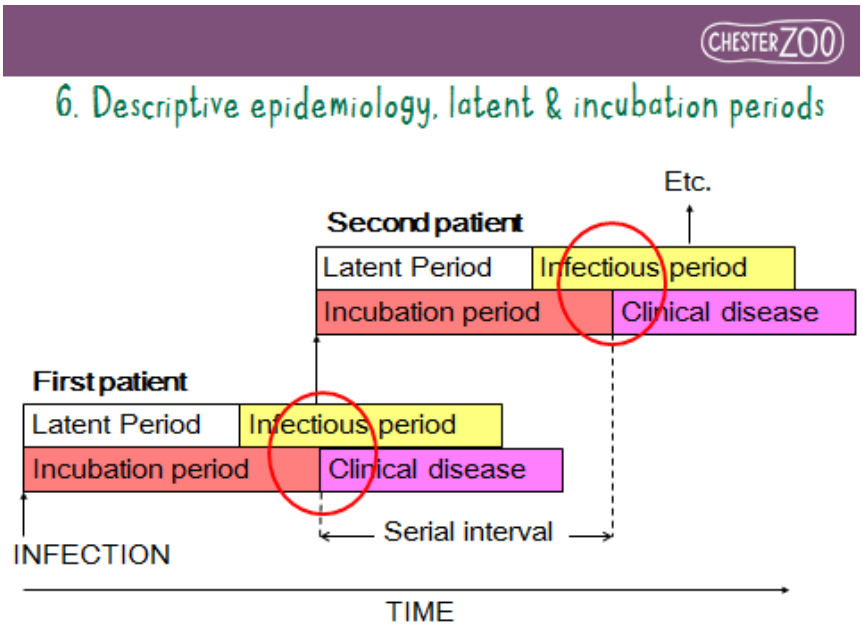
  Tailored outbreak investigation form includes:
  - Identifying information for cases
  - Demographic information (individual characteristics e.g. age, sex, population)
  - Clinical information (see working case definition, step 4)
  - Risk factor information (e.g. diet, introduced animal proximity)
  - Reporter information (who collected data - for future queries)

6. Perform descriptive epidemiology

Characterise the outbreak, summarising by key demographic variables (time, place, host characteristics (age, sex, immune status) & exposures (where, due to certain criteria? e.g. medication, husbandry group))

a. Identify/infer population at risk
b. Clues about aetiology, source, and modes of transmission that can be turned into testable hypotheses (see step 7)
c. Use rates not case numbers where population density varies

Descriptive epidemiology describes the where/whom of the disease, allowing basic intervention and prevention measures to be debated. Early (and continuing) descriptive analysis enables the identification and correction of errors/missing values



What happens after infection with a pathogen in sufficient quantity and virulence to cause disease.

Incubation period varies between diseases, and with the dose of pathogen:

The incubation period extends from the moment an animal is infected until they develop clinical signs of disease. During this time they may be infectious, infectivity often increasing towards the end of the incubation period, DURING A PERIOD THE ANIMAL IS NOT SHOWING CLINICAL SIGNS. This fact has important implications for disease control, since isolation of cases will often occur too late to prevent disease. THIS IS AN IMPORTANT REASON TO MAINTAIN A STRICT QUARANATINE.

Infectious period: This is the time period during which an animal can transmit disease – in many diseases there is therefore overlap with the incubation period.

Latent period: This is the time period from infection until the infectious period starts.

Note that in many infections, a patient may be infectious, but not yet show clinical disease.

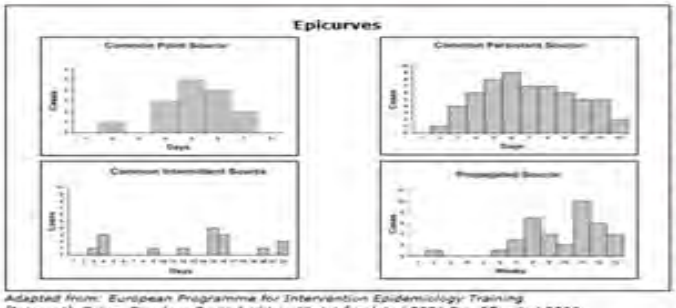
6. Descriptive epidemiology, time-course

Epidemic curve - simple visual display of outbreak magnitude & time trend (frequency of cases by date or time of onset)

- Distinguishes epidemic from endemic disease
- Shape of the curve may provide clues about the pattern of spread e.g. point/ intermittent source/ propagated
- Curve shows current point in epidemic (upswing/ down slope/ end) - Basis for predicting future cases
- Outliers – not in the body of the curve, may provide clues for risk factors
- If pathogenic agent is known, curve can be used to deduce probable time of exposure & help develop a questionnaire focused on that time-period
- Used for evaluation e.g. How long to identify the problem? Are intervention measures working?
- Must be aware, may not yet have data describing full curve

6. Descriptive epidemiology, time-course

- Need onset of illness for each case (time)



Adapted from: European Programme for Intervention Epidemiology Training [Internet]. Solna, Sweden: Smittskyddsinstitutet [updated 2004 Sep 27; cited 2006 Sep 22].

Point-source epidemic - steep upslope, gradual down slope

Continuous common-source epidemic – prolonged point-source with a plateau not a peak

Intermittent common-source epidemic - irregularly jagged epidemic curve

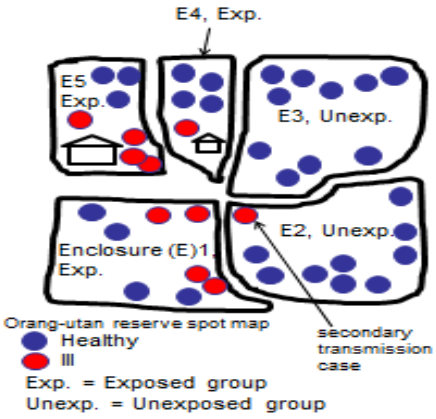
Propagated epidemic - series of progressively taller peaks, one incubation period apart

6. Descriptive epidemiology, epidemic curve

- Is this epidemic curve consistent with a point-source epidemic?
- What is the peak of the outbreak or the median date of onset?
- When is the likely date(s) of exposure, based on one average incubation period prior to the peak (median date) of the outbreak?
- When is the beginning of the outbreak?
- When is the likely dates of exposure, based on the minimum incubation period before the first case?

Epidemic curve eg non-cerebral malaria – was JE in the end in Orangutans??

6. Descriptive epidemiology, place



Assessment of an outbreak by place provides:

- information on the geographic extent of a problem
- demonstration of clusters/ patterns pointing to important etiologic clues
- spot map is simple, useful & provides area-specific rates
- DOES NOT – account for size of underlying population (instead use area map showing area-specific rates)

7. Develop hypotheses

Ideas gained from initial outbreak stages & descriptive analyses

Hypotheses may concern:

d. source of the agent (What is the usual reservoir?)
e. mode of transmission (How is agent usually transmitted?)
f. vehicle/vector of transmission (Which are commonly implicated?)
g. exposures that cause disease (What are the known risk factors?)

Thinking about outbreak curve & place:

h. What events occurred around time of exposure?
i. Why do individuals in one area have the highest attack rate?
j. Why are some groups with particular age, sex, or other characteristics at greater risk?

Should be quantitatively testable

Data can be of different types (categorical, ordinal, quantitative)

8. Evaluate hypotheses epidemiologically

To measure association between exposure & disease, & establish risk factor/s…

***Attack Rate (*AR**) = *No. ill exposed to risk factor / Total exposed to risk factor*

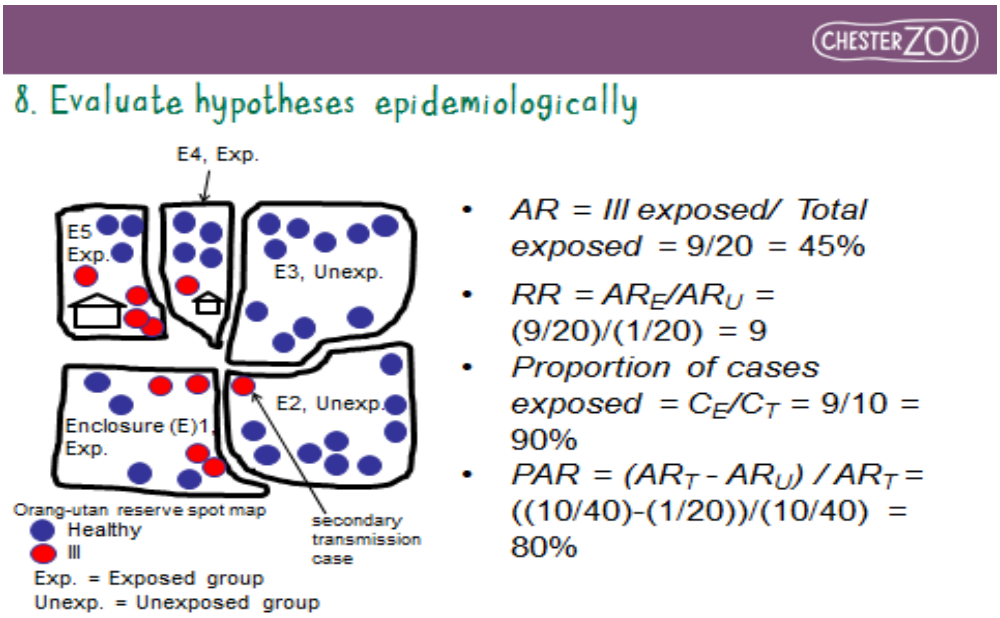
Risk Ratio/Relative Risk (*RR*) = AR *in* ***exposed*** *group* (AR_E) / AR *in* ***unexposed*** *group* (AR_U)

Individuals exposed to risk factor are *X* times more likely to have illness than those unexposed. The larger the RR the greater the risk. RR 1 = no risk.

Once risk factor/s is established…

Proportion of cases exposed = *No. cases exposed to risk factor* (C_E) */ total No. cases* (C_T)

Population attributable risk percent **(PAR)** = (*combined* AR *for exposed & unexposed groups* (AR_T) - AR_U) / AR_T
PAR often under-estimates risk as doesn't account for shared risk factors, ex. cross-contamination of exposures
The **attack rate** measures the proportion of individuals in a population who experience disease after a specific exposure.
The **risk ratio** or **relative risk** measures the association between the exposure and disease by comparing the attack rate in the exposed group to the attack rate in the unexposed group.
The **population attributable risk percent (PAR)** describes the proportion of illness in the entire study population that could be attributable to a given exposure, assuming that those who became ill in the unexposed group and a similar proportion in the exposed group must be attributable to something else. The population attributable risk percent may actually be an underestimate in many outbreaks, since it does not take into account cross-contamination or secondary infection cases.



8. Evaluate hypotheses epidemiologically, statistical significance testing

- Null hypothesis ($\mathbf{N_0}$): Exposure not related to disease (RR=1).
- If exposure has RR>1, undertake Chi-square, Fisher's Exact (if sample size ≤ 5) or other statistical test.
  - Estimates probability (***P*-value**) of finding an association as strong/ stronger than the one observed if N_0 were true. V small P-value (P=0.05 i.e. 5% probability) means observed association occurs rarely if N_0 is true, i.e. exposure has affected illness.

Logistic regression multivariable example: www.ats.ucla.edu/stat/r/dae/logit.htm

	Ill	Well
Exposed	9	11
Unexposed	1	19

Chi-square in R

```
x <- matrix(c(9, 1, 11, 19), ncol = 2) x
chisq.test(x)
```

Output in R...

X-squared = **6.5333**, df = 1, p-value = **0.01059**

But sample size ≤ 5, so type:

```
fisher.test(x)
```

Fisher test output in R…

p-value = **0.008362**

…95 percent confidence interval:
1.645789 713.218297

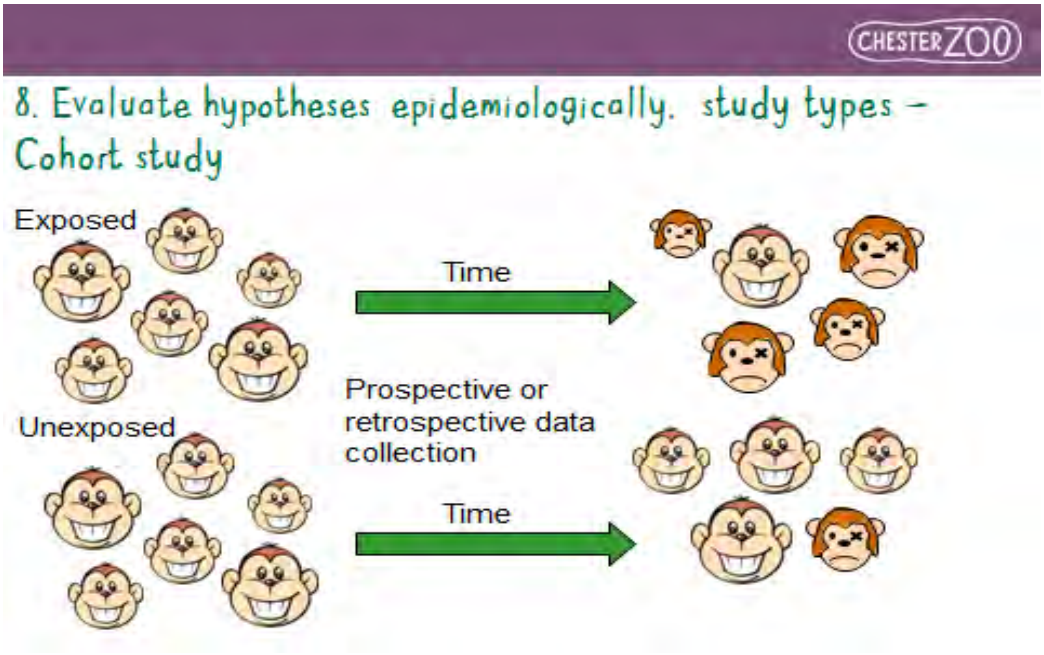
sample estimates: odds ratio
14.55073

8. Evaluate hypotheses epidemiologically, confidence intervals

- A confidence interval (CI) for a RR is the range of values of the RR consistent with the study data. The wider the CI (greater variance in data), the less precise the strength of the association (RR) between exposure and disease.
- A CI provides more information than a *P*-value (observed interval, usually contains the 'true value'), so is often preferred by scientific journals, however either are correct.
- CI calculator (includes other parameters) available at: http://vassarstats.net/odds2x2.html

	Ill	Well
Exposed	9	11
Unexposed	1	19

RR=9, 95% CI 1.25 - 64.59



The Cohort study: Rates –the concept of bias

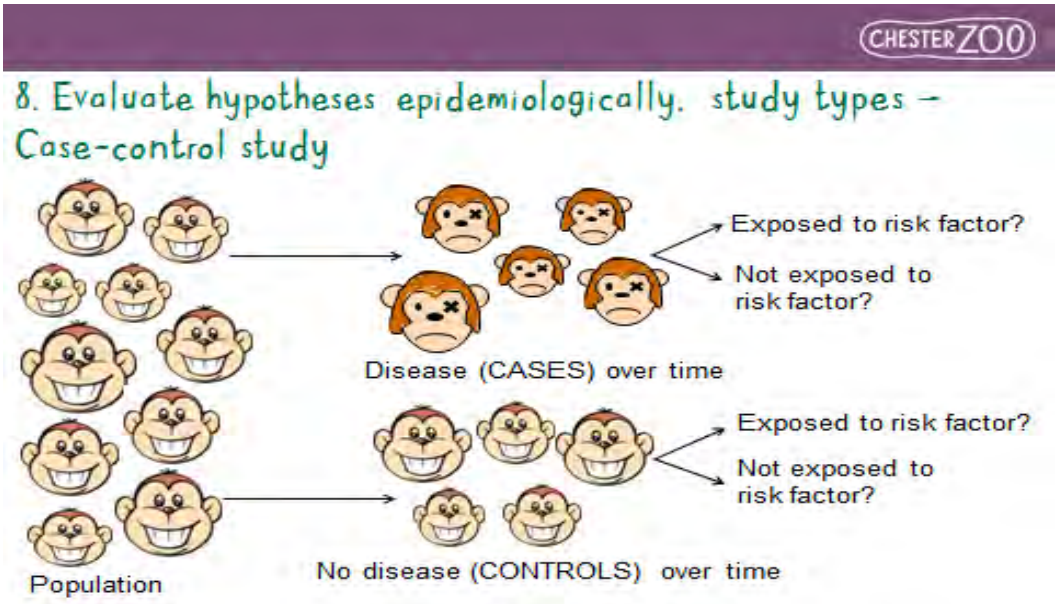
In a cohort study, a group (cohort) of animals exposed to an hypothesized risk factor, and a group not exposed to the factor are selected and observed to record development of disease in each group. For example, if excessive moisture was considered a risk factor for pneumonia in a particular enclosure, a suitable cohort study would comprise a group of chimps housed in a very wet enclosure (exposed) and a group of chimps housed in a dry enclosure (unexposed), each of which would be monitored for the development of pneumonia. Therefore, INCIDENCE is measured and a + b and c + d are predetermined. So we are investigating rates – the number of subjects who fall ill, divided by the total time under study, added by all of the subjects in the cohort. One problem in the analysis of cohort studies is that all subjects are rarely observed for the same time period.

In cohort studies we follow defined groups over time to see how many of them develop disease. By dividing this figure by the original number of subjects, we can calculate the actual risk of disease in each group. In real life, the subjects of a cohort study often enter it at different times, and it becomes practical to use the total time in the study to calculate what proportion fall ill per animal-time unit (months or years), which is then called a rate.

Cohort studies often take a long time, and it is important that all of the subjects are followed up for the entire study, or at least that the causes of loss to follow-up are known for each subject. If we selectively lose contact more with one group of subjects than with the other (e.g if the animals we denote as 'losses to follow up' have in reality died from the disease we are studying), then our estimate of risk or rate will be biased.
Bias may be introduced either by the selection of subjects or by the way in which data is collected. Avoidance of bias requires careful consideration when a study is planned, as once it has been introduced, it may be impossible to adjust for it in the analysis of the data.

A controlled, randomized, double-blind trial tries to eradicate confounders (known and unknown) and biases by letting chance determine who is allocated to which group, and by precluding observer bias. If confounding variables are to be equally distributed between the groups, these cannot be too small, since chance may easily play tricks with small numbers.

The choice between performing a cohort study or a case-control study (see below) is often governed by considerations of time and money, In general, cohort studies have fewer problems with bias, but are more time consuming and expensive.



The Case-control study: Odds and odds ratios – the concept of confounding

In a case control study, a group of diseased animals (cases) and a group of non diseased animals (controls) are selected and compared with respect to presence of the hypothesized risk factor. Risk Factor = excessive dampness in the enclosure. Thus a case control study of pneumonia would involve identification of cases of pneumonia and comparison of the location of those cases (damp Vs dry environment), and a control group that do not have pneumonia. Thus a + c and b + d are predetermined. Case-control studies may be conducted with new studies and therefore may utilize BOTH incidence or prevalence values. What are the 'odds' that the risk factor has something to do with the disease?

Odds for cases = number of cases exposed to the factor
Number of cases not exposed to the factor

Odds for controls = number of controls exposed to the factor
Number of controls not exposed to the factor

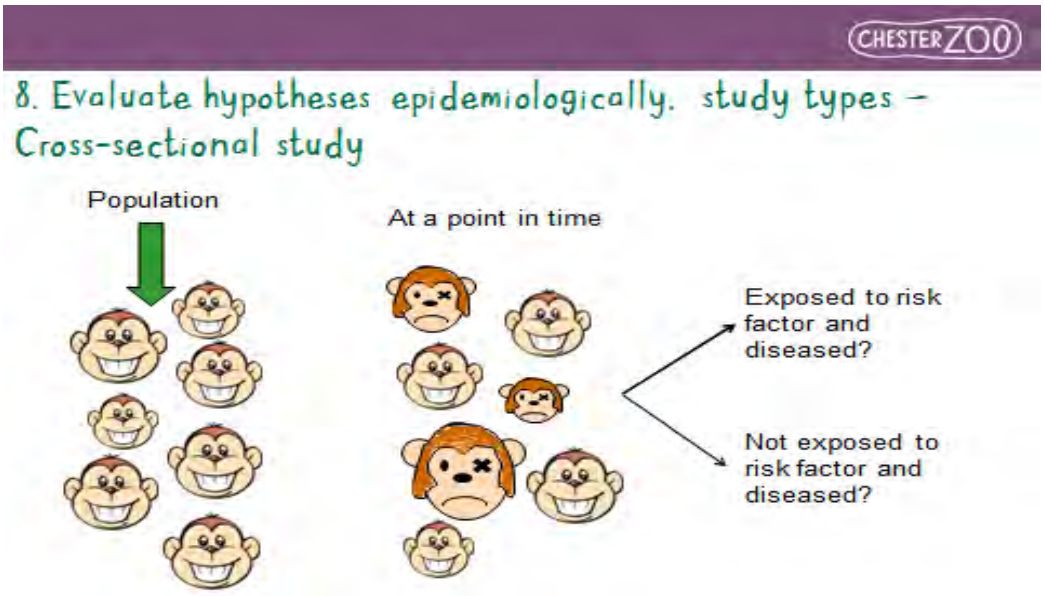
Odds ratio (OR) = odds for cases
Odds for controls

If we lack information about exposures and outcomes in a clearly defined population, we can conduct a case-control study. Risks cannot be calculated, but instead we use odds and odds ratios, which are based on similar ideas.

Since we are only looking at a sample of all possible cases and controls, there is a statistical uncertainty in the exact figures, which is measured by calculating a confidence interval. We say that a factor is significantly associated with disease if the confidence interval around the OR does not include 1. The most difficult part of a case control study is choosing appropriate controls.

Controls should be selected not to be as similar to the cases, but rather to inform us how common a certain risk factor or exposure is in the background population from which the cases arose.
Even if a factor is significantly associated with disease, this may just be a statistical finding, where the division according to exposure also divides the individuals into high-risk and low-risk groups according to some real risk factor. This is called confounding.

The concept of confounding is closely coupled to the concept of cause, and the observational science of epidemiology will always have a problem with proving that it has found a proper cause of disease.

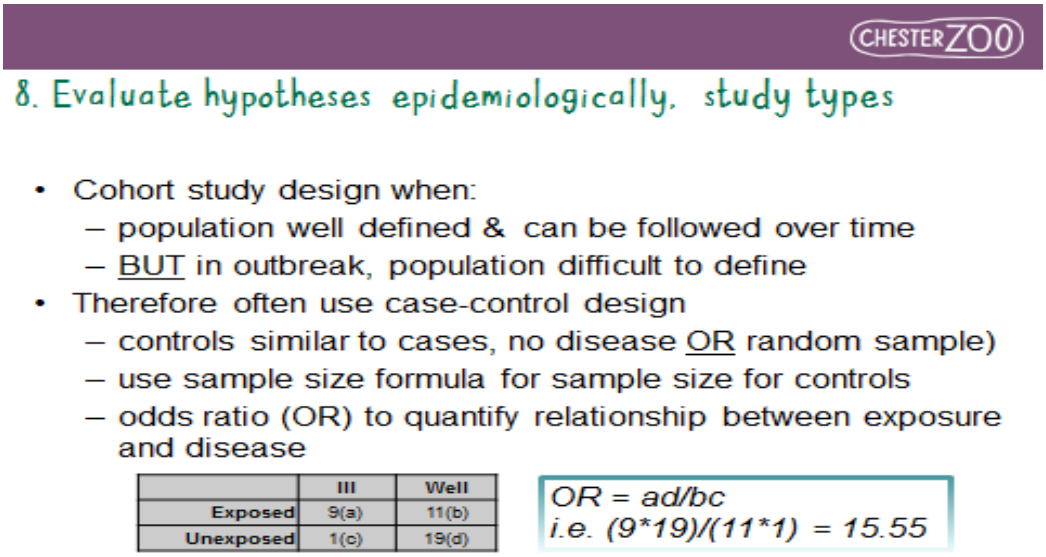


CROSS SECTIONAL STUDIES

The cross-sectional study involves the selection of a sample of *n* individuals from a larger population, and then the determination, for each individual, of the SIMULTANEOUS presence or absence of disease and hypothesized risk factor; prevalence is therefore recorded. For example, in across sectional study of pneumonia, a sample of chimps would be selected and classified according to enclosure and whether or not they had pneumonia. At the beginning of the cross sectional study, only the total number of animals (n) is predetermined. The numbers of animals with and without the disease, and possessing or not possessing the risk factor, are not known initially.

These studies are particularly useful when looking at the seroprevalence of a disease across a population (for example the prevalence of confirmed SIV in PASA sanctuaries). Such studies may be rendered more analytical by relating seroprevalence to factors such as age, gender, geographical location etc.

This raises the idea of seroepidemiology (using serological factors in epidemiological studies). As well as looking at disease prevalence, these studies are also useful in determining the sensitivity and specificity of diagnostic tests, in the evaluation of vaccine effects, and to follow the incidence of an infection. This last can be achieved by sampling a defined cohort, or by means of repeated samples from a larger population. In the latter case, the incidence is estimated from changes in prevalence between samples. An advantage of seroepidemiology in this situation is that it obviates the need for continuous surveillance of cases – the cumulative incidence between two time points will be directly evident from the serological data. In addition, subclinical cases will be included.



9. Reconsider, refine, and re-evaluate hypotheses

Analytic studies may find nothing, particularly if hypotheses not well-founded
If so, rethink hypotheses (e.g. common links between cases, new vehicles, new modes of transmission, disease/agent characteristics, host factors). Are confounding variables, which correlate directly or inversely with the exposure variable being examined, clouding the analytical results? If cases are stratified will this provide more power to the results?

Or hone, the hypotheses based on previous epidemiological analysis (e.g. time spent near exposure, re-investigate place)

Are biases in the controls causing an issue; would a more specific control group (closely matched controls) help?

10. Compare and reconcile with laboratory and environmental studies

Use laboratory evidence to confirm the findings.

Environmental studies examining potential exposures can confirm effect of place or type of exposure

Hopefully, results of epidemiologic, environmental, and laboratory arms of the investigation will complemented each other!

11. Implement control and prevention measures

Goal of outbreak investigation is disease control/ prevention of extra cases
Control/prevention should be implemented ASAP

Confidentiality of data collection, management, sharing is important

Control measures against agent/ source mode of transmission/ portal of entry/ host) include: treatment of affected, decontamination of environment, masking of infectious source (e.g. bed nets, insect repellent, PPE), blocking mode of transmission (e.g. isolation of affected), elimination/ decontamination of vehicle or vector, vaccination, prophylactic use

12. Initiate or maintain surveillance

Implement active surveillance to target disease if not ongoing, to:

k. continue monitoring the situation, determining whether the prevention and control measures are working (Drop in cases? Where are new cases occurring? Are new cases occurring throughout the area, indicating that interventions are ineffective, or are they occurring in pockets, indicating that areas have been missed?)

l. ascertain if the outbreak has spread outside its original area or the area where the interventions were targeted.
    i. If so, effective disease control and prevention measures must be implemented in new areas.

13. Communicate findings

Communications report summarising the investigation, its findings, and outcomes including conclusions and recommendations for action
Audience for communications should be agreed by working group, but may include use of:

m. A written report (including introduction, background, methods, results, discussion, and recommendations) – dissemination to whom?
n. Oral briefings
o. Web-based portals
p. Social-media

And of course, the most important step – communicating to all interested parties (your manager, your staff, other vets, your government, peer reviewed journals, BBC etc.), AND encouraging dialogue between them. Risk communication is particularly important because the perception of risk by people who have examined a disease problem in detail is often very from that of the general public – such as the local village elders, or your manager (!). The former (us) may argue that risk should be determined objectively by the 'data alone', whereas the latter may 'irrationally' colour their perception of risk by subjective factors – often called 'outrage factors'. Reality is usually somewhere in the middle.

Since society generally reacts more to outrage than 'mere hazard', an important part of communicating risk is to make serious hazards 'more outrageous', and modest hazards less so. Gruesome graphic government campaigns highlighting the dangers associated with driving under the influence of drinking or drugs are examples of increasing outrage. The extent to which the 'public' accepts risks is clearly related to the degree of outrage.

Problem based Learning exercises for break out groups.

Groups were asked to imagine they were investigating the problems described within provided examples; Groups worked through what they would do, thinking about the types of questions outlined below to help solve each problem.

Questions:

What are the differential diagnoses?
What measures should you take immediately?
What further questions should be asked to determine the potential source of the initial infection?

You are responsible for the further investigation representing all the relevant authorities.
What do you do?
Should an incident meeting be convened, if so when, and who (which authorities) should be invited to the working group?
What can each of them contribute?
What will your next steps be?
Who does what?

Group Breakout Session:

Scenario 1, **Section 1**

Fat bears!!

You are employed as a consultant by the owners of the facility (a wildlife park) to create a preventative health program. Before you can do that, you discover two sick sun bears. They have generalized fur loss with some foci of dermatitis and both appear obese.

1. What are the differential diagnoses?

2. What measures should you take immediately?

You realize that the problem can't be solved without an animal husbandry change.

3. What do you do?

4. Who are the decision makers that you need to engage with?

5. Of these, who will be able to help?

6. What do you want them to do?

Scenario 1, section 2

You get the weights of the sun bears (60kg F and 80kg M). An activity log for them shows that they spent 20% of their time pacing and 40% of their time doing nothing.

1. Who do you need to involve to help improve the health and welfare of the animals?

2. How would you conclude the investigation and what steps could you take to avoid this occurring in the future?

Scenario 2, Section 1

A snotty Orangutan

You are asked to investigate a case of disease in a 12 year old female Orangutan who has been largely clinically healthy, but every couple of weeks for the previous year it has been noticed that she has a (minor) unilateral nasal discharge. You are asked to anesthetize this animal because you are about to ship it to your quarantine center for release. On physical examination, you find that there is a large amount of fluid within the main air sac.

1. What are the differential diagnoses?

2. How you would eliminate each?

3. What do you do **immediately** to manage and investigate this?

4. Resources are limited. You can initially only do 2 laboratory test procedures. Please chose and explain your choice.

Scenario 2, section 2

The samples come back positive for *Streptococcus pneumoniae* and you estimate approximately three litres of fluid in the air sac. Your manager asks what implications this has for the release, how do you respond…

1. In terms of treatment?

2. In terms of release management?

3. What public communication measures would you take, and who would you go to, to implement these?

Scenario 2, section 3

After two weeks you repeat the bacterial cultures and they come back positive again, but with *Strep* resistance to the antibiotic you are using. The animal has no clinical signs; however, the *S. pneumoniae* is still sensitive to another antibiotic you can administer easily.

1. How do you proceed?

Scenario 2, section 4

The animal is clinically cured, but it is decided to pay special attention to her respiratory tract in the future to catch the illness before it recurs.
From a population management perspective, you want to take preventative medicine measures to minimize future cases of this illness.

1. Do you know what the prevalence of Air saccuilitis is in the group? In your own animals?

You test and find a prevalence of 15%. (younger animal, physical examination, older animals sampling after anesthetizing). What are the risk factors for as in the population?

2. How can you reduce the chance of this disease occurring in the future?

3. What public communication issues would you take?

4. List other respiratory pathogens you are concerned about in orangutans.

Group Discussion on OVAG issues and possible curriculum suggestions for future collaborations: Pak Indar, Steve, Raffaella, Ricko, Yenny, Siska, Citra

Possible formation of a Wildlife Research Center for a master's program at UGM, which would be the first of its kind in Indonesia! Further discussions to follow throughout the year.

Day 3

UGM – parasitology and PCR lab

Review of Parasites **Wendi, Liverpool School of Tropical Medicine**

Microscope stations set up with various parasites – participants identified parasite at each station

PCR Lab – UGM faculty

Review of methodology for collecting and analysing DNA

Afternoon Session: **Exploring Jogjakarta**

Day 4

Housekeeping announcements – travel, invoices, etc., and prepping for future sessions this week (case studies, review of ethics…)

OVAG Resource Center:

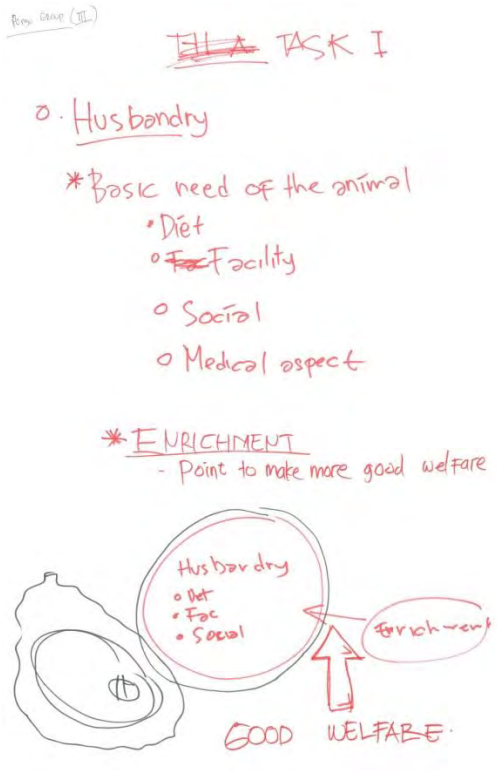
All information (past and present) from workshops is given to participants on flash drives – **The Resource Center** contains ALL information from the past as well as new materials, articles, reports etc. In particular –a Field Sampling and Diagnostics folder that has valuable videos in it. The aim is to get this material on line in some manner so that participants have access via web – but how has not yet been determined.

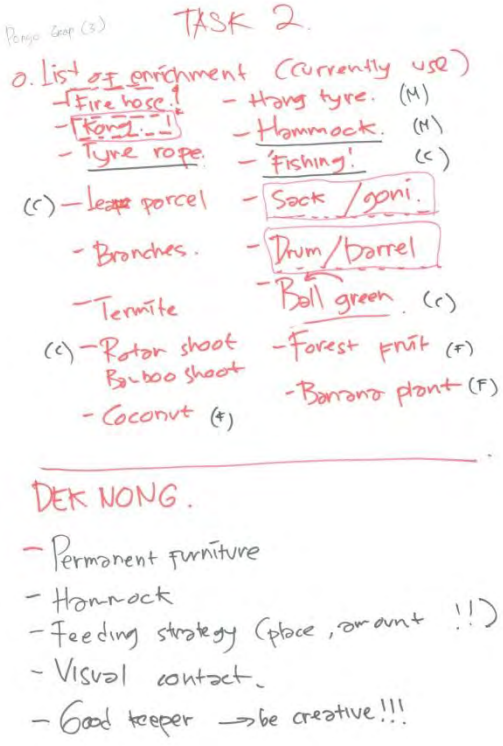
Husbandry and Enrichment **Yenny (SOCP) and Claire (Cheaster Zoo)**

Review of earlier talks – What is good husbandry and what does enrichment mean to you?

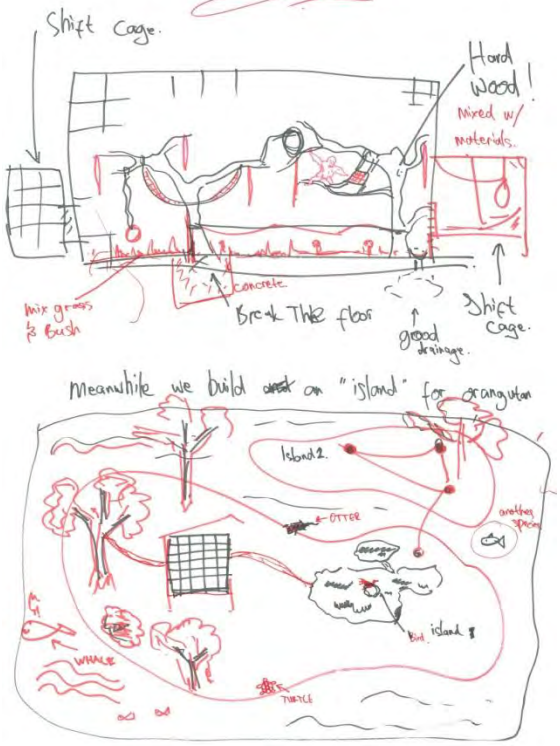
Group Discussion

Group Activity – Assigned groups reviewed enrichment techniques and what they would do if money was no object in terms of orangutan enclosures and enrichment.

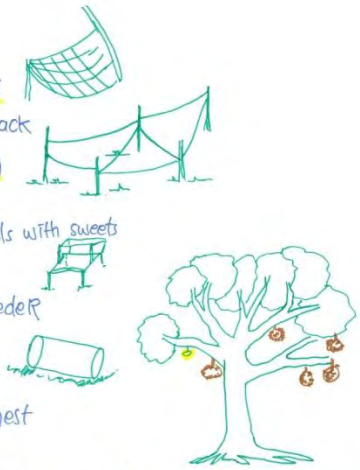




TASK 3



3...
- Hammock
- Happy sack
- Strapping
- 'Kong'
- Bamboo fills with sweets
- Platform
- Honey feeder
- Tong
- Beehives
- Termites nest



4. + Enclosure yang lebih luas (outdoor encl.)
&
5. + Ganti diet (60% vegetables)
+ Pakan di atas

EXTRA answer
* Membeli & membuat pulau "ou"

GROUP 1 - WIGLY
TILA-CASE

1. Good husbandry :
management perawatan satwa yang memastikan satwa mendapat - - -> 5 "animal freedom rights"

2. - Housing
- Nutrition
- Enrichment
- Health management
- Hygiene & biosecurity
- Sosialisation grouping

3. - Es blok
- Pohon
- Daun

LEUSER (blind)
↓
palate, ~~smell~~, auditory

(A) Design of cage
- height
- simple → complex
- harmless.
- water feature (pool, waterfall, river, rain system)

(B) Enrichment item
- leaves, branch
- herbs (palate & smell)
- tong
- whole fruits : cocanut, sugar cane, pineapple
- forest sound : birds, insect, water, another orangutan / animal.
- urine of other animal / ou (pheromone)
- smelly fruit (jackfruit, stinky bean, durian)
- ice block
- ~~whole fruits~~

(C) Social & behaviour
- friends of orangutan (female ou)
- Rawam Feeding time.

GROUP 2 ["HORRAYY"]

① Good husbandry
↳ comprehensive program / management for captive OU (implementation)
↓
ANIMAL WELFARE

② Aspect :
- health : sanitation, biosecurity, quarantine procedur, medical treatment
- nutrition : diet program
- behaviour : observation, size of cage, enrichment, cage design, social grouping, exercise

③ LIST OF ENRICHMENT :

· kong	· tire	· rice sacks *
· fire hose	· leaves, branch	· blanket *
· hammock	· insect	· feeding puzzle
· other OU	· parcel	· feeding hoist
· random feeding time	· fishing	
· whole fruits	· herbs	· water gallon *
· forest school	· nest basket	· barrell *
· ice block		

GROUP 4 LEUSER CASE

① Good husbandry =
welfare ? - Good nutrition
- Good Caging : Sanitation, hygiene,
- Good health
- Good Enrichment
- Good in steps limiting techniques

→ meaning is providing animal welfare

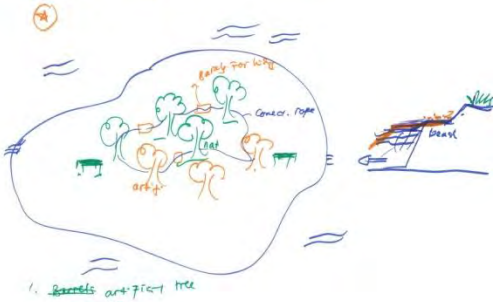
② the most important aspect of husbandry & why ?
- Nutrition / Size
- Animal health.
- Good Enrichment
- Good Caging

All are important & Connected each others. improving well being

③ Enrichment on your cage :
① Cage
Fix things
- Log
- artificial nest
- Swinging tire → Rubber rope
- fire hose hammocks
- Ramps
- Other OU.

② .
- leaves & branch
- Str bamboo honey stick
- Ice block
- termites
- bag sock with leaves and fruit inside
- plastic ball (UR)
- puzzle feeder.

④ Leuser
- Male - adult - Re-wild
① put in Re Islands / Enclosure



1. artificial tree
2. actual tree
3. Connected rope
4. Barrels for wife
5. hammock
6. Wood platform
7. Give food on these blocks ; associate with smell / sound
8. Housing with conditions OU if possible (♀)
- if a way to prevent breeding
- if a way for her to escape

Group 1 – 'Wigly' – Tila (hep B orangutan with obesity issues) Laura presenter

1. Good husbandry – The 5 animal freedoms
2. Housing – nutrition, enrichment, health management, hygiene and biosecurity, group socialization
3. Types of enrichment – ice blocks, access to trees, edible leaves (browse) to encourage species specific behaviors, hammocks, happy sacks, strapping (lianas), kong balls, bamboo filled with sweets, feeding platform, honey feeder, tunnel tubes, beehives, termite nests
4. Outdoor enclosures
5. Variable diet (mix fruit and vegetation
6. If money was no object – buy Borneo for the orangutan!!!

Group 2 – 'Horrayy' – Leuser (blind orangutan) Ayu presenter

1. Good husbandry – comprehensive program and management for captive orang-utan – good animal welfare
2. Aspects:
    a. Health, get from chart for overall enrichment

Specific items for Leuser – focusing on palate, smell and auditory, as more important due to his blindness.

New design for caging – start with a simple cage then slowly introduce him to a more complex cage so he can adapt slowly as each different item gets placed in his cage. Care should be taken in designing a cage that is safe for a blind orangutan. Possibly have a rain system set up? Herbs might be good as they are very fragrant and whole foods should be given rather than cut up foods with many aroma rich foods to trigger his sense of smell…perhaps hide food from him and his sense of smell would allow him to find it? A sound system with forest sounds of birds, and such could be installed. Perhaps occasionally put female orangutan urine around his cage so he can sense that as well. Social behaviour? Perhaps he can be put with an un-releasable female.

Group 3 – 'Deknong' - Ricko and Imam presenters

Husbandry for un-releasable female – increase aspects of husbandry: diet, enrichment, other orangutans in line of sight – some enrichment such as strapping and tunnels (items that would not be harmful for her)

Diagram: new enclosure –a soil substrate for possible plantings, dead trees and hard woods to make the design, hammocks, strapping (climbing ropes) and squeeze cage so that enclosure can be cleaned easily – fresh water available,

Provide an sland enclosure – planting may already be in place but can be enhanced, addition of fire hoses for climbing,

Group 4 – 'Otang' – Leuser (blind) - Dian presenter

Good husbandry should provide all points of animal welfare protocol. Good caging, good health, good enrichment, low stress.

New island enclosure – free of bars which may be dangerous for a blind individual - large trees, protective break so he does not fall in the water – artificial trees with some climbing strapping – he is ex-wild orang-utan so enrichment should consider that – a female? If possible , several platforms

Plan 1 – focusing on other sensory organs, spray safe scents throughout the island – stagger feeding times so that delivery is always at a different time.

Joint Group exercise – thinking about an individual in your own centers – what would you design and provide for that individual?

Non human apes and water? Something to think about as water barriers /moats may not be optimum.

Discussion:

Is enrichment optional? If it is not optional, how does that information get relayed to management? How do you evaluate enrichment practices? Are they working? Have your efforts improved the life of any specific orangutan? Information about this has already been previously provided. Data do need to be used with enrichment programs to evaluate properly….are they using items? What percentage of their time is used?

Case Studies:

Air sacculitis **Steve, Chester Zoo**

Upper respiratory tract infections – constant nasal drainage (normally) can lead to sinusitis (inflammation) if it is not draining correctly – left untreated is can potentially lead to air sacculitus –which can lead to pneumonia which can be fatal.

Video of Air sacculitis surgery at Chester Zoo

A huge team was assembled, which always includes a keeper holding the hand of the patient during any great ape surgery. The keeper can 'feel' if there is movement or a grip and can alert the team immediately – getting (human) specialists to assist is better than trying to figure it out yourself.

Video of sinus exploration (sinusitis)

This particular case should have been dealt with much earlier – then this procedure need not have been performed – why was the wait so long? The zoo who housed this particular orangutan felt that they did not have the expertise and did not ask for expertise! The team wanted to go back and clear the area again, but the zoo refused the last procedure – management felt it was not made clear that there would be 4 procedures…the zoo was also in a hurry to have babies and did not want the female incapacitated again – a Chester Zoo male was housed with the females so that when they were returned to their zoo of origin, the females would be already pregnant.

In Europe – cleaning it out and flushing has worked well – in the US the air sac has been removed.

Why does air sacculitis and sinusitis happen so often in captive orangutans? More materials in digital packet.

Jati, an orangutan with Hep B arrived in MN in September 2013 **Arga, BOSF NM**

Was active and had a good appetite. HBsAg positive – sent out for DNA analysis of virus Hep B (VHB) – positive for Human Hep B virus (Arga was able to discuss with Laura of Malaysia as they shared similar cases with this) – treated with Hepa Q s1dd capsules on Feb 2014 – they were shocked to see that after 4 months the results were negative – so they rechecked – still awaiting results.

Now: 1 cap Hepa Q / extract of sylybum Marianum 87.5 mg., extract of Curcuma Xanthorrhizae 21 mg., Oleum Xanthorrhizae

Perhaps do an additional panel of Anti HBc?

Lively discussion of Hep panels:

What protective measures are set for staff – gloves and mask and all staff have been vaccinated and all staff are checked yearly for Hep and TB.

Laura – they have 3 Hep B orangutans –one staff takes care of quarantine – he wears hazmat suit and special boots – oranguitan is in a cage and is provided with much enrichment but it is not allowed out – Laura's case was a male orangutan who always tested negative and then a few years ago, he tested positive for Hep B – they tested monthly and then after 3 months he tested negative…repeated testing still shows negative result.

Do humans clear Hep B? Might be useful to find out - unimmunized chronic 90% - acute disease recover with very little damage – chronic much more deleterious…. www.cdc.com

Huge implications in determining correct Hepna Virus regarding releases –DNA sequencing may be the best way to determine the correct hepna virus.

Are full tests conducted on wild orangutans for translocation?

Riko does a full test for his translocations

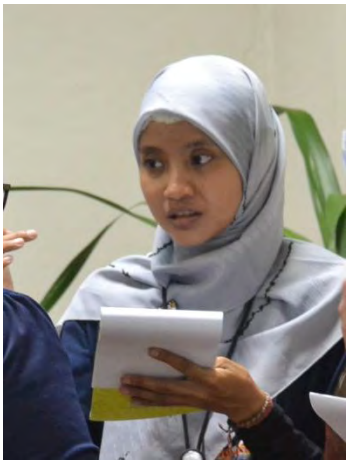
Yenny –most times if they are moving an orangutan quickly – they do no testing

Case study: Fatal snake bite on released orangutan **Winny, The Aspinall Foundation**

Semeru, a male, 7 year old orang-utan, was sent from Perth Zoo for release in Novemer 2011. He died in March 2013, He was released in Bukit Tiga Puluh, Jambi. In the last three days before death he showed low appetite and was very inactive and crying. As he was up 10+ meters in the tree he could not be checked. The following morning there was no movement and he was found dead in nest. The post mortem revealed a snake bite mark. Necropsy showed: edema of organs, congestive edema of lungs – acute hepatotoxicity and gastric area was full of undigested food – severe bleeding in multiple organs.

Cause – bite of venomous animal – most likely a pit viper. Trace of fangs found, severe bleeding, viperine venom is typically hemotoxic, necrotizing and anticoagulant – immediate death.

As this was a captive zoo animal (born in a zoo) he was more vulnerable .



Animal Welfare **Raffaella, Orangutan Conservancy/ Siska, BOS Bogor/ Sumita, UPM**

As reintroduction programs are increasing, and the individuals they can accommodate are increasing, we need to be very watchful in caring properly for wildlife. This means we need to really understand clearly what that means…. Animal Welfare – what does that mean exactly?

Animal welfare is a term that refers to the state of an animal in captivity

The term animal welfare, in its scientific context, refers to the actual state of an animal rather than to the ethical obligations that people have to care for animals. Both failure to cope with the environment and difficulty in coping are indicators of poor welfare. It is a little bit different from conservation….

Conservation is about populations, welfare is about the individual. For us, the protection of wildlife must include both. Preserving species and their natural habitats and ensuring the welfare of the individual animals. For welfare, this means: making certain that an animal is healthy, well-nourished, safe, is able to express natural behaviors, is able to express species-typical relationships, is comfortable, and is not suffering in any way (ex: pain, fear, distress). These items are not one time evaluations, they must be constantly reviewed and adjusted. Some evaluations (from a veterinary perspective) are sometimes simple, such as, effects of a low concentration of body fluids or a high body temperature - where the appropriate treatment can be administered (Broom, 1991). Others can be more complex and involve problems that can interfere with survival and reproduction, for example: deficiencies in mental functioning or insufficient contact with other members of its species and species specific behaviors. Physical, mental, and emotional states can vary from day to day, it is important to consider these states together and over time to provide an assessment of an animal's overall welfare status.

From Endcap website

FIVE FREEDOMS (the principles)	WELFARE QUALITY® (criteria)
Good feeding	**1. Absence of prolonged hunger** **2. Absence of prolonged thirst**
Good housing	**3. Comfort while resting** **4. Thermal comfort** **5. Ease of movement**
Good health	**6. Absence of injuries** **7. Absence of disease** **8. Absence of pain induced by inappropriate management procedures**
Appropriate behaviour	**9. Expression of social behaviours** **10. Expression of natural behaviours** **11. Good human-animal relationship** **12. Positive emotional state**
Protection from fear and distress	**13. Absence of general fear/distress/apathy** **14. Ability to seek privacy/refuge** **15. Absence of surgical or physical modification of the skin, tissues, teeth or bone structure other than for the purposes of genuine medical treatment/ manipulation/sedation**

Compromised welfare if…

- Nutrition Perspective:
    - Inadequate fluid/food intake, or dietary nutritional imbalances (deficiency/excess)
    - Less than normal thirst/hunger,
    - feelings of weakness or debility
- Environment Perspective:
    - Exposure to extreme environmental conditions (hot/cold)
        - Hypo/hyperthermic distress
    - Uncomfortable or injurious floors
    - Persistent discomfort or pain from bruises, joint problems, skin irritation etc.

- Health Perspective:
    - In response to traumatic injury, disease agents or toxins, genetic disorders, or other forms of functional impairment
        - unpleasant experience, i.e. breathlessness, nausea, sickness, pain, distress, fear or anxiety
- Behavior Perspective:
    - Space restriction, or overcrowding & agonistic interactions
    - Lack of substrates allowing for species specific motivation to perform certain behaviors

These behaviors can include:

- foraging/hunting, play and exploration
- normal mating or parenting behavior
- social interactions
- general lack of productive occupation, stimulation or opportunity to perform actions with satisfying consequences

- Mental Perspective:
    - Can arise from sensory & other neural compromises
    - (anything that can affect their mental state)
    - All are integrated and expressed mentally at varying degrees of
        - thirst
        - hunger
        - weakness
        - debility
        - breathlessness
        - nausea etc.

While we consider what wildlife in our care needs to survive, we must also consider the species – as each individual species has its own specific needs – Good welfare must also consider the species-specific needs of wildlife. Another point to consider, especially regarding reintroduction programs, is the wildlife that may not be suitable for release – while our hope is that orangutans (or any animal) will spend a short amount of time in any center, the reality is that some may remain there for a very long time and for some their whole life.

Social Structure

Orangutans like all primates are very social – HOWEVER…. In the wild they do not spend much time with others and can be quite independent – what we typically see in the wild are mothers with offspring and independent males (variable). This really presents a challenge when dealing with orangutans as we typically put them together in groups. Because of space limitations, they do need to be kept in groups, and this is why it is so important that they be organized into the right groups. Orangutan groupings need to be carefully observed so that we can be certain they are in groups that are successful…Bullies with other bullies, sensitive ones with other sensitive ones etc.

Breeding

As we know, orangutan centers are very overcrowded – it is equally important to prevent breeding whenever it is possible – especially for those that will remain in captivity for their entire lives. We, therefore, not only need to consider short term welfare issues for wildlife that will be released but also the very long term welfare issues of wildlife that will remain in captivity.

From AZA (American Zoo Assication):

An animal typically experiences good welfare when healthy, comfortable, well-nourished, safe, able to develop and express species-typical relationships, behaviors, and cognitive abilities, and not suffering from unpleasant states such as pain, fear, or distress. An Animal Welfare Folder is in your OVAG digital packet which includes:

Refinements in husbandry, care and common procedures for non-human primates for you to review by Ninth Report of the BVAAWF/FRAME/RSPCA/UFAW Joint Working Group on Refinement M Jennings and M J Prescott (Joint Editors)

The animal welfare folder contains many other useful and interesting articles .

Are we finished? NO!!! We also need to consider wildlife that is being researched in the field….

There are also rules for them:

You will find a useful article in your digital Animal Welfare Packet about field work.

Useful Websites

http://endcap.eu/animal-welfare-excellence/

http://www.ifaw.org/united-states/our-work/animal-rescue/wildlife-rehabilitation-and-release

http://www.waza.org/files/webcontent/2.members_area/9.animal_welfare/2013%20June%20Long%20Outline%20WAZA%20Strategy.pdf

https://www.aza.org/animal-husbandry-and-welfare/

http://www.daff.gov.au/animalwelfare

Some things to think about….

- Abnormal behaviors: Stereotypies - Directed to self - Directed to another animal

  Failure to function - Anomalous reactivity
- Building, enclosure, facilities,
- Contraceptives
- Escapee(s)
- Euthanasia

Management procedures / Nutrition / Pollution of the sensors: Visual – Olfactory – Auditory - Tactile

Rehabilitation process: Training method

Everybody is struggling with how to properly and ethically maintain wildlife in captivity. Problems with compliance are not unique to south east Asia.

Parasitology Quiz review **Wendi, Liverpool School of Tropical medicine**

Review and discussion of the answers from slide lab practical

Great Ape Reintroduction Workshop Roundup of proceedings at Chester Zoo **Steve**

The workshop was a way of getting centers from all great ape range countries together – organizers also wanted it to be an action driven workshop – not just another talk-fest. Participants were given time sensitive assignments –they have a year (Sept 2014). Purpose: to cover up to date information – individual animal welfare must be taken into consideration not just conservation issues – post release monitoring – pre-release protocols need to be set and monitored – animal welfare needs to be a higher priority – Ben Beck: no evidence that reintroduction increases the welfare of individuals involved. A copy of the proceedings will be given to delegates electronically.

IUCN Translocation – Reintroduction

General reintroduction success indicators

Indicator 1: High post-release survival of released individuals.

Indicator 2: Successful adaptation of released individuals to release site.

Indicator 3: Exhibition of social and other behaviours similar to those observed in wild populations.

Indicator 4: Reproduction within the re-introduced populations.

Indicator 5: Long-term persistence of the re-introduced populations.

Indicator 6: Improved legal status of the release sites.

Indicator 7: Effective management of the release sites leading to ecosystem recovery.

Is reintroduction a conservation tool – for chimps and gorillas : yes Orangutans?

What needs to be done:

Chimp focus – All members of reintroduction projects are part of PASA – as a result information flows really well – 4 sites in Africa – Chim Con Center Guinea – Limbe/Ape Action Africa/Sanaga in Cameroon Tacugama – Sierra Leone

Help Congo and CCC: re-enforcement not just a reintroduction – they were able to prove that this saved the wild population – without the reinforcement – the population would have gone extinct

Key Issues and Challenges covered:

Gorilla success rates is much higher than chimps

Indonesia Section (Ian Singleton in absentia)

Not as strong a response to release information as there is in Africa

IAR – have recently done releases but not prepared to talk about it

Sumatra – into areas where there are no wild orangutans

Malaysia – some wild

Kalimantan – no wild, some with wild

Some projects proactive in dealing with the local communities surrounding release sites

Some have local government involvement

COP – has taken over a zoo in Samarinda KalTim but is not releasing

In Africa, working with the local community went on for years before releases began.

In Indonesia, the concern was that not enough preperation was being done with local community and the releases may not succeed. Very little communication between ngo's – very different from Africa states where they communicate often.

Reintroduction outcomes:

Some in very early stages of release

BOS has 300,000 hectares for orangutan releases and a separate area of 80,0000 hectares

Sepilok – in the past three years only 10 orangutans have come in to rehabilitation center

Sarawak – similar to Sepilok – a handful of releases have been made

Day 5 – last Day!

Ethics scenarios – group activity

Ricko's Group – (Ricko, Rosalie, Barbel, Ikhsan, Imam, Claire, Debby, Yumni) Yumni presented

Received an injured wild orang-utan – they would try to stabilize condition – after one week after rescue notify gov't, local people, etc. – is it releasable (depending on health condition) – they will take 3 months to evaluate condition (depending on severity of injuries and needs to be on a case by case basis)– daily observations – if orang-utan improves, then it can be translocated – if cannot be released due to possible injuries but is still stable, and there is room for permanent care then he can stay – if his condition does not improve and indeed deteriorates, then another meeting with all those involved (gov't etc.) explain situation and group discussion needs to be held about euthanasia (if condition is really poor) – as orangutans in Indonesia belong to the government (really the country) – no one person should make that decision – needs to be discussed and approved by the gov't before any orang-utan can be euthanized.

Hoorayy Group – Winny's group (Winny, Nancy, Joe, Ayu, Aldrin, Andita) Winny presented – get info from flip board paper – Gibbon case – mother rejected baby - and she was very violent - if a choice to save mother or baby – save mother – if baby survives (hand had to be amputated) and be hand raised –what happens long term to the baby? Most hand raised gibbon babies exhibit abnormal behaviors – would have to be kept in captivity for its entire life – decisions need to be thought of in the long term – whenever possible keep baby with mother -

Siska's Group (Siska, Rosa, Wanwan, Arga, Agnes, Hendrik, Laura) – Siska presentingScenario – adult phlanged male becoming very aggressive…what to do

1. Is he releasable? Then increase efforts to release – once released – minimal encounters with long term monitors – they should be made aware of aggressiveness
   If not releasable – find a location: island sanctuary, or zoo?
   Management issue as well as health issue – so discussion need to include staff so that they are aware of problem
2. Blind, deaf, paralyzed female – gets physical therapy but a year ago she has become to deteriorate – what should be done – they cannot come to agreement about what should be done – orangutan may still have spirit to survive – or orangutan may be suffering?
   More specific observations need to be made – to determine which is the best course of action

The art and science of veterinary medicine –
The science – what is clinically possible
The art: how would you feel in the same condition (empathy)

Citra's Group (Citra, Bu Esti, Christine, Dian, Ben, Dwi, Wahid) Dian presenter

Very difficult to get permission for euthanize an orangutan – if the vet decides that euthanasia is best course of action, written request must be sent to the Department of Forestry as they represent the government in this matter –the letter is then sent to upper level personnel with all medical information– and then the wait

begins – a response may never come and forestry department may be asked to come see the orangutan themselves – that may speed up process –that is difficult – but not impossible.

In 2003: can euthanize as long as there is proof as to the need – However, central government may decide one course of action but local government may not follow – so may be best to make association with local PHKA – Perhaps OVAG as a group can make a request for when euthanizing an orangutan, the decision be placed in the hands of center veterinarians on a case by case basis – with follow up information sent to all stakeholders concerned. Need to decide who such receive the request.

Each member from OVAG will draft a document (maybe a template) sent to coordinator, Siska, who will contact centers by end of September 2014 –a draft statement can then be written and sent to OVAG for approval by the membershi . A final statement should be ready to send out by the end of the year to the proper authorities.

Break out groups – scenarios for utilizing Disease Risk Analysis for released or translocated orangutans using OIE methodology – to be assessed at a later date as to effectiveness and assessment.

CPR demo – to music Stayin' Alive by The BeeGees (as has perfect beat for CPR)

Publishing:

Task 1 – should I publish – beginning group – Siska lead

Task 2 – Grammar – advanced group

Scenarios Task 1 delegates were previously given these scenarios to review on their own:

1. 20 year old gorilla with rare form of viral infectious – not usually common in older gorillas – not enough info – if you had a number of cases – perhaps – could be a poster?
2. SIV positive paper – report summary of findings – what is the purpose of publishing – letter to editor? Case series? Not enough to report on 20 pages but the beginnings of a critical review of these cases from a particular areas
3. Analyse 50 cases of SIV – no new findings – but does lend additional support – would depend on what was previously published
4. A series of examples from literature and some field based studies – genetics should have this info – how many papers can you get from your work? pathology paper/population paper – no ! one onlyi… data has one message so there should only be one paper

Grammar task – Brief communication review **Steve and Raffaella**

Post it wall:

1. Ex TB – give birth control to females or castrate males? – vasectomy for males/implants need replacing and continued contact/castration may make problems with hormones/
2. Is it okay to do birth control if orangutan is never released – can sub species be mixed? – yes but signage needs to be made clear for potential visitors – birth control is mandatory

3. Can wild orangutans be released without Hep B screening? – do not hold orangutans in captivity for it – but may be part of their regular health assessment – this will also allow you to collect information on OU Hepna viruses –
4. If translocated – needs to be done as soon as possible – but if they are in the center for under two weeks – they do not need health screening – but you can take samples to store and analyse – but if they need to stay longer, then they count as a captive and so full health screening needs to be done –
5. Management of TB – if an orangutan has TB and he is treated and he is showing no clinical signs and he then relapses – is that grounds for euthanasia? OVAG decided in 2009 that we should euthanize – original statement stands
6. Predator avoidance training – very difficult – using fake snakes or scents may risk the loss of novelty and they may adapt – very tricky
7. OVAG needs to include Indonesian Vet Association, which we have done
8. Should we give human Hep B vaccine in zoos – is there a response to it – we know it is safe but we do not know its effectiveness – use guidelines from CDC…why do we not vaccinate? Precautionary measure from IUCN guidelines – may work for zoos but currently not done in centers –
9. Nutrition: giving milk to adult orangutans – is it better for soy milk or regular milk – you should NOT give milk to adults – babies soy or cow – or formula –

Quiz re- distributed

Microscope calibration Session **Wendi**

Review of how to calibrate your microscope with eye piece shat should have come with your equipment There is an eyepiece micrometer and a stage micrometer (which is a scaled rectangular shaped bar) usually needs to be purchased separately. 1,000 microns in a millimetre.

The '0' on the eyepiece micrometer and the stage micrometer need to be lined up.

The detailed instructions will be emailed to participants as this is not in your digital packet. If this is not done, you may not be measuring accurately. Mistakes usually get made due to the mathematics.

Case Studies

Risk factors for air sacculitis **Steve**

Part of a larger body of work of risk factors for rehabilitant orangutans ….Rosalie will present this as a poster at IPS in August in Viet Nam.

Many are interested as it affects zoo as well as center orangutans. Ex. In captive orangutans, fecal inhalation? Obesity? Stress? Bornean may be at more risk than Sumatran – what are the risk factors? Patient / husbandry / environment (weather)

5 year study to get a large enough number – 124 orangutans with air sacculitis –(NM) some have surgery, some are managed medically without surgery

Highest in males from 2 to 8 years of age – age group seems to be getting younger – average weight – no obesity issues / husbandry – ventilations and sleeping spaces
Ventilation – amount of air circulating
Sleeping space – available horizontal space and what does each orangutan weigh – the more crowding in the night with low air flow – higher incidence
Weather – smoking-ness (smoky or non smoky) smoky has correlation with incidence of air sacculitis

Relapse cases take longer to clear, if they begin to relapse –they will relapse more often, more often occurs in males (high rate of relapse). Cannot do much about age and whether they are male but the other factors may possibly be monitored and adjusted for.

In US, there is a study to look at cystic fibrosis in captive orangutans. There are some genetic mutations in orangutans that have history of respiratory ailments. On going – possibility of including Europe and in situ cases.

Collection and storage of DNA material for PCR

Two methods for collecting fecal – collect it quickly and bottle it – front piece better – wear gloves and store in freezer, if not in a sealable box with silica and get to lab quickly.
Storage in ethanol (95%) make sure fecal is completely covered – this can degrade quite quickly –
Yield is better and samples are dry –
RNAlater is also possible – more costly but high yield

Final method is hair sampling – very simple – wear gloves, tweezers and collect with silica gel, seal it and send to lab.

For species genetics – will be sent to participants via email as late addition to this report.

New facilitating committee formed for the 2015 OVAG meeting.

Gavo III presented to Siska

ORANGUTAN CONSERVANCY

ORANGUTAN VETERINARY ADVISORY GROUP WORKSHOP

2014 REPORT

Section 4

Quiz

Question	Answer	Comment	Pre workshop (0) as a %	Post workshop (0) as a %	Pre workshop (1/2 mark) as a %	Post workshop (1/2 mark) as a %	Pre workshop (full mark) as a %	Post workshop (full mark) as a %	Improved, worsened, no change
The **main** cause of death in malaria is due to:	C Anaemia	We did not have a parasitology wet lab this year. The poor scores here indicate we may need to keep that going	71	96	16	4	13	0	Worse
Rhabditiform (L1) larvae of *Strongyloides* species can be distinguished from Hookworm species larvae by:	C Strongyloides larvae have a pointed posterior end		68	96	6	0	26	4	Worse
Dientamoeba fragilis may be diagnosed by examining	D A Giemsa/Field's stained smear		78	61	3	4	19	35	Improve
Define 'biosecurity'	Similar to: Protocols designed to reduce the risk of pathogen transmission	Not sure what the issue is here	10	14	26	35	64	51	Worse
Which of the following are components of a disease or pathogen contingency plan?	THEY ALL ARE A. A list of people and organisations to contact in a disease outbreak, and why they must be contacted. B. Biosecurity protocols C. Methods of disease transmission and management strategies to reduce transmission D. A map of your facility E. background information on the disease of concern	Covered in workshop	52	18	3	25	45	57	Improve
List ways pathogens and disease can be transmitted. (as many as you can).	Faecal-oral, direct contact, Aerosol, indirect (soil/ water/vector), body fluids	Group already has a good grasp of this	12	14	10	14	78	72	No change
For each answer to question 6, describe one way of how you can break that transmission	Hygiene (hand washing), PPE, etc	Covered in workshop	22	14	19	29	60	57	Improve

Define disease risk	Similar to: Disease Risk is the likelihood of the occurrence and the magnitude of the consequences (severity) of a pathogen entering a population – for this you need a vulnerable population and the possibility of exposure, to a particular pathogen.	Questions like this may be better with led - e.g Disease risk is likelihood combined with what of a pathogen entering the population? (Answer: Consequence). Need to improve	60	35	37	40	3	25	Improve
Define malnutrition	Similar to: Malnutrition occurs when the body does not get the right amount of vitamins, minerals, and other nutrients it needs to maintain healthy tissues and organ function and can occur when an animal is either undernourished or overnourished.	Group had a reasonible grasp of this, but were often concentrating on the under nutirion aspect only, hence the large numbers of 1/2 marks	3	7	48	40	49	53	No change
What is the OIE and who is your country representative?	The OIE (World Organisation for Animal Health) is the intergovernmental organisation responsible for improving animal health worldwide. Rep will vary by country.	Covered in workshop	42	25	48	32	10	43	Improve
An orang-utan stops breathing under anaesthetic. Your emergency resuscitation protocol should include several things, but what should be done immediately?	D. Confirm airway patency	Covered in workshop - need to repeat	45	46	13	7	42	47	Improve
In radiography – the Higher the kV	A. The faster the electrons are at hitting the plate and C. The greater the tissue penetration	Not covered in workshop - last covered in 2011 - need to repeat	52	36	45	64	3	0	No change

In 1 sentence, suggest when it is reasonable to consider euthanasia of an orangutan.	Open answers	Covered in workshop, but subjective question, people improved in communicating this	6	4	23	7	71	89	Improve
In one or two sentences describe what a polymerase chain reaction (PCR) is and when it should be employed as a diagnostic test?	Similar to: The polymerase chain reaction (PCR) is a biochemical technology in molecular biology used to amplify a single or a few copies of a piece of DNA across several orders of magnitude, generating thousands to millions of copies of a particular DNA sequence. PCR allows for rapid and highly specific diagnosis of infectious diseases, including those caused by bacteria or viruses. PCR also permits identification of non-cultivatable or slow-growing microorganisms such as mycobacteria, anaerobic bacteria, or viruses from tissue culture assays and animal models. The basis for PCR diagnostic applications in microbiology is the detection of infectious agents and the discrimination of non-pathogenic from pathogenic strains by virtue of specific genes	Covered in workshop	26	10	37	43	37	47	Improve
List AT LEAST 3 other ways to investigate pathogens in the living individual.	At least 3 to get a mark	Covered in workshop	22	7	3	25	75	68	Improve

List the following types of investigative studies in order of result reliability, with the most reliable first	C. Systematic review, E. Meta-analysis, D. Randomised control trial, A. Cohort Studies, G. Case series, F. Single Case report, B. Expert Opinions, textbooks, personal experience and the internet	Covered in workshop, but need to expand on - tricky ideas to follow	55	53	19	25	26	22	No change
What are the top 5 sources of information you would make use of when faced with a medical issue you need to investigate	Open Answers	Covered in workshop, but subjective question, people improved in communicating this	13	4	13	7	74	89	Improve
For each of the following diagnostics, state whether the test is looking for the Mycobacteria itself, or for the body reaction to it	A: TST body reaction B: 454 Sequencing Organism C: Statpak body reaction D: Paralens organism E. MAPIA organism F. Culture organism	Not covered in workshop - last covered in 2013 - need to repeat	60	53	13	18	27	29	No change
(a) List the reasons for putting samples in formalin when doing a post mortem (b) List sampling methods other than 'in formalin' during a post mortem	Photos to histology. Bonus points if mention multiple aliquots.	Covered in workshop	22	11	22	25	56	64	Improve
A. How should you test for Tuberculosis? B. Provide a differential diagnosis list for other pathogens with similar clinical signs to TB.	As many modalities as possible – culture and PCR currently most recommended. Other respiratory pathogens and chronic causes of weight loss.	Covered in workshop	22	18	39	29	39	53	Improve