An introduction to Bird flu 禽流感
(= Avian influenza)

Materials are taken from recent media. Version 2.2.2004
Some current terms that are hard to forget:

Mad cow disease
SARS
Bird flu
Our country is at risk.

Feb 1, 2004
The situation of Avian flu changes everyday.
Avian flu is more infective than SARS.
Only time will tell if Hong Kong’s defences can keep the threat at bay, says WHO

Bird flu fears growing on mainland
What is bird flu?

Avian flu (H5N1) is a type of influenza that mainly infects birds but occasionally affects humans. Avian flu can be transmitted from live birds to people, although transmission between humans is very inefficient.

Infected birds may develop

* mild illness
* or become fatal

and result in severe epidemics.
**Epidemic** - the appearance of a particular disease in a large number of people at the same time: e.g. a flu/AIDS epidemic.

**pandemic** - a disease which exists in almost all of an area or in almost all of a group of people, animals or plants: e.g. a pandemic of ……
The 1918 – 1919 influenza pandemic caused an estimated 40 to 50 million deaths worldwide. (WHO data)
The initial symptoms of avian flu are similar to those of other influenza viruses, including fever, generalised muscle pain, cough and sore throat.

However, it is more likely to result in high fever, chest infection, respiratory failure, multi-organ failure, and death.

(Govt info.)
Many Chinese cities and villages reported an epidemic outbreak of bird flu.
Something has gone wrong. **In fact, many other Asian countries have also reported an Avian flu outbreak.**
Update on Avian flu in our world

World organisation for animal health:

http://www.oie.int/downld/AVIAN%20INFLUENZA/A/AI-Asia.htm
The transmission routes
Hong Kong suffered from an outbreak of H5N1 bird flu in 1997. 18 were infected and 6 died. Patients developed severe respiratory disease. It was the first documented case in history. Decisive action to destroy all chickens within 3 days might have averted a pandemic (WHO’s comment).
What is meant by $\text{H5N1}$?

$\text{H} = \text{Hemagglutinin}$

$\text{N} = \text{Neuraminidase}$

These are *two separate protein molecules* which exist on the *surface* of the virus. The numbers refer to the sub-types.
The envelope contains rigid "spikes" of haemagglutinin and neuraminidase (the two protein molecules). Source: http://web.uct.ac.za/depts/mmr/stannard/fluivirus.html
The “little things” are too big for us.
Many Asian countries are seriously affected by bird flu at nearly the same time. What might be the transmission route(s)?
Some scientists hypothesize that migratory birds (遷徙候鳥), particularly waterfowl (such as wild ducks) may transmit the bird flu. (Right picture: An officer was taking samples of migratory birds’ faeces for laboratory analysis).
Why faeces samples are taken?
In the large intestine, there are millions of bacteria which act as "host" for the parasitic viruses.
Other than migratory birds, could there be other possible agents that carry the bird flu viruses?
Live chickens are vector of the bird flu in places where quarantine control is inadequate.
**quarantine** 檢疫隔離：a period of time during which a person or animal that might have a disease is kept away from other people or animals so that the disease cannot spread

**Vector** : a species which carries pathogen(s) 病原體 from one organism to another.
Formation of new strains (or mutants)
遺傳變種
The over-crowded condition of rearing and keeping live (活) chickens provide a favourable breeding ground for pathogenic microbes to mass reproduce rapidly.
**Pathogen** = a disease causing species,

   e.g. a virus or a bacterium.

   e.g. H5N1 is a pathogenic (致病的) virus.
Scientists have long worried that in areas where live poultry and other animals (e.g. pig) are in close contact with each other, the genes of viruses may easily “reshuffle” to create new strains, some of which are harmful (or even fatal) to our farm animals and
It refers to the recombinatión of genes (基因重组) to form new strains (or mutants) of viruses that may be highly pathogenic.
If the genes of human influenza (人流感基因) are also incorporated (納入) into the mutants of avian flu virus, the latter can transmit from person to person.

Diagram Source:
http://www.omedon.co.uk/influenza/influenza
The life cycle of a virus:

Viruses inject their genetic material (DNA or RNA) into a bacterial host and reproduce inside it. This mechanism offers a means of "genes reshuffling".

Web-link address, please click!

http://www.utc.edu/Faculty/Becky-Bell/P-210-lysis.jpg

Note that like HIV, Avian viruses have RNA as their genetic material.
This diagram shows the life cycle of the influenza A virus. For the advanced learner.
Roaming poultry ...... in the eyes of biologists, could be seen as moving gene bank.
It is thought that **mutant viruses** are formed from the "**genes mixing**" of birds and eventually they can infect humans. (Case study – Avian flu, HK 1997) Diagram source: Scientific American
有科學證據顯示，上述禽流感變種會透過一個名為「基因重新組合」（genetic re-assortment）的過程而發生。當禽流感病毒和人類流感病毒在同一時間感染同一動物，兩者的基因便有機會在該動物的細胞內重新組合，而出現一種新的組合，情況就如我們把一副紙牌重新洗勻，以致出現新的紙牌組合。新組合的基因可能會產生一種對人類屬全新、完全缺乏免疫力的流感病毒，意味全球性廣泛傳播和死亡將會出現。

勞永樂醫生, 立法會議員 10.2.2004
H5N1 virus:

- **High mutation rate**
- Capable of **taking up genes from other species**
- **Highly pathogenic** (i.e. disease-causing)
- It remains **viable** (i.e. “alive” and “infective”) in the **egesta/excreta** of birds for up to **10 days** or more.
Many unknown facts...

Transmiss-

Mutation?

Bird (chicken)

Human

Pig
Some speculate that pig might be the "mixing vessel".
Rapid and random mutation may produce new strains of viruses that are highly pathogenic.

The descendants of those H5N1 viruses (HK, 1997)
It is still not sure whether avian flu can use human as the vector. 2.2.04
Communicable diseases can spread very fast in a world of mass transport – both locally and internationally.
While the allegation may not be justified, it reminds us of the moral obligation we should have in an age of rapid globalisation (全球化).
Communicable diseases must be controlled at the source.

(Also called contagious disease)
Control measures must be implemented at all levels.
The quarantining of infected farms, and the destruction of infected or potentially exposed flocks, can prevent viral spread and their establishment in a poultry population.
Chicken farms are sterilised by spraying rearing cages and their surrounding with disinfectant.
infect 感染
infected by …
infection
to disinfect …to sterilise
disinfectant 消毒劑
Improper method of disposal can further spread the disease of avian flu.
Killed chickens are buried and disinfected.
Is the measure hygienic enough?
Hygiene 衛生

a state of cleanliness to the standard of preventing diseases

Hygienic …
These workers should have worn protective facial mask as their nose were so near to the urinogenital opening of the chicken.
Frontline workers must be **effectively protected**. Note the use of disposable protective clothing, facial mask, rubber gloves and boot.
Vaccination (疫苗注射) (i.e. injection of vaccine 疫苗) of chickens against the bird flu virus.
vaccination
The HKSAR sponsored free vaccination service for poultry traders.
Whether vaccines are effective protector or not, experts have different opinions.
The use of **existing vaccines** effective against currently circulating **human influenza strains** can reduce the **chance of co-infection** of humans with **BOTH avian and human influenza strains**, and thus reduce the **risk** that genes will be exchanged. It is a preventive measure.
Should workers in the poultry business be vaccinated against the bird flu virus?
Eggs are used as “mini-incubator” to multiply viruses, or they are a sample source.
These children were watching a load of dead chickens.

So dangerous! **Education** is essential.
Even some retail traders are not aware of the **potential risks**.
NO gloves protection.
His licence may be withdrawn.
Citizens must realise that touching live poultry is a risky behaviour.
The issue of improper refrigeration during transport and storage.
As long as chicken egg and chicken flesh are thoroughly cooked, they are still safe for eating.
Eating eggs safely.

Raw (生), insufficiently cooked eggs might contain viruses and bacteria (e.g. *Salmonella* sp. 沙門氏菌 that cause food poisoning (食物中毒).
China is our main supplier of eggs.
徹底煮熟，勿購來歷不明豬肉

繼食雞之後，食豬是否安全？
港大微生物學系助理教授黃世賢指出，豬隻感染禽流感後的影響，要視乎有關病毒的毒性是否厲害，如果病毒足以使豬隻病死，人類便切勿食用來自這些死豬的豬肉。

不過，部分豬隻即使感染了禽流感，會像感染其他豬類感冒菌般不會發病，市民只要把這些豬肉完全煮熟後，已可將禽流感病毒殺死。透過食用而感染禽流感的風險便很低。由於豬肉是否安全取決於豬肉的來源，市民別購買來歷不明的豬肉。
Avian flu has a negative impact on our economy, at different levels.
Economic losses.
The Hang Seng Index dropped nearly three hundred points on an early 2004 day in response to the bird flu scare.
The Avian flu problem is not just a scientific, technological or medical problem. It is also an economic and political issue.
Policy-makers must do things for public good.
Government measures to deal with an emergency outbreak of the bird flu.

Are these effective measures?
政府發言人說 (30.1.2004)：
「我們接獲內地當局通知有關個案的情況，決定即時停止活禽鳥及禽肉入口到香港，包括雞、鴨、鵝、寵物鳥和一日齡雛雞。」
Recreational parks with live birds are temporarily closed. The famous birds paradise in Mai Po is not excluded.
To suspend the importation of chickens into markets.

To temporarily close the Mai Po Marshes and the walk-in aviaries in recreational parks.

To terminate market tenancies and cancel fresh provision shop licences if there is a breach of special conditions among the traders.

To require all poultry retailers to wear aprons and boots while at work, and to wear rubber gloves when handling live poultry.

To require all poultry farm workers to wear gloves as one of the biosecurity measures in the farm licensing conditions.

To strengthen the surveillance programmes for a possibility of avian influenza in markets, at border points and in farms.

To increase the number of tests and strengthen our inspections.

To encourage traders to voluntarily vaccinate against avian flu.
Closing down the birds zone in recreational park but keeping the sale of imported live birds in Mongkok legal, it seems that Government policy is inconsistent. (Feb 2, 2004)
學生須申報曾否往疫區

專家：飛沫可能帶病毒

他指出，禽畜的排泄物含有病毒可傳染人類，同樣人類的飛沫也有可能帶病毒，但現時所見傳播力弱，故越南、泰國感染人數未見激增。他認為並未即時構成嚴重的健康威脅，毋須提高措施監管疫區來港人流。他又說，越南兩姊妹雖然沒有接觸禽畜，但她們身處疫區，居住環境範圍也有可能有病毒感染。

A limited control on travel.
國務院防治禽流感八大措施

國務院總理溫家寶昨天主持召開國務院常務會議，研究部署高致病性禽流感防治工作。會議提出八項防治措施，要求各地落實。

一、已發現疫情的地區，要及時準確公布疫情，堅決防止疫情擴散；
二、未發現疫情的地區，要抓緊做好防疫的各項工作；
三、落實防疫經費，對按規定撲殺和強制免疫所需經費，由中央和地方財政分擔；
四、組織對高致病性禽流感病毒及其防治進行科技攻關，積極開展禽流感防治的國際交流與合作；
五、加強對進出口禽類及其產品的檢疫工作，防止疫情傳入傳出；
六、做好高致病性禽流感防治科普知識的宣傳工作；
七、堅決防止高致病性禽流感對人的感染；
八、建立應對突發重大動物疫情的機制。
Many parties are watching the bird flu situation.
The world must get ready to prevent a pandemic outbreak of influenza.
Advice for the average citizen
禽流感及沙士都由病毒形成。病毒同病菌最大分别係病毒有细胞核，本身无法繁殖，必須入侵動物細胞，利用「客體」細胞进行繁殖。由於唔係病菌，因此抗生素對病毒無效，主要依赖人體內免疫系统对付。例如喱风，由於人類免疫系统早已認得喱风病毒，一旦入侵，可立即生产免疫細胞加以对付，通常三幾日便可将之滅滅（喱风係醫生食藥只係减少毒素所引起的副作用，对付喱风病毒仍依赖人體內免疫系统，因此在外圍喱风，医生啱啱啱唔啱就叫病人多喝水及多休息）。病毒存在泥土或水中，多達十幾萬種，大部分对人類无害。因為人類同病毒相處己有幾百萬年，早已互相適應。不過，病毒變異，人類免疫系統無法辨別，一旦入侵人体，啱啱啱就足以致命（因为空大部分药物都未能有效对付病毒）。有效方法係將病毒製成疫苗後將之殺死，然後注入人体，讓人体製造免疫系统能辨別，及早製造免疫細胞，當真的病毒入侵，便可立刻加以对付。
Observe hygienic practice!
Prevention of Avian Flu (Govt. info.)

Droppings of infected birds and poultry may carry the avian flu virus, so avoid touching live birds or poultry or their droppings.

If you have been in contact with live birds or poultry, immediately wash your hands thoroughly with liquid soap and water.

Cook poultry and eggs thoroughly before eating.

If you have flu symptoms, consult a doctor and wear a mask to prevent spreading the disease.

The best protection against influenza is having good body resistance. This can be achieved through a balanced diet, regular exercise, adequate rest, reducing stress, and not smoking.

Avoid crowded places with poor ventilation.

If you develop fever and respiratory symptoms after returning from
To view some pictures of pathogens (Anthrax, avian flu, Ebola, Hepatitis, HIV, rabies ...), refer to
http://www.cdc.gov/global/cards.htm

食環署 - 食用安全小貼士

A summary of key control measures

Quarantine control
Restriction on importation, transport, storage
Protective devices for traders
Segregation of patients (isolation + intensive care)
Monitoring / surveillance
Frequent testing
Vigorous inspection
Vaccination
Maintenance of hygiene
Cross-border information exchange
International co-operation
Further reference:

Update on Avian flu in our world:
http://www.oie.int/download/AVIAN%20INFLUENZA/AI-Asia.htm

Access excellence
http://www.accessexcellence.org/AB/GG/influenza.html

The big book of viruses
http://www.virology.net/Big_Virology/BVRNAortie.html
End.

This slide series would be modified as the Avian flu situation changes. Let's hope for the best, do our best and prepare for the worst.