
Hi ! Glad to Meet You !!
領角鴞 25 cm 臺大可見
Collared Scops Owl

2010生物化學(甲) (B02 20101)

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請帶學生證

請勿使用修正液

Functions of Carbohydrates

Carbohydrates have six major functions within the body:

1).providing energy and regulation of blood glc.

2).sparing the use of proteins for energy

節制

3).fat to be metabolized properly and preventing ketosis酮病

4).biological recognition processes

5).flavor and sweeteners; dietary fiber

6).regulation of nerve tissue and is the ONLY source of energy for the brain.

Human consumes *ca.*160 ± 20 g glc per day

(75 % in brain, only 20 g in body fluid).

What is the rule for D-, L- form of Amino acid ??

將amino acid之-COOH置上方，additional functional group, -R置下方，若-NH_2在右側爲 -D；左側爲 -L.

What is the rule for D-, L- form of Sugar??

距離主要官能基(-CHO; -CO)-最遠C^c之-OH在右側爲-D；左側爲-L.

D- dextro : L- levo.; d : l; (+) : (-). α : β
α-D (+) : α -D (-). ; β-D (+) : β -D (-).
α-L (+) : α-L (-). ; β-L (+) : β-L (-).

4.Reducing power :

①.reducing sugar--

Silver mirror rx (銀鏡反應) (Tollen's solution – $AgNO_3 + NH_4OH$) :

$$\underline{RCHO} + 2Ag(NH_3)_2^+ + 2OH^- \rightarrow \underline{RCOO^-} + NH_4^+ + 3NH_3 + 2\underline{Ag}_{(s)} + H_2O$$

Fehling's test (斐林試驗) (Fehling's solution- $CuSO_4$; Na,K-tartrate + NaOH)

$$RCHO + 2\,Cu^{2+} + 5\,OH^- \rightarrow RCOO^- + Cu_2O(s) + 3H_2O$$

cuprous oxide, brick-red.

②.nonreducing sugar--

silver mirror

-7-04-

Na,K-tartrate-酒石酸鉀鈉

Tartaric acid; Tartrate

Copper-Tartrate-Complex

Copper-Citrate-Complex

(p241;*245*, F7-10)

德國人拉青格(Birth name-Joseph Alois) 第265任天主教教宗-本篤十六世(Benedict XVI) .

※ Quiz ! What is Benedict 本篤 solution?

Benedict's solution- Deep-blue alkaline solution used to test aldehyde group, -CHO. The solution is used to test glucose in urine, a symptom of diabetes Benedict's solution: Na-citrate, Na_2CO_3, & $CuSO_4$ It reacts chemically like Fehling's solution; the cupric ion (complexed with citrate ions) is reduced to cuprous ion by aldehyde group, and precipitates as cuprous oxide, brick-red. Cu_2O.

-7-05--

Quiz! Which ones are reducing sugars ??

glucose, fructose, maltose, sucrose,

G 1P, G 6P, F 1P, F 6P, F 1,6P, F 2,6P, GlcNAc,

P.240,241,244; *p244*, *245*, *246*.

Aldose: C1-free; Ketose: C1& C2-free

Ans: glucose, fructose, maltose, G 6P, F 6P. GlcNAc,

sucrose: α1,2 glycosidic bond

keep in mind: common sugars are reducing sugars,

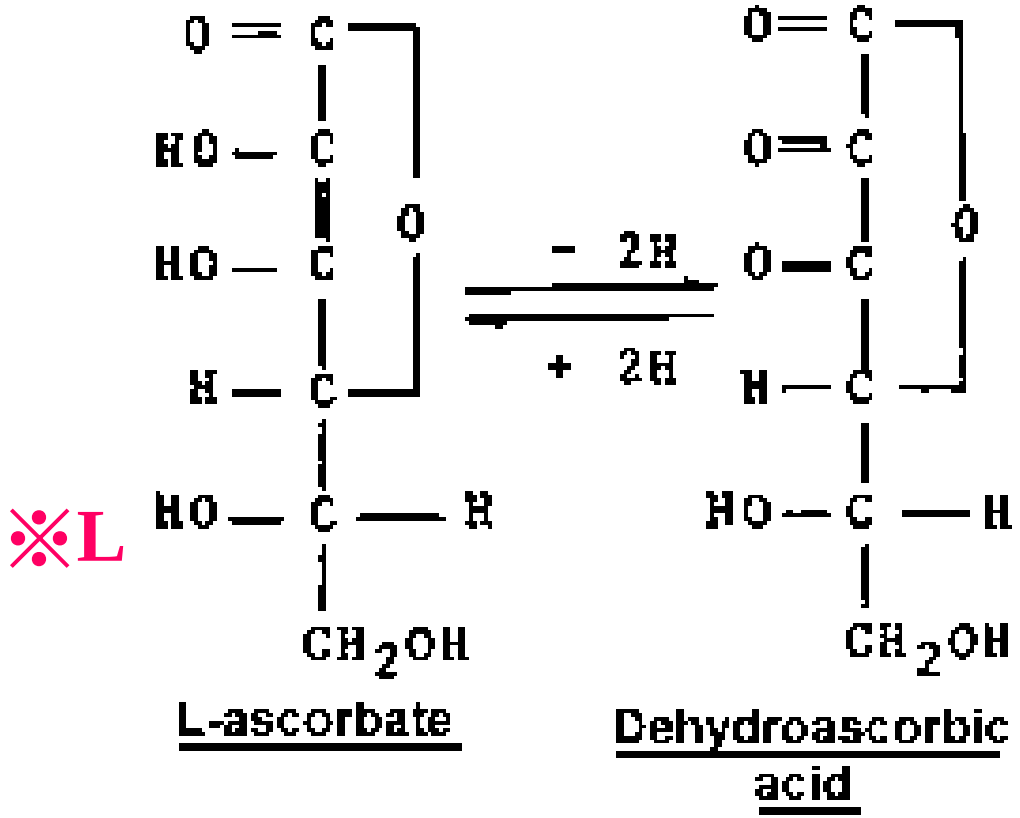
except, Sucrose!

什麼是保健食品或美白產品廣告所稱的「左旋C」

維他命C水溶液的旋光度是正值，因此維他命C是「右旋性」化合物，非「左旋性」化合物。 樟腦百分之百是右旋性，絕無左旋性樟腦。人體對化合物的左旋和右旋有「反應特異性」。右旋性維他命C對人體有效，但左旋性維他命C則無法吸收。

Vitamin C 「左旋式」；「右旋性」寫爲：??

L-(+)-Ascorbic Acid



L-(+)-Ascorbic Acid; 『左旋式右旋性』

L-(-)-Ascorbic Acid; 『左旋式左旋性』

D-(+)-Ascorbic Acid; 『右旋式右旋性』

D-(-)-Ascorbic Acid; 『右旋式左旋性』

Only L-(+)-Ascorbic Acid
『左旋式右旋性』
is digestible nutrient for human.

水溶性**Vit. C**只能在體內**2~3**小時，酯化**C** 能有效釋放達**8**小時，使服用的**Vit. C**更能有效被身體所吸收。

Vitamine? Vitamin? Vitamin F

amino acid? essential aa?

除 **tryptophan** 外均有 **-e**

Essential Amino Acids-

MILK WH FTV Rxxx **-7-11-**

Vit. F (essential fatty acid)-

ω-3 fatty acids: Linolenic acid or ALA (18:3)

ω-6 fatty acids: Linoleic acid or LA (18:2)

糖度計 糖度曲折度計 Refractometer Brix

Degrees Brix (symbol Bx) is a unit representative of the sugar content of an aqueous solution.

One degree Brix corresponds to 1 gram of sucrose in 100 grams of solution and thus represents the strength of the solution as a percentage by weight (% w/w)

§ 7-6. Reactions and Derivatives of Sugars

③.dil. OH^-- rearrangement (isomerization; keto-enol tautomerism) Fru. → (enediol) → Glc. (or Man.).

2).Glycoside formation (p243; *245* F7-11)

①.$R_1OH + R_2OH \rightarrow R_1OR_2 + H_2O$

②.intermolecular dehydration at anomeric-OH→ C^a-OR

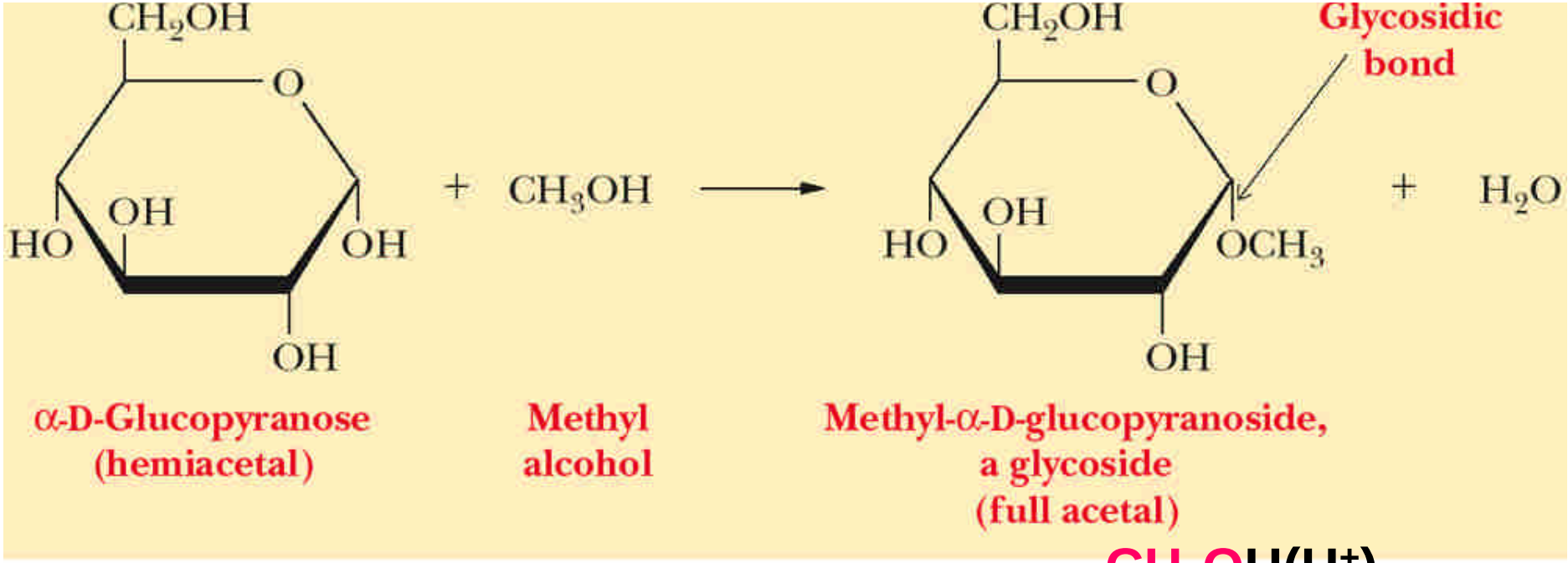
③.methyl glycoside (exhaustive methylation)

徹底的

Glycolytic linkage ?

methyl glycoside formation

C^a-OH易-OR化;C^a-OR易水解

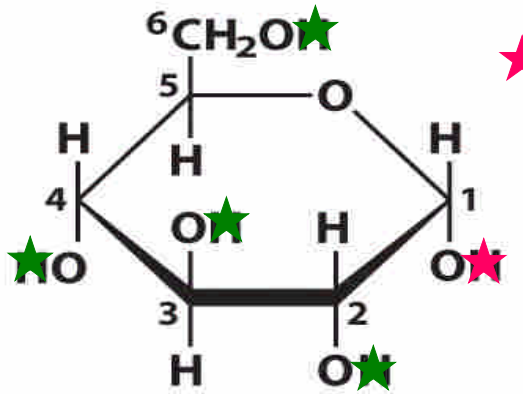


exhaustive methylation

$C_6H_{11}O_5$-OH + CH_3OH → $C_6H_{11}O_5$-OCH_3 + H_2O

$CH_3OH(H^+)$

★: CH_3-

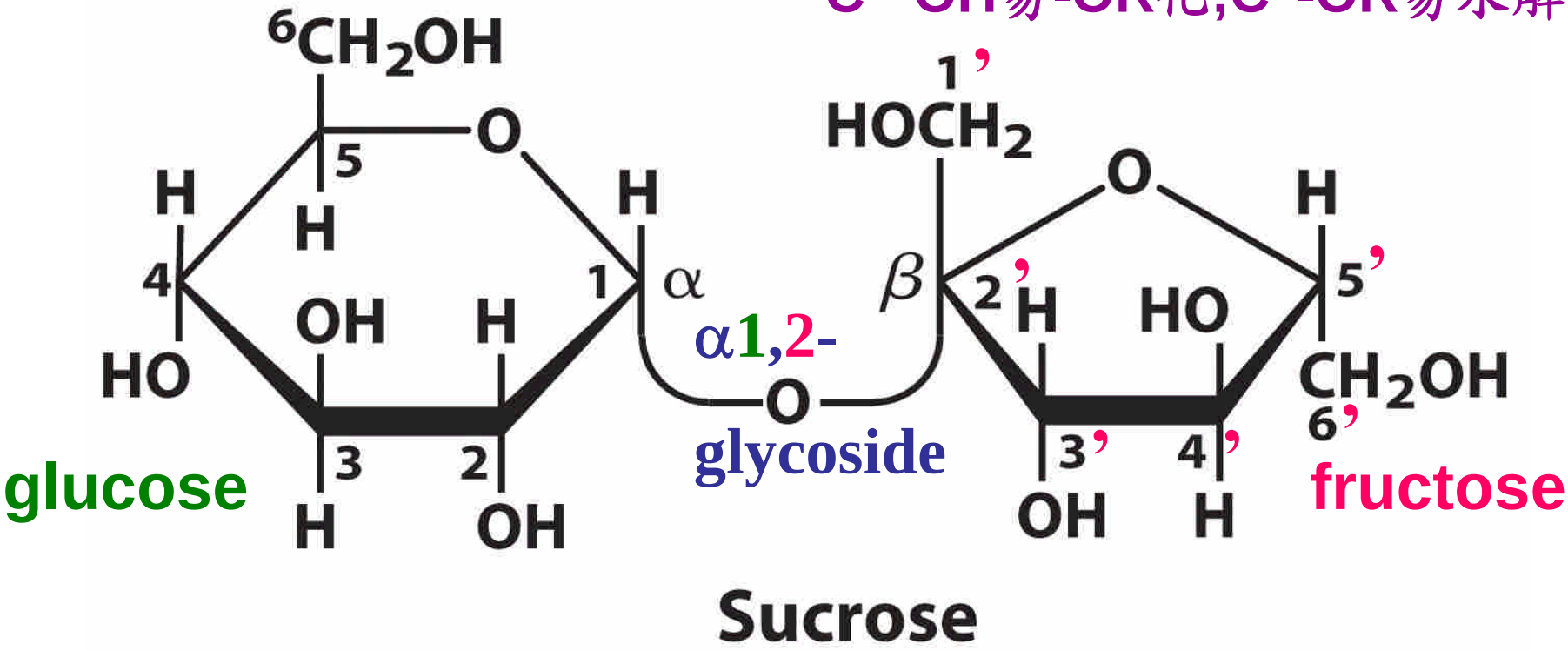


α-D-Glucopyranose

Dimethyl Sulfate

$(CH_3)_2SO_4$

C^a-OH易-OR化;C^a-OR易水解



Sucrose

CH_3OH(H^+)→C1'-OCH_3 →(DMS + NaOH)→Octamethyl-Sucrose →(H^+) →2,3,4,6-tetra-O-Me-Glucoside + 1', 3',4',6'-tetra-O-Me-Fructoside.

p.244. *246*, F.7-12中. -7-16-1-

Taste of Honey: (p268-10; *p271-5*)

Fructose in honey- mainly in β-D-pyranose

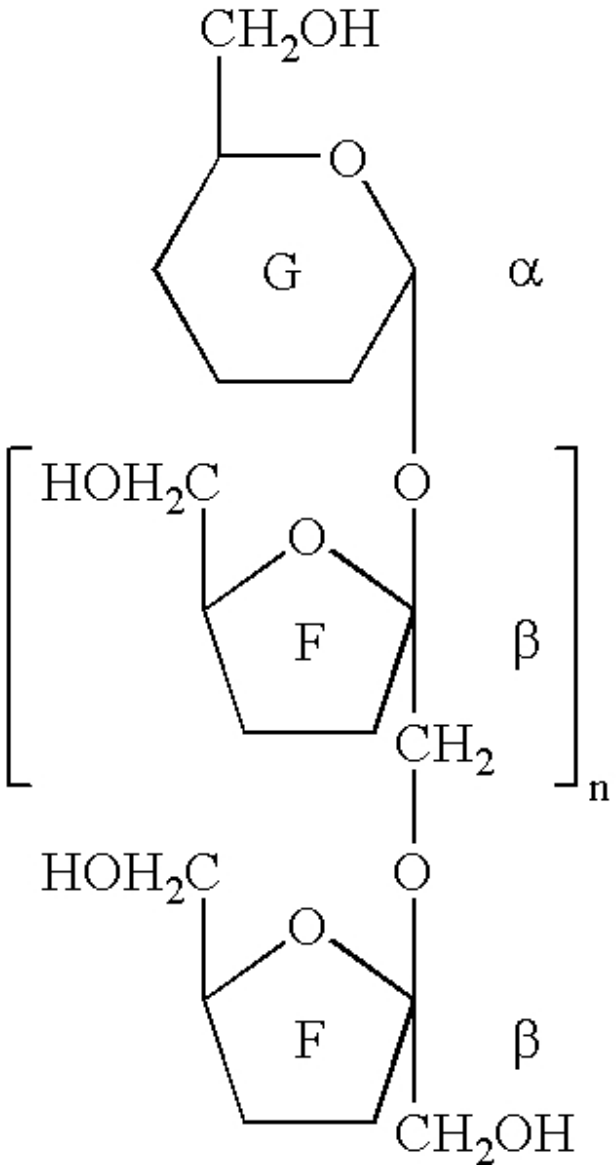
(x2 glucose sweetness.)

β-D-furanose- less sweetness.

Honey and High-fructose corn syrup is used for sweetening *cold* but not *hot* drinks.

Fructooligosaccharides (果寡醣, 低聚果糖 FOS) also called oligofructose or oligofructan, is a class of oligosaccharides used as an artificial or alternative sweetener. FOS exhibits sweetness levels between 30 and 50 percent of sugar in commercially-prepared syrups. It occurs naturally, commercial use emerged in the 1980s in response to consumer demand for healthier and calorie-reduced foods. Glc-(Fru)n or (GFn) β(2-1) glycosidic bonds

-7-17-1



Fructooligosaccharide

sucrose

β1,2

-7-17-2

果寡糖是一種大分子醣類，難被人體吸收利用，它就像水溶性纖維素一樣，低熱量，對人體當然較沒有負擔。果寡糖是人體腸胃道益生菌的**growth factor**，果寡糖可能使腸胃道中的比菲德氏益菌**(Bifidobacteria)**濃度上升。 香蕉、洋蔥、大蒜、蘆筍

insulin, glucagon induction

Vitamin P; Phenylpropanoids

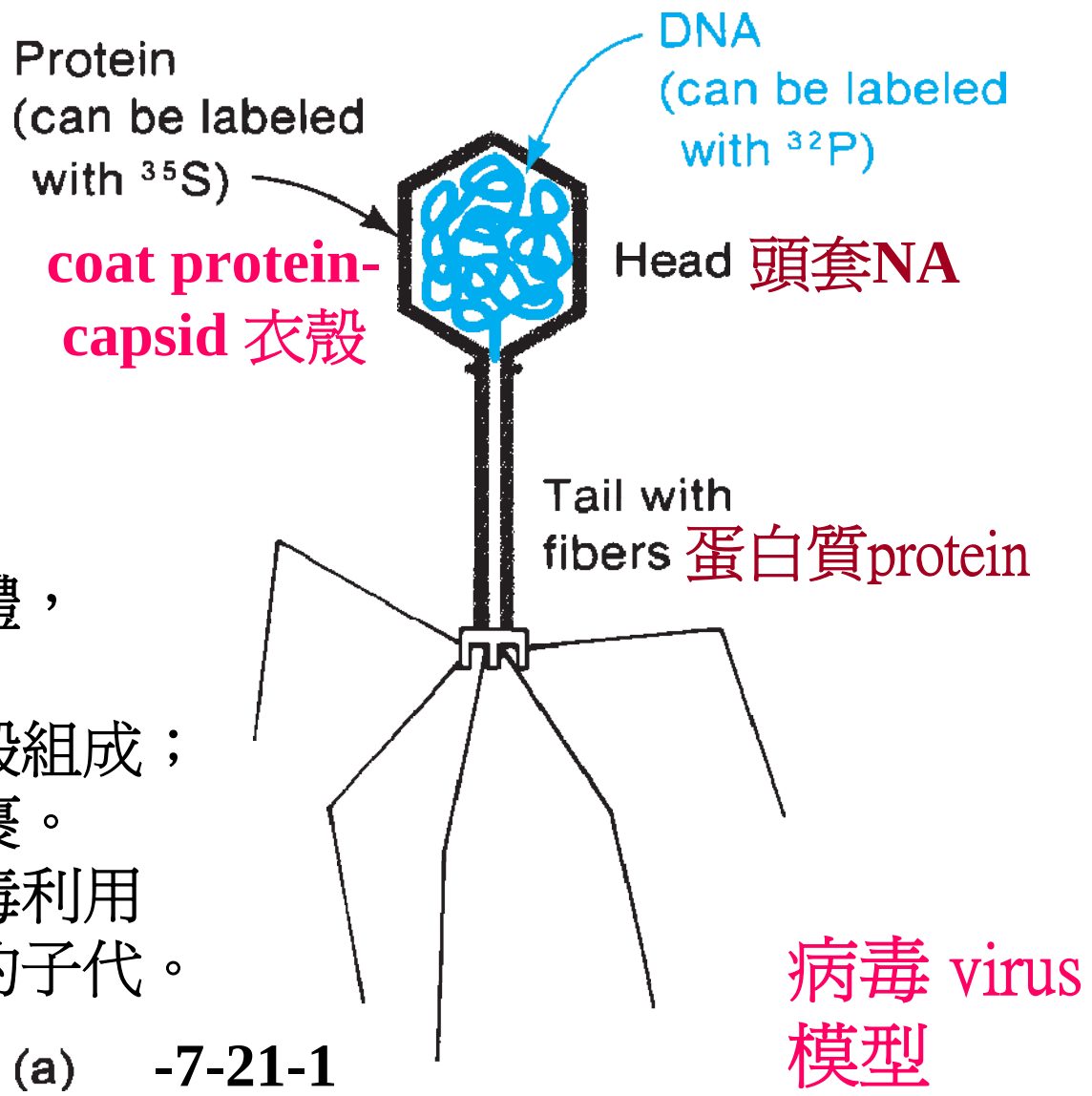
-7-17-3

Avian influenza virus (禽流感病毒, AIV):

H5N1 is a highly pathogenic strain of avian influenza (bird flu). The name *H5N1* refer to the subtype of surface antigens present on the virus: hemagglutinin (血球凝集素H) type 5 & neuraminidase (神經胺酶, N) type 1. N-ase is an antigenic glycoprotein enzyme found on the surface of the influ. virus. Neuraminidase cleaves terminal sialic acid (p259,*263*) residues from carbohydrate moieties on the surfaces of infected cells. This promotes the release of progeny viruse from infected cells. 9 neuraminidase subtypes are known, many occur only in various species of ducks and chickens. Subtypes N1 and N2 have been positively linked to epidemics in human.

Hemagglutinin (凝素 HG) is antigenic glycoprotein found on the surface of the influenza viruses and is responsible for binding the virus to the cell that is being infected. The name *hemagglutinin* comes from the protein's ability to cause erythrocytes to clump together Functions and mechanisms of action: HG has two primary functions: the recognition of target vertebrate cells, accomplished through the binding of these cells' sialic acid-containing receptors, and fusion of host and viral endosomal membranes, accomplished through the recruitment of SA molecules to the fusion site where some undergo conformational alterations to destabilize the lipid bilayer, hence cooperatively forming a fusion intermediate which associates the two bilayers.

病毒(virus):



病毒:
一種非細胞的生物學實體，
只能在宿主細胞中複製。
病毒由核酸和蛋白質外殼組成；
但一些動物病毒有膜包裹。
在被感染的細胞中，病毒利用
宿主的合成能力複製它的子代。

(a) -7-21-1

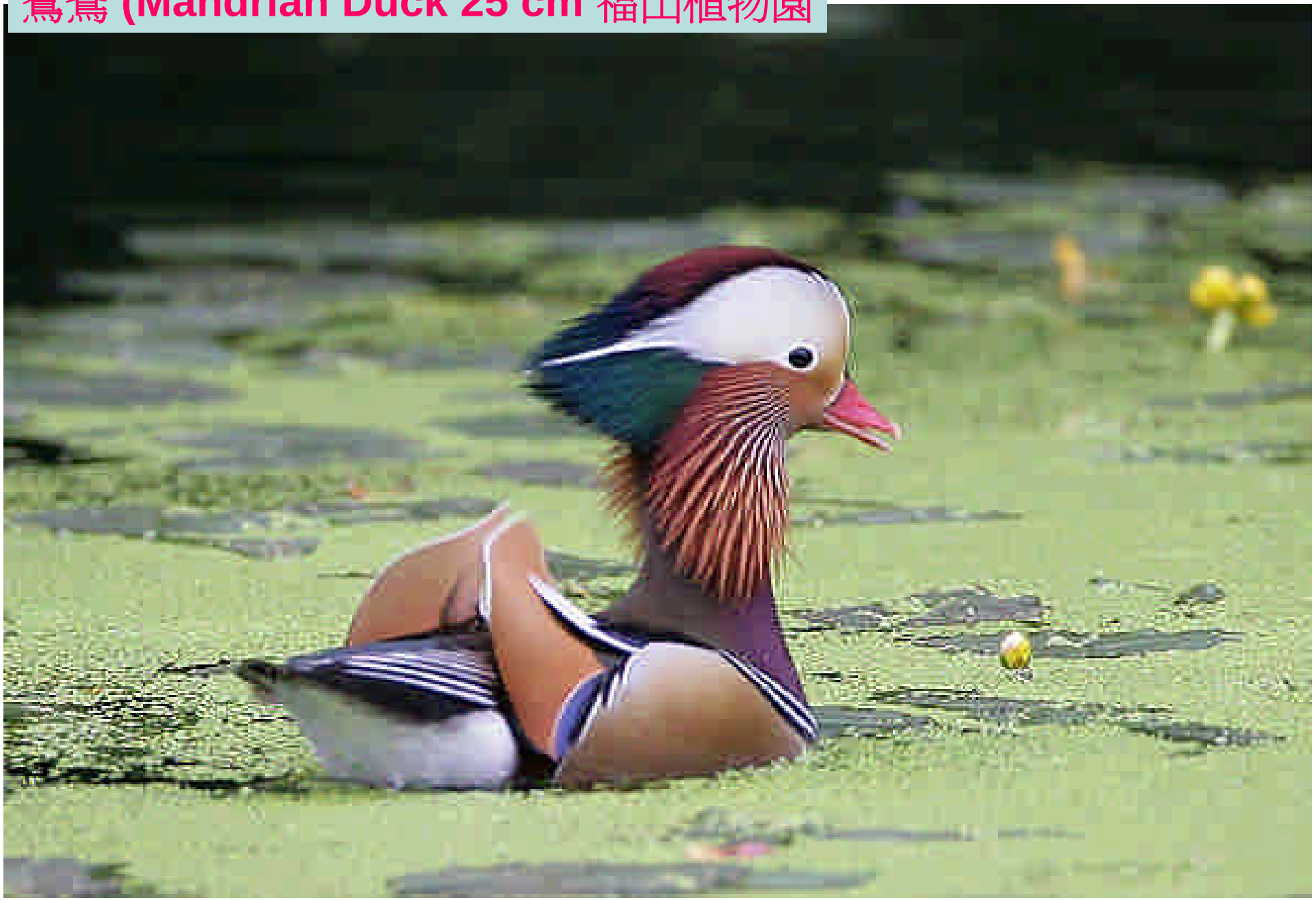
病毒 virus
模型

Sialic acid (p259, *263*) is derivative of 9-C monosaccharide named from the Greek (*sialos*) 'saliva'. N-acetylneuraminic acid (Neu5Ac). SA are found in animal and bacteria, especially in glycoprotein and ganglioside. Sialic acid-rich glycoprotein bind selectin in human and other organism. Cancer cell that can metastasize often has a lot of SA-rich glycoprotein. This helps these late-stage cancer cells enter the blood stream. The negative charge of SA is responsible for the slippery feel of saliva and mucins coating the organ. Despite its role of acting as " " for invading pathogen, SA is involved in preventing infection (mucus associated with mucous membranes--mouth, nose, respiratory tract), it also acts as a receptor for influenza viruse to allow attachment to mucous cells (an early step in contracting the flu.).

愛的迷茫？！

真的只羨鴛鴦不羨仙嗎？

鴛鴦 (Mandrian Duck 25 cm 福山植物園

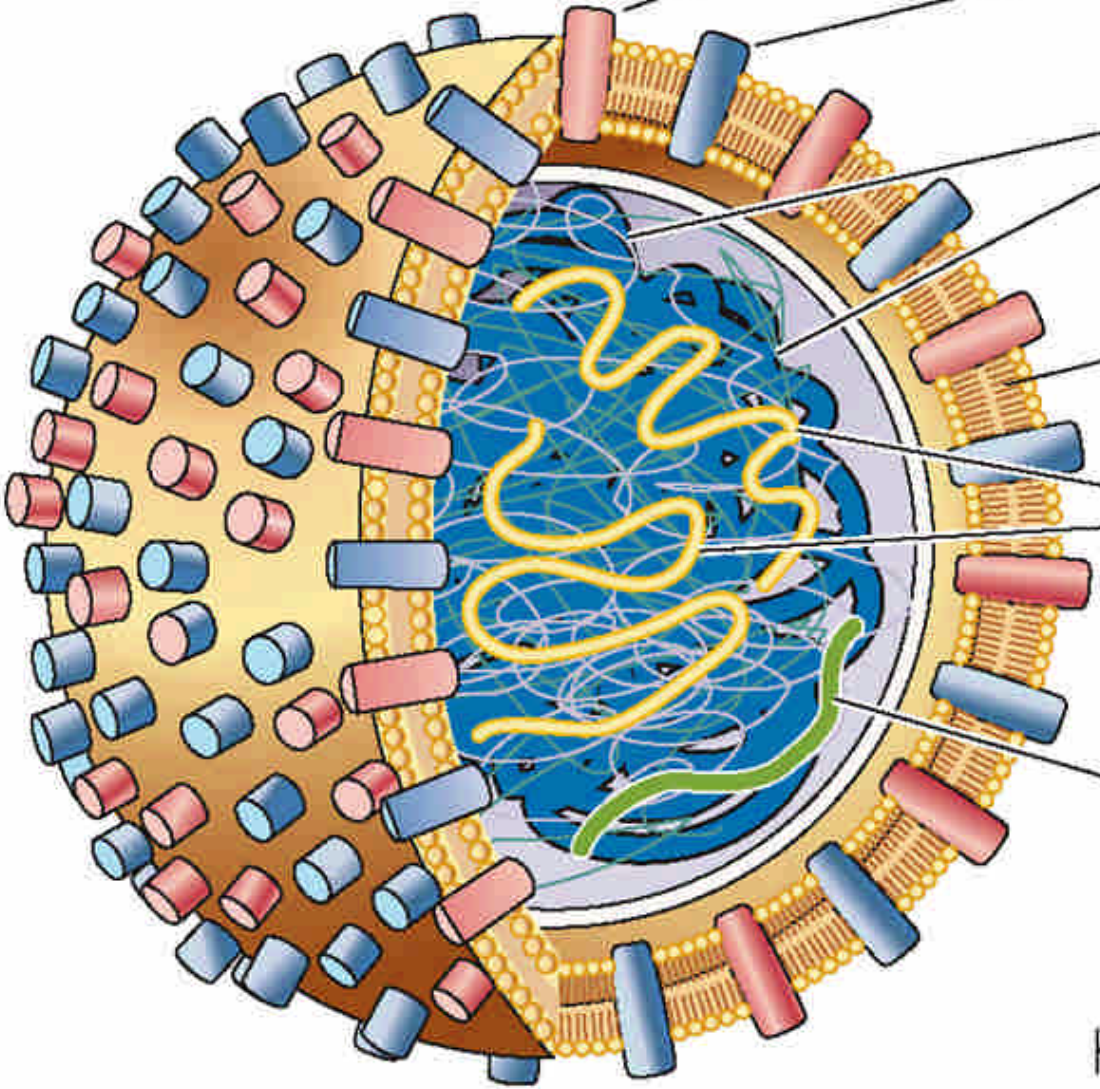



圓滾滾，胖嘟嘟！ 粉紅鸚嘴
(Vinous-throated parrotbill. 12 cm
臺灣特有亞種) 俗稱-圓頭仔
臺灣野鳥生態影展
新光三越九A, 9F

不同型流感有不同表面抗原變異性很高。流感病毒表面抗原含有表面蛋白質-神經胺酸酶 (neuraminidase,NA)。此NA的活性部位(active site)在不同型的流感病毒株中卻都相同。NA用來促使利用宿主(host)細胞完成複製的病毒從宿主細胞釋放出來，同時幫病毒穿透呼吸道的粘膜細胞。一旦此NA酶蛋白質的功能遭到抑制，病毒的複製及感染能力即受到破壞。克流感Tamiflu成份 oseltamivir.(由八角抽取之莽草酸Shikimate製造)是羅氏藥廠(Swiss Hoffmann-Roche)專利藥；瑞樂沙RELENZA®

是GlaxoSmithKline 藥廠的專利藥名稱，其學名爲Zanamivir 均是NA的抑制劑，作用在流感病毒NA的active site，使受感染的宿主細胞所製造出來的新病毒顆粒無法釋放出來，因而阻止了流感病毒的複製與擴散。因爲此active site在各類型流感病毒皆相同，克流感對A型及B型流感皆有效。流感疫苗是一種不活化疫苗，僅含有抗原成分而沒有病毒殘餘活性，係依WHO每年建議更新的病毒株組成。所以流感疫苗副作用較少. 據研究報告顯示：流感疫苗對健康年輕人有70~90% 保護效果。對老年人則可減少50~60% 罹患流感之嚴重性及其併發症，並可減少80%之死亡率，就預防層面言之，流感疫苗比較經濟。

The influenza virion.
流感 RNA病毒



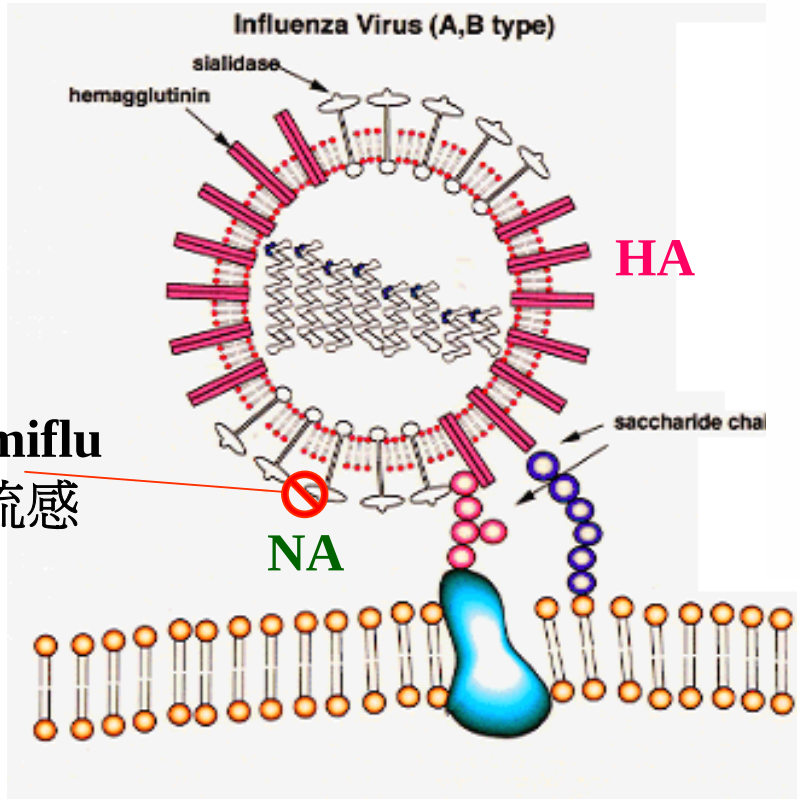
Hemagglutinin (HA)
血球凝集素
Neuraminidase (NA)
神經酸酵素
Matrix
protein (M_1)
Lipid
bilayer
Nucleoproteins
(NP, PA, PB1, PB2)
核蛋白質
RNA
← 50 nm →

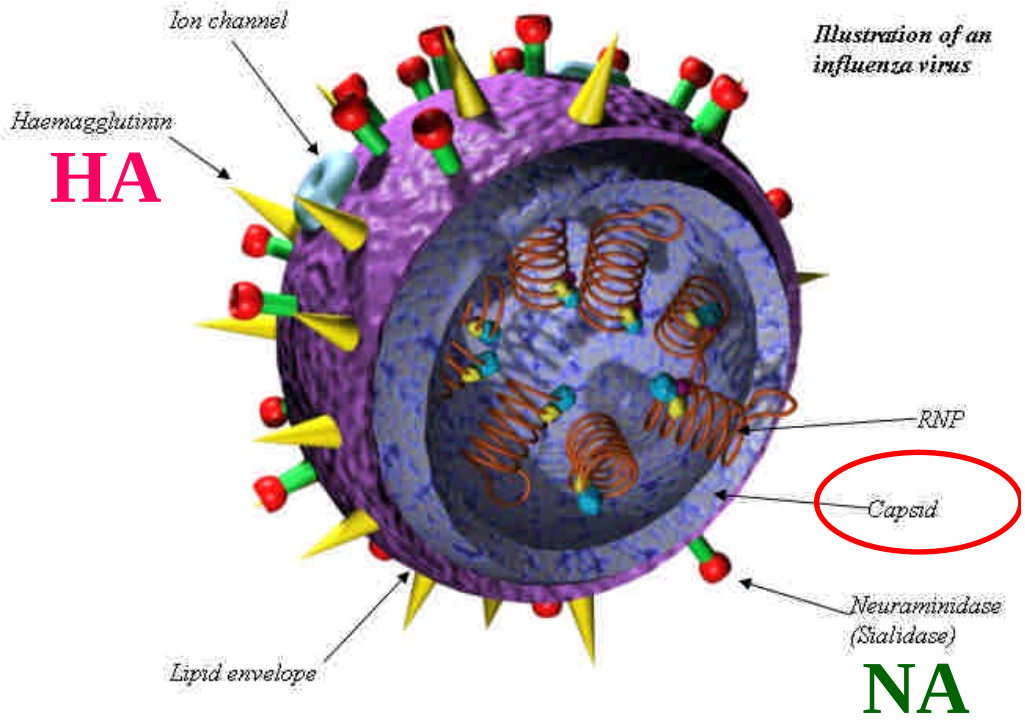
-7-23-1

Neuraminidase (NA)

Cleaves the glycoside linkages of sialic acid.

克流感是NA的抑制劑使AIV無法感染宿主





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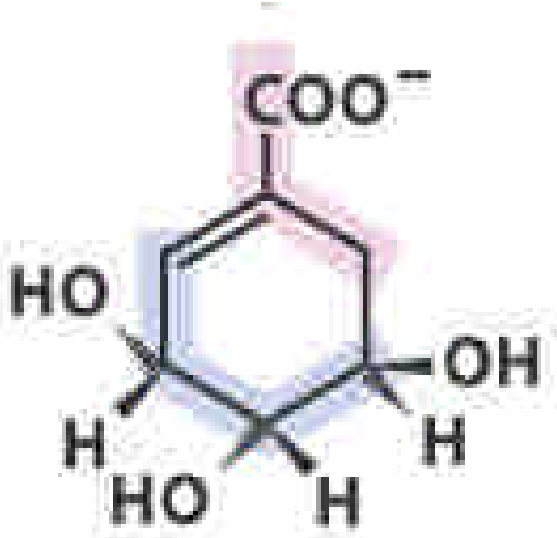
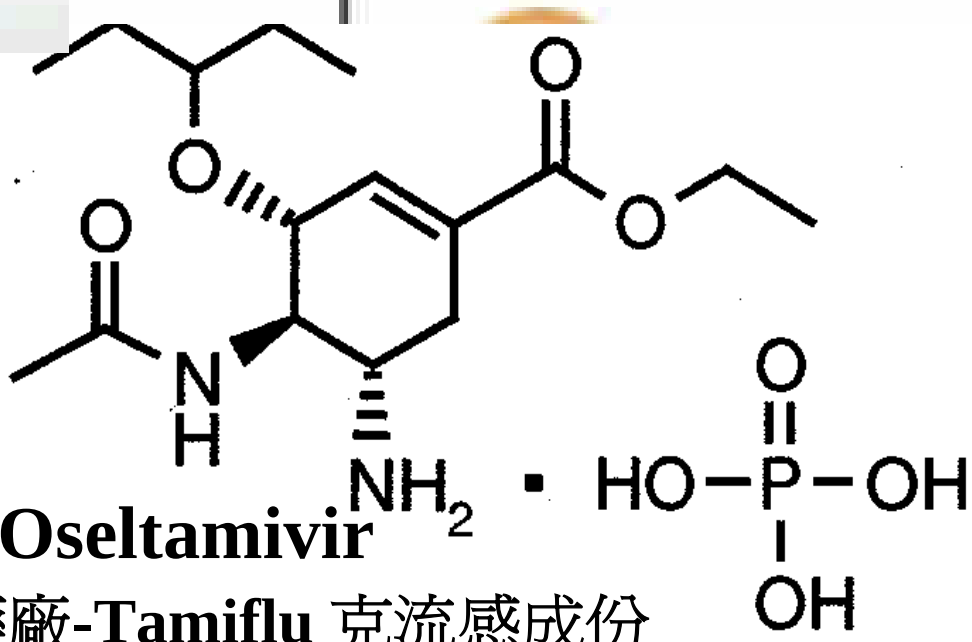


八角;莽草酸

Shikimate

-7-23-3



Oseltamivir

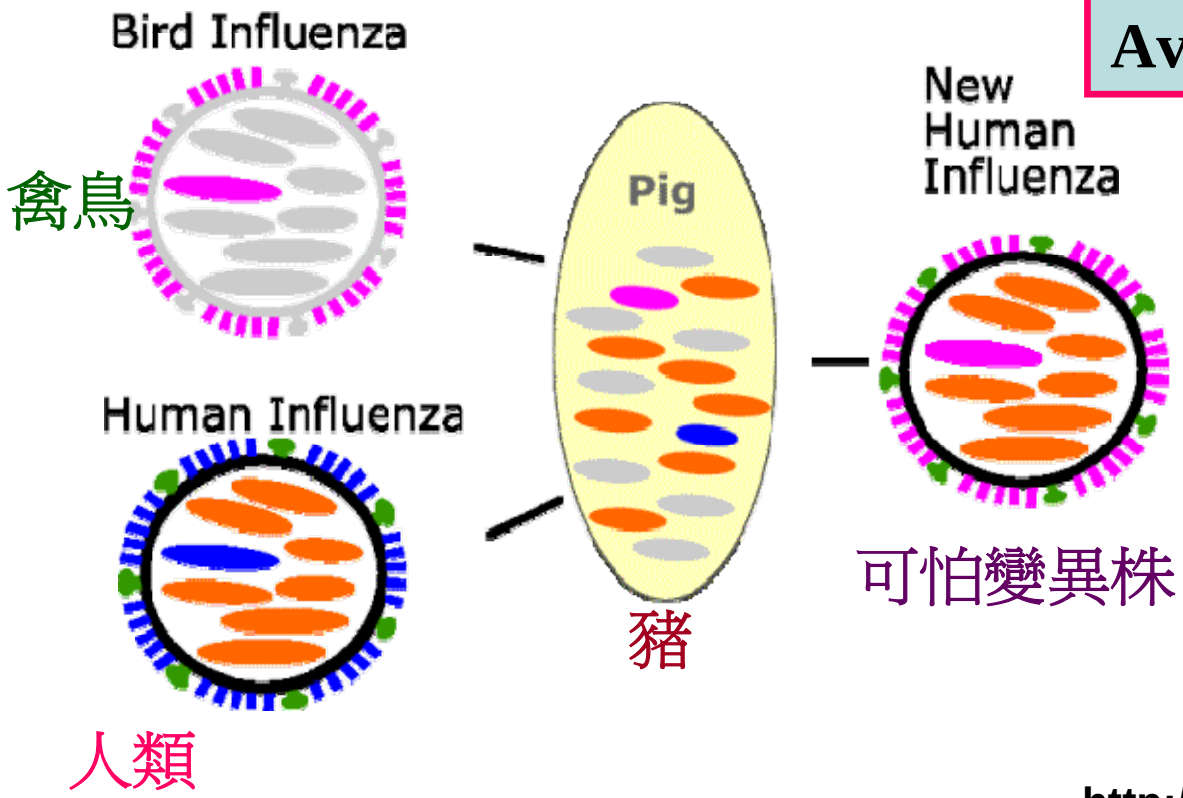
羅氏藥廠-**Tamiflu** 克流感成份
與八角成分之莽草酸相似

禽流感病毒很容易產生變異

- 定點突變(Point mutation)
- 基因重組(Gene reassortment)

如果禽流感病毒在豬體內重組再傳給人將是可怕的變異株

Human-H1, α2,6-linked SA
Avian-H5, α2,3-SA



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http://www.iph.fgov.be/flu/NL/12NL.htm

Sialic acid是**Neu5Ac**，由**neuraminiic acid C-5**的胺基乙醯化。細胞表面的**SA**能爲流感病毒所辨認，**Inf. V.**的**Hemagglutinin (a lectin)**辨認**SA**與之結合,感染**(infection)**細胞後進入**host**；成熟的病毒會以**Neuraminidase (a sialidase)** 把**host cell**表面的**SA**切掉離開 **(release)**。流感藥多是抑制 **neuraminidase,**如**Tamiflu,**但副作用大,對神經有不良影響。人流感結合的是 **NeuAc α(2-6)Gal,** 所以用 **NeuAc α(2-6)Gal** 的**oligosaccharide**作**hemagglutinin inhibitor;** 禽流感結合的是**NeuAc α(2-3)Gal**，要用 **NeuAc α(2-3)Gal** 的**oligosaccharide**作爲 **hemagglutinin inhibitor**，所以人一般是不會受禽流感所感染，除非禽流感病毒發生突變，如**Asn**^{182} 突變成**Lys**，**Gln**^{192}突變成**Arg**，突變後的禽流感病毒就會對人造成威脅。鴿子沒有禽流感困擾是因鴿子細胞表面是 **NeuAc α(2-6)Gal** 的**oligosaccharide**。

-7-24-上 下