

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

Emerging & Pandemic Influenza A(H1N1)pdm09 Part 1: Principles & etiology

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https://sites.google.com/site/emergingreemergingdisappearing/emerging_ebook/emerging_index-htm

Definitions

Re-emerging

اولین موارد آنفلوآنزای
پرنندگان در انسان (۱۹۹۷)

اولین موارد آنفلوآنزای
با منشاء خوکی و پرنندگان
در انسان (۲۰۰۹)

Emerging

Infectious

Diseases

Disappearing ??

Definitions

- **Epidemic** - is an increase in disease above what you would normally expect
- **Pandemic** - is a worldwide epidemic

Definition and public health importance

- *Influenza is one of the known viral infectious diseases,*
- *Has killed millions of peoples during pandemics, epidemics and sporadic forms.*
- *One of the most remarkable features of influenza virus is the frequency of changes in antigenicity.*⁴

Definition and public health importance

- *Alteration of the antigen:*
Leads to infection with variants to which little or no resistance is present in the population at risk.

تغییرپذیری آنتی ژنیک ← ناپایداری آنتی کری = عدم تداوم ایمنی (ناشی از دریافت)

Definition and public health importance

- *The strain currently circulating is a novel Influenza A(H1N1)pdm09*
- *It is thought to be composed of 1. avian, 2. human, and 3. swine components from various continents*

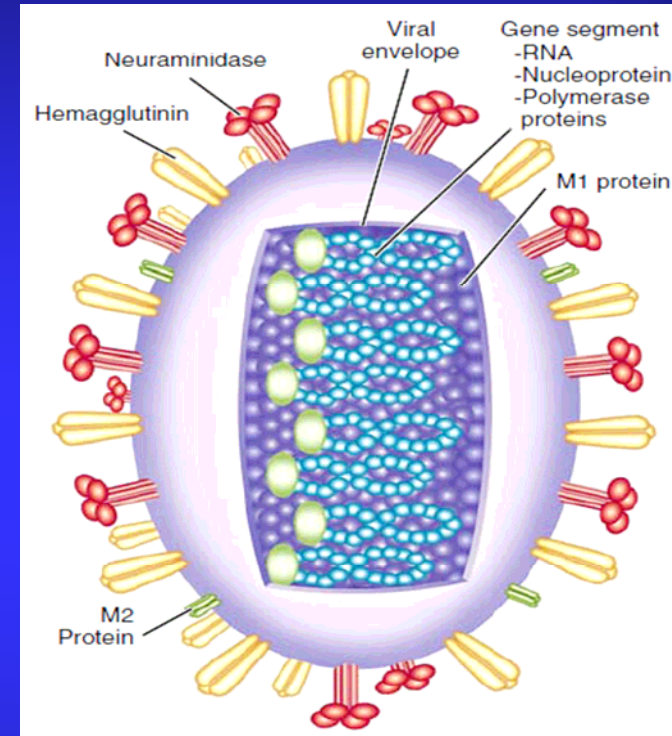
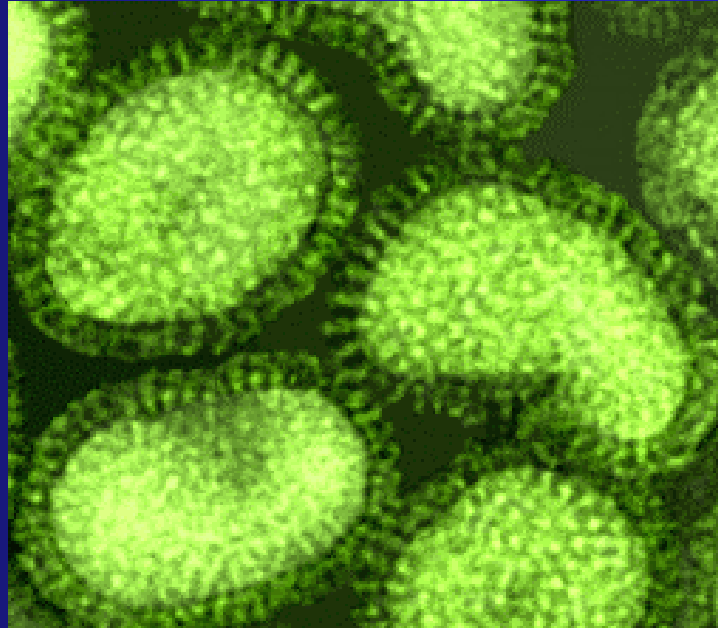
A(H3N2) viruses predominated, followed by A(H1N1)pdm09 and influenza B viruses.

Etiologic agent

- **New Strain** of Influenza Virus
 - First Detected in April 2009 in the U.S.
- **Originally Called** “Swine Flu”
 - Initial Tests Showed Many Genes Similar to Influenza Virus Occurs in Pigs
 - **Further Studies** - New Virus is Very Different from Viruses in North American Pigs

فروردین ماه ۱۳۸۸، قاره آمریکا، مکزیک

Influenza Virus



RNA virus

Surface glycoproteins:

H / HA- Haemagglutinin

N / NA - Neuraminidase

Etiologic agent

Family: Orthomyxoviridae

- segmented (8), ssRNA genome
- lipid envelop

Type (Genera): Influenzavirus Types A, B and C











































Subtypes: Human - H₁N₁, H₂N₂, H₃N₂, H₅N₁,
H₉N₂, H₁N₂, H₇N₇
A(H7N9), and A(H10N8)

Animals – H₁ to H₁₆, N₁ to N₉

Animals & Human Subtypes

H1N1	H1N2	H1N3	H1N4	H1N5	H1N6	H1N7	H1N8	H1N9
H2N1	H2N2	H2N3	H2N4	H2N5	H2N6	H2N7	H2N8	H2N9
H3N1	H3N2	H3N3	H3N4	H3N5	H3N6	H3N7	H3N8	H3N9
H4N1	H4N2	H4N3	H4N4	H4N5	H4N6	H4N7	H4N8	H4N9
H5N1	H5N2	H5N3	H5N4	H5N5	H5N6	H5N7	H5N8	H5N9
H6N1	H6N2	H6N3	H6N4	H6N5	H6N6	H6N7	H6N8	H6N9
H7N1	H7N2	H7N3	H7N4	H7N5	H7N6	H7N7	H7N8	H7N9
H8N1	H8N2	H8N3	H8N4	H8N5	H8N6	H8N7	H8N8	H8N9
H9N1	H9N2	H9N3	H9N4	H9N5	H9N6	H9N7	H9N8	H9N9
H10N1	H10N2	H10N3	H10N4	H10N5	H10N6	H10N7	H10N8	H10N9
H11N1	H11N2	H11N3	H11N4	H11N5	H11N6	H11N7	H11N8	H11N9
H12N1	H12N2	H12N3	H12N4	H12N5	H12N6	H12N7	H12N8	H12N9
H13N1	H13N2	H13N3	H13N4	H13N5	H13N6	H13N7	H13N8	H13N9
H14N1	H14N2	H14N3	H14N4	H14N5	H14N6	H14N7	H14N8	H14N9
H15N1	H15N2	H15N3	H15N4	H15N5	H15N6	H15N7	H15N8	H15N9
H16N1	H16N2	H16N3	H16N4	H16N5	H16N6	H16N7	H16N8	H16N9

Influenza A HA and NA Subtypes

H1					N1				
H2					N2				
H3				Other Animals	N3				
H4				Other Animals	N4				
H5				Other Animals	N5				
H6					N6				
H7				Other Animals	N7				Other Animals
H8					N8				Other Animals
H9					N9				
H10									
H11									
H12									
H13									
H14									
H15									

Etiologic agent

Humans can be infected with avian, swine and other zoonotic influenza viruses, such as:

1. Avian influenza virus subtypes

A(H5N1), A(H7N9), and A(H9N2)

1. Swine influenza virus subtypes

A(H1N1), A(H1N2) and A(H3N2)

Influenza sub-groups (A,B,C, D)

- **Influenza type A**
 - Highly infective
 - Infects many species (Humans, swine, equine, birds, marine mammals)
 - Antigenic shift and drift
 - Causes frequent widespread epidemics and pandemics
 - Significant mortality in young persons
 - Currently circulating in humans are subtype A(H1N1) and A(H3N2) influenza viruses.

Influenza sub-groups (A,B,C,D)

- **Influenza type B**
 - Only found in humans
 - Capable of producing severe disease
 - Antigenic drift
 - Cause of regional epidemics
 - Generally confined to older adults or persons at high risk
 - Currently circulating influenza type B viruses belong to either B/Yamagata or B/Victoria lineage.

Influenza sub-groups (A,B,C,D)

Influenza type C

- Causes mild disease (without seasonality)
- Humans are natural hosts but isolates also found in pigs
- Antigenic drift
- Does not cause epidemics
- Not present public health importance

Influenza sub-groups (A,B,C, D)

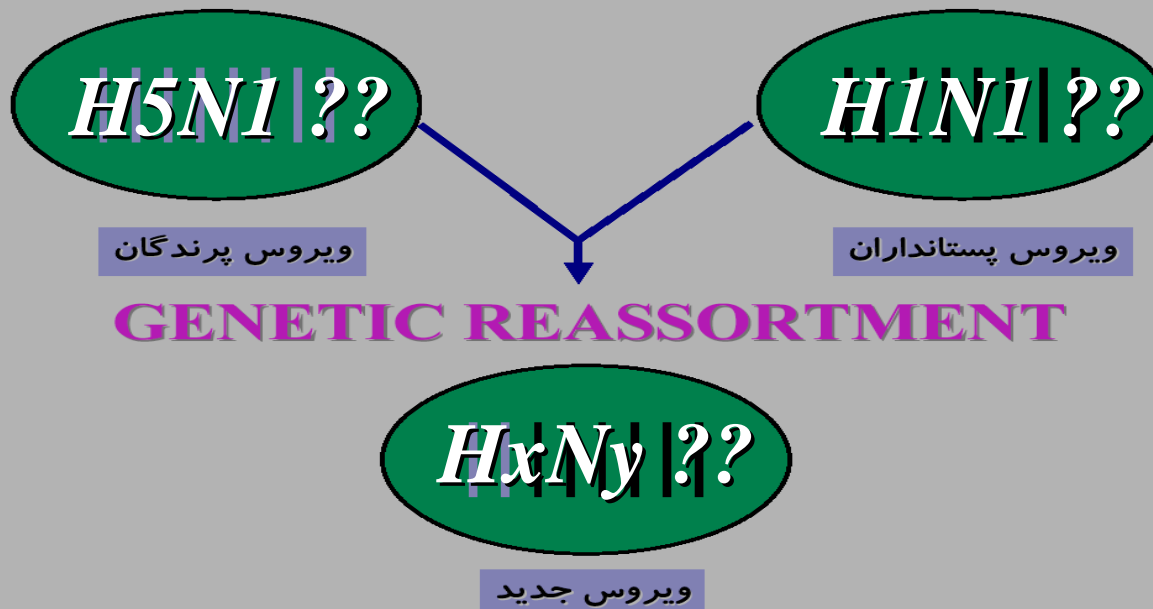
- **There are four types of influenza viruses: types A, B, C and D:**
- **Influenza type D**
 - Influenza D viruses primarily affect cattle
 - Are not known to infect or cause illness in people.

Influenza (Avian and other zoonotic) Fact sheet Updated November 2018

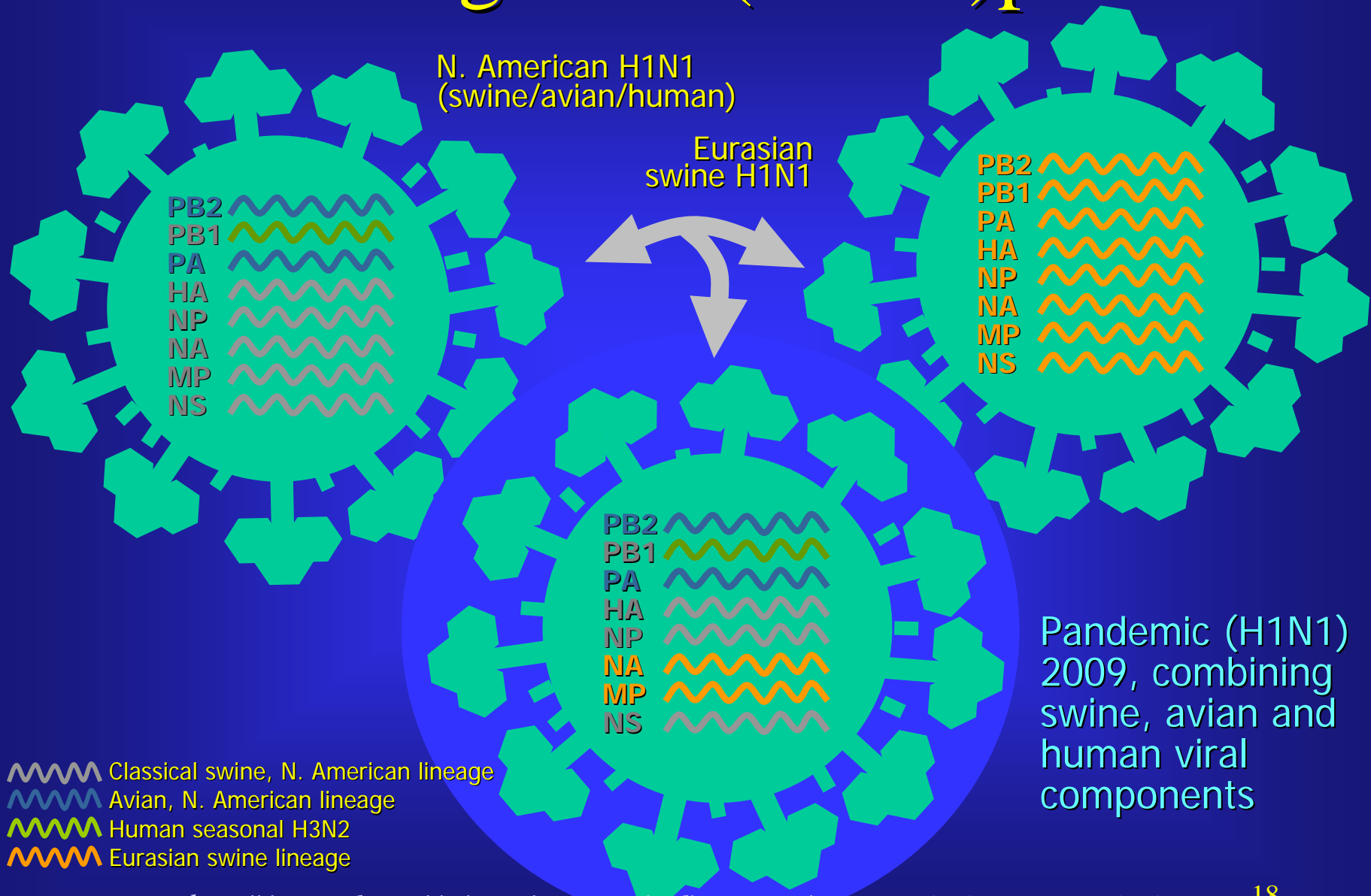
ویروس عامل پاندمی

پیش بینی در سال های

قبل از ۲۰۰۹؟ (۱۹۹۷)؟



Genetic origins of (H1N1)pdm09



https://sites.google.com/site/emergingreemergingdisappearing/emerging_ebook/emerging_index-htm

avian, human, and swine components

Novel A(H1N1)

- The strain currently circulating is a novel Influenza A(H1N1)*pdm09*
- It is thought to be composed of avian, human, and swine components from various continents
- This strain is most likely a new subtype of A/H1N1 not previously seen in swine or humans

A(H1N1)pdm09 composed of:

Avian,

Human,

Swine

components from various continents

این اولین ویروس شناخته شده آنفلوآنزا است که ژنوم آن ترکیبی از سه ویروس خوکی، پرندگان و انسانی است! و چه بسا رفتار اپیدمیولوژیک، بالینی و پاراکلینیکی متفاوتی با رفتارهای شناخته شده سایر ویروس‌های آنفلوآنزا از آن بروز کند!

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رفتارهای غیرقابل انتظاری که طی سال‌های ۲۰۰۹ تا پایان ۲۰۱۹ از ویروس A(H1N1)pdm09 بروز کرده است:

۱ - تظاهرات گوارشی در بیش از ۲۵٪ موارد

۲ - پایین بودن میزان مرتالیتی و مریدیتی در آغاز پاندمی و همه‌گیری‌های اولیه و افزایش آن طی همه‌گیری‌های بعدی تا پایان سال ۲۰۱۹ (در پاندمی‌های پیشین، عکس این رویه، رخ داده است)

بدیهی است که رفتارهای ناشناخته دیگر این ویروس نیز غیرقابل پیش‌بینی می‌باشد.

ویژگی‌های مهم ویروس آنفلوآنزای A(H1N1) 2009

- **Infectivity**
- **Pathogenicity**
- **Virolence**
- **Antigenicity**
- **Immunogenicity**

Case Definitions

Suspect, Probable, Confirmed

- **Suspect Case:** a person with acute febrile respiratory illness with onset
 - Within 7 days of close contact with a person who is a confirmed case of *pdmo9* infection, or
 - Within 7 days of travel to community where there are one or more confirmed cases of A(H1N1)*pdmo9* infection, or
 - Resides in a community where there are one or more confirmed cases of *pdmo9* infection.

Case Definitions

Suspect, Probable, Confirmed

- **Probable Case:** a person with an acute febrile respiratory illness who is positive for influenza A, but negative for H1 and H3 by influenza RT-PCR

Case Definitions

Suspect, Probable, Confirmed

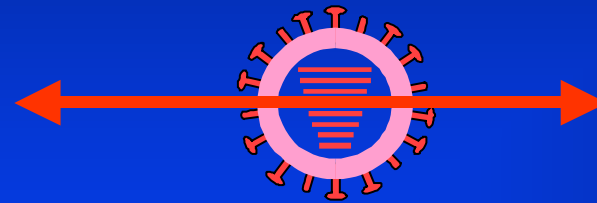
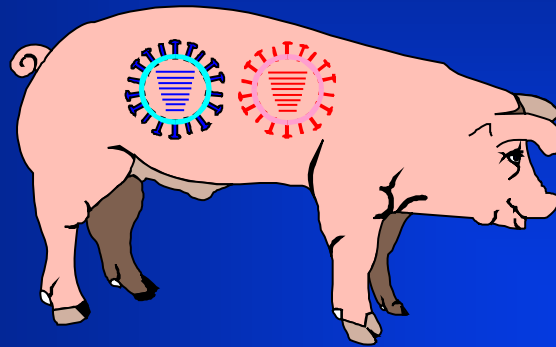
- **Confirmed Case:** a person with an acute febrile respiratory illness with laboratory confirmed *pdm09* infection at CDC by one or more of the following tests:
 - Real time RT-PCR
 - Viral culture

Case Definitions

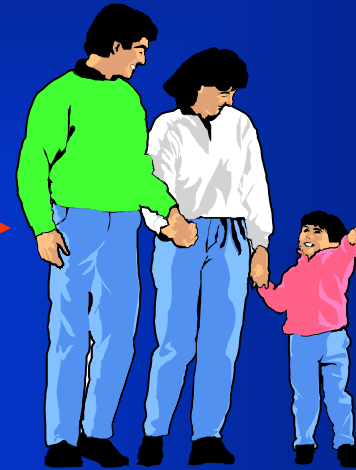
مورد قطعی (بهداشت کانادا، ۲۰۱۹)

1. **Detection** or isolation of influenza virus from appropriate clinical specimen(s) OR
2. Demonstration of a significant (i.e., **fourfold or greater**) rise in antibody titres to influenza between acute and convalescent sera OR
3. **An epidemiologic link** to a laboratory-confirmed case OR
4. Detection of influenza-specific **ribonucleic acid (RNA)**

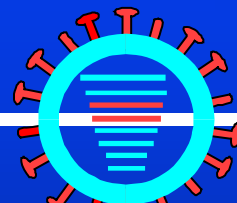
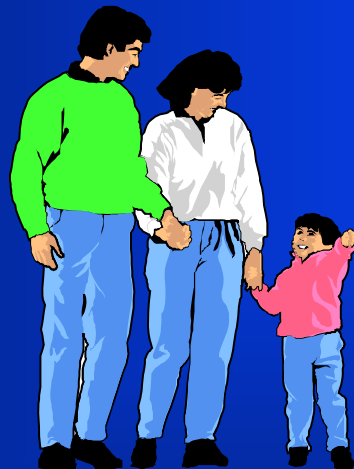
انتقال متقابل ویروس آنفلوآنزای خوکی نوع حیوانی



Swine-HIN1



قبل از سال ۲۰۰۹



Human
A(HIN1)



سال ۲۰۰۹

انتقال ویروس آنفلوآنزای خوکی نوع انسانی

Influenza Type A Viruses: Antigenic Shift 1889-2009

<u>Year</u>	<u>Subtype</u>	<u>Common Name</u>	<u>Source</u>
1889	H2N2		?
1900	H3N8		?
1918	H1N1	Spanish flu	Avian
1957	H2N2	Asian flu	Avian ¹
1968	H3N2	Hong Kong flu	Avian ¹
1977	H1N1	Russian flu 1978	?
2009	H1N1	Swin flu (pdm09)	3 Vi

¹Reassortant with avian virus

این همان پاندمی بعدی است که تا اوایل سال ۱۳۸۸ منتظر آن بودیم!؟ ولی آخرین جهانگیری آنفلوآنزا نخواهد بود

2009 - Swine & Avian viruses

2004 – H7N1 Avian virus

2004 – H7N3 Avian virus

2004 – H5N1 Avian virus

2003 – H7N7 Avian virus

2003– H5N1 Avian virus

1999 – H9N2 Quail virus

1997 – H5N1 Avian virus

1995 – H7N7 Duck virus

1993 – Swine/avian recombinant

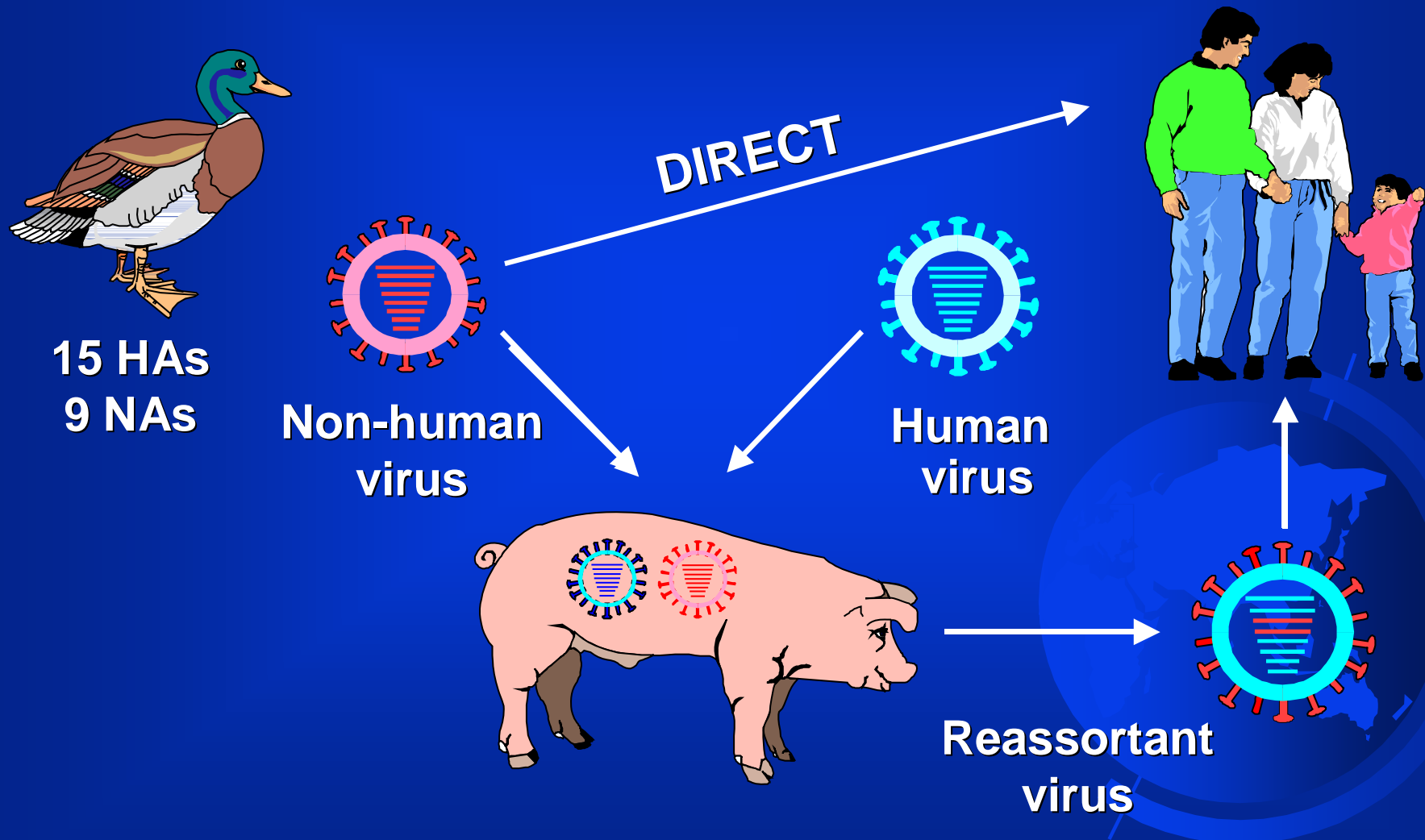
1988 – H1N1 Swine virus

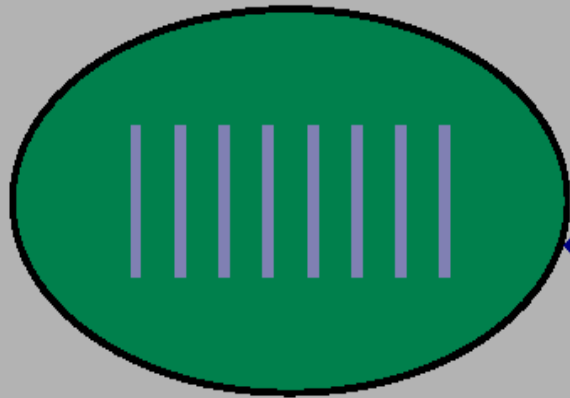
1986 – H1N1 Swine virus

1977 – H1N1 Swine flu

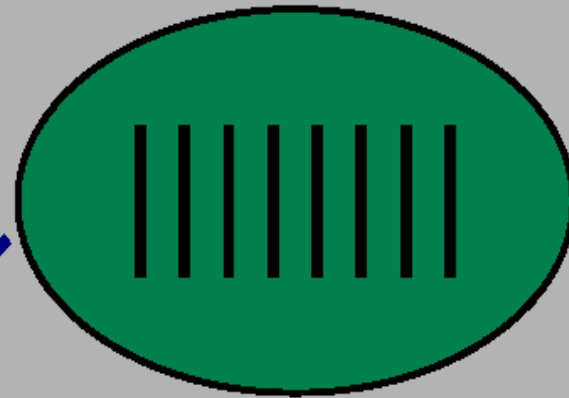
Timeline of human infection with novel influenza viruses
(1968-2009)

Mechanism of antigenic shift





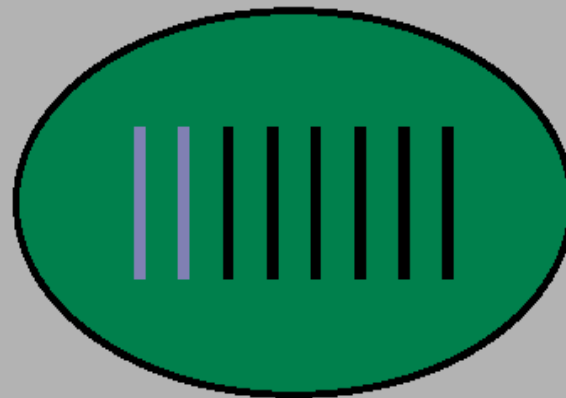
ویروس پرندگان



ویروس پستانداران



GENETIC REASSORTMENT

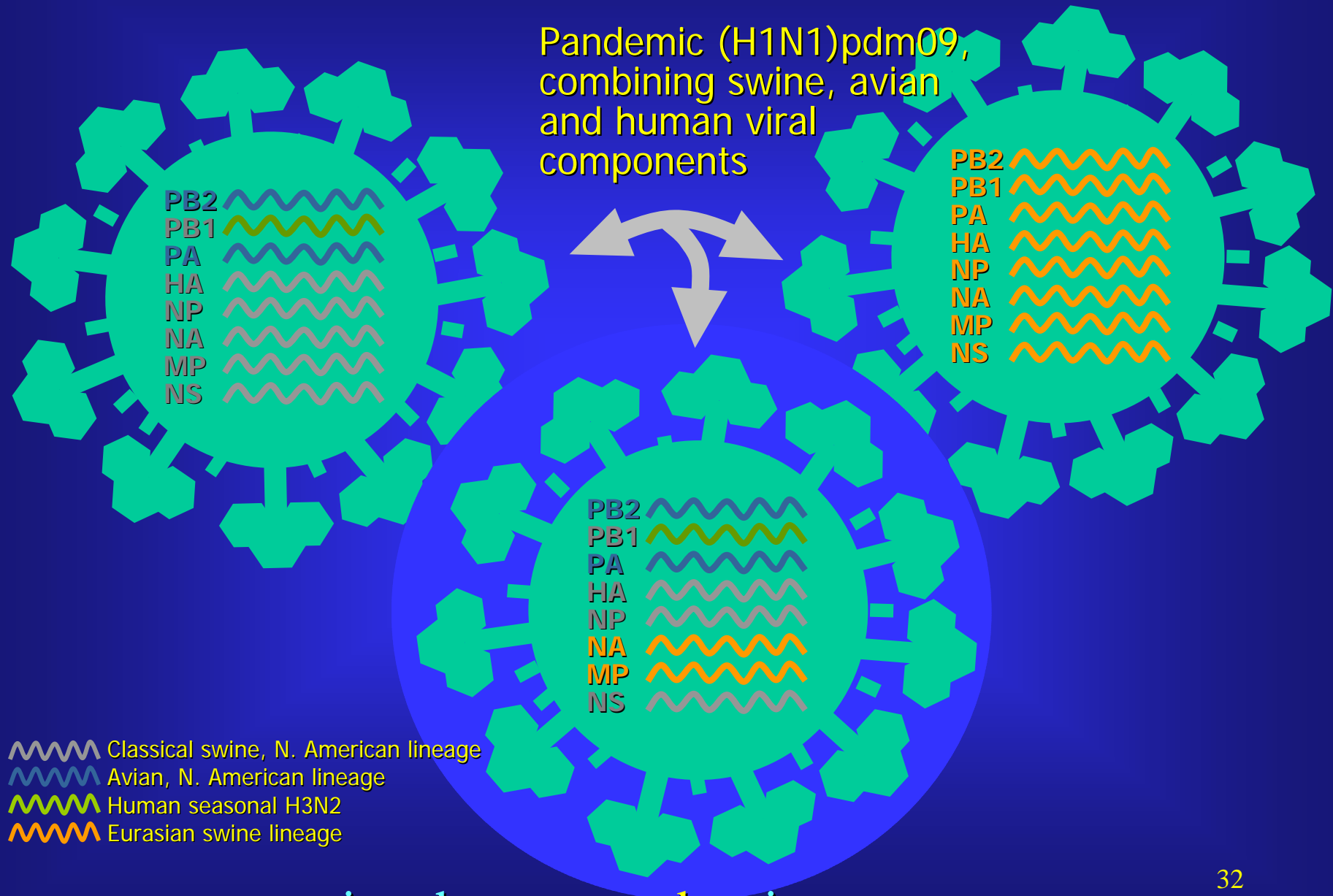


ویروس جدید

https://sites.google.com/site/emergingreemergingdisappearing/emerging_ebook/emerging_index-htm

شکل ۳ - ترتیب مجدد ژنتیک پس از امتزاج ویروس آنفلوآنزای پستانداران و پرندگان

Genetic origins of (H1N1) 2009



avian, human, and swine components

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