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## CONFERENCE ON INTERNATIONAL SCIENTIFIC DEVELOPMENTS: INSIGHTS INTO MODERN SCIENCE AND INNOVATIVE PRACTICES

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# CONFERENCE ON INTERNATIONAL SCIENTIFIC DEVELOPMENTS: INSIGHTS INTO MODERN SCIENCE AND INNOVATIVE PRACTICES

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# VIRUSLAR EVOLUTSIYASI VA MUTATSIYALARINING YANGI INFEKSION KASALLIKLAR PAYDO BO'LISHIDAGI AHAMIYATI

**Rasulova Oygul Salom qizi**

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virus evolutsiyasi, mutatsiya, RNK viruslari, reassortatsiya, rekombinatsiya, zoonoz, yangi infeksion kasalliklar, SARS-CoV-2.

**Annotatsiya.** Tezisda viruslar evolutsiyasi va mutatsiyalarining yangi infeksion kasalliklar paydo bo'lishidagi o'rni xalqaro adabiyot ma'lumotlari asosida ko'rib chiqiladi. RNK viruslarida mutatsiya tezligi nukleotid bo'yicha bir nusxa ko'chirishda $10^{-3}$–$10^{-6}$ ga yetishi, bu hujayra DNK replikatsiyasidan kamida bir tartibga yuqoriligi, koronaviruslar bundan istisno bo'lib ekzonukleaza (korrektura) faolligiga ega ekani ko'rsatiladi. Mutatsiyalar bilan birga rekombinatsiya va reassortatsiya (gripp pandemiyalari misolida) hamda retseptor bilan bog'lanishni o'zgartiruvchi mutatsiyalarning xo'jayin almashishidagi roli tahlil qilinadi. 1940–2004 yillardagi 335 ta yangi infeksion kasallik hodisasining 60,3% zoonoz bo'lgani keltiriladi. SARS-CoV-2 variantlari mutatsiyalarning epidemik ahamiyatiga misol sifatida ko'rib chiqiladi. Tezisda muallifning o'z eksperimental ma'lumotlari keltirilmagan.

**Kirish.** Yangi infeksion kasalliklarning ko'pchiligi hayvonlardan odamga o'tgan patogenlar bilan bog'liq. Jones va hammualliflari 1940–2004 yillardagi 335 ta yangi infeksion kasallik hodisasini tahlil qilib, ularning 60,3% zoonoz bo'lganini, zoonozlarning 71,8% yovvoyi hayvonlardan kelib chiqqanini va bunday hodisalar soni 1980-yillarda OIV pandemiyasi davrida eng yuqori bo'lganini aniqlagan; virus yoki prionlar sabab bo'lgan hodisalar 25,4% ni tashkil etgan [1].

Viruslarning, ayniqsa RNK viruslarining yangi xo'jayinga moslashishi ularning o'zgaruvchanligiga asoslanadi: RNK viruslarida mutatsiya tezligi nukleotid bo'yicha bitta nusxa ko'chirishda $10^{-3}$–$10^{-6}$ oralig'ida bo'lib, bu hujayra DNK replikatsiyasidagidan bir va undan ortiq tartibga yuqori [2]. Tezisning maqsadi – virus mutatsiyalari va evolutsiyasining asosiy mexanizmlarini hamda ularning yangi infeksion kasalliklar paydo bo'lishidagi ahamiyatini adabiyot ma'lumotlari asosida ko'rib chiqish.

## 1. Virus mutatsiyalarining mexanizmlari va tezligi

Sanjuán va Domingo-Calap ma'lumotlariga ko'ra, viruslarda mutatsiya tezligi bir hujayra infeksiyasida nukleotid bo'yicha taxminan $10^{-8}$ dan $10^{-4}$ gacha almashinuv oralig'ida o'zgaradi: DNK viruslarida asosan $10^{-8}$–$10^{-6}$, RNK viruslarida esa $10^{-6}$–$10^{-4}$. Ko'pchilik RNK polimerazalarida 3′-ekzonukleaza (korrektura) faolligi yo'q, koronaviruslar esa bundan istisno; teskari transkriptazalarda ham bu faollik bo'lmagani uchun retroviruslar boshqa RNK viruslari bilan o'xshash tezlikda evolyutsiyalanadi [3]. Domingo va hammualliflari esa tezlikni bitta nukleotid kiritilishiga nisbatan ifodalab, RNK viruslari uchun $10^{-3}$–$10^{-6}$ oralig'ini keltiradi; bu ikki ko'rsatkich turli o'lchov birliklarida berilganini hisobga olish kerak [2].

Koronaviruslarning genomi ma'lum bir zanjirli RNK genomlari orasida eng yirigi (32 kb gacha) bo'lib, ularning polimeraza majmuasida nsp14 oqsilining 3′→5′ ekzonukleaza (ExoN) domeni mavjud. Sichqon gepatit virusida ExoN faolsizlantirilganda mutatsiyalar chastotasi taxminan 15 baravar oshgan, bunday virus nukleozid analoglariga (jumladan letal mutagenlarga) sezgirroq bo'lgan; SARS-CoV-2 uchun nsp14 mutatsiya tezligini qanchalik pasaytirishi mazkur sharhda yozilgan vaqtda aniqlanmagan. Mualliflar SARS-CoV-2 ning xo'jayinlararo evolyutsiya tezligini yiliga bir joyga $(1{,}2 \pm 0{,}5) \times 10^{-3}$ mutatsiya deb keltiradi [2]. Mutatsiya tezligi va mutatsiya chastotasi bir narsa emas: bir xil xato tezligida ham mutant chastotasi mutant nusxalarning replikativ imkoniyatiga qarab o'zgaradi, xatolarning yo'l qo'yiladigan chegarasi (xato bo'sag'asi) esa saqlanishi kerak bo'lgan axborot murakkabligiga bog'liq [2].

Xo'jayin omillari ham mutatsiyalarga hissa qo'shadi: APOBEC3 fermentlari OIV-1 da G→A almashinuvini chaqiradi (mualliflar bahosiga ko'ra, OIV-1 mutatsiyalarining 98% gacha qismi shu orqali, bu teskari transkriptaza xatosidan 40 baravardan ortiq yuqori), ADAR fermentlari esa adenozinni inozinga aylantirib A→G almashinuvini beradi (birinchi marta qizamiq virusida ko'rsatilgan) [3]. Mexanizmlar 1-jadvalda umumlashtirilgan.

**1-jadval. Viruslarda o'zgaruvchanlik mexanizmlari va ularning ko'rsatkichlari (adabiyot ma'lumotlari)**

| Mexanizm | Ko'rsatkich yoki misol | Manba |
|---|---|---|
| Polimeraza xatolari (nuqtaviy mutatsiyalar) | RNK viruslari: $10^{-6}$–$10^{-4}$; DNK viruslari: $10^{-8}$–$10^{-6}$ (almashinuv/nukleotid/hujayra infeksiyasi) | [3] |
| Korrektura faolligining yo'qligi yoki mavjudligi | Koronaviruslarda nsp14 ExoN; sichqon gepatit virusida ExoN faolsizlanganda mutatsiya chastotasi ≈ 15 baravar yuqori | [2] |
| Xo'jayin fermentlari (APOBEC, ADAR) | OIV-1 mutatsiyalarining ≈ 98% APOBEC hisobiga (mualliflar bahosi) | [3] |
| Reassortatsiya (segmentli genomlar) | Gripp: 1957 (H2N2), 1968 (H3N2) va 2009 (H1N1) pandemiyalari | [4; 5] |
| Rekombinatsiya | SARS-CoV retseptor bilan bog'lanish motivi rekombinatsiya orqali olingan bo'lishi mumkin, so'ngra mutatsiyalar bilan takomillashgan | [5] |
| Retseptor bilan bog'lanishni o'zgartiruvchi mutatsiyalar | It parvovirusi: kapsidda kamida 2 mutatsiya; SARS-CoV: S oqsilining 479 va 487-qoldiqlari | [5] |

*Izoh: jadval ko'rsatilgan manbalar asosida muallif tomonidan tuzilgan.*

## 2. Rekombinatsiya, reassortatsiya va xo'jayin almashishi

Faqat mutatsiyalar emas, genetik materialni almashish ham virus evolutsiyasida muhim. Riboviruslar va retroviruslarda rekombinatsiya tezligi mutatsiya tezligi bilan musbat bog'liq; rekombinatsiya foydali mutatsiyalarni zararli fondan ajratishi va birlashtirishi mumkin, ammo ma'lum chegaradan keyin zararli allellar to'planishiga ham olib keladi [3]. Gripp virusida o'zgaruvchanlikning ikki turi ajratiladi: antigen siljish (drift) – RNKga bog'liq RNK-polimeraza xatolari (nuqtaviy mutatsiyalar) natijasi; bu fermentda korrektura faolligi yo'qligi ta'kidlanadi, antigen sakrash (shift) – bir vaqtda zararlagan turli shtammlar genom segmentlarining reassortatsiyasi natijasi; replikatsiyada noto'g'ri nukleotid qo'shilish tezligi $10^{-3}$–$10^{-4}$ deb baholanadi [4].

Reassortatsiya pandemiyalarni keltirib chiqargan: 1957 yil H2N2 va 1968 yil H3N2 pandemiyalarida gemagglyutinin (va 1957 da neyraminidaza) qush grippi viruslaridan kelib chiqqan deb taxmin qilinadi, 2009 yil H1N1 pandemiyasida esa Shimoliy Amerika qush viruslari, odam H3N2 va cho'chqa H1N1 hamda H1N2 viruslari genlari birlashgan. Sharhda keltirilishicha, 1918 yil pandemiyasida taxminan 40–50 million, 1957, 1968 va 2009 yillarda har birida kamida 500 ming kishi halok

bo'lgan [4]. Parrish va hammualliflari gripp viruslari suv qushlaridan odamlarga, cho'chqa va otlarga o'tganini, 1957 va 1968 yillardagi pandemiyalarda reassortatsiya ishtirok etganini, qushlar va sutemizuvchilarda sialik kislotaning turli bog'lanishlari tanilgani uchun bog'lanish joylari moslashuv jarayonida tez o'zgarishi mumkinligini ta'kidlaydi [5].

Xo'jayin almashishida mutatsiyalar belgilovchi bo'lishi mumkin. It parvovirusi 1970-yillar boshida mushuksimonlar virusidan paydo bo'lib, 1978 yilga kelib butun dunyoga tarqalgan; buning uchun kapsidda kamida ikkita mutatsiya it transferrin retseptoriga samarali bog'lanishni ta'minlagan. SARS-CoV da odam ACE2 retseptori bilan bog'lanishda S oqsilining 479 va 487-qoldiqlari asosiy rol o'ynagan. Biroq yangi xo'jayinga moslashtiruvchi mutatsiyalar ko'pincha dastlabki xo'jayindagi moslashuvchanlikni kamaytiradi, qisman moslashgan oraliq variantlar esa ikkala xo'jayinda ham kam moslashgan bo'lishi mumkin; bu xo'jayin almashish hodisalarining kamligini tushuntirishi mumkin [5].

### 3. Yangi infeksion kasalliklar va SARS-CoV-2 misoli

SARS-CoV-2 misolida mutatsiyalarning epidemik ahamiyati yaqqol ko'rinadi. Akkızning sharhiga ko'ra, S oqsilidagi D614G mutatsiyasi yuqori yuqumlilik va tarqalish bilan, N501Y – ACE2 ga yuqori yaqinlik va replikatsiya bilan, E484K – immun qochish bilan, P681R esa yuqori replikativ moslik va yuqumlilik bilan bog'langan. Alfa varianti avvalgi Buyuk Britaniya liniyalaridan taxminan 50% ko'proq yuqumli, Delta esa Alfaga qaraganda taxminan 60% tez tarqalgan; Omikron S oqsilida 30 dan ortiq mutatsiyaga ega bo'lib, JSST uni 2021 yil 26 noyabrda tashvishlantiruvchi variant deb e'lon qilgan [6]. Bu raqamlar sharhdan keltirildi va ularning alohida mutatsiyalarga emas, mutatsiyalar majmuiga bog'liqligini hisobga olish zarur: masalan, sharhda D614G ning o'zi antigenlikni o'zgartirmasligi, N501Y ning o'zi esa emlash natijasida hosil bo'lgan neytrallanishga sezilarli ta'sir ko'rsatmasligi qayd etilgan [6].

Yangi kasalliklar paydo bo'lish xavfi hamma hududlarda bir xil emas: Jones va hammualliflari xavf xaritalarini tuzib, yangi infeksion kasalliklar paydo bo'lish ehtimoli yuqori hududlar quyi kengliklardagi rivojlanayotgan mamlakatlarda

ko'proq, kuzatuv va tadqiqot kuchlari esa rivojlangan mamlakatlarda to'plangan degan xulosaga kelgan [1]. Shu sababli virus genomlarini kuzatish (genomik nazorat) va zoonoz kasalliklarni erta aniqlash muhim; bu xulosa adabiyot ma'lumotlariga tayangan holda muallifning mulohazasidir. Antiviral yondashuvlarda esa letal mutagenez, ya'ni mutatsiyalar sonini xato bo'sag'asidan oshirish orqali virusni yo'qotish, kengspektrli yondashuv sifatida taklif etilgan [2].

**Xulosa.** Adabiyot ma'lumotlari RNK viruslarining yuqori mutatsiya tezligi ($10^{-3}$–$10^{-6}$), rekombinatsiya va reassortatsiya hamda retseptor bilan bog'lanishni o'zgartiruvchi mutatsiyalar yangi infeksion kasalliklar paydo bo'lishining evolyutsion asosini tashkil etishini ko'rsatadi. Biroq mutatsiya o'zi yetarli emas: xo'jayinga moslashuv moslik muvozanatiga bog'liq va kam hollarda sodir bo'ladi, yangi kasalliklar paydo bo'lishida esa ekologik va ijtimoiy omillar ham muhim (60,3% hodisa zoonoz). Shu sababli virus evolyutsiyasini kuzatish bilan birga zoonoz manbalarni nazorat qilish zarur.

## FOYDALANILGAN ADABIYOTLAR

1. Jones K.E., Patel N.G., Levy M.A., Storeygard A., Balk D., Gittleman J.L., Daszak P. Global trends in emerging infectious diseases // *Nature*. – 2008. – Vol. 451, No. 7181. – P. 990–993. – DOI: 10.1038/nature06536.

2. Domingo E., García-Crespo C., Lobo-Vega R., Perales C. Mutation rates, mutation frequencies, and proofreading-repair activities in RNA virus genetics // *Viruses*. – 2021. – Vol. 13, No. 9. – Art. 1882. – DOI: 10.3390/v13091882.

3. Sanjuán R., Domingo-Calap P. Mechanisms of viral mutation // *Cellular and Molecular Life Sciences*. – 2016. – Vol. 73, No. 23. – P. 4433–4448. – DOI: 10.1007/s00018-016-2299-6.

4. Wong K.H., Lal S.K. Alternative antiviral approaches to combat influenza A virus // *Virus Genes*. – 2023. – Vol. 59. – P. 25–35. – DOI: 10.1007/s11262-022-01935-3.

5. Parrish C.R., Holmes E.C., Morens D.M., Park E.-C., Burke D.S., Calisher C.H., Laughlin C.A., Saif L.J., Daszak P. Cross-species virus transmission and the emergence of new epidemic diseases // *Microbiology and Molecular Biology Reviews*. – 2008. – Vol. 72, No. 3. – P. 457–470. – DOI: 10.1128/MMBR.00004-08.

6. Akkız H. The biological functions and clinical significance of SARS-CoV-2 variants of concern // *Frontiers in Medicine*. – 2022. – Vol. 9. – Art. 849217. – DOI: 10.3389/fmed.2022.849217.