Secret hiding places in the eye and beyond: what about after SARS-CoV-2 infection?

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Dear Editor:

In a prospective study, Rokohl and colleagues looked into the possibility that SARS-CoV-2 may hide in the eyes of pre-screened asymptomatic patients in a tertiary eye care center \([1]\). The authors explored this possibility in 1145 patients of whom none had any real-time reverse transcriptase-polymerase chain reaction (RT-PCR)–confirmed virus-positive result from nasopharyngeal swabs, suggesting that all study individuals were uninfected. Regarding conjunctival swabs, all tested eyes yielded virus-negative results. Clearly, this is important empirical information in regard to infection risks for ophthalmologists and medical staff in tertiary eye care centers, including the handling of human corneal donor tissue — always provided that patients or donors are not infected.

We compliment the authors for taking this initiative and call for research regarding hiding places of SARS-CoV-2 to be expanded: What about infected individuals, viz., COVID-19 patients, survivors, or asymptomatic carriers, and virus material persistence in immune-privileged sites of the eye and elsewhere?

To exemplify why “secret” hiding sites in infected individuals may become of interest, in 1967 a virus reservoir in sperm was proposed in the course of discovering the Marburg virus (MV) \([2]\). Careful observations had suggested that several diseased men’s testes were also infected and abstaining from sex until further notice was recommended after hospital dismissal. Yet, after one MV patient left hospital and had intercourse with his wife, she developed symptoms and signs of Marburg disease. From the overall evidence, it was concluded that the infection occurred via virus-containing ejaculate. In other words, an until then unappreciated (described as “unusual” \([2]\)) spermatogenous infection route from an MV reservoir which existed for almost 4 months was suggested. Regarding another filovirus, sexual transmission from a male survivor of Ebola virus disease \([EVD]\) to his female partner was suspected in 2015 \([3]\). That Ebola virus RNA can persist many months after manifestation of disease \([4]\) — in semen from an EVD survivor with pre-existing HIV infection it was detected 565 days after acute disease \([5]\) — conveys that understanding virus clearance and remaining virus “potential” from immune-privileged sites/organs is important for individuals and possibly public health \([6]\).

Regarding SARS-CoV-2, investigating virus materials in semen of COVID-19 cases in acute and recovery phases yielded ambiguous results. The question of whether virus material may persist in the privileged immunity site of the testes remains open \([7]\). In contrast, regarding SARS-CoV-2 in the eye, Rokohl and colleagues pointed out that the virus was unambiguously detected in ocular tissues, tears, and conjunctival secretions of COVID-19 patients \([1]\). The key question of whether long(er)-term SARS-CoV-2 persistence in immune privileged sites such as in the eyes \([8]\) of COVID-19 survivors or asymptomatic carriers may hold long(er)-term risks is empirically open and should be explored with targeted research \([9, 10]\).

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Declarations

Conflict of interest  The authors declare no competing interests.

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References

1. Rokohl AC, Grajewski RS, Wawer Matos PA, Koch HL, Dewald F, Klein F, Fätkenheuer G, Lehmann C, Cursiefen C, Heindl LM (2021) No secret hiding place? Absence of SARS-CoV-2 on the ocular surface of 1145 hospitalized patients in a pandemic area. Graefes Arch Clin Exp Ophthalmol 1–4. https://doi.org/10.1007/s00417-021-05086-3
2. Martini GA, Schmidt HA (1968) Spermatogenic transmission of the “Marburg virus”. (Causes of “Marburg simian disease”). Klin Wochenschr 46:398–400
3. Mate SE, Kugelman JR, Nyenswah TG, Ladner JT, Wiley MR, Cordier-Lassalle T, Christie A, Schroth GP, Gross SM, Davies-Wayne GJ, Shinde SA, Murugan R, Sieh SB, Badio M, Fakoli L, Tawe F, de Wit E, van Doremalen N, Munster VJ, Pettitt J, Prieto K, Humrighouse BW, Ströher U, DiClaro JW, Hensley LE, Schoepf RJ, Safronetz D, Fair J, Kuhn JH, Blackley DJ, Laney AS, Williams DE, Lo T, Gasasira A, Nichol ST, Formenty P, Kateh FN, De Cock KM, Bolay P, Sanchez-Lockhart M, Palacios G (2015) Molecular evidence of sexual transmission of Ebola virus. N Engl J Med 373:2448–2454
4. Deen GF, Brounet N, Xu W, Knust B, Sesay FR, McDonald SLR, Ervin E, Marrinan JE, Gaillard P, Habib N, Liu H, Liu W, Thorson AE, Yamba F, Massaquoi TA, James F, Aribayaraj A, Ross C, Bernstein K, Coursier A, Klen J, Carino M, Wurie AH, Zhang Y, Dumbuya MS, Abad N, Idriss B, Wi T, Bennett SD, Davies T, Ebrahim FK, Meites E, Naidoo D, Smith SJ, Ongpin P, Malik T, Banerjee A, Erickson BR, Liu Y, Liu Y, Xu K, Brault A, Durski KN, Winter J, Sealy T, Nichol ST, Lanmu M, Bagura J, Landoulsi S, Jambai A, Morgan O, Wu G, Liang M, Su Q, Lan Y, Hao Y, Formenty P, Ströher U, Sahr F (2017) Ebola RNA persistence in semen of Ebola virus disease survivors - final report. N Engl J Med 377:1428–1437
5. Purpura LJ, Rogers E, Baller A, White S, Soka M, Choi MJ, Mahmoud N, Wasunna C, Massaquoi M, Kollie J, Dweh S, Bemah P, Ladele V, Kpakaj J, Jawara M, Mugaisha M, Subah O, Faikai M, Bailey JA, Rollin P, Marston B, Nyenswah T, Gasasira A, Knust B, Nichol S, Williams D (2017) Ebola virus RNA in semen from an HIV-positive survivor of Ebola. Emerg Infect Dis 23:714–715
6. Gross JV, Slanger TE, Cullen P, Erren M, Erren TC (2015) Stopping possible sexual transmission of filoviruses. Clin Infect Dis 60(12):1871–1872
7. Sharun K, Tiwari R, Dhama K (2020) SARS-CoV-2 in semen: potential for sexual transmission in COVID-19. Int J Surg 84:156–158
8. Varkey JB, Shantha JG, Crozier I, Kraft CS, Lyon GM, Mehta AK, Kumar G, Smith JR, Kainulainen MH, Whitner S, Ströher U, Uyeki TM, Ribner BS, Yeh S (2015) Persistence of Ebola virus in ocular fluid during convalescence. N Engl J Med 372:2423–2427
9. Qu JY, Xie HT, Zhang MC (2021) Evidence of SARS-CoV-2 Transmission through the ocular route. Clin Ophthalmol 15:687–696
10. de Freitas Santoro D, de Sousa LB, Camara NOS, de Freitas D, de Oliveira LA (2021) SARS-COV-2 and ocular surface: from physiology to pathology, a route to understand transmission and disease. Front Physiol 12:612319

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