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CORONAVIRUS DISEASE 2019 UPDATE (88): GERMANY, ANIMALS, RESEARCH, PIG, CHICKEN, BAT, FERRET

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Date: Tue 7 Apr 2020

From: Martin Beer <Martin.Beer@fli.de> [edited]

COVID-19: Experimental infection of fruit bats, ferrets, pigs and chicken with SARS-CoV-2 at Friedrich-Loeffler-Institut



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Animals were intranasally inoculated with 10⁵ TCID₅₀ and monitored for virus shedding by samples taken from the upper respiratory tract as well as fecal samples. In addition, animals were euthanized for necropsy at different time points. In all experiments, contact animals were also investigated.

We report here that pigs (n=9) and chickens (n=17) were not susceptible to intranasal infection by SARS-CoV-2. All swab samples as well as organ samples and contact animals remained negative for SARS-CoV-2-RNA. In

contrast, intranasal inoculation of *Rousettus aegyptiacus* fruit bats (n=9) resulted in a transient infection in the respiratory tract, with virus replication detectable in the nasal epithelium, trachea, lung and lung associated lymphatic tissue. Infectious virus was isolated from the nasal epithelium and trachea of one animal at 4 days post infection. We also detected viral RNA in the nasal epithelium of 1 out of 3 contact animals sacrificed at day 21 post infection.

Most efficient virus replication was observed in ferrets, with high yields of viral RNA in nasal washing fluids from 8 of 9 animals from 2 days post infection (dpi) to 8 dpi. Interestingly, all 3 non-inoculated contact ferrets became infected and viral RNA was present in nasal washing fluids starting at 12 dpi. Screening of organ samples revealed prominent viral RNA loads only in the upper respiratory tract as confirmed by positive immunohistochemistry and in situ-hybridization in the nasal cavity. SARS-CoV-2 reactive antibodies were detected from day 8 in the inoculated ferrets and in one contact ferret on day 21 dpi.

In summary, pigs and chickens could not be productively infected by SARS-CoV-2 under these experimental conditions, an information that is relevant for a solid risk assessment. Furthermore, virus replication in ferrets resembles the situation of a mild human infection and this species might serve as a useful model for further studies e.g. testing vaccines or antivirals.

[The FLI COVID-19-Team; Balkema-Buschmann A., Beer M., Breithaupt A., Graaf A., Groschup, M., Grund Ch., Harder T., Hoffmann D., Mettenleiter Th. C., Rissmann M., Schlottau K., Schoen J.]

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[We are grateful to the FLI team for this firsthand information.

This report of experimental infection trials in FLI, involving bats, ferrets, pigs and chickens, deserve to be compared with recent animal experimental trials reported from China (20200402.7173286, item 2).

The research team from the HVRI in Harbin found that SARS-CoV-2 "replicates poorly in dogs, pigs, chickens, and ducks, but efficiently in ferrets and cats". The similar results in the species which were subject to testing in both institutes, namely pigs, chickens and ferrets, are strikingly convincing of their significance. HVRI's (China) findings in cats have, in the meantime, been further established by the recent report on COVID-19 in other

felids (New York, 20200406.7191352). - Mod.AS]

[This experiment confirms the findings of the recent work carried out in China and adds the experimental exposure of fruit bats, which resulted in viral replication in the respiratory tract. The findings also suggest that there was transmission to a sentinel bat.

It is worth mentioning that the species used for this experiment, the Egyptian fruit bat (*Rousettus aegyptiacus*), is phylogenetically distant from the bats that are known reservoir of SARS-like viruses (horseshoe bats, *Rhinolophus* spp.). Fruit bats belong to the Pteropodidae family (megabats) while horseshoe bats are in the Rhinolophidae family. The Egyptian fruit bat, however, is amenable to experimental work as it can be bred in captivity and has been used as a model animal for neurophysiological research. - Mod.PMB

HealthMap/ProMED map available at:

Germany: <http://healthmap.org/promed/p/101>

See Also

COVID-19 update (85): USA (NY) tiger, OIE 20200406.7191480

COVID-19 update (84): USA, tigers 20200406.7191352

COVID-19 update (76): China (HU) animal, cat, owned, stray, seropositive 20200403.7179946

COVID-19 update (75): China (Hong Kong) cat, OIE 20200403.7179945

COVID-19 update (70): China (Hong Kong) cat, pets & stock 20200402.7173286

COVID-19 update (58): Belgium, cat, clinical case, RFI 20200327.7151215

COVID-19 update (57): global, re-using PPE, DR Congo, more countries, WHO 20200327.7149046

COVID-19 update (56): China (Hong Kong) animal, dog, final serology positive 20200326.7146438

COVID-19 update (45): China (Hong Kong) animal, dog, 2nd case PCR positive 20200319.7112693

COVID-19 update (37): China (Hong Kong) animal, dog, prelim. serology negative 20200312.7081842

COVID-19 update (30): China (Hong Kong) dog, susp, serology pending 20200306.7057595

COVID-19 update (25): China (Hong Kong) dog, susp, OIE 20200302.7040373

COVID-19 update (22): companion animals, dog susp, RFI 20200229.7036661

COVID-19 update (17): China, animal reservoir, wildlife trade & consumption 20200225.7024245

COVID-19 update (11): animal reservoir, intermediate hosts, pangolin susp 20200220.7009213

COVID-19 update (08): companion animals, RFI 20200218.7002276

COVID-19 update (06): animal reservoir, intermediate hosts 20200217.6997782

Novel coronavirus (40): animal reservoir, pangolin poss intermediate host, RFI 20200210.6972104

Novel coronavirus (28): China (HU) animal reservoir 20200201.6943858

Novel coronavirus (22): reservoir suggested, bats 20200129.6930718

Novel coronavirus (20): China, wildlife trade ban 20200127.6922060

Novel coronavirus (18): China (HU) animal reservoir 20200125.6915411

Novel coronavirus (15): China (HU) wild animal sources 20200123.6909913

Novel coronavirus (03): China (HU) animal reservoir suggested, RFI 20200114.6887480

Novel coronavirus (01): China (HU) WHO, phylogenetic tree 20200112.6885385

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