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COVID19 Research Update

Birmingham Health Partners
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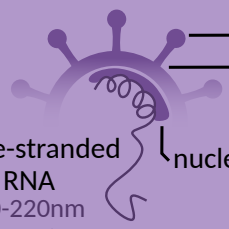
SARS-CoV-2

Source: **Park**, Clin Exp Pediatr, 2020; **Zhu *et al.***, New Eng J Med, 2020; **DearLove *et al.***, bioRxiv, 2020

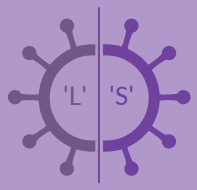


single-stranded RNA
80-220nm diameter

FIVE ESSENTIAL GENES: spike, envelope, RNA polymerase, matrix, nucleoprotein

80% similarity to SARS-CoV

two strains identified



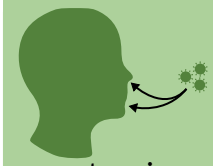
but same infectivity and aggressiveness

in **5700** samples

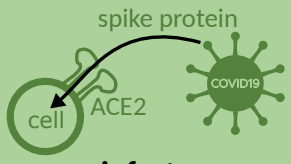
- minimal diversity
- ↓
- universal 'global' vaccine possible
- and trials underway at key sites including Oxford and Birmingham

Infection pathway

Source: **Cevic, Bamford and Ho**, Clin Microbiol Infect, 2020; **Risitano *et al.***, Nature, 2020



entry via mouth or nose



infects upper respiratory epithelium and alveoli by the ACE2 receptor

the **virus replicates** using the cells machinery and **new virus released** by **exocytosis** or the **bursting of the cell**

immune response

- **macrophages** take up virus, produce cytokines, causes vasodilation and oedema
- **neutrophils** release reactive oxygen species and can damage alveoli
- **dendritic cells** present virus to T cells to activate adaptive immune system
- **complement** can co-ordinate other immune cells
- **T cells** kill infected cells
- **B cells** generate virus-neutralising antibodies

Viral loads

Source: **Wolfel *et al.***, Nature, 2020; **Wang *et al.***, JAMA, 2020; **Yang *et al.***, medRxiv, 2020; **Li *et al.***, JAMA, 2020; **Han *et al.***, Lancet, 2020; **To *et al.***, Lancet, 2020; **Li *et al.***, J Med Virol, 2020

virus found in:

- throat and nose
- saliva
- sputum
- bronchoalveolar lavage

(live virus)

- faeces
- urine
- blood
- sperm

PCR test

high rate of false-negatives as low viral loads in early disease

→ re-test 2-3 days later

does not detect live virus

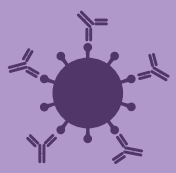
9 mild patients

- throat swab and sputum
- high PCR results
- no live virus cultured

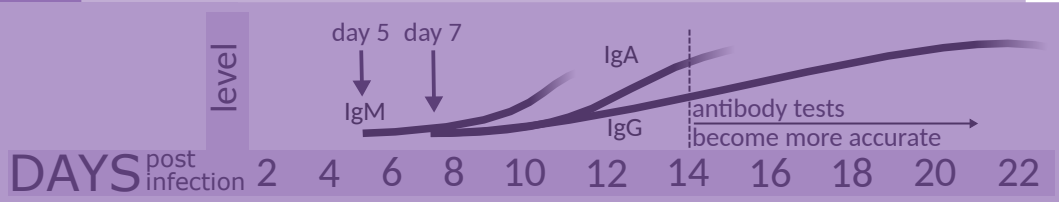
supports 7-14 day isolation

Serology

Source: **Klimpel**, Medical Microbiology, 1996; **To *et al.***, Lancet, 2020; **Ma *et al.***, medRxiv, 2020; **Shields *et al.***, medRxiv, 2020



antibodies neutralise virus by preventing entry into the cell



based on general immunology data

patients n=16

IgG detected after 14 days
IgM correlated with virus neutralisation

patients n=9

IgA and IgM peaked at day 16-20
IgG peaked at day 21-25
IgA correlated with disease severity

heathcare workers

554 asymptomtic had **PCR test**
2.4% positive
516 serum antibody test
17% of asymptomatic were positive
37.5% of previously symptomatic were positive

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Generated in collaboration with researchers at the University of Birmingham. This is not a clinical guideline or SOP. This is a summary of the latest evidence available internationally on the management, treatment and science underlying COVID-19 disease presented in accompaning report.