Bad Blood? An Evolving Tale of Risk Within a COVID-19 World

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Science
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The difference a year makes

The need for personal space:
• Split shifts
• Working From Home
  > Enabling remote access
  > IT requirements & equipment

Keeping clean:
• Change in cleaning rotas
• Fire door access
• Providing hand wash/sanitiser stations
  > Making hand sanitiser
Microbiology safety cabinets
As the pandemic evolved

• Diversified the work we do (kit building/bio-banking)
• Heightened awareness of product shortages & increased communication with suppliers
• Remote QA auditing
• Patient centric sampling drive – COVID and beyond…
• Forced us to do things differently - not necessarily a bad thing (more efficient? more effective?)
Risk Assessment stage 1: The beginning

• Require notification of potential COVID samples
  > BBV sample handling approach – limited capacity

• Extrapolating knowledge from SARS/MERS 1,2
  > Matrix prevalence of vRNA
  > Virus Deactivation
  > Medical evidence on exposure risk from SARS/MERS samples?

• No data ≠ No risk

“this is a respiratory disease - blood samples are less dangerous than the person in the hood next to you.”

Stage 1

All suspected COVID samples handled in MSC hood until deactivation

- LC-MS = protein denaturation stage
- Early reports for heat deactivation used 60°C¹
  - impact on a number of biologics

Islands of automation?

- Need to build more hoods?
- Power, gas lines etc in the hood

"Clinical laboratories must perform their own risk assessments for handling biological specimens from patients with suspected or confirmed COVID-19.”

“Exposure to upper and lower respiratory tract specimens in the absence of appropriate containment and control measures is likely to represent the greatest risk of SARS-CoV-2 laboratory acquired infection.”

Stratify samples by Risk:
- Respiratory tract samples > Faeces/Urine > Blood/Serum/Plasma
Advice from NHS trusts

CL2 - “diagnostic assays using whole blood, serum and plasma, including routine biochemistry and haematology, unless there is a risk of generating aerosols”

Specialist clinical chemistry facilities (LCMS, ELISA etc) vs bioanalytical labs?

High Risk - respiratory tract specimens, faeces

Low Risk – urine, blood, serum, plasma, CSF

The biggest risk is still other people – distance, wash hands, don’t touch your face
Handling SARS-CoV-2 +ve blood: Focus on the greatest area of risk

Categorise staff risk – high risk, moderate risk etc
Evidence in the literature

RT-PCR on samples from 205 patients:
BALF (93%), sputum (72%), nasal swabs (63%), fibrobronchoscope brush biopsy (46%), pharyngeal swabs (32%), feces (29%), and blood (1%). None of the 72 urine specimens tested positive \(^1\)

Infectious virus was readily isolated from samples derived from the throat or lung, but not from stool samples—in spite of high concentrations of virus RNA. Blood and urine samples never yielded virus (9 cases) \(^2\)

Stage 2 - Aerosol production & blood samples

Processes with higher risk
• Centrifuge buckets,
• Liquid handlers,
• Vortexing

Assess each workflow & minimise aerosol risk or investigate deactivating the samples

Shouldn’t we always be concerned about aerosol production?
SARS-CoV-2 can be deactivated with 1

- TRIzol
- Formaldehyde
- beta-propiolactone
- 100°C for 5 minutes
- 56°C for 45 minutes

Impact on Biologics/Serology/Biomarkers

Stratifying by Sample Type

Confirmed COVID samples

High Risk
- Cleaning Initial samples during unpacking
- Respiratory samples (Nasal swabs, BALF, sputum)
- Faeces
- Urine
- Plasma/Serum/Blood where risk of Aerosol production

Low Risk
- Deactivated samples
- Plasma/Serum/Blood where no risk of Aerosol production
- Dried blood samples
- Dried blood eluates containing Tween
Stage 3 – Further data comes to light

Hospital staff prevalence – June/July 2020 (>4000 staff)

- Ambulance/Paramedics: 22%
- COVID wards, Phlebotomists, Triaging: 23%
- Non-COVID ward staff: 3%
- GP staff: 5%
- Pathology Laboratory staff: 4%
Stage 3 – New reports in the literature¹

RT-PCR on plasma/serum samples from 674 acute and convalescent cases & attempted virus isolation from a subset of RNA-positive samples.

vRNA - 12.7% of COVID patient serum samples (n=212) & 0% ≥28 days post symptom onset (n=494)
RT-PCR Cycle threshold was high (range 33.5-44.8) – low copy numbers?

PCR-positive sera inoculated into cell culture did not produce any cytopathic effect or yield an increase in detectable SARS-CoV-2 RNA.

1) Andersson MI, Arancibia-Carcamo CV, Auckland K et al. SARS-CoV-2 RNA detected in blood products from patients with COVID-19 is not associated with infectious virus. Wellcome Open Res 2020, 5:181
“vRNA was detectable at low viral loads in a minority of serum samples collected in acute infection, but was not associated with infectious SARS-CoV-2 (within the limitations of the assays used). This work helps to inform biosafety precautions for handling blood products from patients with current or previous COVID-19.”

1) Andersson MI, Arancibia-Carcamo CV, Auckland K et al. SARS-CoV-2 RNA detected in blood products from patients with COVID-19 is not associated with infectious virus. Wellcome Open Res 2020, 5:181
Bad Blood?

No change for high risk samples

All COVID confirmed primary tubes handled & cleaned in MSC

Plasma/Serum/Blood at CL2*

Education & Training

Remain vigilant to our PPE procedures when handling samples
Thank you

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