

Rotavirus infection increases PGE₂ production, leading to increased rotavirus yield and rate of replication

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Background

It is well known that, for vaccination to be successful, the host should be able to respond with a strong immune response. The immune system can be modulated by several molecules, including lipid-derived signalling molecules, to be either pro-inflammatory or anti-inflammatory. Prostaglandin E₂ (PGE₂) is a well-known pro-inflammatory mediator that can be produced from arachidonic acid (AA). Therefore, we tested the effect that rotavirus (RV) SA11 infection has on the production of prostaglandin E₂, and possible effects that this has on RV replication.

Method

MA104 cells were grown for 24h in DMEM, supplemented with 50 μM of α -linolenic acid (GLA), a precursor of AA. The effect of supplementation on RV SA11 was monitored by determining the rate of viral replication with growth studies, followed by TCID₅₀ titrations. The effect on viral RNA yield was monitored by qRT-PCR 16h post infection. Production PGE₂ was monitored by ELISA and authenticated with mass spectrometry. Possible co-localisation between RV and PGE₂ was evaluated with confocal microscopy.

Results

Results showed that RV infection of unsupplemented cells caused an increase in PGE₂ production. In addition, supplementation with GLA showed a further increase in PGE₂ production during RV infection. The PGE₂ production in GLA supplemented cells coincided with an increase in the replication rate of SA11 as well as the viral yield with approximately three logs. Mass spectrograms showed that the production of PGE₂ could be dependent on viral-dose. Confocal microscopy images showed a clear co-localisation between RV and PGE₂. Results will be correlated with viral RNA yield.

Conclusion

RV SA11 induces the production of PGE₂ dose-dependently, while GLA supplementation further increases the production of PGE₂. The increase in PGE₂ coincides with increases in both the yield and replication rate of SA11. While AA is an additive generally used within baby formula, with data showing that it is critical for the health of infants via its modulatory role in the immune system, the influence of AA on RV infection remain to be determined.