Rhinovirus, Influenza A, and Influenza B and their Impact on MxA, PCT, and CRP Biomarkers

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OBJECTIVE

This study analyzed the impact of three commonly presenting acute respiratory viruses on serum levels of myxovirus resistance protein A (MxA), procalcitonin (PCT), and C-reactive protein (CRP).

BACKGROUND

Elevated MxA protein levels are strongly correlated with a systemic acute viral infection while elevated PCT and CRP levels are associated with bacterial infections. Normal values of MxA are less than 15 ng/ml, PCT less than 0.1 ng/ml, and CRP less than 10 mg/L.

METHODS

A sub-analysis was performed on subject data garnered from a prospective, multicenter, blinded, observational clinical trial that enrolled patients with acute febrile upper respiratory symptoms at 11 clinical emergency departments and urgent care centers, both private and academic, across the United States from December 2013 through October 2014. All patients underwent viral polymerase chain reaction (PCR) testing of nasopharyngeal and oropharyngeal samples as well as routine oropharyngeal bacterial cultures. In addition, venous blood was collected for MxA, PCT, and CRP testing.

RESULTS

The mean rhinovirus MxA level was found to be in the normal range. Only 15% of rhinovirus infections stimulated a significantly elevated MxA. Influenza A and B generate a much higher systemic MxA response compared against rhinovirus. All three viruses may infrequently cause elevated PCT and cause an elevated CRP in nearly 50% of cases.

Virus	Number	Mean MxA (ng/ml)/SD	p value	Mean PCT (ng/ml)	Number of PCT ≥ 0.1 ng/ml (%)	Mean CRP (mg/L)	Number of CRP ≥ 20 mg/L (%)
Rhinovirus	42	11.9 +/- 13.2	-	0.05	5 (12)	28.0	21 (50)
Influenza A	12	45.4 +/- 24.2	$p < 0.0001$	0.08	3 (25)	62.9	6 (50)
Influenza B	13	35.1 +/- 19.5	$p < 0.0001$	0.06	1 (8)	22.9	5 (38)

*SD = standard deviation; unpaired t-test performed at p = 0.05; PCT = procalcitonin, CRP = C-reactive protein

CONCLUSIONS

Rhinovirus is often locally identified in nasopharyngeal and oropharyngeal samples without an associated systemic host response, whereas Influenza A and B both stimulate significant elevations in MxA. Combining the presence of MxA with PCT or CRP may lead to better differentiation of viral from bacterial infection and lead to less unnecessary antibiotic prescriptions, less resistance, and reduced costs associated with overtreatment.

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