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Birth season has been reported to be a risk factor for several immune-mediated diseases. We hypothesized that this association is mediated by differential changes in neonatal immune phenotype and function with birth season. We sought to investigate the influence of season of birth on cord blood immune cell subsets and inflammatory mediators in neonatal airways. Cord blood was phenotyped for 26 different immune cell subsets, and at 1 month of age, 20 cytokines and chemokines were quantified in airway mucosal lining fluid. Multivariate partial least squares discriminant analyses were applied to determine whether certain immune profiles dominate by birth season, and correlations between individual cord blood immune cells and early airway immune mediators were defined. We found a birth season-related fluctuation in neonatal immune cell subsets and in early-life airway mucosal immune function. The seasonal airway immune pattern was associated with the number of activated and regulatory T cells in cord blood whereas it was independent of concomitant presence of pathogenic airway microbes. Specifically, summer newborns presented with the lowest levels of all cell types and mediators; fall newborns displayed high levels of activated T cells and mucosal IL-12p70, TNF-α, IL-13, IL-10, and IL-2; and winter newborns had the highest levels of innate immune cells, IL-5, type 17-related immune mediators, and activated T cells. Birth season fluctuations seem to affect neonatal immune development and result in differential potentiation of cord blood immune cells and early airway mucosal immune function.

General information
State: Published
Organisations: Center for Biological Sequence Analysis, Department of Systems Biology, University of Copenhagen
Number of pages: 22
Pages: 1238-1246.e13
Publication date: 2016
Peer-reviewed: Yes

Publication information
Journal: Journal of Allergy and Clinical Immunology
Volume: 137
Issue number: 4
ISSN (Print): 0091-6749
Ratings:
BFI (2019): BFI-level 2
Web of Science (2019): Indexed yes
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): CiteScore 6.94 SJR 5.049 SNIP 2.6
Web of Science (2017): Impact factor 13.258
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 6.87 SJR 5.618 SNIP 2.901
Web of Science (2016): Impact factor 13.081
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): CiteScore 6.62 SJR 5.739 SNIP 2.849
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): CiteScore 6.61 SJR 4.969 SNIP 2.935
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): CiteScore 7.1 SJR 4.917 SNIP 3.069
Web of Science (2013): Impact factor 11.248
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): CiteScore 6.94 SJR 4.819 SNIP 2.847
Web of Science (2012): Impact factor 12.047
ISI indexed (2012): ISI indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): CiteScore 6.8 SJR 5.161 SNIP 2.717
Web of Science (2011): Impact factor 11.003
ISI indexed (2011): ISI indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 4.061 SNIP 2.352
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 3.915 SNIP 2.48
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 4.146 SNIP 2.388
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 3.682 SNIP 2.554
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 3.53 SNIP 2.628
Scopus rating (2005): SJR 3.018 SNIP 2.439
Scopus rating (2004): SJR 2.971 SNIP 2.43
Scopus rating (2003): SJR 2.678 SNIP 2.307
Web of Science (2003): Indexed yes
Scopus rating (2002): SJR 2.419 SNIP 1.987
Scopus rating (2001): SJR 2.024 SNIP 1.869
Scopus rating (2000): SJR 1.404 SNIP 1.742
Scopus rating (1999): SJR 1.487 SNIP 1.663
Original language: English
Keywords: Birth season, Airway mucosa, Cord blood immune cells, Neonatal immunity
DOIs:
10.1016/j.jaci.2015.08.041
Source: FindIt
Source-ID: 2287930929
Research output: Research - peer-review › Journal article – Annual report year: 2016