SUPPLEMENTARY FIGURE LEGENDS

Supplementary Fig. 1. Gating strategy of ILC2s

Lung single cells were isolated and stained with Lin (CD11b, CD11c, CD3, Gr-1, B220, TCRβ, Ter-119, NK1.1), ST2, CD90, CD25 and CD127. ILC2s were defined as Lin^- $CD25^+$ $CD127^+$.

Supplementary Fig. 2. Quantification of certain innate cell populations in the lungs of RA or O_2-exposed mice.

Neonatal mice were exposed to RA or O_2 for 7 days. Total DCs, $Fc\varepsilon RI^+$ DCs, mast cells and basophils were quantified in the lungs at PN28. n=3 or 4 mice per group (mean ± SEM). * $P \leq 0.05$.

Supplementary Fig. 3. Cytokine producing cells in the lungs of RA or O_2 exposed-mice following HDM challenge.

Cytokine producing cells in the lungs were measured by intracellular staining. n=4 mice per group (mean ± SEM). * $P \leq 0.05$.

Supplementary Fig. 4. Absolute numbers and frequencies of ILC2s in the lungs of RA or O_2 exposed-mice following chronic HDM challenge

Mice were exposed to RA or O_2 and challenged with HDM as in Fig. 4. Numbers or frequencies of ILC2s in the lungs were determined by flow cytometry at PN56. n=4 mice per group (mean ± SEM).

Supplementary Fig.5. Neonatal hyperoxia promotes oxidative stress in the lungs.

Neonatal mice were exposed to RA or O_2 for 7 days and then housed in RA. (A) ROS levels in lung epithelial cells of RA or O_2- exposed mice were determined by H2DCFDA staining at PN21. n=3 to 5 mice per group (mean ± SEM). * $P \leq 0.05$. (B) Oxidative stress genes in the lungs of RA, O_2- exposed or SFN-treated O_2- exposed mice were measured through mouse oxidative stress RT^2 PCR array at PN15.

Supplementary Fig. 6. IL-33 signaling enhances allergy and asthma gene expression.
Gene expression fold changes were compared between indicated two groups. (A) WT RA group v.s. O_2 group. (B) ST2-deficient RA v.s. O_2 groups. (C) WT O_2 group v.s. ST2 deficient O_2 group.

Supplementary Fig. 7. Serum cytokine levels in Term or Preterm infants.
Human sera from term or preterm infants were collected. IL-33, IL-5, IL-13 and IL-4 levels were determined by multiplex. (A) The levels of cytokines were represented by column graph. (B and C) Pie charts of the frequencies of indicated serum IL-33 concentration ranges in the groups of term infant, pre-term infant with or without BPD criteria (B), or in the groups of infants born before 30 weeks of gestational age, between 30 to 37 gestational age or over 37 gestational age (C).

Supplementary Fig. 8. Correlation analysis of serum IL-33 and IL-13, and serum IL-33 and IL-5 in term infants.
Correlations between serum IL-33 and IL-5 or serum IL-33 and IL-13 were evaluated by Pearson's test using GraphPad Prism.

Supplementary Fig. 9. Correlation analysis of serum IL-33 and IL-13, and serum IL-33 and IL-5 according to infant age groups.
Correlations between serum IL-33 and IL-5 or serum IL-33 and IL-13 in samples collected from infants younger than 18 months or infants between 18 months and 30 months of age were evaluated by Pearson's test using GraphPad Prism.

Term

	gender	gestational age (weeks)	age (mo)	IL-33 (pg/ml)	IL-13 (pg/ml)	IL-5 (pg/ml)	IL-4 (pg/ml)
1	M	40	7.6	1.85	*n.d.*	0.5	*n.d.*
2	F	38	14.5	26.18	29.12	4.15	*n.d.*
3	F	38	14.5	10.87	143.37	17.28	0.47
4	F	40	21.8	15.54	38.27	4.41	*n.d.*
5	M	39	14.2	4.22	11.68	1.24	*n.d.*
6	F	40	3.4	2.64	*n.d.*	0.84	3.35
7	F	39	18.9	26.76	174.24	26.73	24.38
8	M	38	6.3	*n.d.*	*n.d.*	3.29	*n.d.*
9	M	38	6.5	5.8	*n.d.*	0.97	15.75
10	M	40	27.0	36.4	48.27	5.85	*n.d.*
11	F	40	25.2	*n.d.*	94.54	14.99	5.98
12	F	40	25.1	0.45	*n.d.*	*n.d.*	*n.d.*
13	F	40	8.8	*n.d.*	*n.d.*	0.3	*n.d.*
14	F	39	11.4	2.84	*n.d.*	1.24	*n.d.*
15	F	40	29.0	5.8	*n.d.*	0.02	*n.d.*
16	M	40	10.1	0.65	*n.d.*	2.17	*n.d.*

	gender	gestational age (weeks)	age (mo)	IL-33 (pg/ml)	IL-13 (pg/ml)	IL-5 (pg/ml)	IL-4 (pg/ml)
1	M	35	16.17	4.22	34.93	4.67	*n.d.*
2	F	32	7.87	*n.d.*	*n.d.*	0.3	*n.d.*
3	F	32	7.87	*n.d.*	*n.d.*	*n.d.*	*n.d.*
4	M	32	7.87	9.12	*n.d.*	2.04	9.74
5	F	30	9.50	8.34	*n.d.*	1.1	5.98
6	M	35	11.97	6.38	*n.d.*	0.43	*n.d.*
7	F	32	12.37	4.22	8.62	1.64	*n.d.*
8	F	32	12.37	3.83	33.8	3.09	*n.d.*
9	F	32	12.87	8.93	1.73	1.1	*n.d.*
10	M	32	12.87	3.44	5.62	1.24	*n.d.*
11	F	28	23.80	8.53	*n.d.*	1.5	*n.d.*
12	F	28	23.80	5.4	3.23	2.3	13.38
13	M	31	18.40	46.8	132.37	14.86	*n.d.*
14	M	34	12.70	*n.d.*	*n.d.*	1.17	*n.d.*
15	F	30	15.20	13.01	89.07	9.38	12.18
16	M	31	21.33	*n.d.*	23.53	3.22	*n.d.*
17	M	32	11.80	3.83	*n.d.*	2.5	3.35
18	F	31	14.10	2.25	*n.d.*	0.84	*n.d.*
19	F	31	14.50	*n.d.*	14.46	2.83	*n.d.*
20	M	35	22.50	*n.d.*	*n.d.*	1.1	*n.d.*
21	F	34	15.53	43.72	97.65	14.99	*n.d.*
22	M	34	22.23	29.85	108.66	9.65	10.36
23	F	30	19.23	*n.d.*	*n.d.*	*n.d.*	*n.d.*
24	M	30	19.23	*n.d.*	*n.d.*	0.7	*n.d.*
25	M	32	11.60	3.24	*n.d.*	0.84	*n.d.*
26	M	35	21.40	4.22	4.49	1.64	*n.d.*
27	F	35	21.40	11.26	*n.d.*	1.77	*n.d.*
28	M	29	14.53	4.42	*n.d.*	1.24	9.13
29	M	29	14.53	5.6	*n.d.*	0.84	*n.d.*
30	F	33	8.03	*n.d.*	*n.d.*	*n.d.*	*n.d.*
31	M	33	8.03	*n.d.*	*n.d.*	*n.d.*	*n.d.*
32	M	33	13.07	3.1	*n.d.*	*n.d.*	*n.d.*
33	M	31	12.10	9	9.72	1.78	14.47
34	M	30	23.33	131.56	122.59	14.33	0.12

	gender	tational age (wee	age (mo)	IL-33 (pg/ml)	IL-13 (pg/ml)	IL-5 (pg/ml)	IL-4 (pg/ml)
1	F	24	20.07	1.45	*n.d.*	0.02	*n.d.*
2	F	24	20.10	1.45	*n.d.*	1.5	*n.d.*
3	M	26	27.53	*n.d.*	*n.d.*	0.02	*n.d.*
4	F	28	15.07	3.04	*n.d.*	0.16	*n.d.*
5	M	29	25.53	93.18	1.73	1.24	*n.d.*
6	F	24	25.50	12.04	18.49	2.7	*n.d.*
7	F	25	23.43	4.81	*n.d.*	0.7	*n.d.*
8	F	24	19.47	18.25	*n.d.*	*n.d.*	*n.d.*
9	F	30	6.97	*n.d.*	*n.d.*	0.7	*n.d.*
10	F	28	22.50	56.03	201.56	26.86	10.97
11	F	28	22.50	3.04	*n.d.*	0.57	*n.d.*
12	F	29	19.87	2.64	*n.d.*	1.1	*n.d.*
13	M	26	18.47	6.58	*n.d.*	1.37	*n.d.*
14	M	25	20.63	0.25	*n.d.*	*n.d.*	*n.d.*
15	M	26	24.10	1.65	*n.d.*	1.37	0.47
16	M	26	18.37	6.58	59.33	6.84	*n.d.*
17	F	33	13.03	2.25	*n.d.*	1.64	*n.d.*
18	M	26	23.60	22.9	50.29	7.03	19.24
19	F	24	25.07	59.69	7.67	2.5	10.97
20	F	26	25.53	75.66	207.14	29.87	16.92
21	F	25	17.37	*n.d.*	*n.d.*	1.5	*n.d.*
22	M	28	10.33	*n.d.*	*n.d.*	0.77	*n.d.*
23	F	28	8.23	1.85	*n.d.*	0.43	*n.d.*
24	F	27	24.40	13.99	*n.d.*	1.1	8.51
25	F	27	24.70	1.85	*n.d.*	1.24	*n.d.*
26	M	27	18.53	13.6	77.84	9.38	33.84
27	M	26	19.77	65.65	198.06	25.82	3.35
28	M	24	12.73	2.25	*n.d.*	2.96	14.56
29	M	27	13.03	5.8	*n.d.*	3.36	*n.d.*
30	M	26	10.27	3.04	*n.d.*	1.64	*n.d.*
31	M	29	18.57	8.93	*n.d.*	0.7	1.24

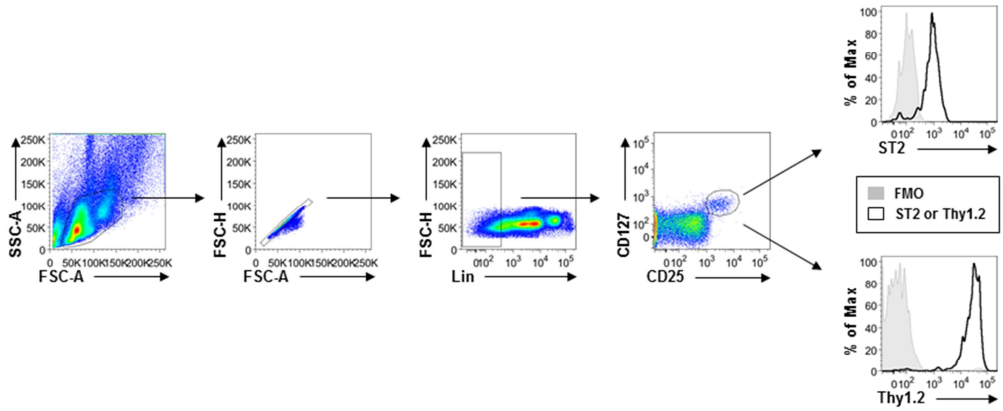
Pre-term no BPD

	gender	gestational age (weeks)	age (mo)	IL-33 (pg/ml)	IL-13 (pg/ml)	IL-5 (pg/ml)	IL-4 (pg/ml)
1	M	35	16.17	4.22	34.93	4.67	*n.d.*
2	F	32	7.87	*n.d.*	*n.d.*	0.3	*n.d.*
3	F	32	7.87	*n.d.*	*n.d.*	*n.d.*	*n.d.*
4	M	32	7.87	9.12	*n.d.*	2.04	9.74
5	F	30	9.50	8.34	*n.d.*	1.1	5.98
6	M	35	11.97	6.38	*n.d.*	0.43	*n.d.*
7	F	32	12.37	4.22	8.62	1.64	*n.d.*
8	F	32	12.37	3.83	33.8	3.09	*n.d.*
9	F	32	12.87	8.93	1.73	1.1	*n.d.*
10	M	32	12.87	3.44	5.62	1.24	*n.d.*
11	F	28	23.80	8.53	*n.d.*	1.5	*n.d.*
12	F	28	23.80	5.4	3.23	2.3	13.38
13	M	31	18.40	46.8	132.37	14.86	*n.d.*
14	M	34	12.70	*n.d.*	*n.d.*	1.17	*n.d.*
15	F	30	15.20	13.01	89.07	9.38	12.18
16	M	31	21.33	*n.d.*	23.53	3.22	*n.d.*
17	M	32	11.80	3.83	*n.d.*	2.5	3.35
18	F	31	14.10	2.25	*n.d.*	0.84	*n.d.*
19	F	31	14.50	*n.d.*	14.46	2.83	*n.d.*
20	M	35	22.50	*n.d.*	*n.d.*	1.1	*n.d.*
21	F	34	15.53	43.72	97.65	14.99	*n.d.*
22	M	34	22.23	29.85	108.66	9.65	10.36
23	F	30	19.23	*n.d.*	*n.d.*	*n.d.*	*n.d.*
24	M	30	19.23	*n.d.*	*n.d.*	0.7	*n.d.*
25	M	32	11.60	3.24	*n.d.*	0.84	*n.d.*
26	M	35	21.40	4.22	4.49	1.64	*n.d.*
27	F	35	21.40	11.26	*n.d.*	1.77	*n.d.*
28	M	29	14.53	4.42	*n.d.*	1.24	9.13
29	M	29	14.53	5.6	*n.d.*	0.84	*n.d.*
30	F	33	8.03	*n.d.*	*n.d.*	*n.d.*	*n.d.*
31	M	33	8.03	*n.d.*	*n.d.*	*n.d.*	*n.d.*
32	M	33	13.07	3.1	*n.d.*	*n.d.*	*n.d.*
33	M	31	12.10	9	9.72	1.78	14.47
34	M	30	23.33	131.56	122.59	14.33	0.12

Pre-term BPD

	gender	gestational age (weeks)	age (mo)	IL-33 (pg/ml)	IL-13 (pg/ml)	IL-5 (pg/ml)	IL-4 (pg/ml)
1	F	24	20.07	1.45	*n.d.*	0.02	*n.d.*
2	F	24	20.10	1.45	*n.d.*	1.5	*n.d.*
3	M	26	27.53	*n.d.*	*n.d.*	0.02	*n.d.*
4	F	28	15.07	3.04	*n.d.*	0.16	*n.d.*
5	M	29	25.53	93.18	1.73	1.24	*n.d.*
6	F	24	25.50	12.04	18.49	2.7	*n.d.*
7	F	25	23.43	4.81	*n.d.*	0.7	*n.d.*
8	F	24	19.47	18.25	*n.d.*	*n.d.*	*n.d.*
9	F	30	6.97	*n.d.*	*n.d.*	0.7	*n.d.*
10	F	28	22.50	56.03	201.56	26.86	10.97
11	F	28	22.50	3.04	*n.d.*	0.57	*n.d.*
12	F	29	19.87	2.64	*n.d.*	1.1	*n.d.*
13	M	26	18.47	6.58	*n.d.*	1.37	*n.d.*
14	M	25	20.63	0.25	*n.d.*	*n.d.*	*n.d.*
15	M	26	24.10	1.65	*n.d.*	1.37	0.47
16	M	26	18.37	6.58	59.33	6.84	*n.d.*
17	F	33	13.03	2.25	*n.d.*	1.64	*n.d.*
18	M	26	23.60	22.9	50.29	7.03	19.24
19	F	24	25.07	59.69	7.67	2.5	10.97
20	F	26	25.53	75.66	207.14	29.87	16.92
21	F	25	17.37	*n.d.*	*n.d.*	1.5	*n.d.*
22	M	28	10.33	*n.d.*	*n.d.*	0.77	*n.d.*
23	F	28	8.23	1.85	*n.d.*	0.43	*n.d.*
24	F	27	24.40	13.99	*n.d.*	1.1	8.51
25	F	27	24.70	1.85	*n.d.*	1.24	*n.d.*
26	M	27	18.53	13.6	77.84	9.38	33.84
27	M	26	19.77	65.65	198.06	25.82	3.35
28	M	24	12.73	2.25	*n.d.*	2.96	14.56
29	M	27	13.03	5.8	*n.d.*	3.36	*n.d.*
30	M	26	10.27	3.04	*n.d.*	1.64	*n.d.*
31	M	29	18.57	8.93	*n.d.*	0.7	1.24

Supplementary figure 1



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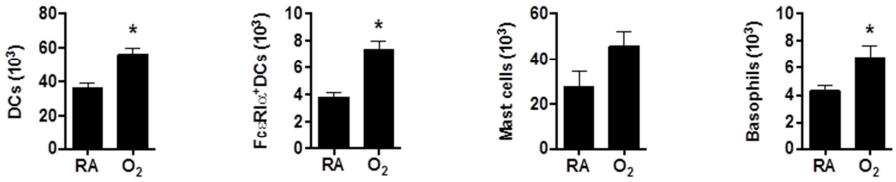

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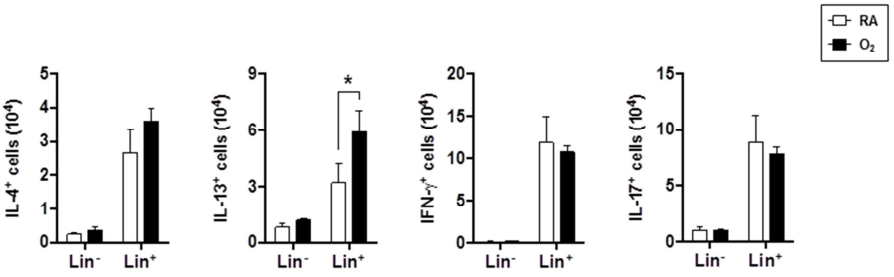

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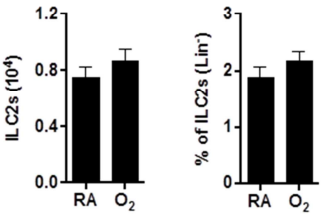

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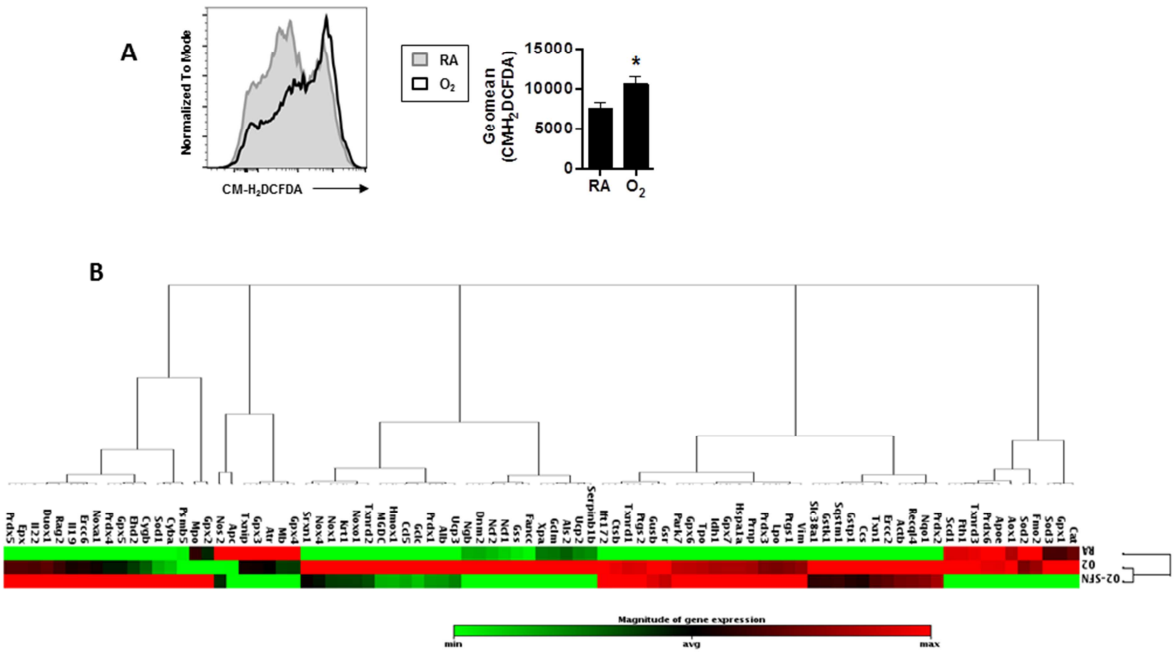

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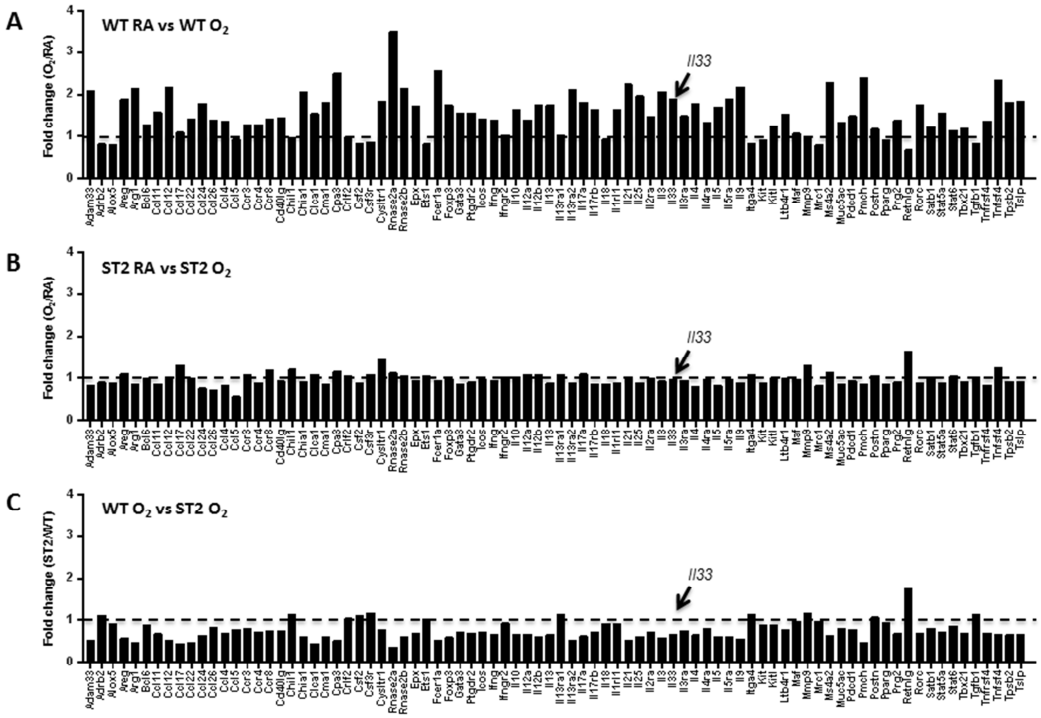

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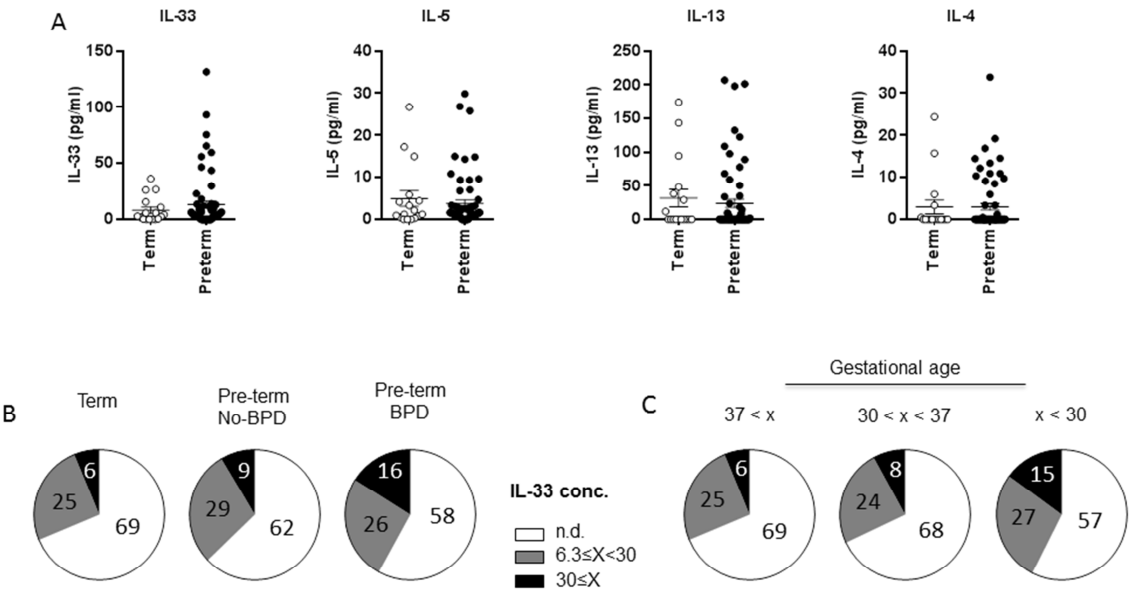
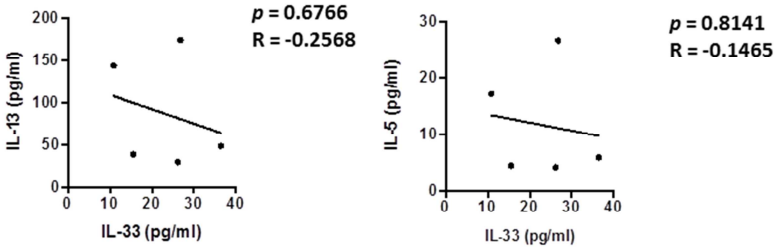


Supplementary figure 8



Supplementary figure 9