# The Role of FRs in Indoor Dust in Potentiating/Facilitating Allergic Responses to Inhaled Allergens

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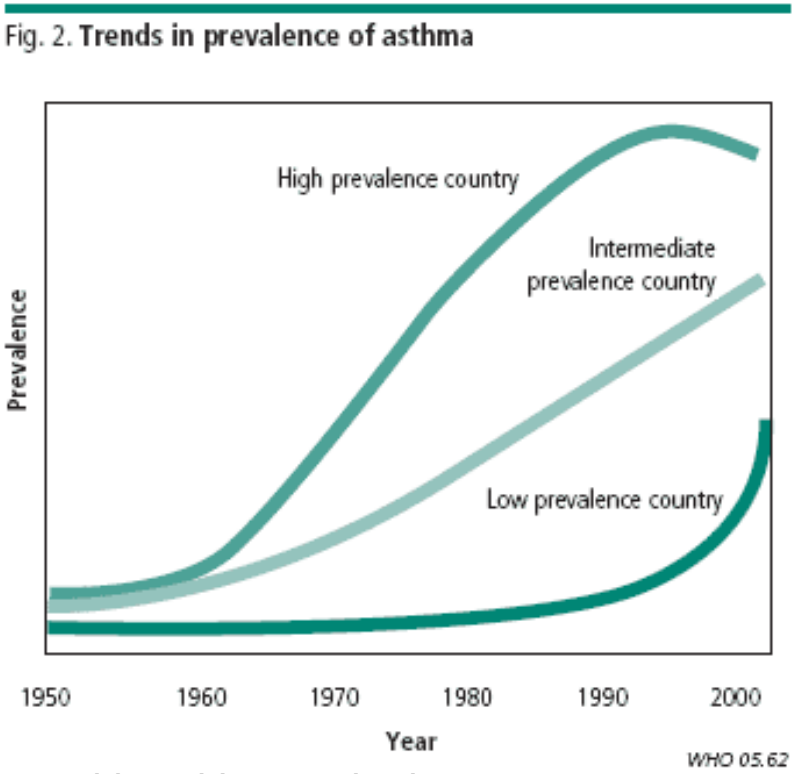
EXPERIMENTAL IMMUNOLOGY

INFLAME

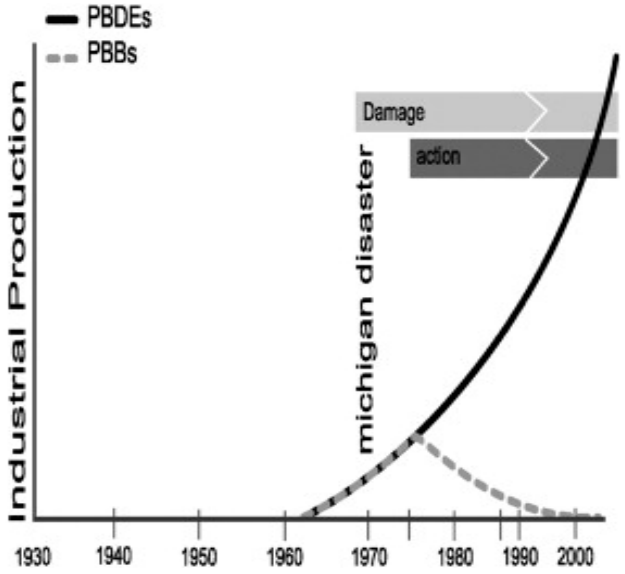
MARIE CURIE ACTIONS

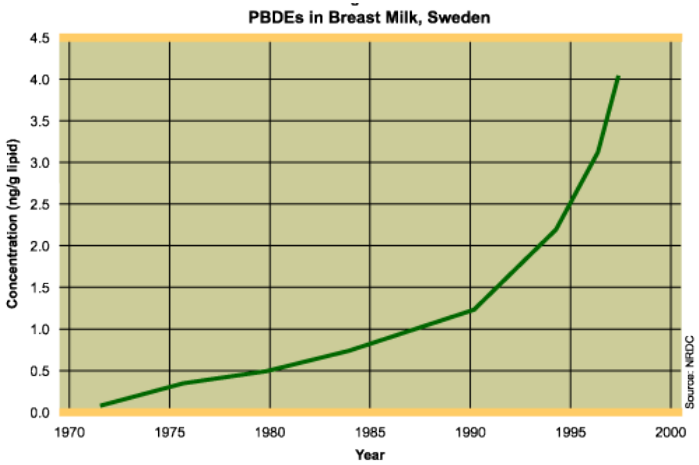
# EPIDEMICAL INCREASE IN INCIDENCE ASTHMA

## *IS THERE AN ASSOCIATION WITH EXPOSURE TO PBDES?*

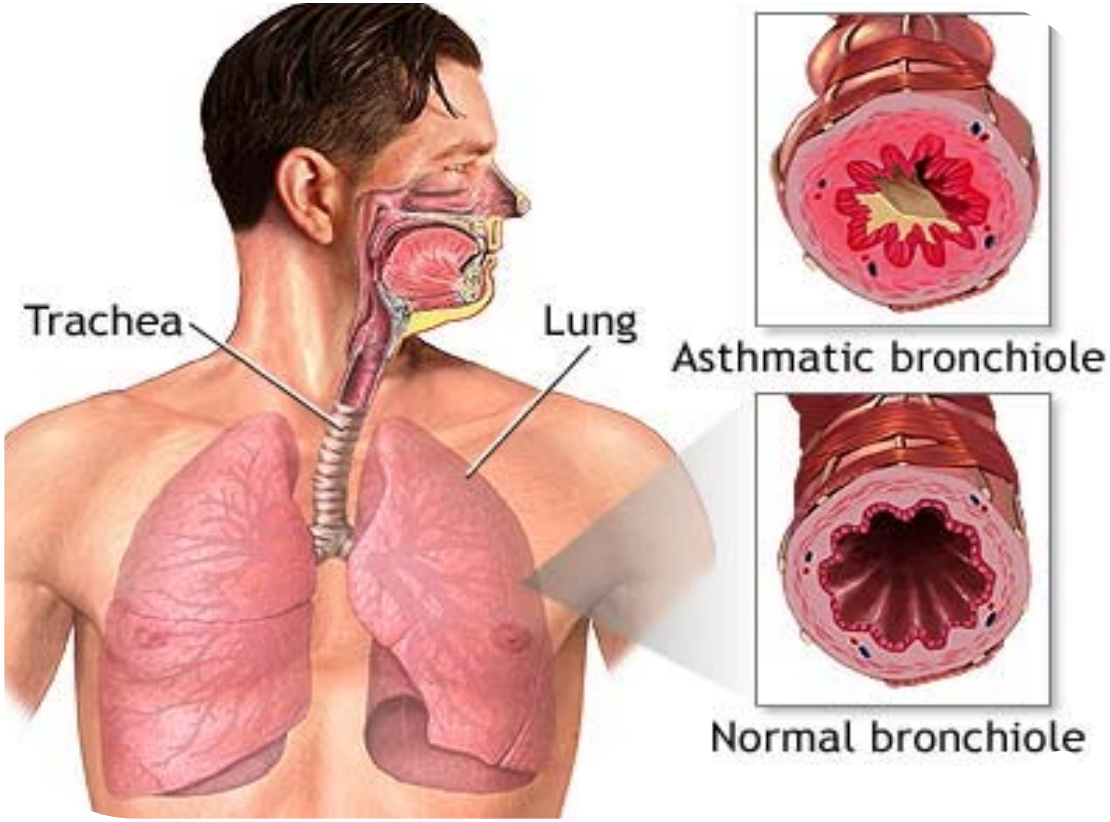



*World Health Organisation 2005*



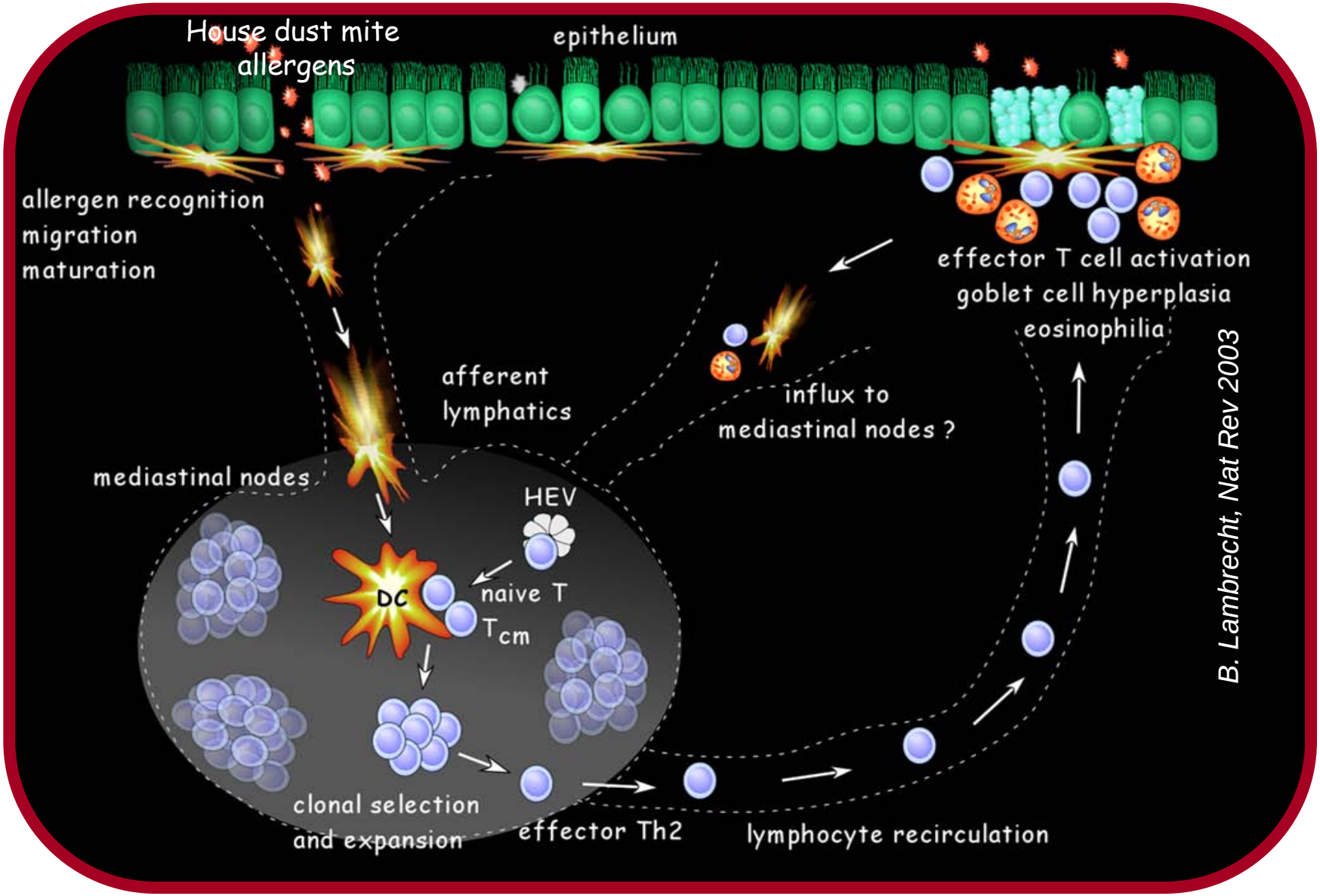
# Allergic Asthma



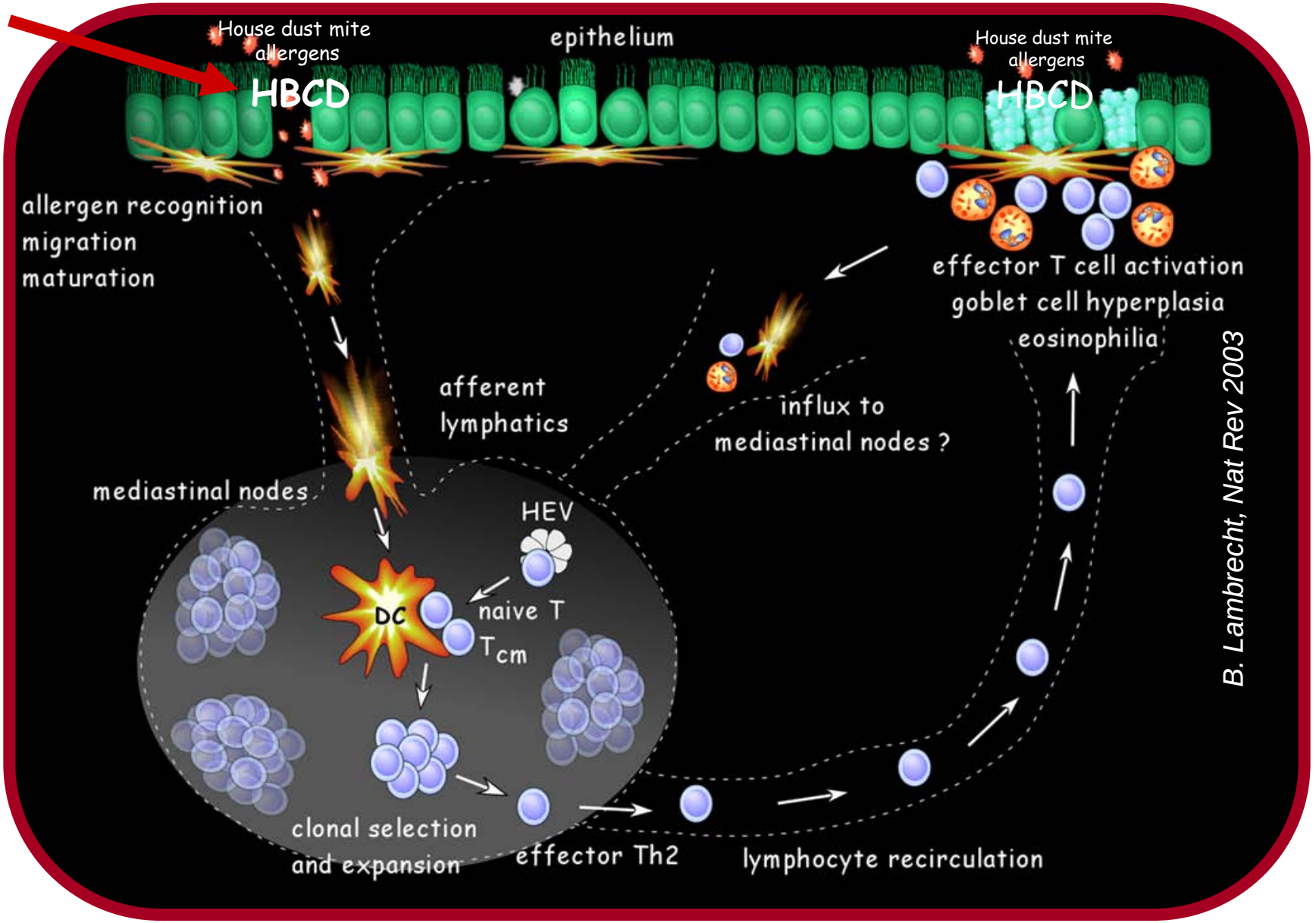

-Chronic inflammation of airways
-Aero-allergens induce bronchoconstriction

<u>Inhalation of dust:</u>
*House dust mite*
*Chemicals (Flame Retardants)*

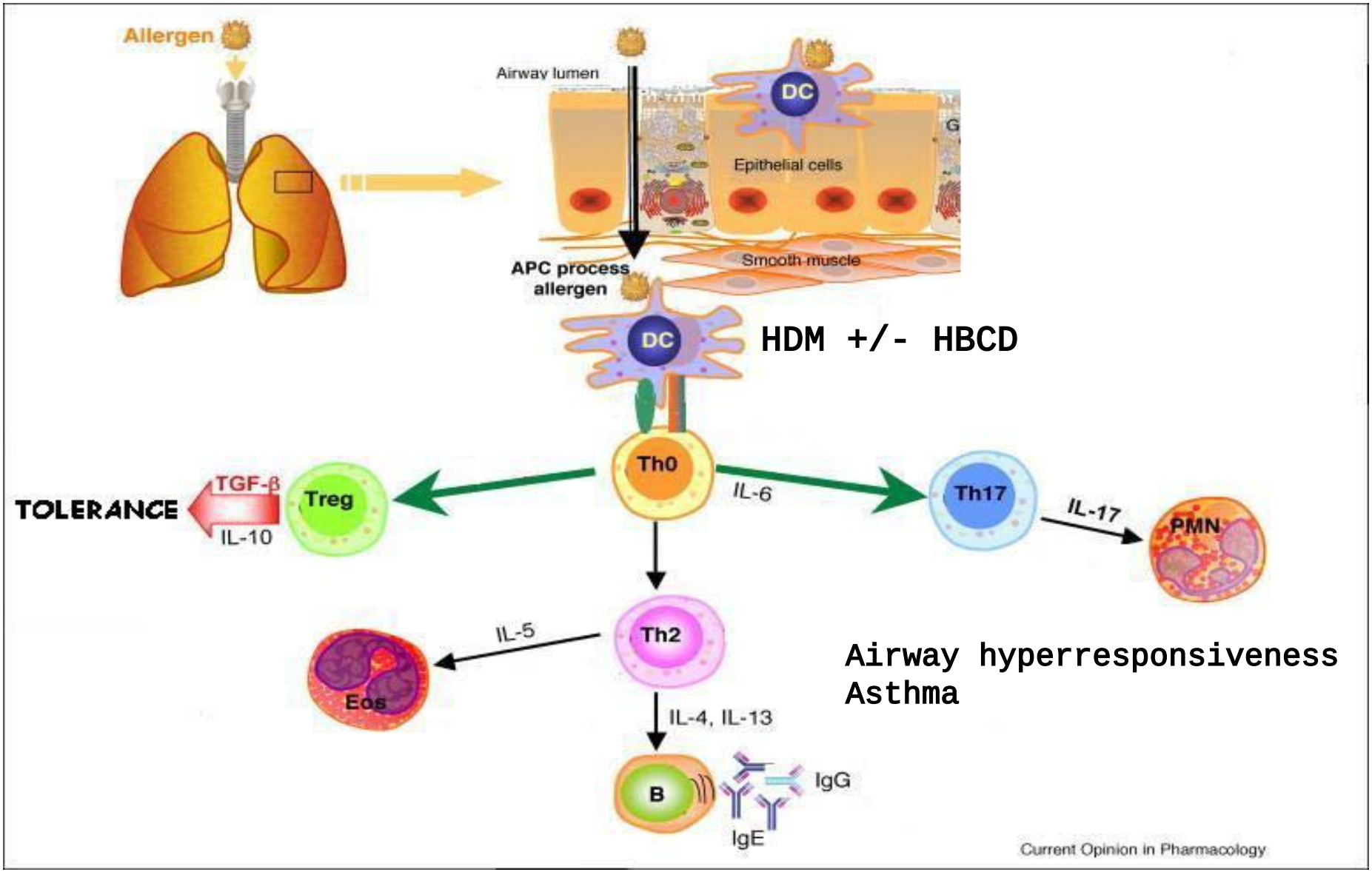
# Role of dendritic cells in sensitisation and during allergen challenge



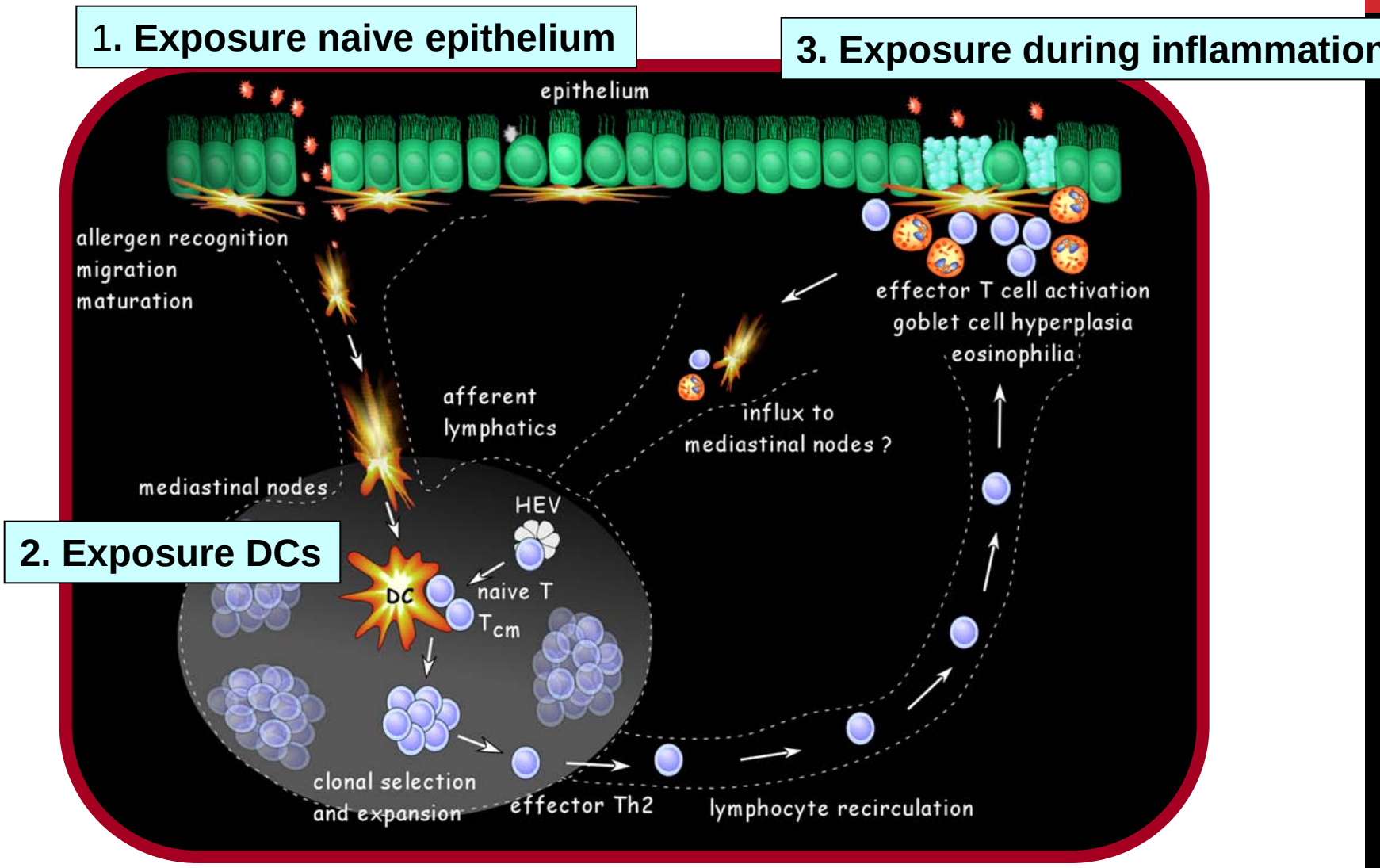
# Role of dendritic cells in sensitisation and during allergen challenge



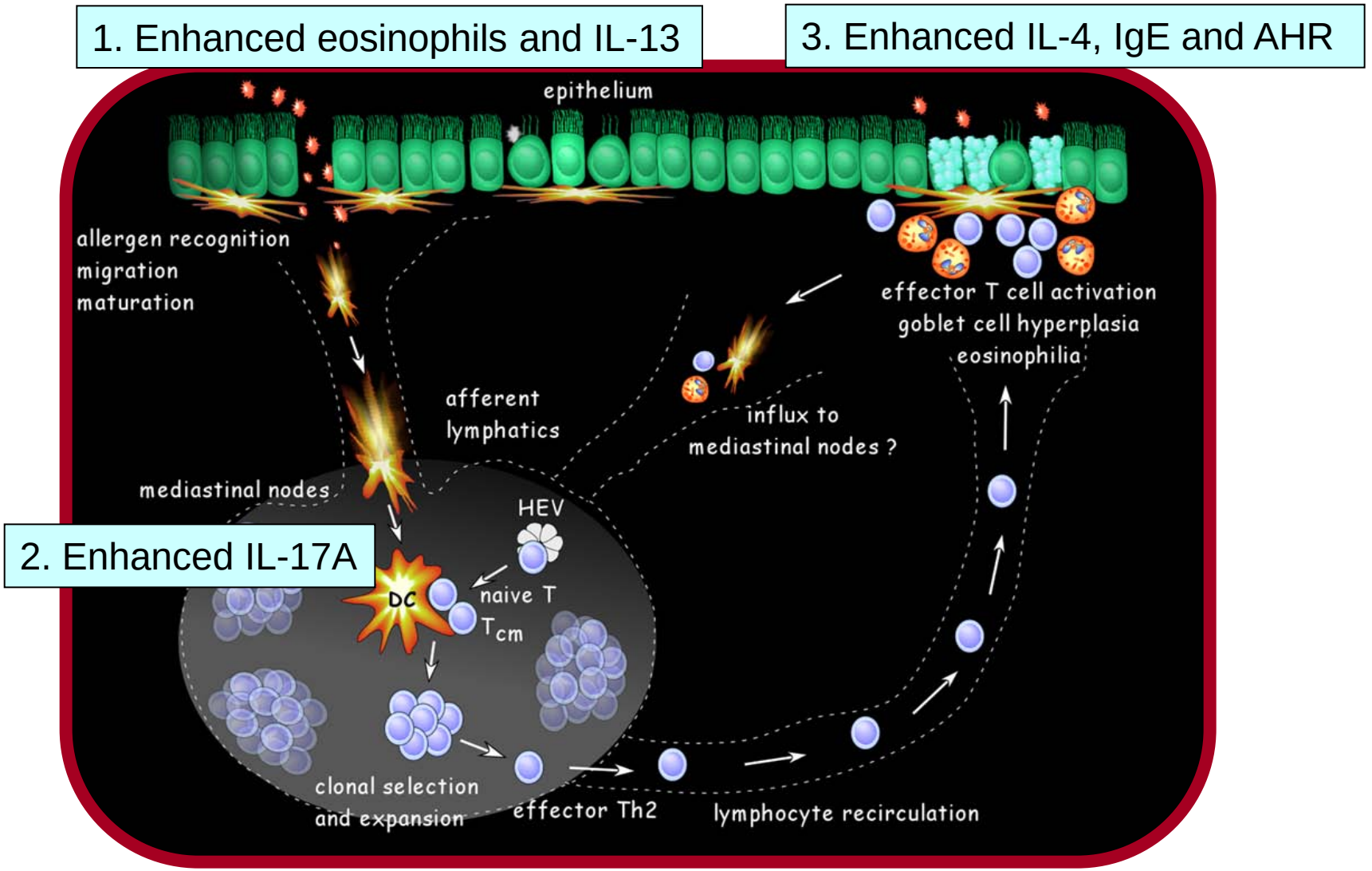
# Activated DCs can determine the type of immune response by instructing naive T cells



# MOUSE MODELS FOR ROLE OF HBCD IN HDM INDUCED ASTHMA



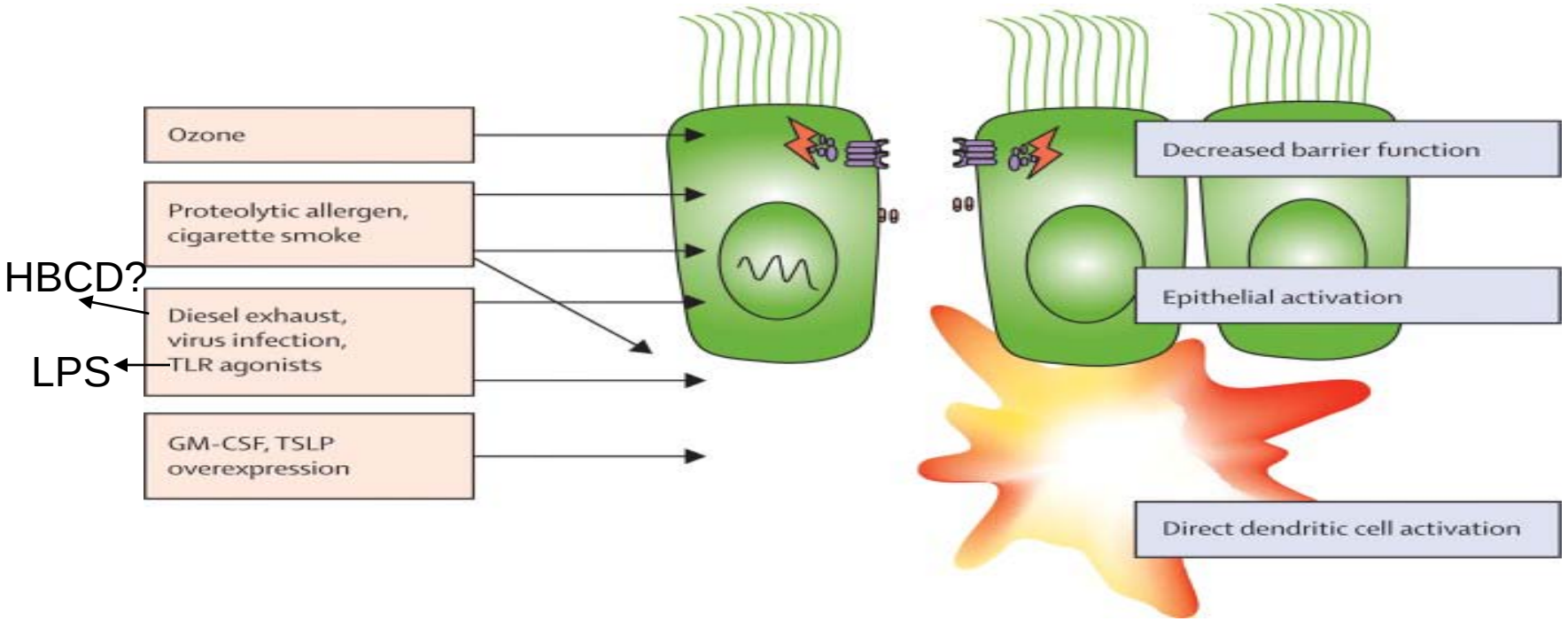
# HBCD can contribute to an aggravation of the immune response to hdm at different stages of the response



# What's the role of HBCD in the aggravation of the immune response to HDM?

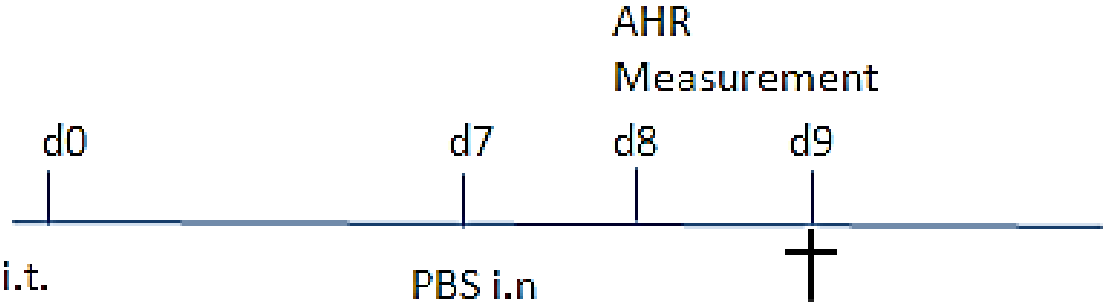
*- Does HBCD act as a 'DANGER' signal for dendritic cells?*

# ‘Danger signals’ (adjuvants) in the induction of the inflammatory response




Bart N Lambrecht , Hamida Hammad, The Lancet Volume 376, Issue 9743 2010 835 - 843

# RESULTS:

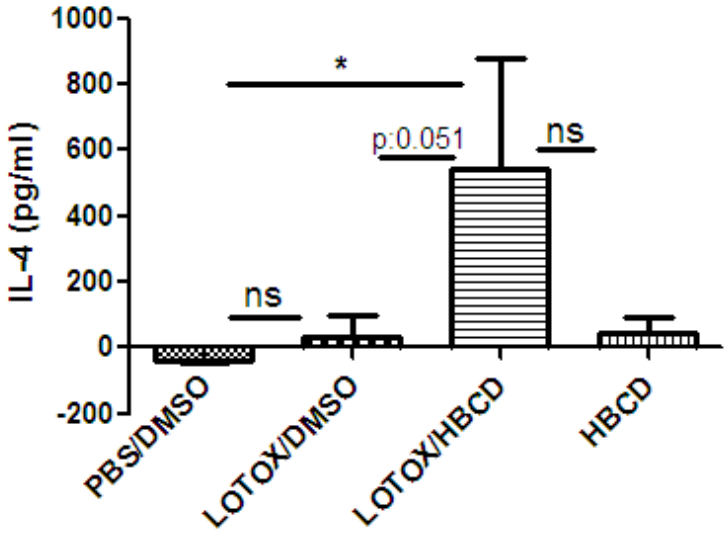


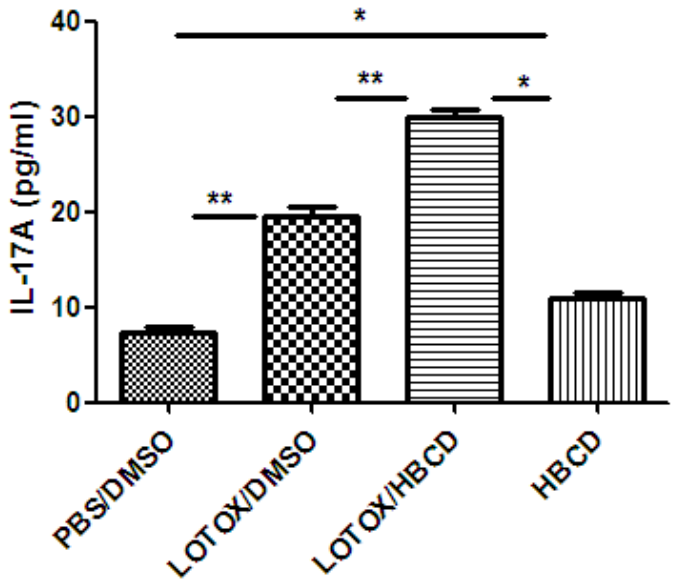

**Group 1:** PBS i.t. — PBS i.n

**Group 2:** HDM Lotox/DMSO i.t. — HDM Lotox/DMSO i.n.

**Group 3:** HDM Lotox/ FR i.t. — HDM Lotox/FR i.n.

**Group 4:** FR i.t. — FR i.n.



# Is **Early exposure to FRs** via house dust associated with **Development of Allergic Asthma?** A birth cohort study.

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vrije Universiteit amsterdam

Astma Fonds
Binnenkort Longfonds

amc

EXPERIMENTAL IMMUNOLOGY

# STUDY POPULATION

**Swedish birth cohort (BAMSE)**

- Questionnaire

-heredity
-socioeconomic factors

**4089 children (1994-1996 new born) followed up to 8 years**

**-**House dust samples were collected at about 2 months after birth.

- GALEN criteria: Wheezing, Doctor diagnosis, Anti asthma drugs in the last year
- preceding evaluation at age 4 and at age 8 or at age 8 only

**110 children identified as allergic asthma**

- Controls never experienced asthma and no sensitization (matched for socio-economic status, sex and genetics)

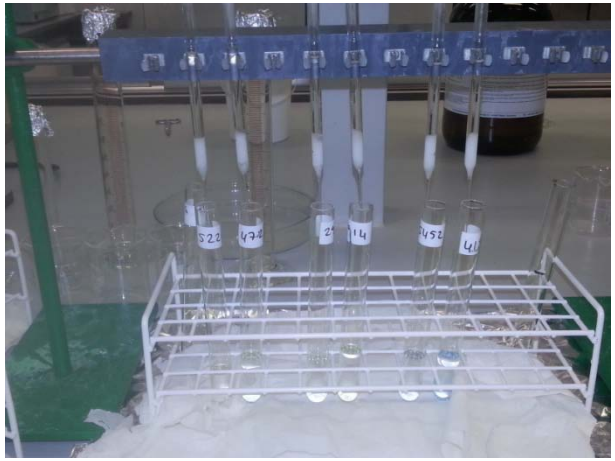
# CHARACTERISTICS OF THE SELECTED POPULATION

| | | Never asthma (n=110) | Transient asthma (4 yrs) | Late asthma (8 yrs) | Persistent asthma (4-8 yrs) | Total asthma (n=110) |
|---|---|---|---|---|---|---|
| sex | 0 female | 48 | 11 | 18 | 19 | 48 |
| | 1 male | 62 | 20 | 28 | 14 | 62 |
| her | 0 no | 63 | 15 | 28 | 20 | 63 |
| | 1 yes | 47 | 16 | 18 | 13 | 47 |
| SEI | 0=blue collar | 21 | 2 | 10 | 9 | 21 |
| | 1=white collar | 89 | 29 | 36 | 24 | 89 |
| | 2=other | 0 | 0 | 0 | 0 | 0 |
| Sens at 4 yrs | 0=no | 88 | 11 | 30 | 26 | 67 |
| | (missing values) | (22*) | (8*) | (5*) | (1*) | |
| | 1=yes | 0 | 12 | 11 | 6 | 29 |
| Sens at 8 yrs | 0=no | 99 | 1 | 25 | 24 | 50 |
| | (missing values) | (11*) | (1*) | | | |
| | 1=yes | 0 | 29 | 21 | 9 | 59 |

# ANALYSIS OF FLAME RETARDANTS IN HOUSE DUST

- Dust samples were extracted with acetone and toluene and cleaned up by $Na_2SO_4$ column → **OPFRs** ready for GC-MS analysis

- Next, samples were cleaned up by $H_2SO_4$ silica columns → **PBDEs** ready for GC-MS analysis



# PRELIMINARY RESULTS:

**Concentrations organophosphate flame retardants in house dust of asthmatic children and controls**

| | | House dust Asthmatic children | | | | | | House dust matched controls | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| OPFR (ng/g dust) | LOD | >LOD (%) | Minimum | 25th | median | 75th | maximum | >LOD (%) | minimum | 25th | median | 75th | Maximum |
| TCEP | 20 | 93.3 | <LOD | 49.5 | 101 | 266 | 298301 | 98.1 | <LOD | 53 | 109 | 211.5 | 323418 |
| TCPP1 | 20 | 95.2 | <LOD | 61.5 | 117 | 235 | 203982 | 94.3 | <LOD | 43.5 | 93 | 414 | 727777 |
| TDCPP | 40 | 94.3 | <LOD | 85.5 | 151 | 441 | 538514 | 91.4 | <LOD | 88 | 168 | 404.5 | 185931 |
| TBEP | 400 | 93.3 | <LOD | 1124.5 | 3329 | 6016.5 | 43363 | 91.4 | <LOD | 1434.5 | 3702 | 7118.5 | 57209 |
| TPP | 20 | 100 | 109 | 279 | 419 | 772 | 13474 | 100 | 96 | 306 | 619 | 1466 | 70313 |
| EHDP | 20 | 100 | 27 | 102.5 | 159 | 278.5 | 15342 | 100 | 27 | 110 | 172 | 413.5 | 7364 |
| MMP-TCP | 40 | 81 | <LOD | 94.5 | 190 | 430.5 | 4793 | 89.5 | <LOD | 114.5 | 291 | 730 | 42712 |
| ∑OPFRs | | | 885 | 3652 | 6498 | 12895 | 582405 | | 839 | 3548 | 6598 | 13838.5 | 74192 |

# ACKNOWLEDGEMENTS:

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**VU-IVM**
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Prof Dr. Pim Leonards

**Occupational and Environmental Health, Karolinska Hospital**
Magnus Wickman

| | 5320-1 | 5320-2 | 5320-0 | | 6965-1 | 6965-2 | 6965-0 | | 5926-1 | 5926-2 | 5926-0 | | 5000-1 | 5000-2 | 5000-0 | | 3096-1 | 3096-0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TiBP | | | | | | | | | | | | | | | | | | |
| TBP | | | | | | | | | | | | | | | | | | |
| TCEP | 81 | 98 | 130 | | <19 | <22 | 89 | | *32 | *39 | *53 | | 1898 | 2112 | 4061 | | *32 | 83 |
| TCPP1 | 84 | 117 | 120 | | 184 | 328 | 354 | | 69 | 129 | 208 | | 31089 | 32316 | 33877 | | 75 | 156 |
| TCPP2 | | | | | | | | | | | | | | | | | | |
| TDCPP | 163 | *94 | 139 | | 500 | 303 | 387 | | 632 | 916 | 1097 | | 555654 | 646108 | 618415 | | <38 | <42 |
| TBEP | 3606 | 4193 | 4920 | | 2166 | 2388 | 1774 | | <390 | <381 | *810 | | 3341 | 5893 | 5076 | | 1658 | 4389 |
| TBPd27 | | | | | | | | | | | | | | | | | | |
| TPP | 161 | 181 | 152 | | 125 | 136 | 199 | | 413 | 426 | 466 | | 173 | 163 | 373 | | 306 | 447 |
| EHDP | 128 | 124 | 141 | | 181 | 237 | 193 | | 175 | 147 | 90 | | 488 | 408 | 354 | | *37 | *66 |
| TEHP | | | | | | | | | | | | | | | | | | |
| MMM-TCP | | | | | | | | | | | | | | | | | | |
| MMP-TCP | 1145 | 1041 | 988 | | <38 | <44 | *118 | | 291 | 562 | *109 | | 137 | 239 | 150 | | <38 | 165 |
| MPP-TCP | | | | | | | | | | | | | | | | | | |
| PPP-TCP | | | | | | | | | | | | | | | | | | |

# Concentrations of polybrominated diphenyl ethers in matched samples of indoor dust and breast milk in New Zealand

Jonathan D. Coakley [a,*], Stuart J. Harrad [b], Emma Goosey [b], Nadeem Ali [c], Alin-Constantin Dirtu [c], Nele Van den Eede [c], Adrian Covaci [c], Jeroen Douwes [a], Andrea 't Mannetje [a]

[a] Centre for Public Health Research, Massey University, Wellington 6140, New Zealand
[b] School of Geography, Earth and Environmental Sciences, University of Birmingham, Birmingham B15 2TT, UK
[c] Toxicological Center, University of Antwerp, Universiteitsplein 1, 2610 Wilrijk, Belgium

**Table 2**
Summary of PBDEs in indoor dust and breast milk.

| | Floor dust (ng/g) | | | | | Mattress dust (ng/g) | | | | | Breast milk (pg/g lipid) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | N = 33 | | | | | N = 16 | | | | | N = 33 | | | | |
| Congener | Mean | Median | Minimum | Maximum | % < LOD | Mean | Median | Minimum | Maximum | % < LOD | Mean | Median | Minimum | Maximum | % < LOD |
| BDE17 | 0.1 | 0.1 | 0.1 | 1.0 | 88 | 0.3 | 0.1 | 0.1 | 0.9 | 69 | 2.4 | 2.2 | 0.6 | 5.6 | 27 |
| BDE28 | 0.7 | 0.6 | 0.1 | 1.3 | 12 | 1.2 | 0.8 | 0.1 | 7.7 | 6 | 217.9 | 181.0 | 48.8 | 751.0 | 0 |
| BDE47 | 30.2 | 24.2 | 0.3 | 98.0 | 3 | 56.1 | 46.3 | 6.5 | 288.4 | 0 | 2673.8 | 2140.0 | 317.0 | 7710.0 | 0 |
| BDE49 | 1.6 | 1.3 | 0.1 | 3.6 | 6 | 2.1 | 2.2 | 0.1 | 5.0 | 6 | 25.6 | 20.9 | 6.5 | 96.4 | 0 |
| BDE66 | 1.0 | 0.8 | 0.1 | 3.1 | 27 | 1.3 | 1.1 | 0.1 | 7.8 | 25 | 31.4 | 26.2 | 5.4 | 103.0 | 0 |
| BDE85 | 2.3 | 1.7 | 0.1 | 7.6 | 21 | 2.2 | 1.9 | 0.1 | 5.8 | 25 | 51.6 | 45.1 | 2.2 | 168.0 | 6 |
| BDE99 | 51.8 | 31.5 | 3.3 | 219.1 | 0 | 83.9 | 41.8 | 8.1 | 540.3 | 0 | 565.9 | 560.0 | 66.2 | 1290.0 | 0 |
| BDE100 | 9.7 | 6.4 | 0.3 | 41.1 | 3 | 16.1 | 9.8 | 0.3 | 94.1 | 6 | 568.7 | 499.0 | 70.8 | 1820.0 | 0 |
| BDE153 | 8.8 | 4.6 | 0.3 | 58.9 | 12 | 10.6 | 6.7 | 0.3 | 58.2 | 6 | 750.4 | 517.0 | 142.0 | 3820.0 | 0 |
| BDE154 | 4.7 | 3.7 | 0.3 | 19.8 | 27 | 7.1 | 3.1 | 0.3 | 43.1 | 13 | 39.0 | 35.5 | 6.5 | 101.0 | 0 |
| BDE183 | 12.8 | 2.7 | 0.3 | 238.4 | 33 | 7.5 | 6.3 | 0.3 | 21.1 | 25 | 66.1 | 42.3 | 11.5 | 512.0 | 0 |
| BDE196 | 4.7 | 0.3 | 0.3 | 44.2 | 55 | 10.3 | 4.9 | 0.3 | 34.3 | 25 | 16.5 | 12.6 | 2.5 | 43.9 | 6 |
| BDE197 | 4.7 | 0.3 | 0.3 | 68.0 | 61 | 5.6 | 3.6 | 0.3 | 17.5 | 25 | 127.9 | 108.0 | 50.3 | 320.0 | 0 |
| BDE203 | 2.9 | 0.3 | 0.3 | 25.0 | 64 | 8.1 | 3.0 | 0.3 | 30.3 | 25 | 18.8 | 16.5 | 3.0 | 45.0 | 15 |
| BDE206 | 114.4 | 24.0 | 3.2 | 989.3 | 0 | 163.6 | 52.7 | 3.5 | 1253.3 | 0 | 30.6 | 18.0 | 2.9 | 195.0 | 12 |
| BDE209 | 2505.2 | 598.0 | 28.8 | 27394.3 | 0 | 2703.0 | 1018.0 | 105.9 | 21956.2 | 0 | 375.6 | 190.5 | 65.3 | 3140.0 | 3 |