

가습기살균제 건강피해의 역사와 방향

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Google

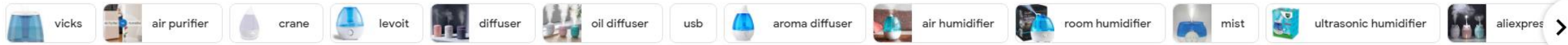
humidifier



전체 이미지 동영상 뉴스 지도 더보기

도구

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Vicks Filter Free Cool Mist Hu... frysfood.com · 재고 있음



How to Use a Humidifier: Types, Maintenance, Safe... healthline.com



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Vicks Ultrasonic Cool Mist H... vickshumidifiers.com



300ml Aromatherapy Diffuser... aliexpress.com · 재고 있음



Vicks Humidifier Ultrasonic L... dischem.co.za · 재고 있음



Classic 100 Ultrasonic Cool ... levoit.com · 재고 있음



Xiaomi Mi Smart Antibacte... alzashop.com · 재고 있음



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파일:Ultrasonic Cool Mist ... ko.m.wikipedia.org



White Drop Ultrasonic Cool... crane-usa.com · 재고 있음



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Best Mini Humidifiers F... refinery29.com



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관련 검색어

- dehumidifier
- humidifier design
- humidifier icon



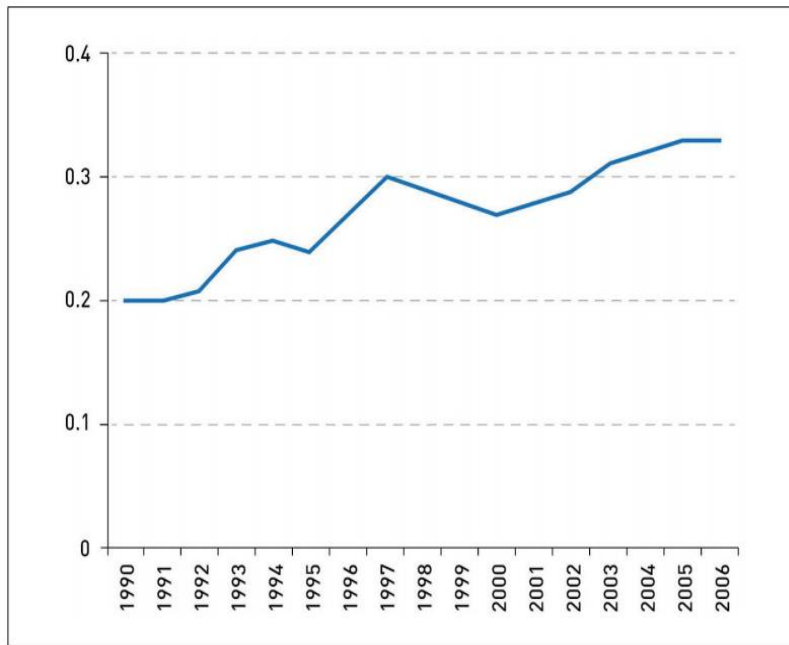
Vicks Warm Vaporizer 1.5 Gal. ... wayfair.com · 재고 있음



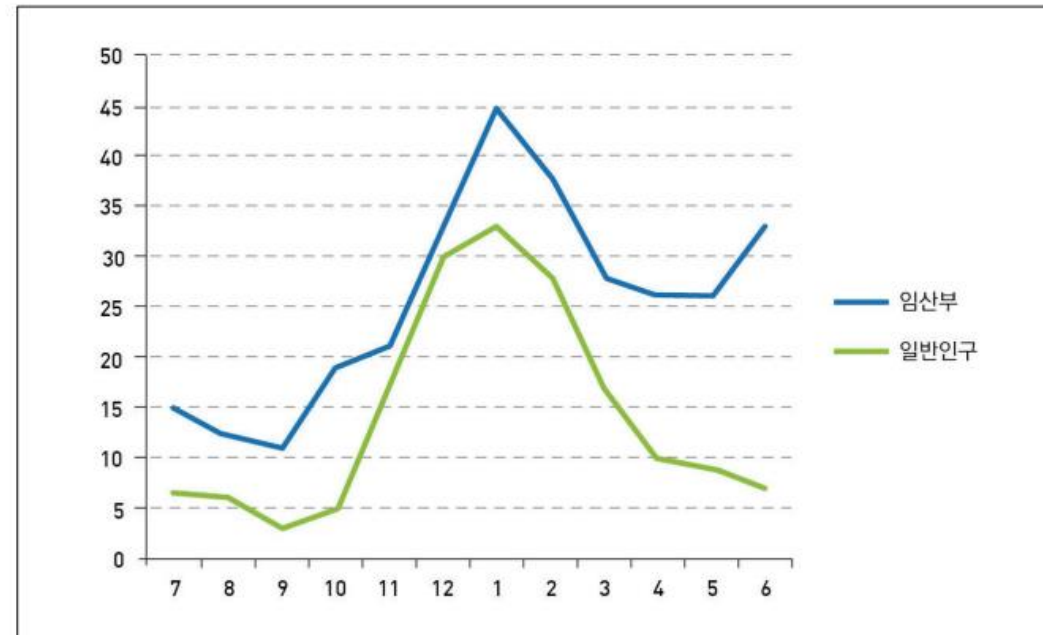
Filter Free Cool Mist Humidifier ... babiesrus.ca · 재고 있음

Humidifier

- Humidifier
 - ↑ Use of humidifier in Korea, Especially more in pregnant women
 - Proper humidity → bronchitis, cough....



Trends of humidifier per house in Korea



Monthly percentage of humidifier use in Korea

Disinfectant

- Definition of disinfectant
 - “A chemical substance or compound used to inactivate or destroy microorganism on inert surfaces”
 - Distinguished from other antimicrobial agents such as antibiotics or antiseptics.
 - Working by destroying the cell wall of microbes or interfering with their metabolism
 - Household grade disinfectant: suitable for “general” purpose

Humidifier Disinfectant (HD)

- Humidifier disinfectant (HD)
 - “Bacteria-breeding humidifier” “Humidifier sickness symptoms”
 - Need of disinfectant for cleaning or sanitizing the humidifier (necessary)
 - First commercial products in Korea (1994)
 - Over 8 million persons for 18 years (estimated)

HD associated tragedy in 2011, Korea

- Several severe, respiratory distressed, and pregnant pneumonia patients → ICU care
 - Reported to KCDC for concern about outbreak of viral disease
 - What's in common among patients?
 - CC: Dyspnea
 - Age: 20~30, perinatal, Onset: Feb ~ March
 - Clinical course: slow progressive but abrupt aggravation
 - CT: R/O Viral disease R/O Interstitial disease
 - Microbes: no common pathogen, weak evidence of infection
 - Treatment response: no response to antibiotics, anti-viral, and anti-fungal agents, mild response to systemic corticosteroid

HD associated tragedy in 2011, Korea

- Turning point
 - Lettering among Pulmonology specialists
 - Similar adult patients in other referral hospitals, including “male” patient
 - Similar patients in “child” also
 - Repeatedly experience similar patients for years
 - Especially in winter and spring season

Korean Journal of Pediatrics Vol. 51, No. 4, 2008

DOI : 10.3345/kjp.2008.51.4.383

■ Original article : Clinical study ■

2006년 초에 유행한 소아 급성 간질성폐렴

울산대학교 의과대학 서울아산병원 소아과학교실, 서울대학교 의과대학 소아과학교실*, 인제의대 상계백병원 소아과학교실†

전종근 · 진현승 · 강은경* · 김효빈[†] · 김병주 · 유진호 · 박성종 · 홍수종 · 박준동*

가습기 살균제 건강피해 사건 백서 (2014)
CK Cheon et al. Korean J Pediatr 2008;51:383-390

Humidifier Disinfectant (HD) Tragedy in Korea

- Turning point
 - In multidisciplinary meeting
 - Pathology
 - : acute or subacute damage around small airway → possibility of inhaled materials
 - Most patients are child and perinatal women
 - Usually, live indoors → indoor use materials
 - Seasonal: Late winter ~ early spring → possibility of humidifier related

Humidifier Disinfectant (HD) Tragedy in Korea

- Characteristics of Unknown disease with home humidifier use
 - Acute progressive, refractory hypoxemia
 - Chest image: Bilateral diffuse infiltration and GGO → lobular micronodules
 - Pathology: Necrotizing bronchiolitis
 - No definite pathogen, No exposure to toxic agent
 - No response to corticosteroid or immunosuppressant

Case-Series Reports: HD-associated lung injury

ORIGINAL ARTICLE

A cluster of lung injury associated with home humidifier use: clinical, radiological and pathological description of a new syndrome

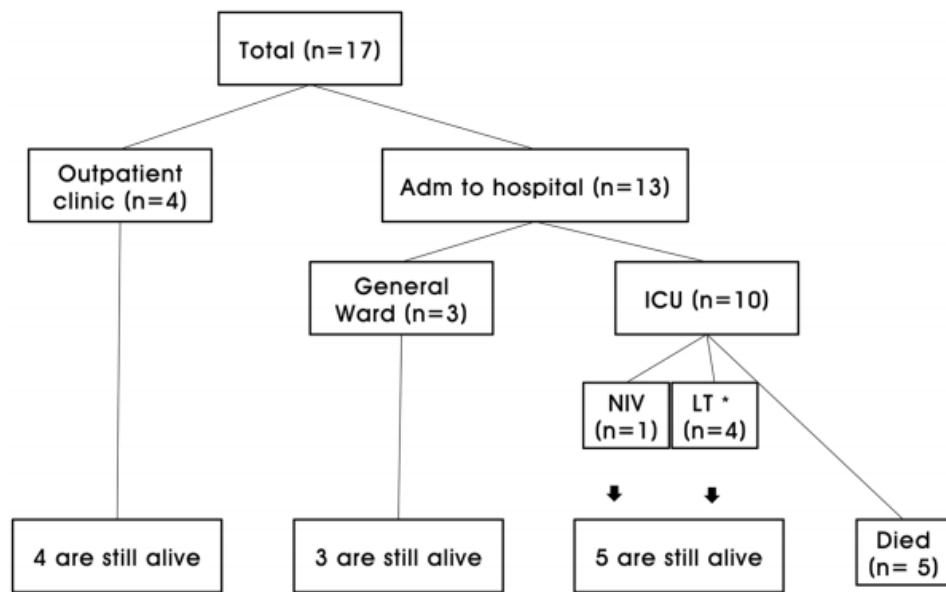
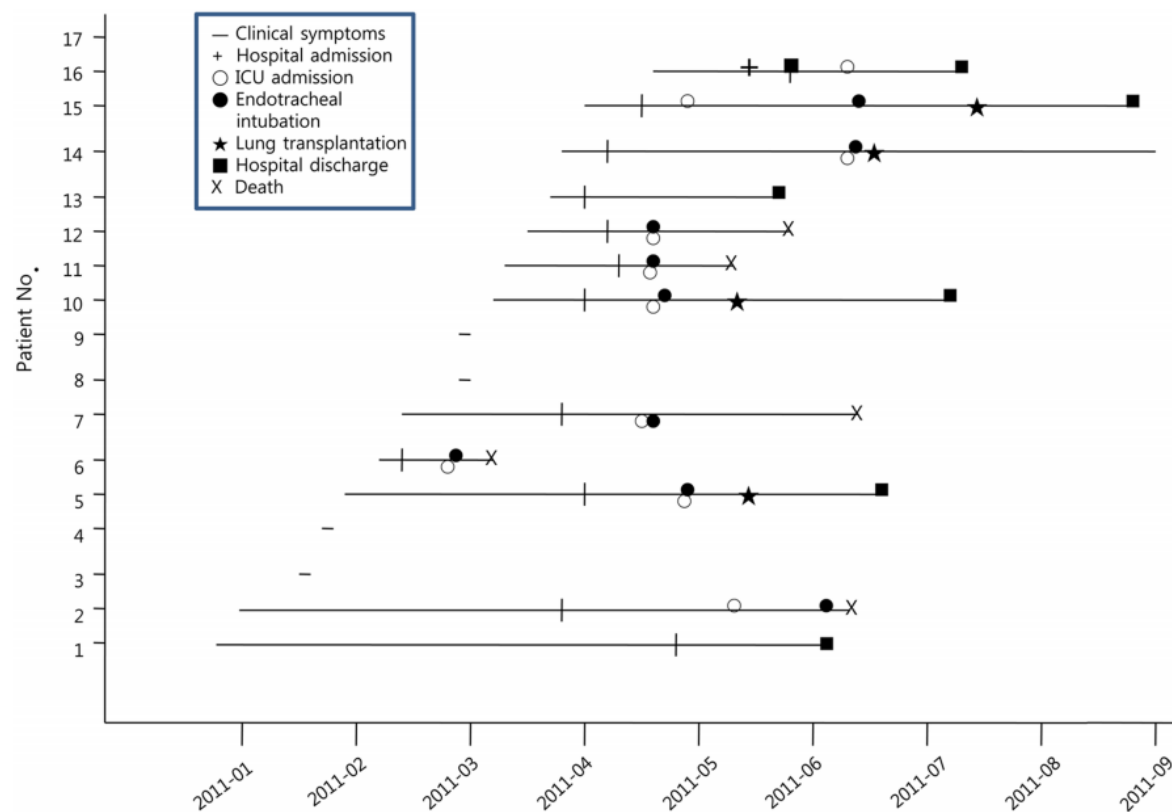


Figure 2 Characteristics and outcomes of 17 patients with lung injury associated with humidifier use. ICU, intensive care unit; LT, lung transplantation; NIV, non-invasive ventilation.

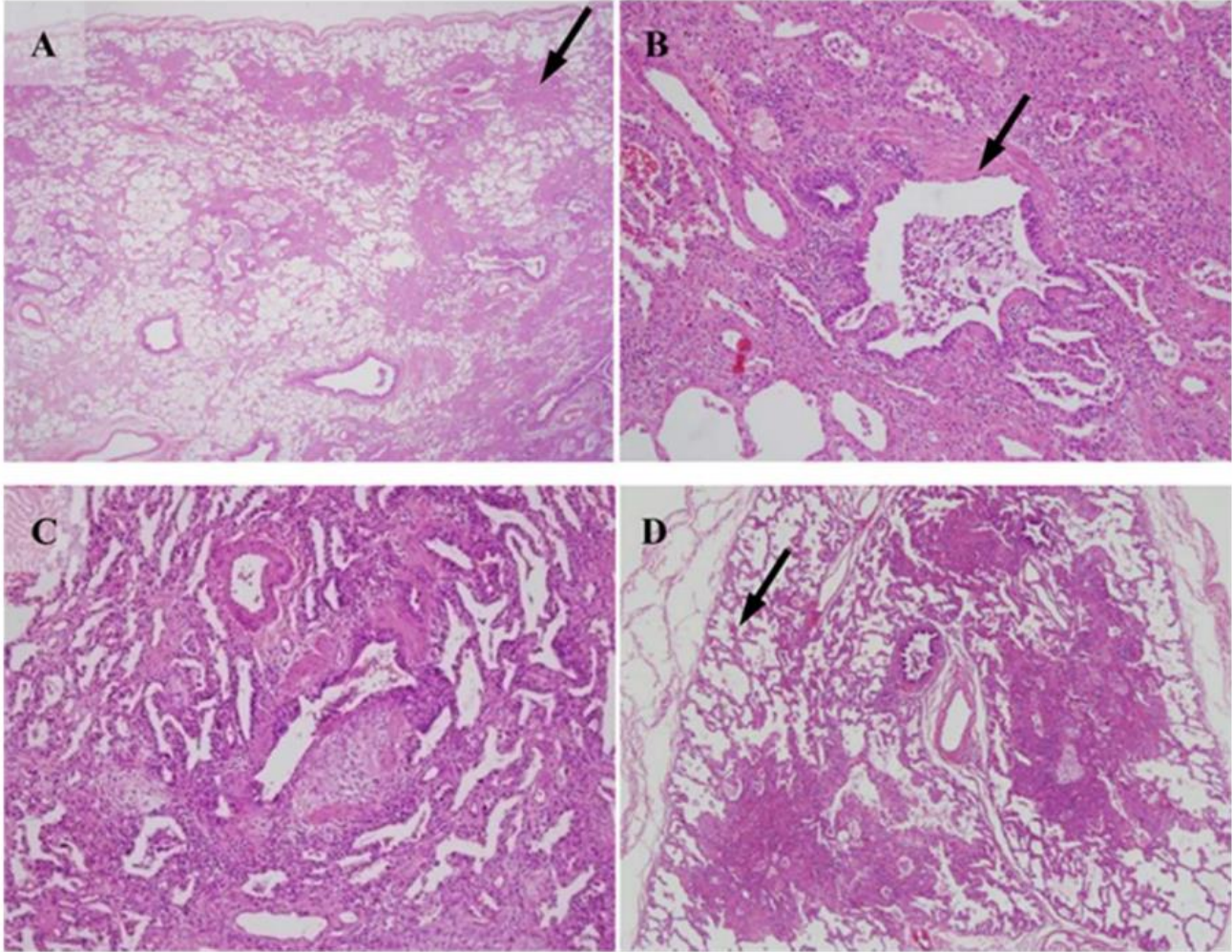
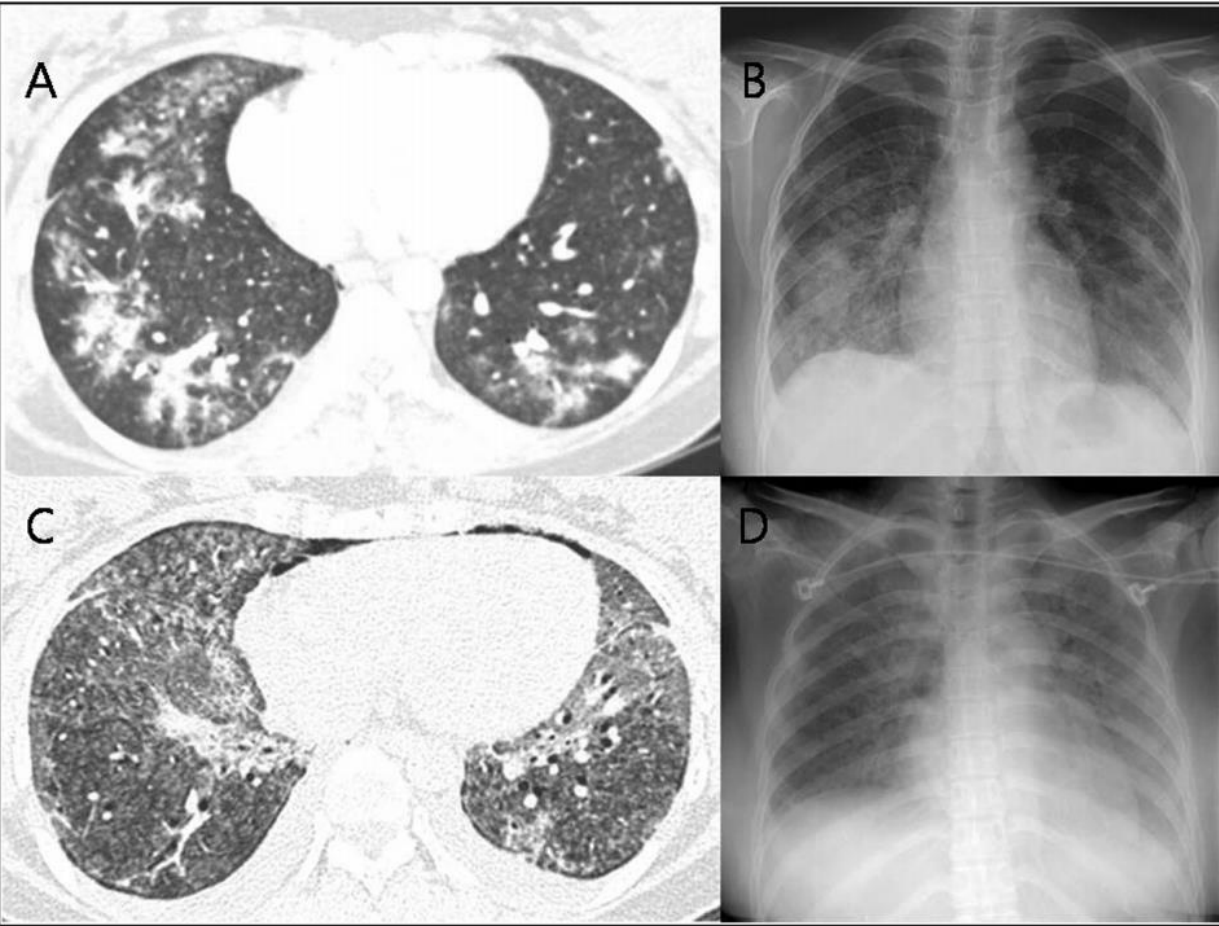


Case-Series Reports: HD-associated lung injury

Table 1 Demographic and clinical characteristics of the 17 patients with humidifier disinfectant-associated lung injury*

Variable	All patients (n=17)	Patients who survived (n=12)	Patients who died (n=5)	p Value†
Demographics				
Female sex	15 (88.2%)	10 (83.3%)	5 (100%)	1.000
Age (years)	35 (28–49)	36 (29–49)	34 (28–36)	0.246
≤30 years	3 (17.6%)			
>30 to ≤40 years	11 (64.7%)			
>40 to ≤50 years	3 (17.6%)			
Peripartum	11 (64.7%)	6 (50.0%)	5 (100%)	0.102
Familial cluster	4 (23.5%)	4 (33.3%)	0 (0.0%)	0.261
Treatment and prognosis				
Intensive care	10 (58.8%)	5 (41.7%)	5 (100%)	0.044
Mechanical ventilation	9 (52.9%)	4 (33.3%)	5 (100%)	0.029
Extracorporeal membrane oxygenation	8 (52.9%)	4 (33.3%)	4 (80.0%)	0.131
Lung transplantation	4 (23.5%)	4 (33.3%)	0 (0.0%)	0.261
Onset of symptoms before admission (days)	30 (1–120)	32.5 (20–120)	20 (1–80)	0.362
Admission to intubation (days)	11 (1–59)	40 (9–59)	10 (1–32)	0.914
Onset of symptoms before death (days)			61 (27–116)	
Admission to death (days)			36 (20–60)	
Laboratory data at admission‡				
Leukocyte count (/1000 mm ³)	10.9 (5.5–42)	9.5 (5.5–26.9)	16.1 (8–42)	0.141
C-reactive protein (mg/dL)	1.73 (1–14)	0.96 (0.1–8)	4.34 (1.7–14)	0.094

Case-Series Reports: HD-associated lung injury



Hong S-B, et al. Thorax 2014;69:694-702.

Case-Series Reports: HD-associated lung injury

Variable	Case group		Control group		Univariate analysis*	
	N	(%)	N	(%)	Odds ratio	Confidence interval (95%)
Marriage	11	(100)	16	(72.7)	6.6	(0.8-∞)
Have children [†]	10	(90.9)	11	(68.8)	5.3	(0.4-331)
Air cleaner use	7	(63.6)	16	(72.7)	0.8	(0.1-5.2)
Air freshener use	5	(45.5)	4	(18.2)	3.6	(0.6-26.1)
Humidifier use	11	(100)	6	(27.3)	33.7	(4.5-∞)
Humidifier disinfectant use	11	(100)	3	(13.6)	47.8	(6.9-∞)
House fungus	9	(81.8)	11	(50.0)	4.9	(0.7-∞)
House-hold insecticide use	7	(63.6)	11	(50.0)	2.6	(0.4-20.7)
Sodium hypochlorite use [‡]	8	(88.9)	15	(88.2)	0.95	(0.04-65.2)
Sauna	5	(45.5)	6	(27.3)	2.5	(0.4-16.1)
Chemical use in job [§]	1	(11.1)	1	(4.6)	2.3	(0.03-174)
Chemical use in hobby [§]	5	(45.5)	5	(23.8)	3.4	(0.5-27.1)
Hair spray	4	(36.4)	6	(27.3)	1.6	(0.2-9.8)

Hong S-B, et al. Thorax 2014;69:694-702.

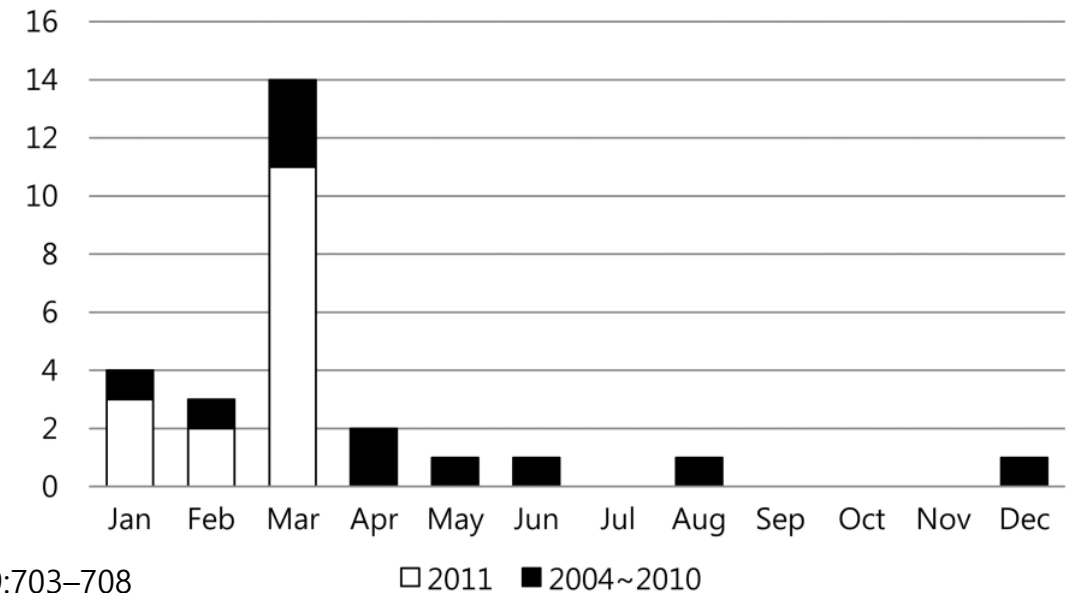
Case-Control Study: HD-associated lung injury

ORIGINAL ARTICLE

A cluster of lung injury cases associated with home humidifier use: an epidemiological investigation

Hwa Jung Kim,¹ Moo-Song Lee,^{1,2} Sang-Bum Hong,³ Jin Won Huh,³
Kyung-Hyun Do,⁴ Se Jin Jang,⁵ Chae-Man Lim,³ Eun Jin Chae,⁴ Hanyi Lee,⁶
Miran Jung,⁷ Young-Joon Park,⁸ Ji-Hyuk Park,⁹ Geun-Yong Kwon,⁹ Jin Gwack,⁹
Seung-Ki Youn,⁹ Jun-Wook Kwon,¹⁰ Byung-Guk Yang,¹¹ Byung-Yool Jun,¹²
Yangho Kim,¹³ Hae-Kwan Cheong,¹⁴ Byung Chul Chun,¹⁵ Heon Kim,¹⁶
Kyuhong Lee,¹⁷ Younsuck Koh³

- Case definition
 - Bilateral, centrilobular or diffuse GGOs observed on HRCT
 - Symptoms or signs not consistent with other clinical Dx
 - Young adults (20~54 years)



Case-Control Study: HD-associated lung injury

Table 3 Strength of the association between the lung injury and indoor environmental factors

	cOR	(95% CI)	aOR*	(95% CI)	aOR†	(95% CI)
Compared with all controls (n=121)						
Indoor moulds	4.39	(1.47 to 13.13)	4.19	(1.30 to 13.53)	5.03	(1.35 to 18.80)
Humidifier	13.70	(1.77 to 106.26)	14.44	(1.77 to 117.91)	–	
Humidifier detergent	47.27	(6.05 to 369.69)	–		53.01	(6.33 to 444.17)
Insecticide	3.90	(1.31 to 11.65)	3.86	(1.13 to 13.20)	4.00	(0.97 to 16.51)
Compared with controls with pulmonary disease (n=55)						
Indoor moulds	3.90	(1.22 to 12.49)	6.68	(1.52 to 29.38)	6.23	(0.94 to 41.41)
Humidifier	15.24	(1.89 to 122.62)	22.87	(2.34 to 223.26)	–	
Humidifier detergent	54.92	(6.66 to 453.23)	–		116.82	(9.88 to ∞)
Insecticide	3.02	(0.94 to 9.64)	7.31	(1.46 to 36.55)	15.93	(1.94 to 130.84)
Compared with controls with allergic disease (n=30)						
Indoor moulds	3.90	(1.10 to 13.80)	3.92	(0.82 to 18.63)	3.98	(0.63 to 25.05)
Humidifier	11.33	(1.33 to 96.80)	21.14	(1.70 to 263.40)	–	
Humidifier detergent	34.00	(3.94 to 293.32)	–		72.87	(4.34 to ∞)
Insecticide	5.20	(1.45 to 18.71)	4.73	(0.99 to 22.62)	5.55	(0.83 to 37.05)
Compared with controls with obstetric disease (n=36)						
Indoor moulds	9.09	(2.13 to 38.77)	8.59	(1.50 to 49.19)	15.03	(1.66 to 136.45)
Humidifier	11.20	(1.33 to 94.47)	10.01	(0.68 to 147.80)	–	
Humidifier detergent	42.00	(4.82 to 365.82)	–		71.32	(3.71 to ∞)
Insecticide	4.87	(1.29 to 18.42)	2.92	(0.55 to 15.53)	1.32	(0.13 to 13.12)

*Adjusted OR from multivariable analysis that included exposure to indoor mould, humidifier use and insecticide use.

†Adjusted OR from multivariable analysis that included exposure to indoor mould, humidifier detergent use and insecticide use.

aOR, adjusted OR; cOR, crude OR.

Case-Control Study: HD-associated lung injury

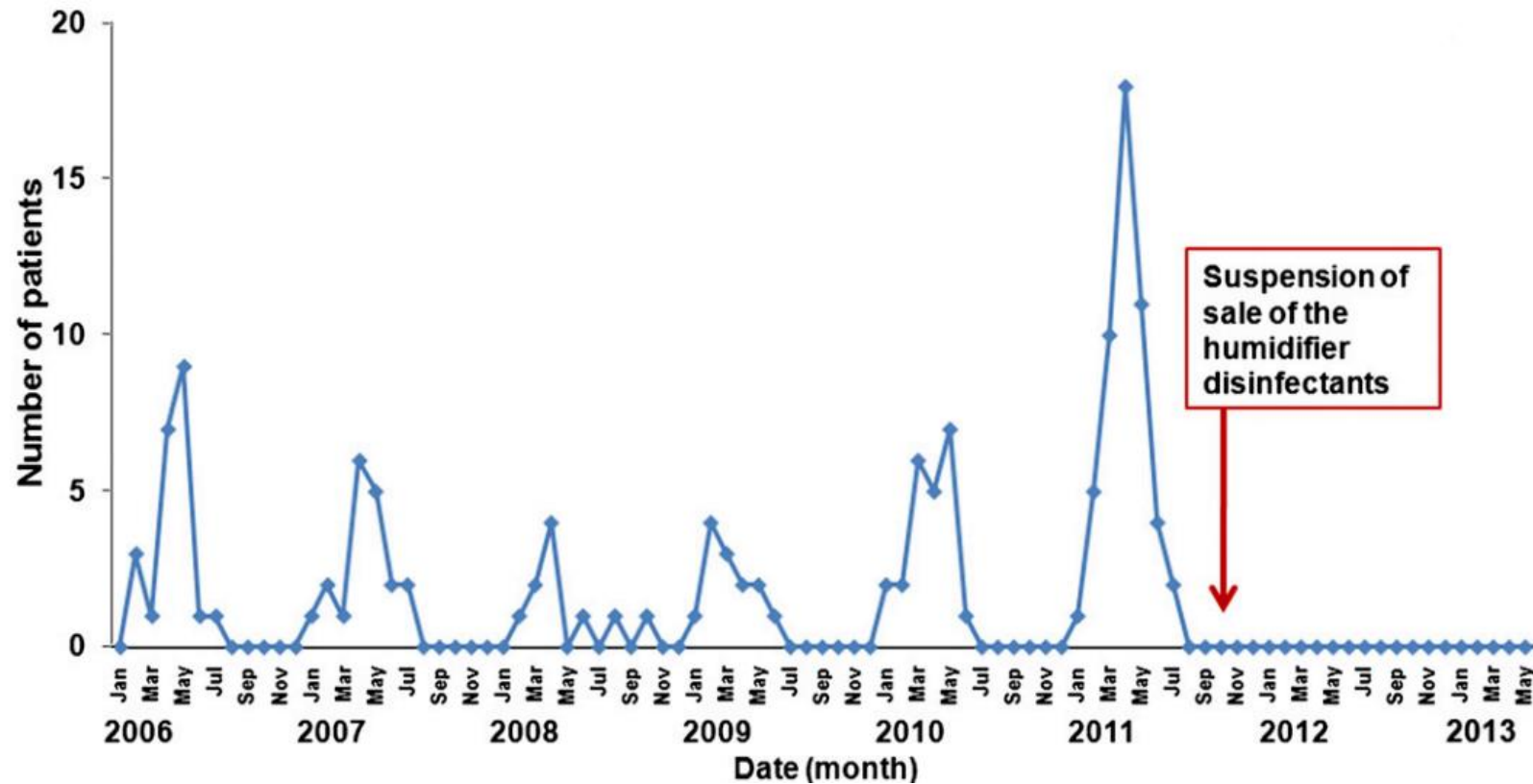
Table 4 Results of an additional survey on the humidifier detergent exposure of cases

	2011 cases (n=16)	2004–2010 case (n=12)
Chemical type		
PGH	2 (12.5%)	0 (0.0%)
PHMG	12 (75.0%)	10 (83.3%)
Unknown	2 (12.5%)	2 (16.7%)
Exposure duration (months, mean±SD)		
Lifetime cumulative	17.5±14.8	9.9±5.8
Between 2011F/W and 2012S/S	4.7±1.2	

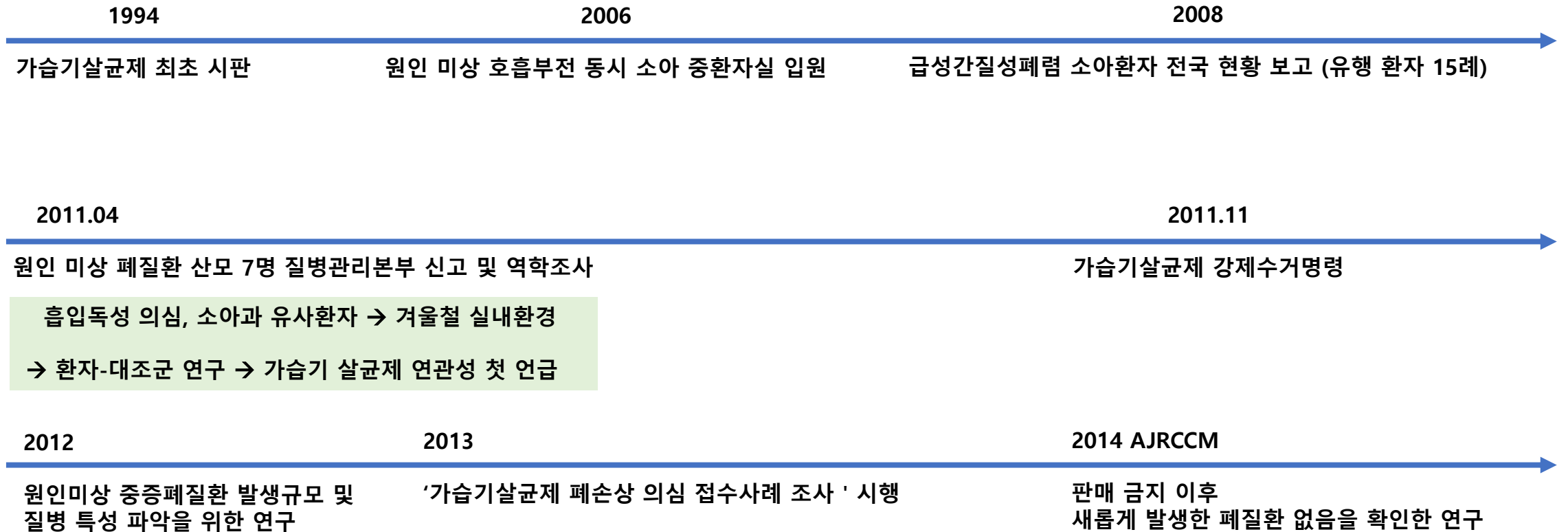
Unknown disease → related with Humidifier and Humidifier Disinfectant

After prohibiting the use of HD

- Prohibiting the sale of HD products (2011.11)
- Monitoring of prospective nationwide monitoring system (Adult & Children)

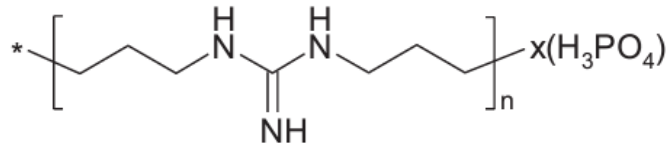


Timeline of revealing the HD disaster in Korea

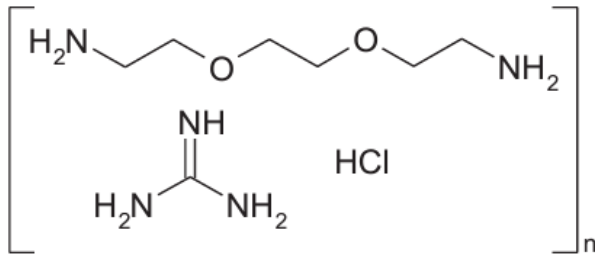


Chemical Materials of HD

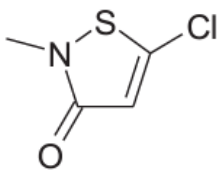
PHMG, PGH, and CMIT/MIT



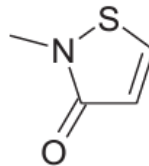
Polyhexamethyleneguanidine phosphate (n/x=1~2)
(PHMG phosphate)
CAS RN 89697-78-9



Oligo(2-(2-ethoxy)ethoxyethyl guanidinium chloride (PGH)
CAS RN 374572-91-5



5-Chloro-2-methylisothiazol-3(2H)-one
(CMIT)
CAS RN 26172-55-4



2-Methylisothiazol-3(2H)-one
(MIT)
CAS RN 2682-20-4



Lack of inhalation toxicity results

PHMG Toxicology Results

per oral (harmful), percutaneous (low), skin irritation (none), ocular irritation (severe), skin sensitization (limited evidence)

PGH Toxicology Results

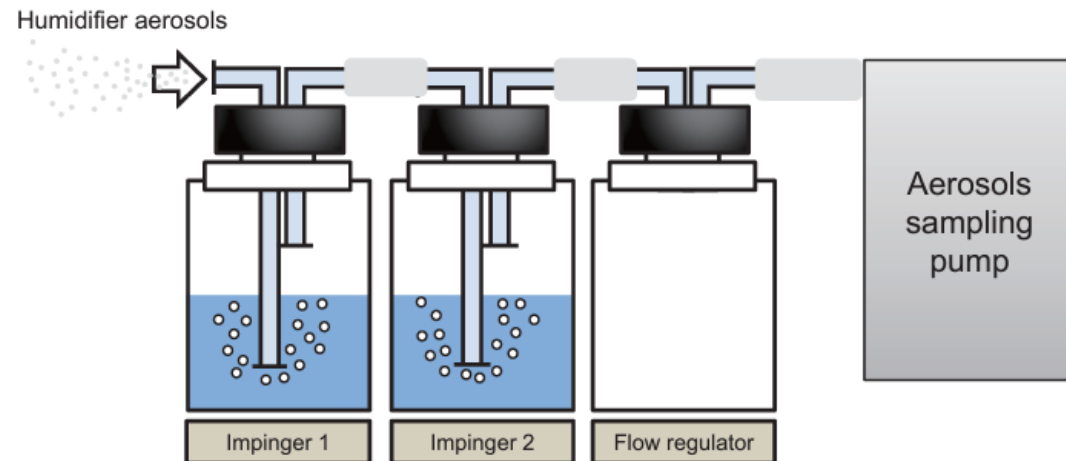
per oral (low), skin irritation (none), ocular irritation (none), skin sensitization (none)

CMIT/MIT Toxicology Results

skin irritation (severe), ocular irritation (+), 3m inhalation (AR, 1.15 minimal)

Rare evaluation data about inhalation toxicity

Reproduce analysis of HD exposure



Reproduce analysis of HD exposure

Table 2. Derivation of health risk quotients for the use of humidifier disinfectants

Active ingredient	PHMG	PGH	CMIT/MIT
Exposure assessment			
Content of active ingredient in the product	0.125	0.5	0.019
Emission rate (mg/hr)	3.12	12.5	0.475
Time-weighted average concentration in the bedroom (mg/m ³)			
Scenario 1	0.056	0.040	-
Scenario 2	0.093	0.140	-
Scenario 3	0.780	0.530	0.021
Health risk quotient			
Initial screening [4]	2,500	10,500	9.41
Scenario 1	1,400	1,000	-
Scenario 2	2,300	3,500	-
Scenario 3	20,000	13,000	12

PHMG: polyhexamethyleneguanidine, PGH: oligo(2-(2-ethoxy)ethoxyethyl guanidinium chloride, CMIT/MIT: chloromethyl/methyl isothiazolinone, NOEC: no-observed effect concentration.

Reproduce analysis of HD exposure

2019 CMIT/MIT 노출재현실험

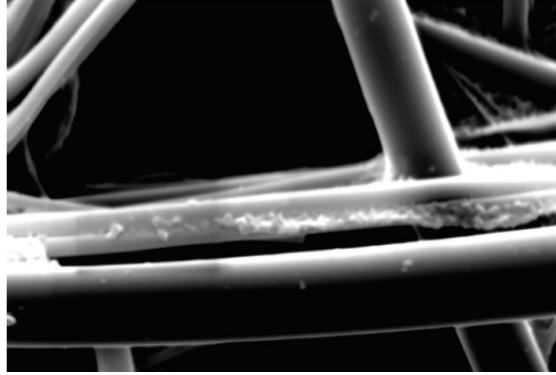
표 3-11. 권장사용량과 환기율 조건에 따른 CMIT/MIT 정상상태 측정농도 요약(자료수=3)

CMIT/MIT 사용량 비 환기율(회/hr)	권장사용량 1배		권장사용량 5배		권장사용량 10배	
	CMIT	MIT	CMIT	MIT	CMIT	MIT
0.3	0.952	0.398	3.097	1.037	14.12	3.313
0.5	0.741	0.332	4.407	1.431	14.79	3.958
1.0	1.012	0.304	4.368	1.752	9.742	3.108

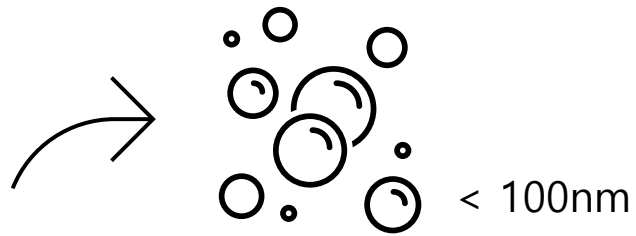
단위: $\mu\text{g}/\text{m}^3$

PHMG, PGH, CMIT/MIT → confirm of HD exposure by humidifier

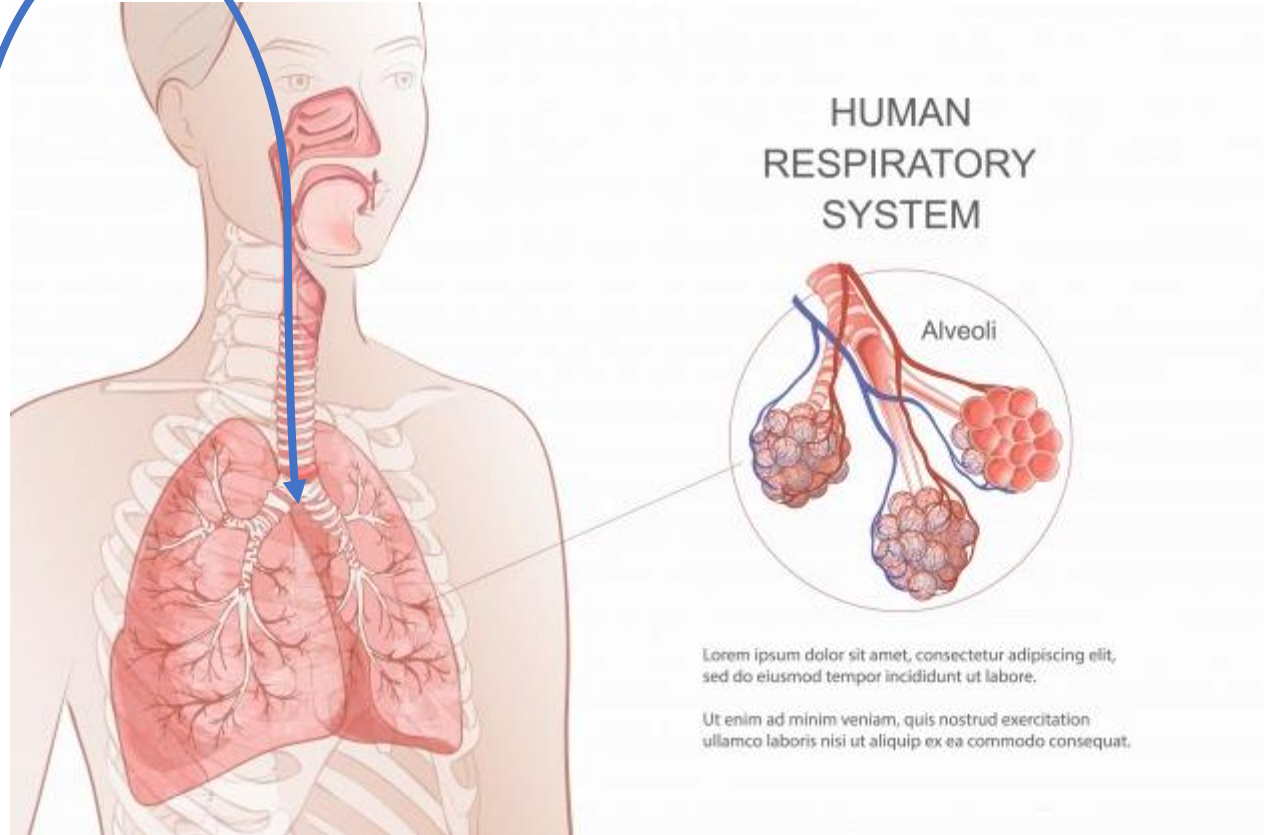
Entry to human body of HD particles



Aerosolized HD particles



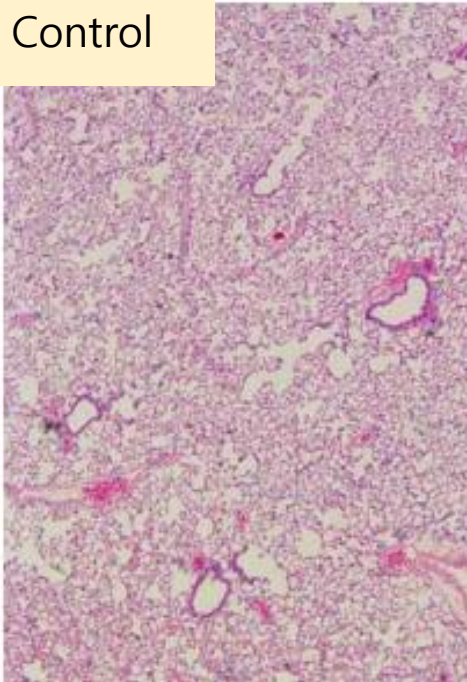
Humidifier



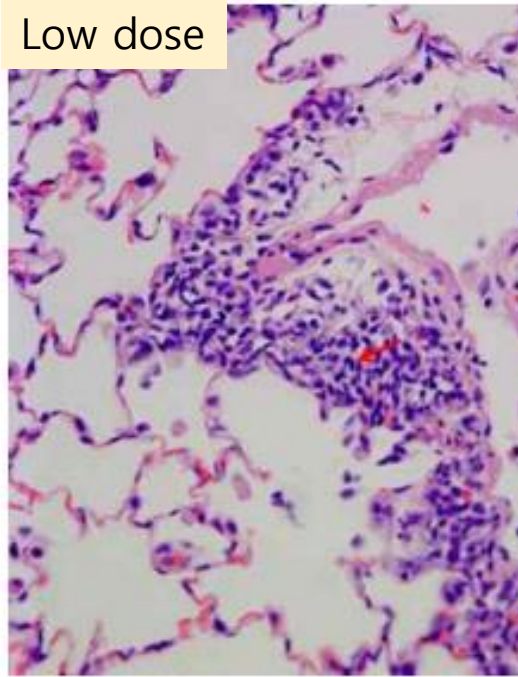
Evidence from Animal and Human study

Animal Study – PHMG: Acute Exposure

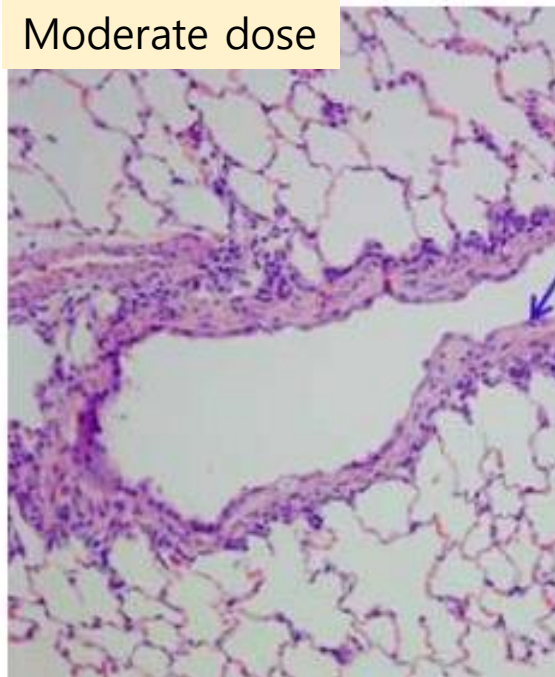
Control



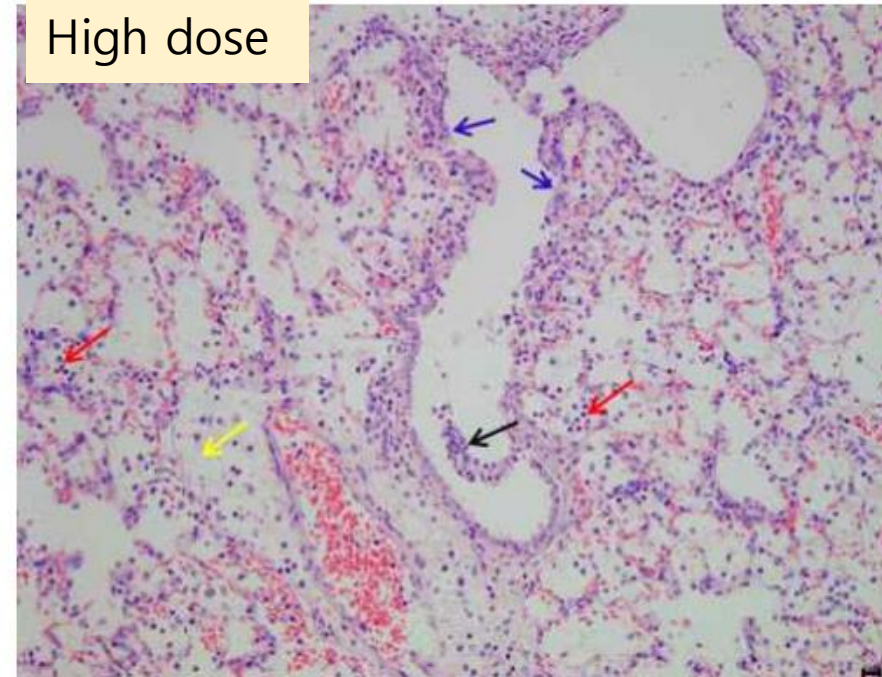
Low dose



Moderate dose



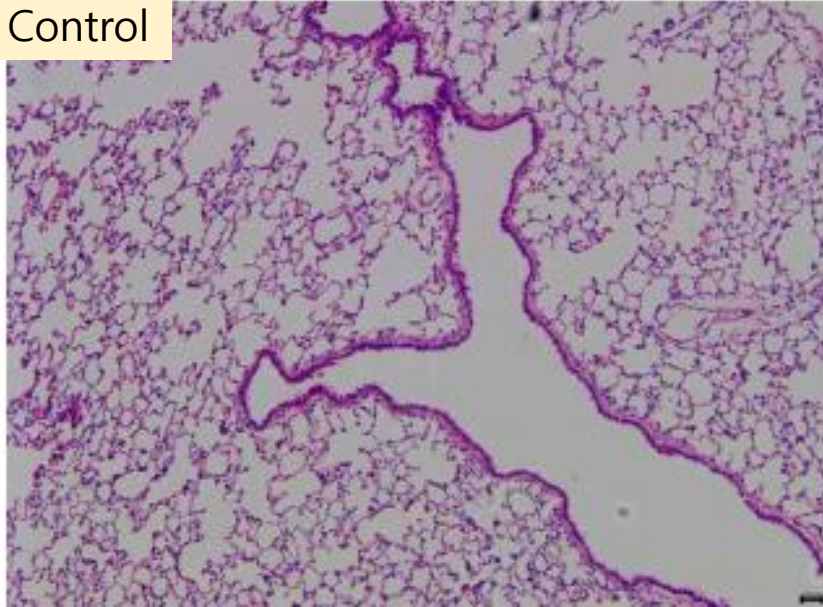
High dose



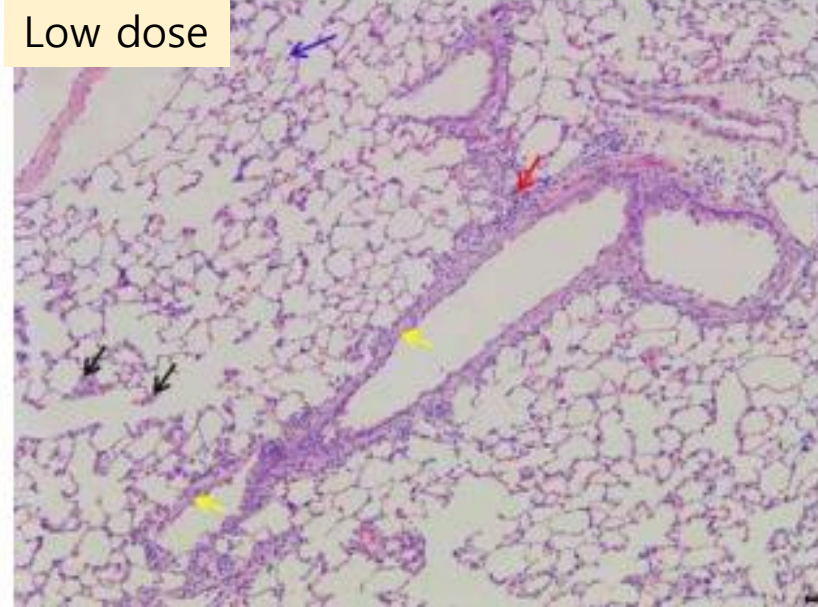
SD Rat by nose inhalation exposure for 4hr, Low ($20\text{mg}/\text{m}^3$), Moderate ($80\text{ mg}/\text{m}^3$), High ($300\text{ mg}/\text{m}^3$)

Animal Study – PHMG: repeated exposure

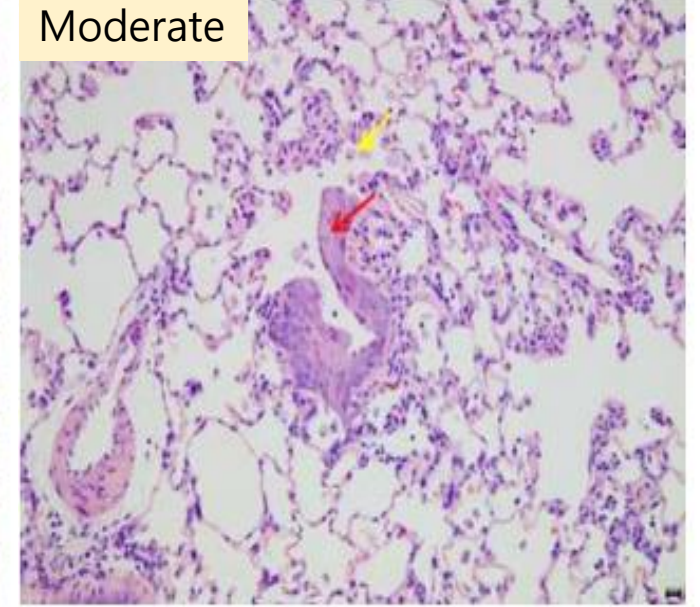
Control



Low dose

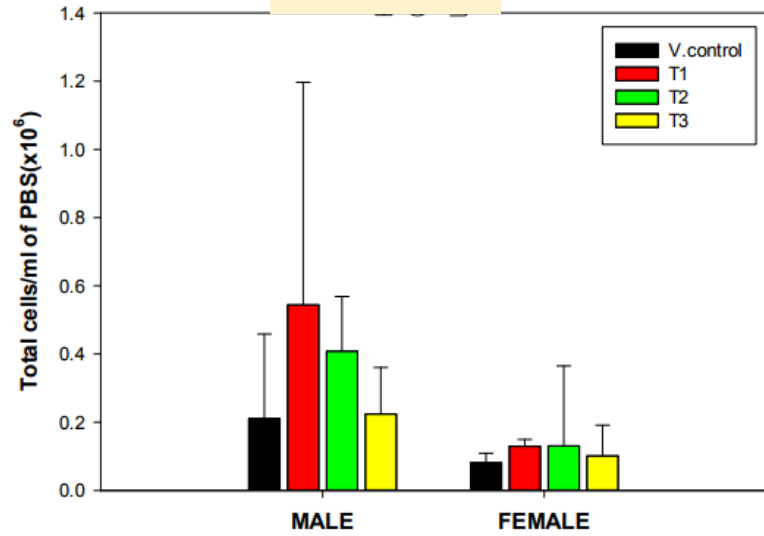


Moderate

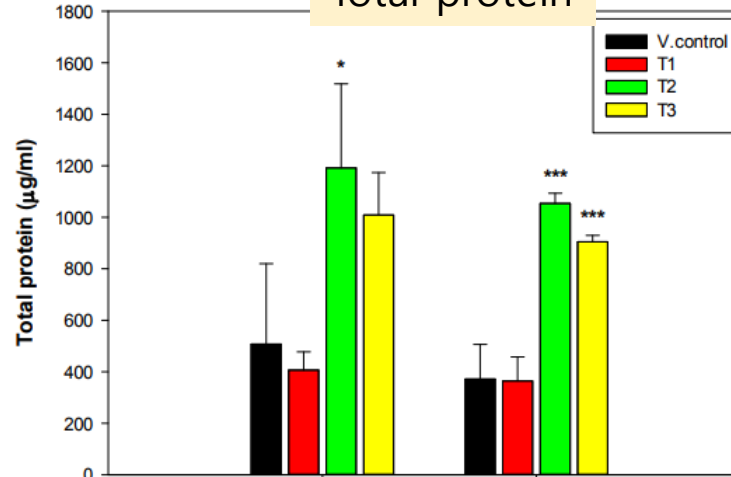


Animal Study – PHMG: repeated exposure

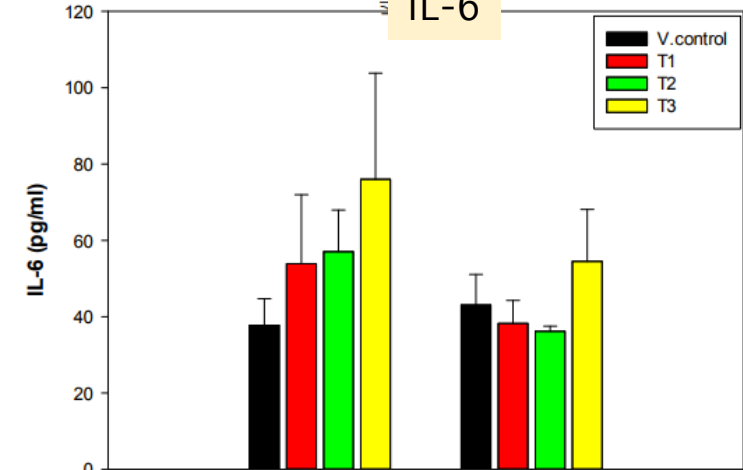
Total cells



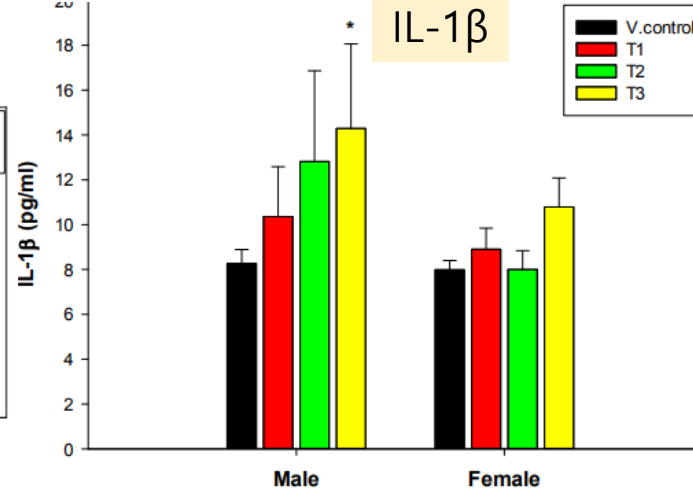
Total protein



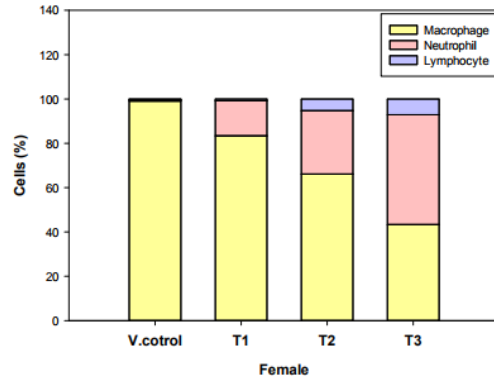
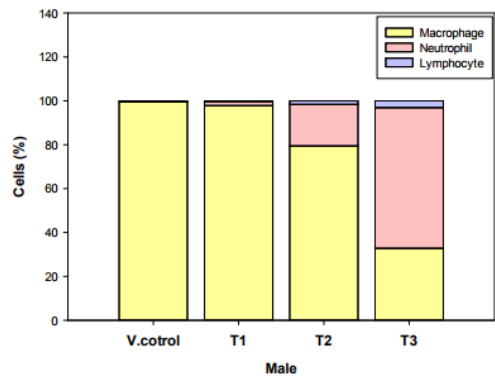
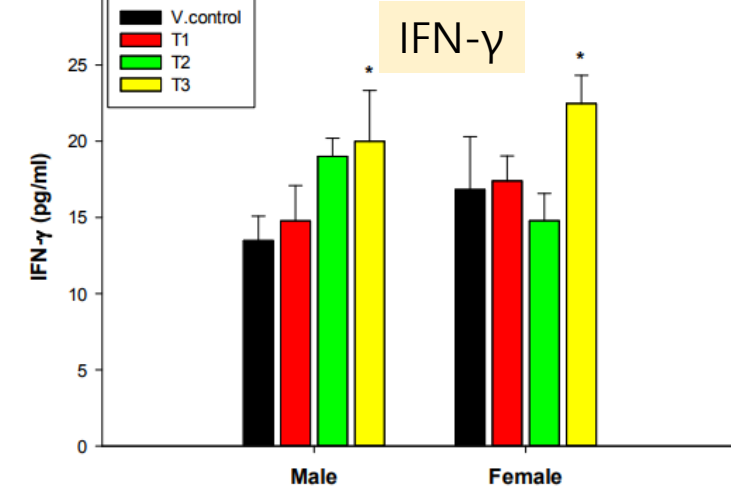
IL-6



IL-1β

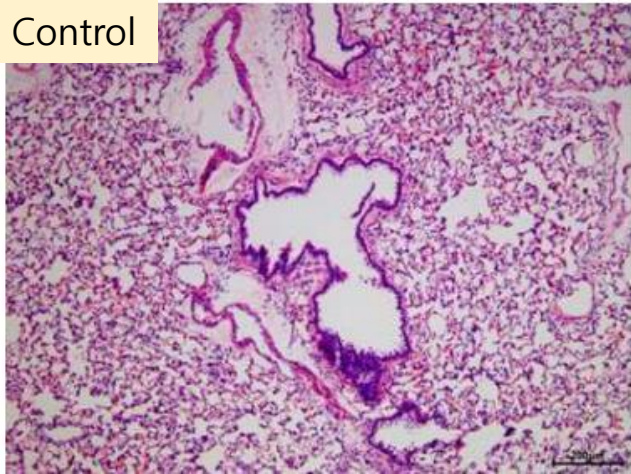


IFN-γ

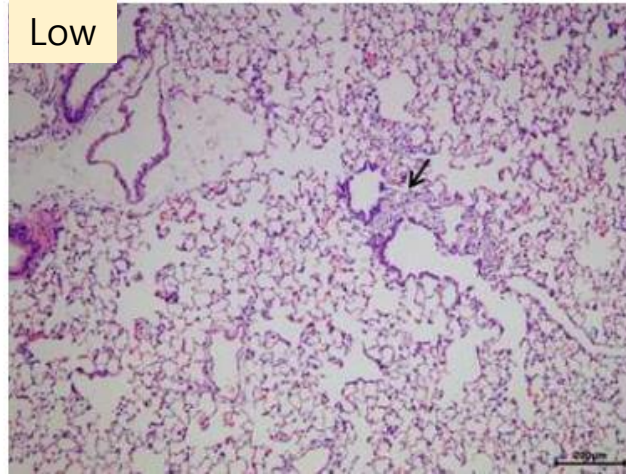


Animal Study – PGH: subacute inhalation

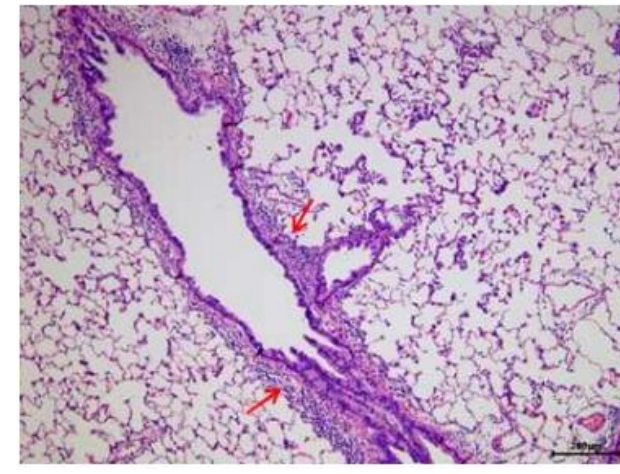
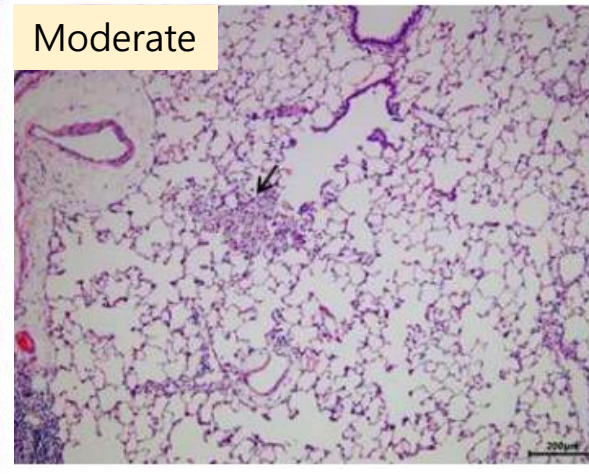
Control



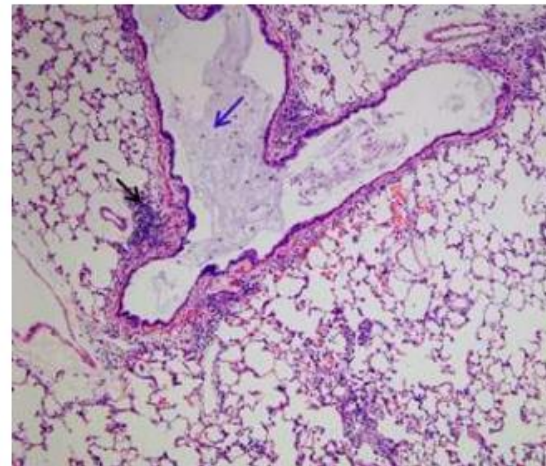
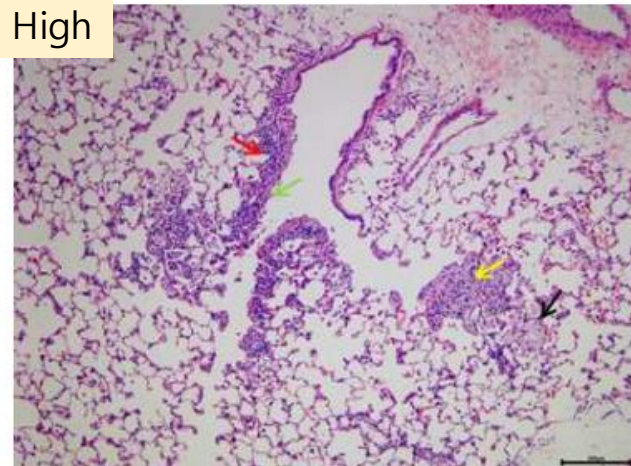
Low



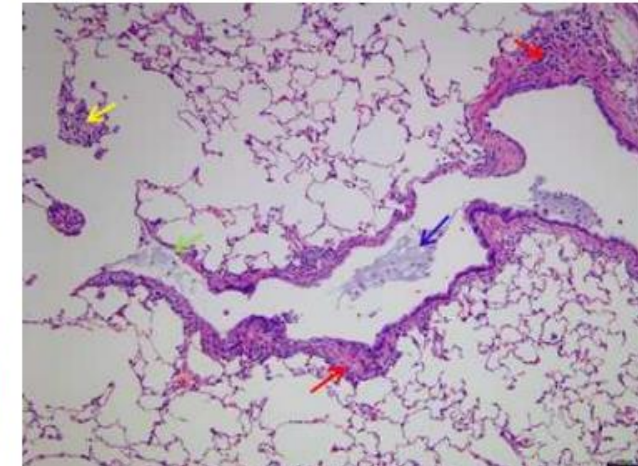
Moderate



High

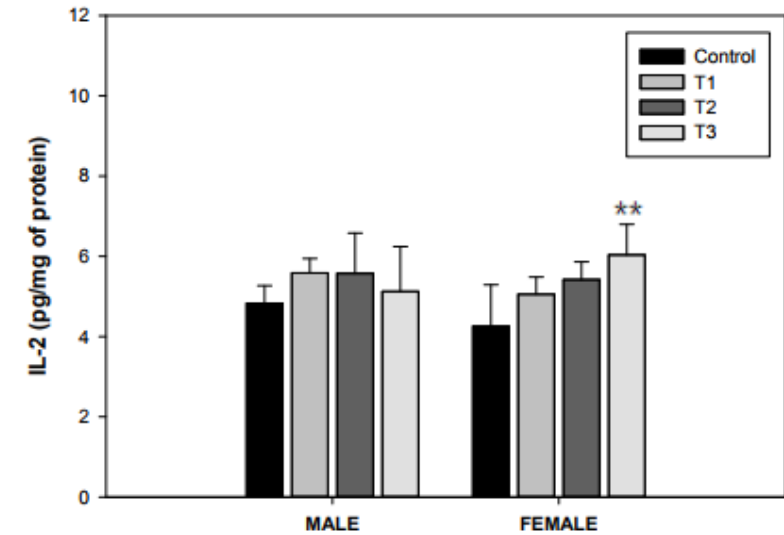
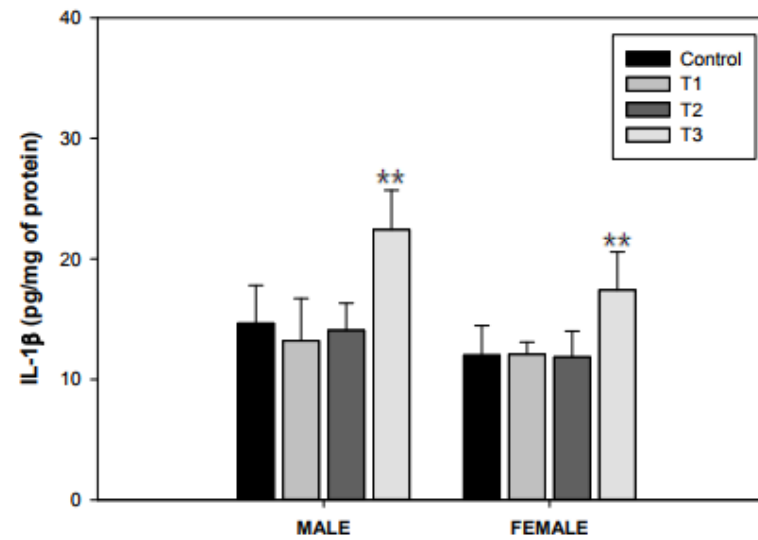
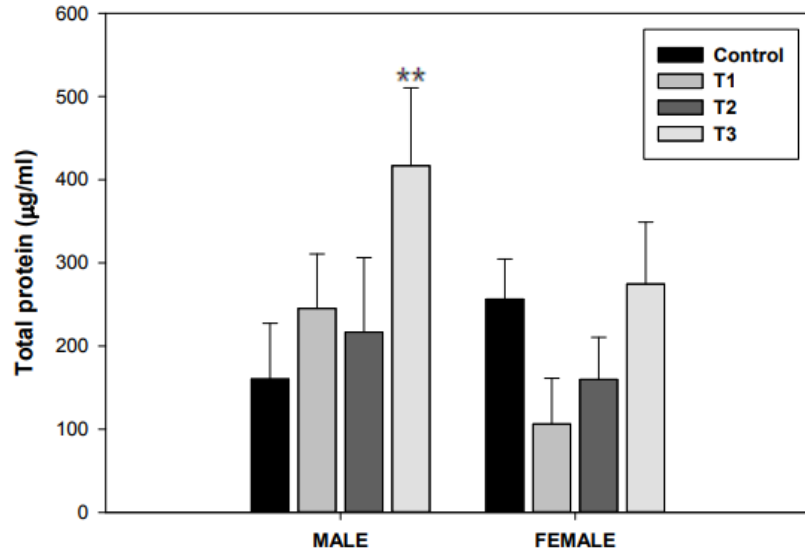
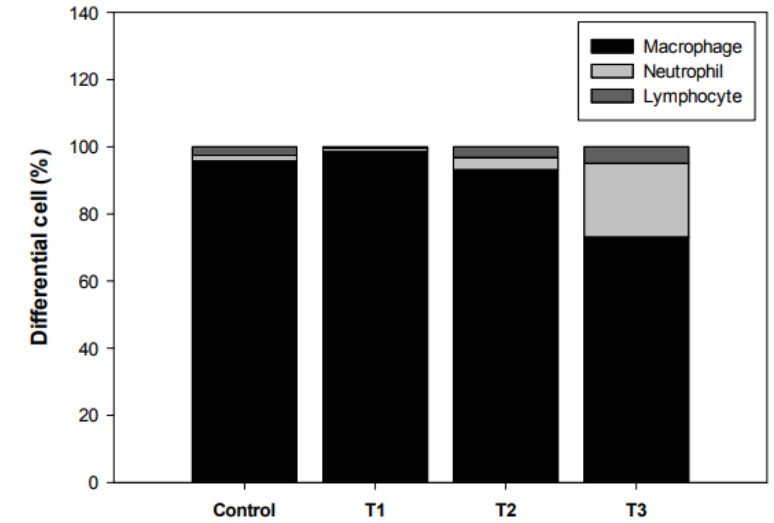
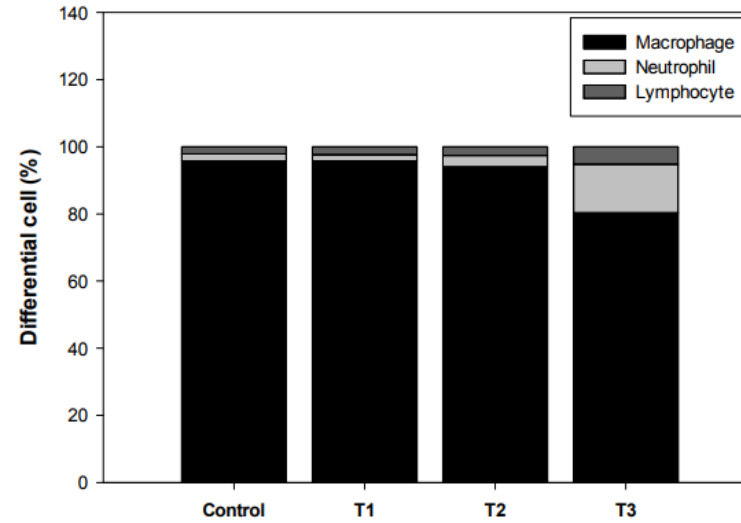
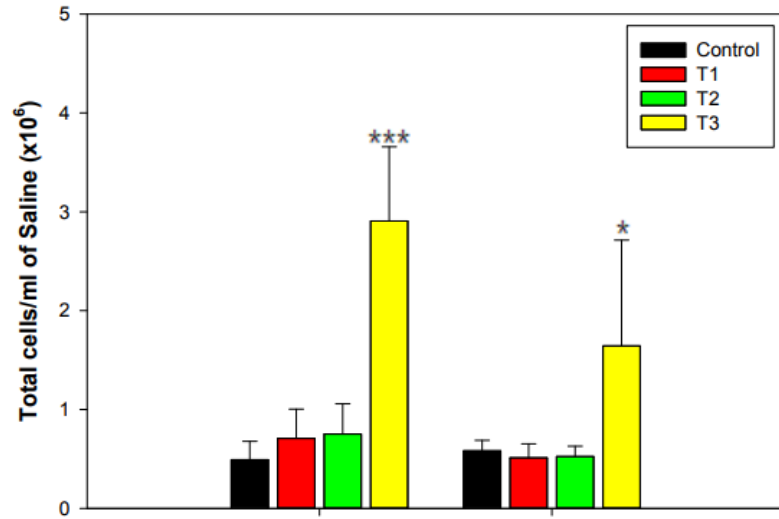


After recovery

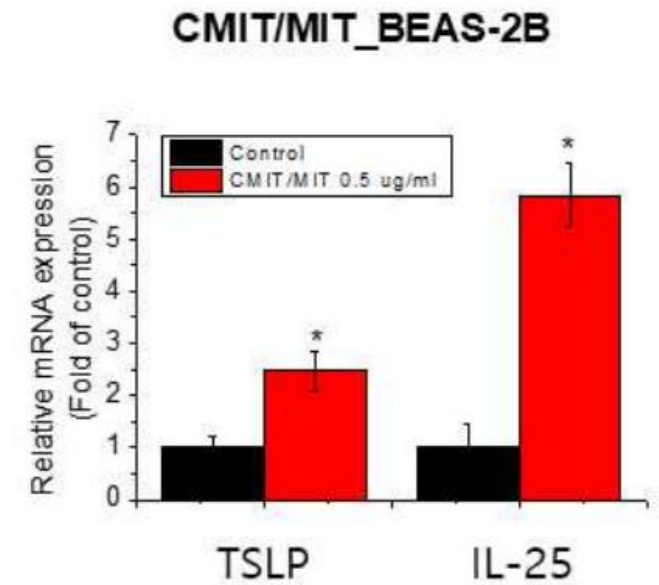
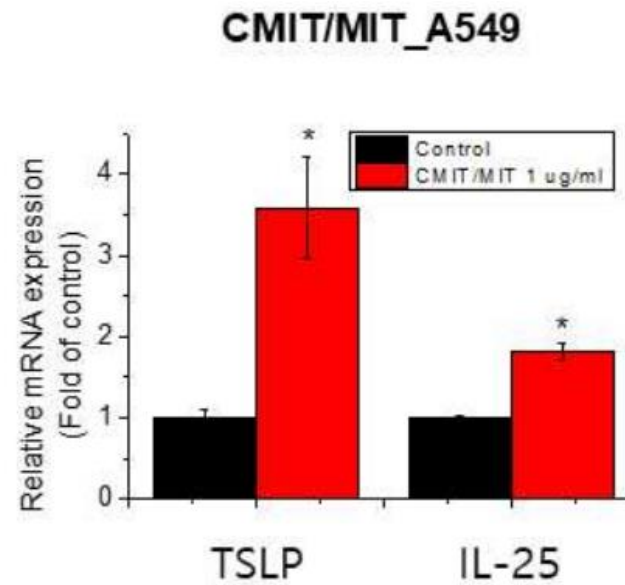
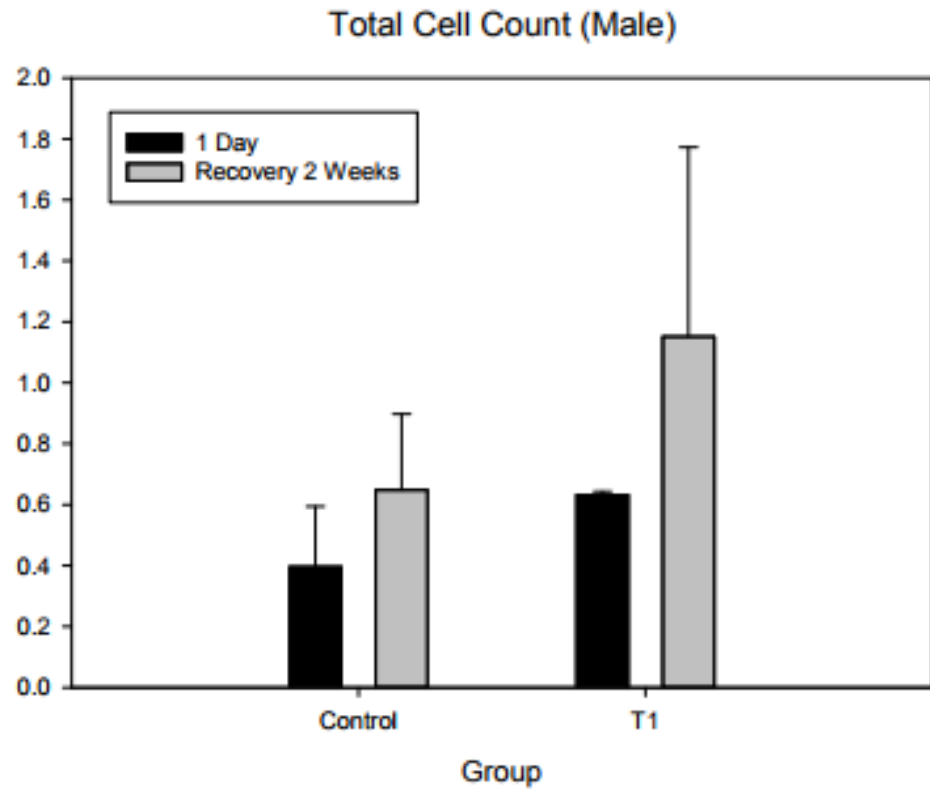


SD Rat, 0, 0.10, 0.50, and 2.00 mg/m³ for 4 weeks, by nose

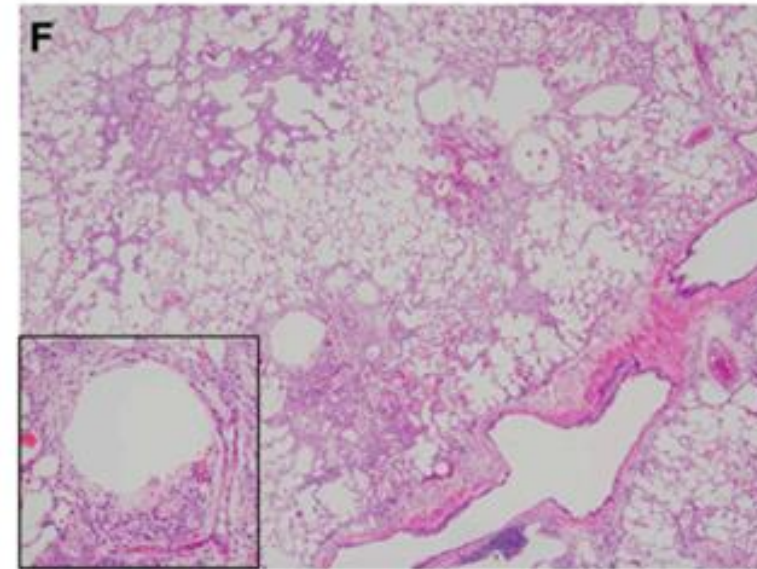
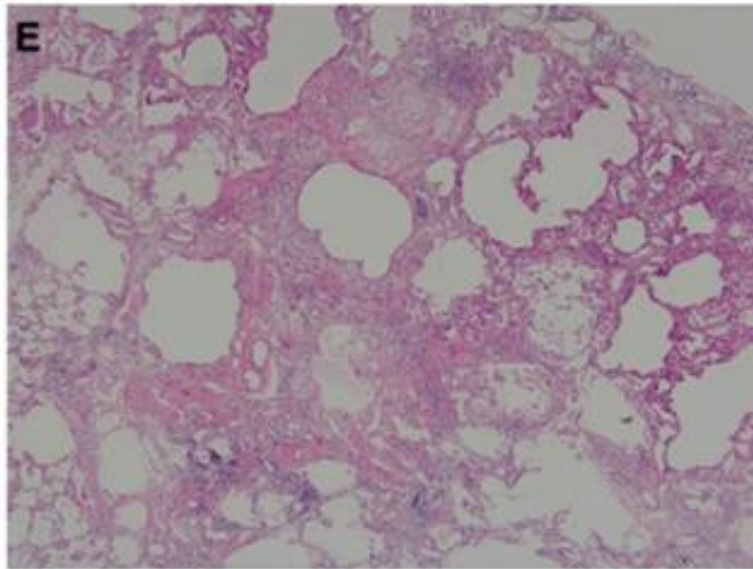
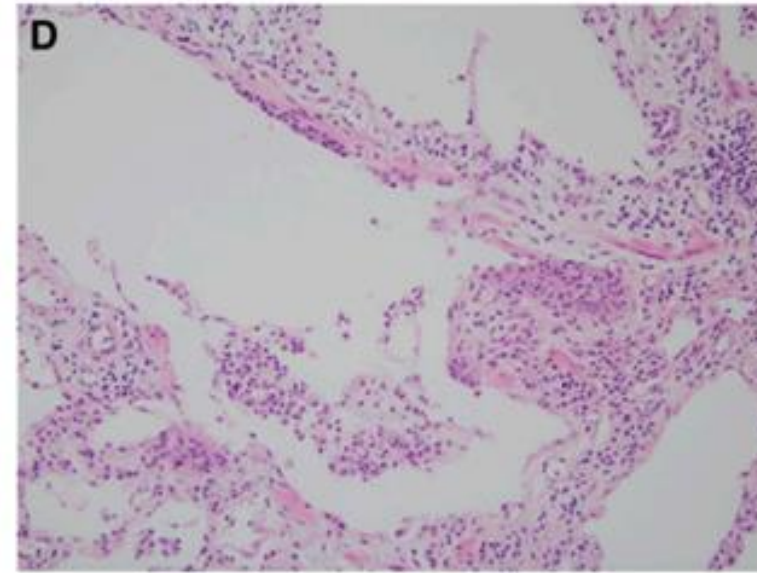
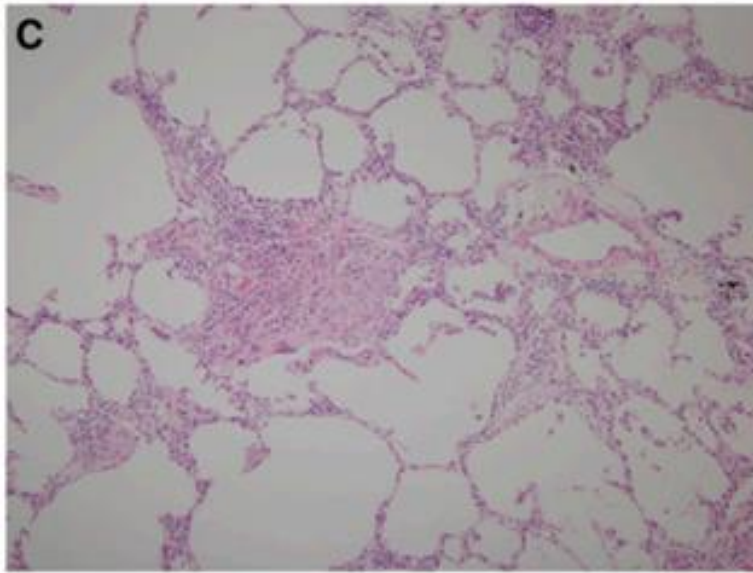
Animal Study – PGH: subacute inhalation



Animal Study – CMIT/MIT: chronic inhalation



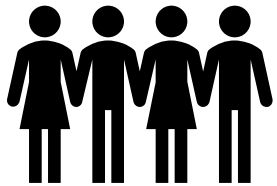
Human Histopathology: HD case



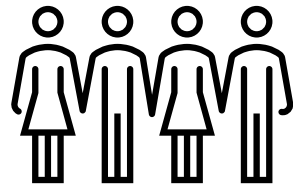
Evidence of possible mechanism

What is the process of HD diseases?

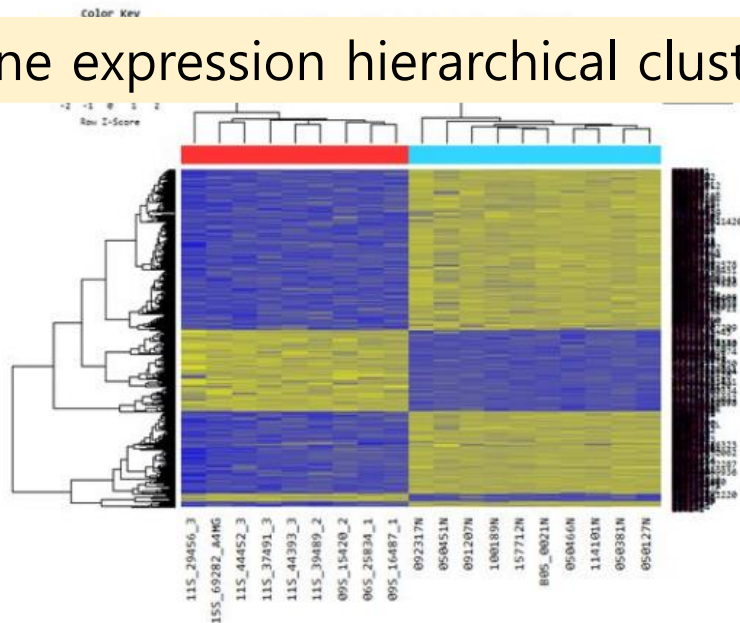
disease



control

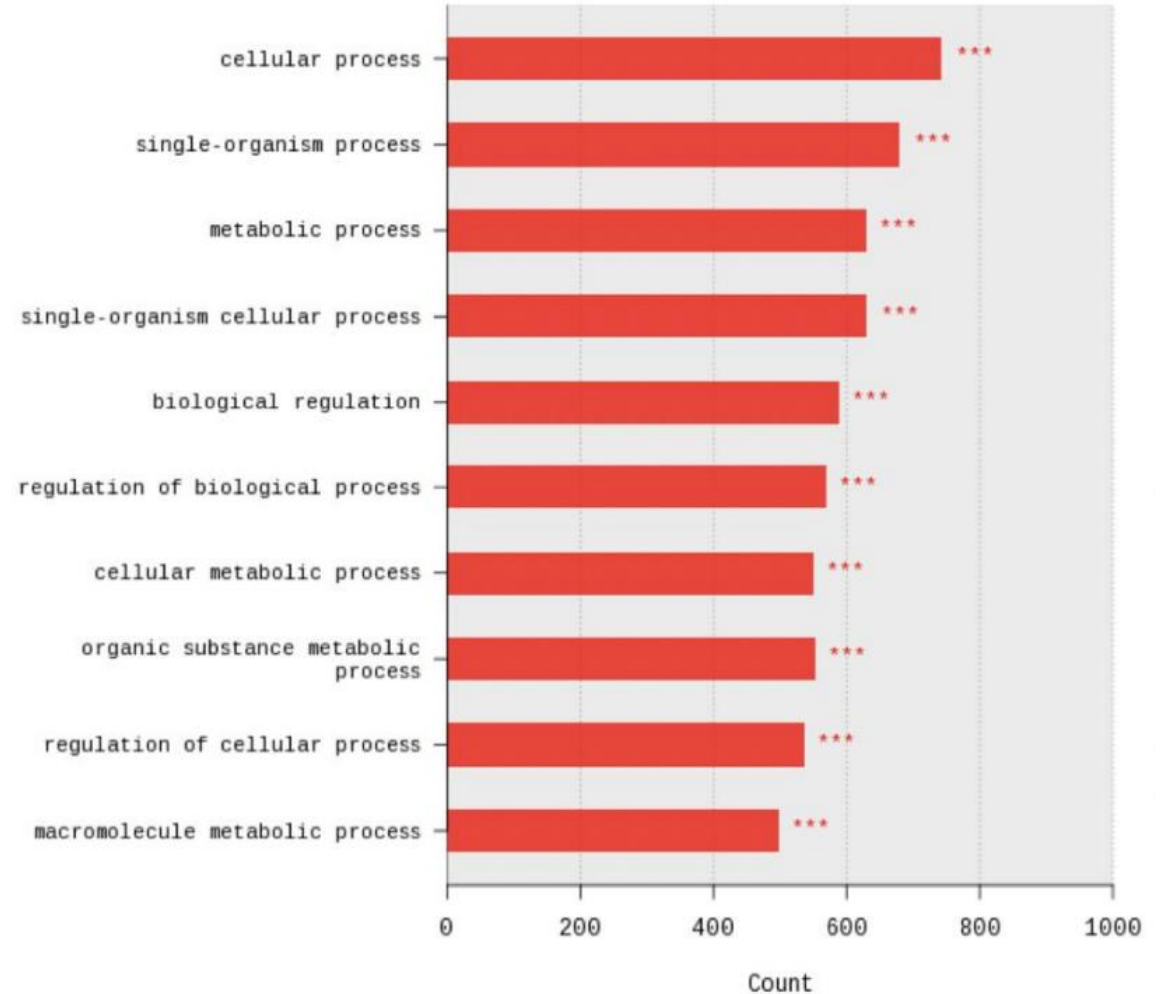


Gene expression hierarchical clustering

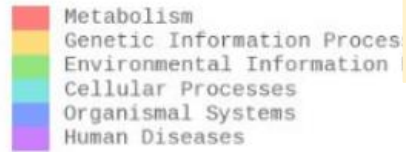


Biological Process

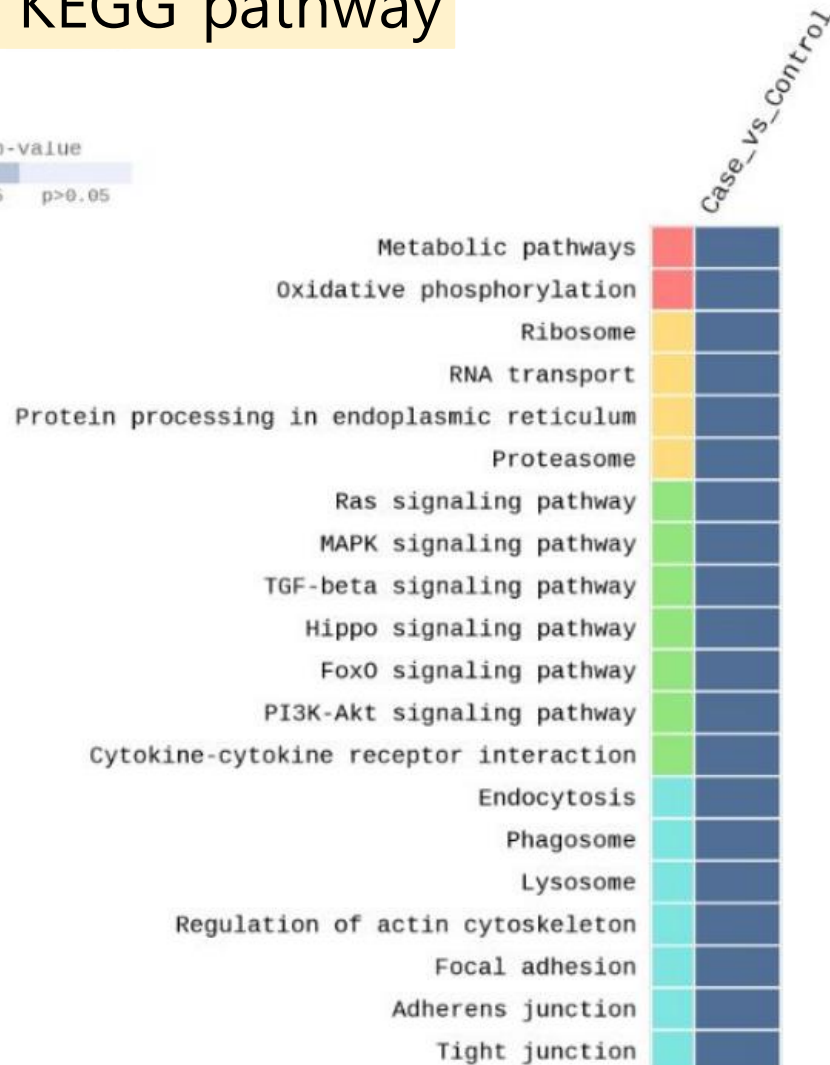
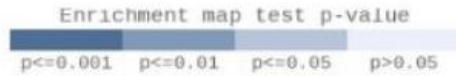
Top 10 Terms of GO Functional Analysis
PValue<0.05(*), 0.01(**), 0.001(***)



What is the process of HD diseases?



KEGG pathway



- TGF β signaling \rightarrow lung fibrosis
- Oxidative phosphorylation
 - \rightarrow Oxidative stress
 - \rightarrow Asthma, COPD, cancer?
- RAS and MAPK pathway
 - \rightarrow cell growth, differentiation, survival

Possible toxic mechanism of HD associated disease

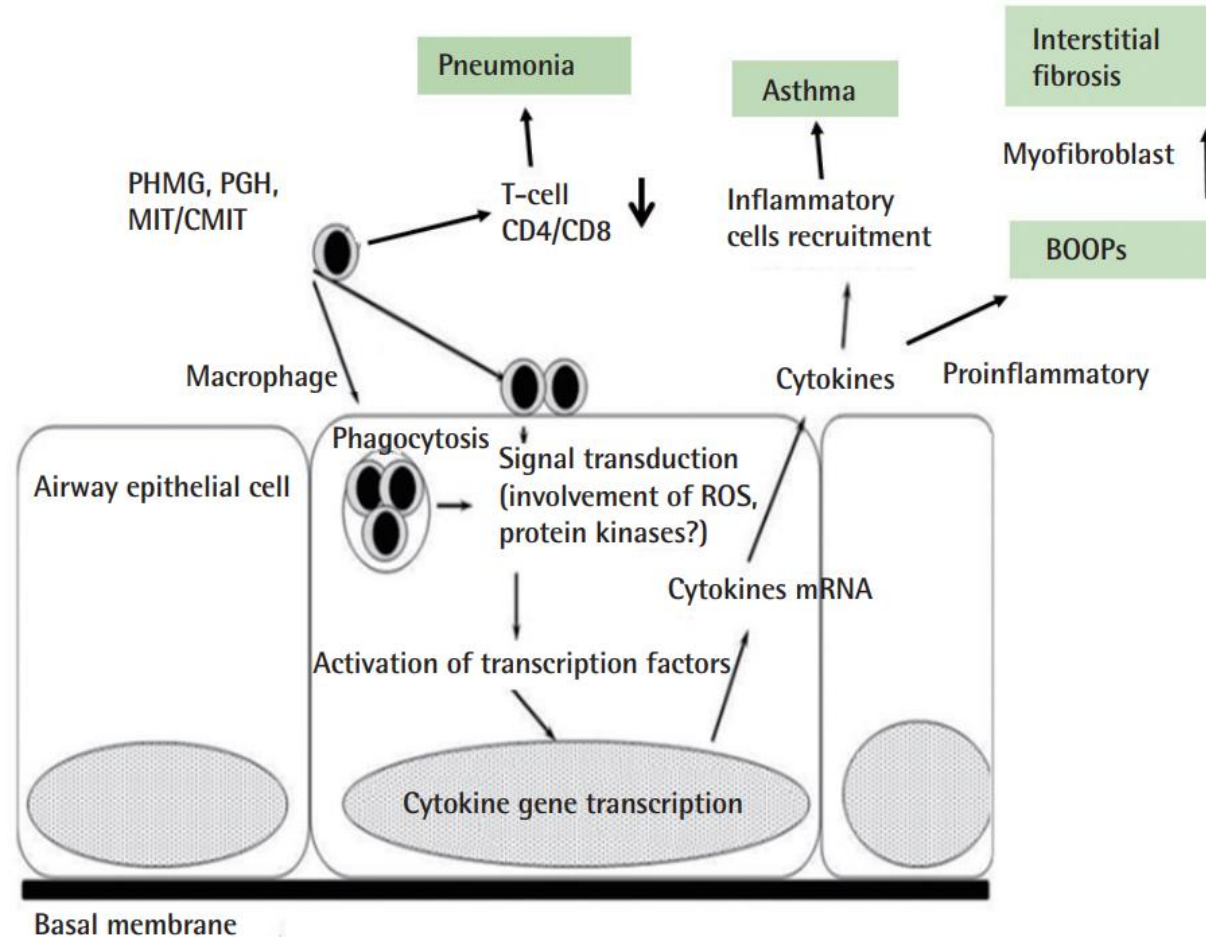
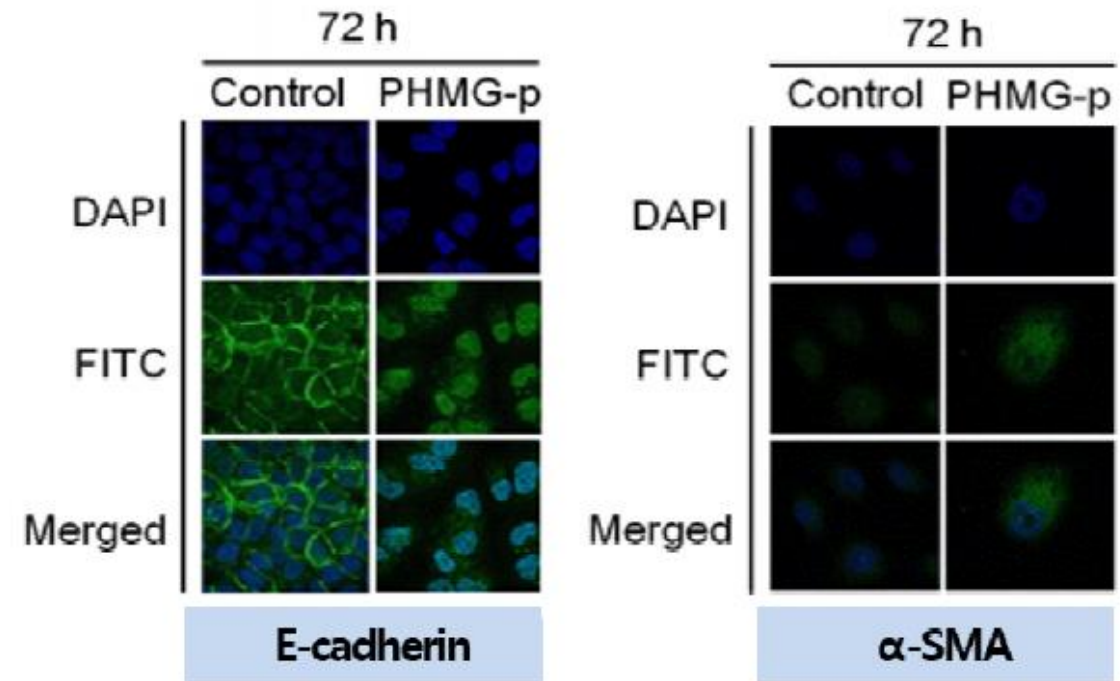
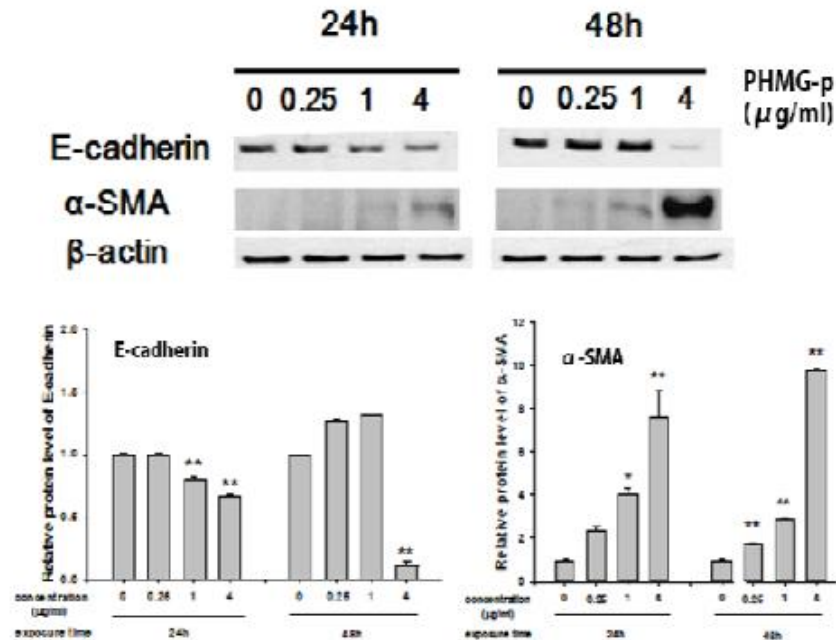


Figure 1. Polyhexamethylene guanidine phosphate, a humidifier disinfectant, induced cellular response: proinflammatory cytokines elevation and infiltration of immune cells into the lungs. PHMG, polyhexamethylene guanidine; PGH, oligo(2-[2-ethoxy]ethoxyethyl) guanidinium chloride; MIT, methylisothiazolinone; CMIT, chloromethylisothiazolinone; BOOPs, bronchiolitis obliterans and organizing pneumon; ROS, reactive oxygen species.

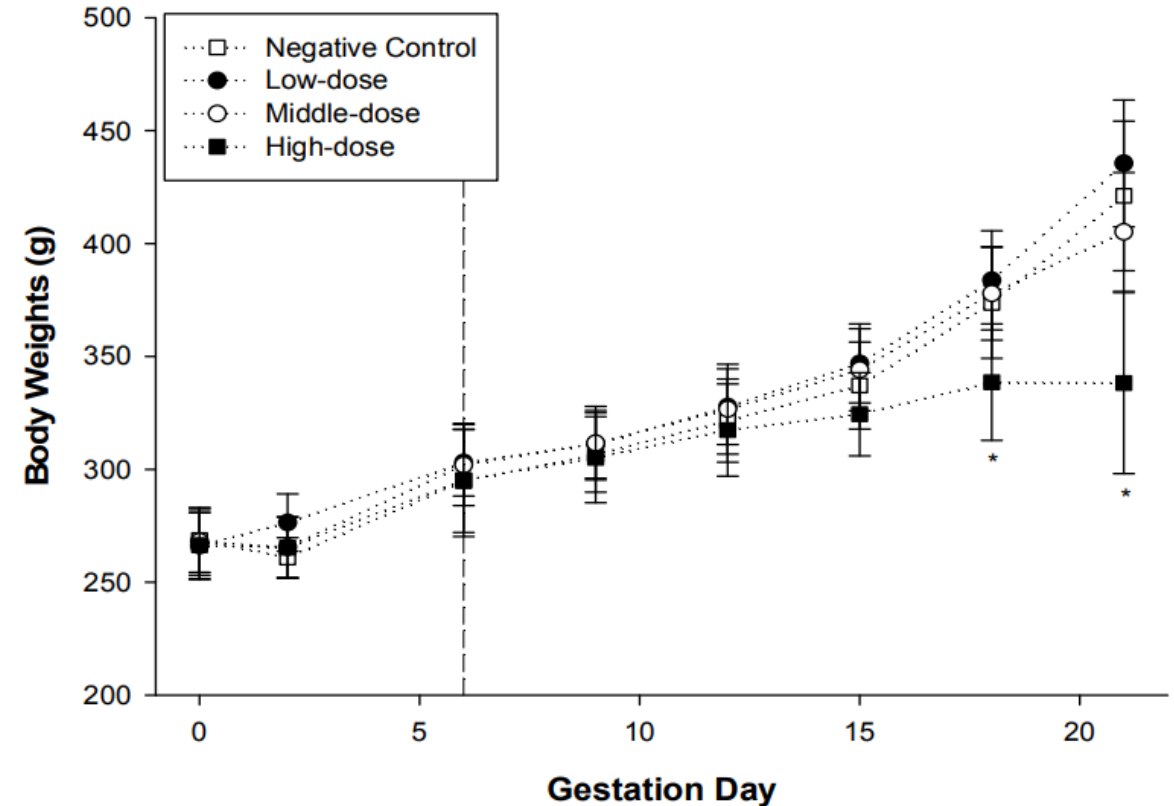
HD associated health problem: Lung fibrosis

- PHMG
 - ↓ E-cadherin, ↑ α -SMA
 - EMT modulator change
 - Toxicity to cell membrane

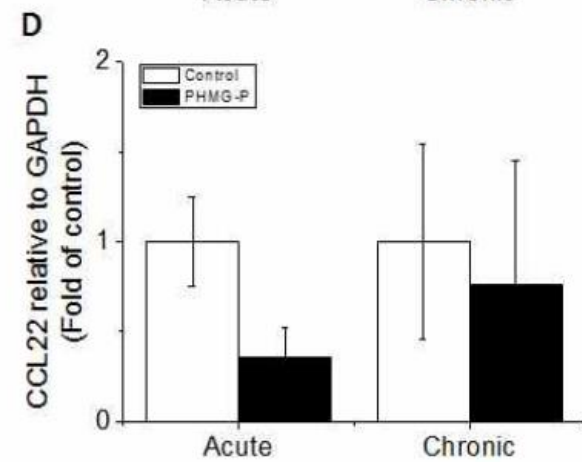
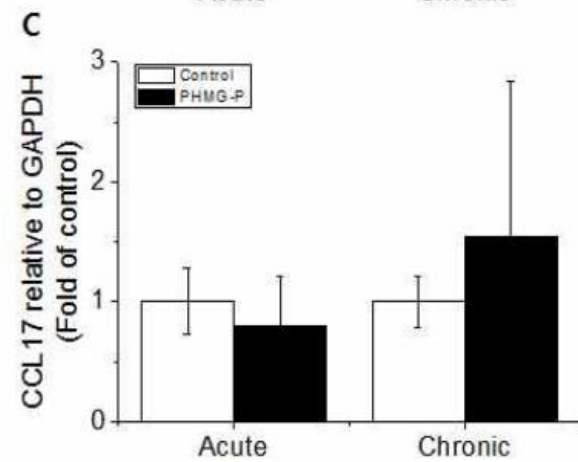
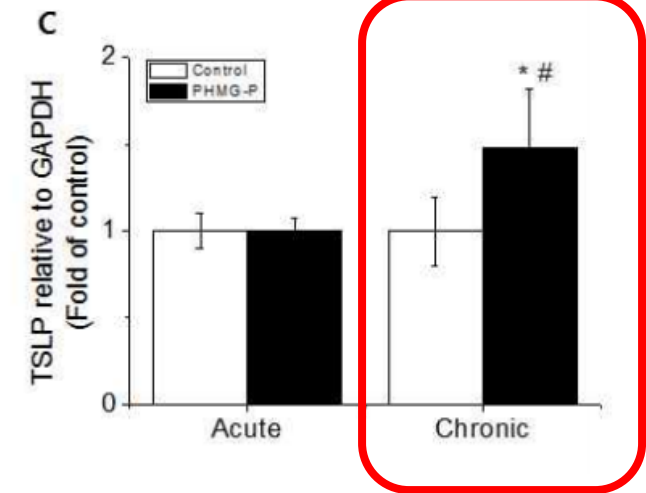
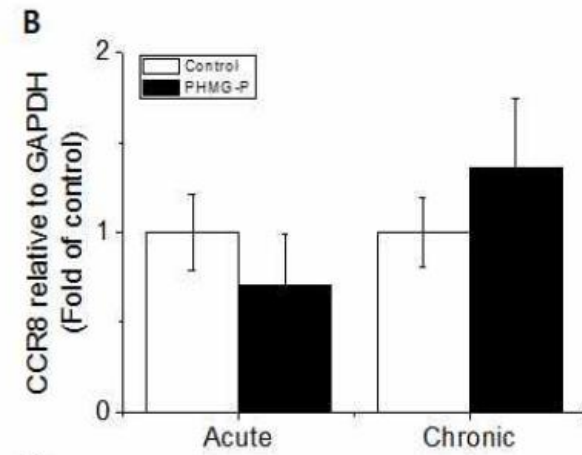
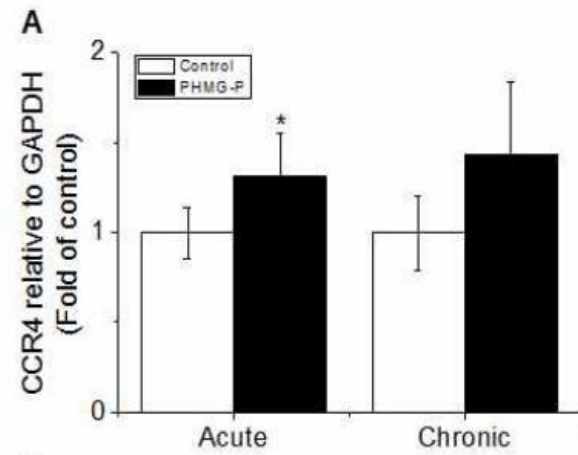
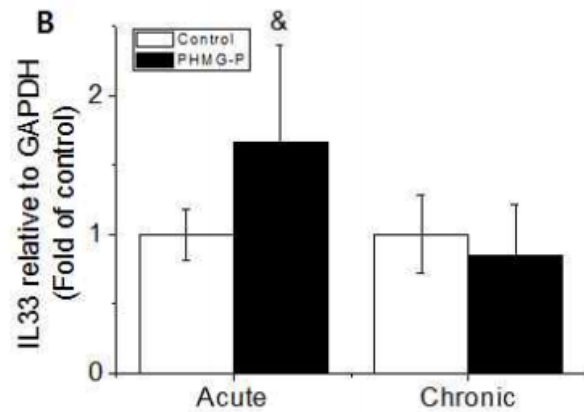
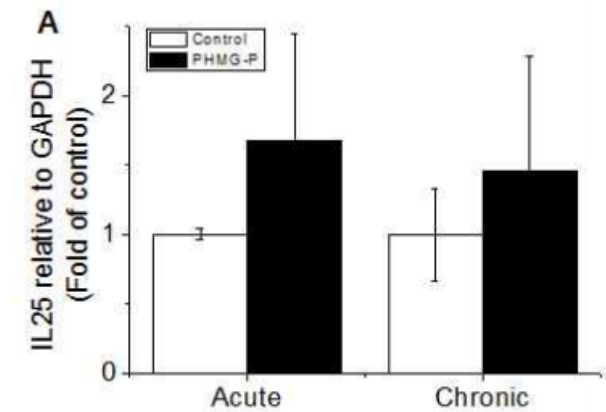


HD associated health problem: Fetal effects

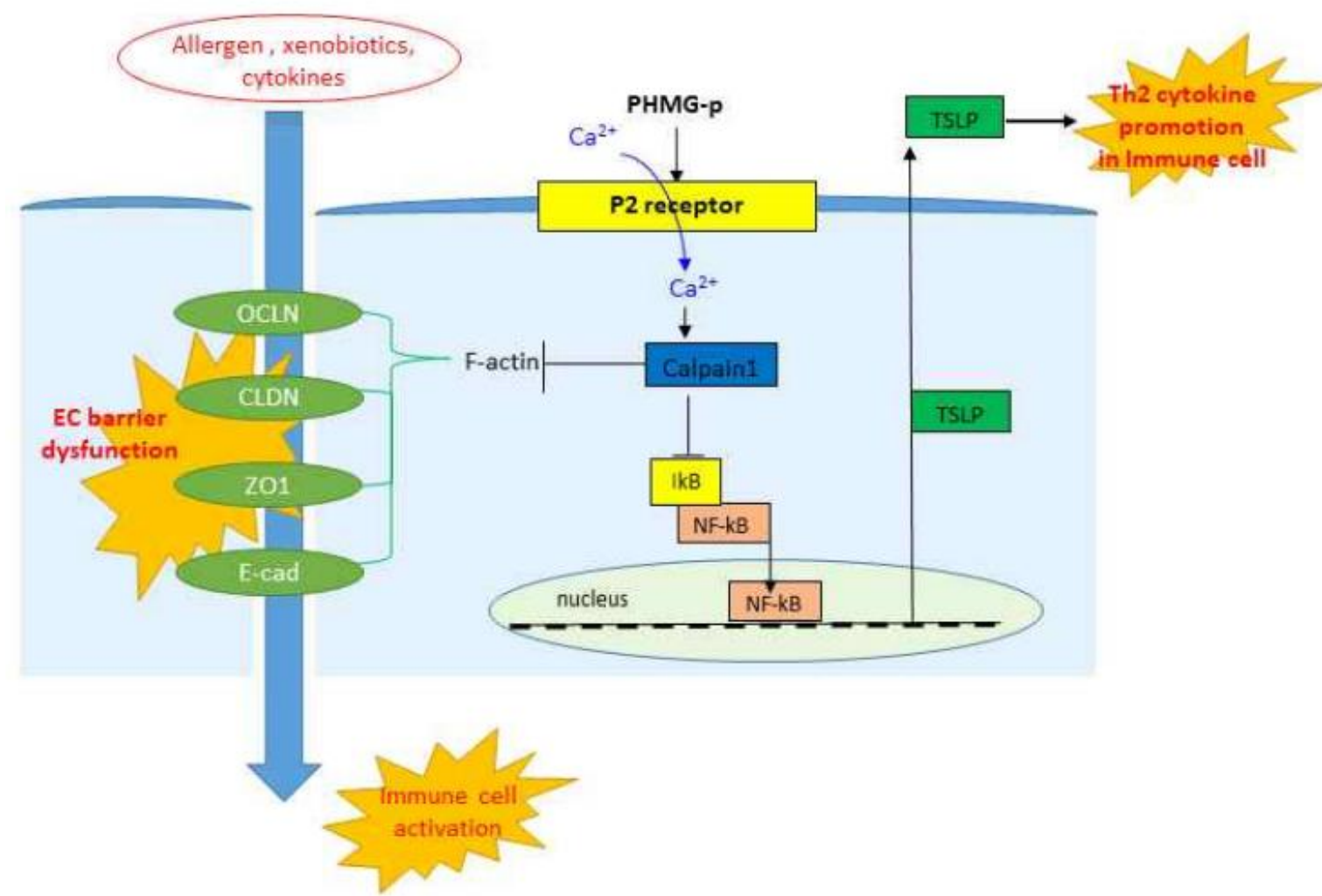
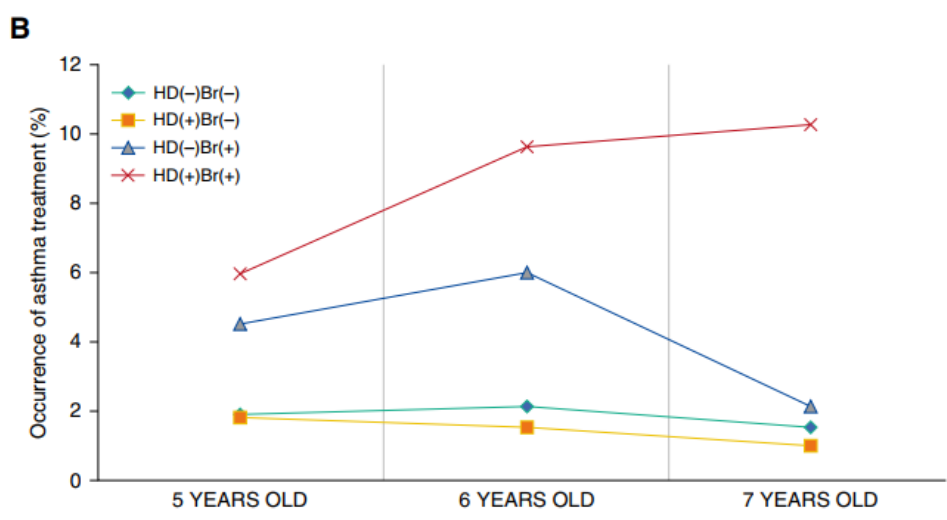
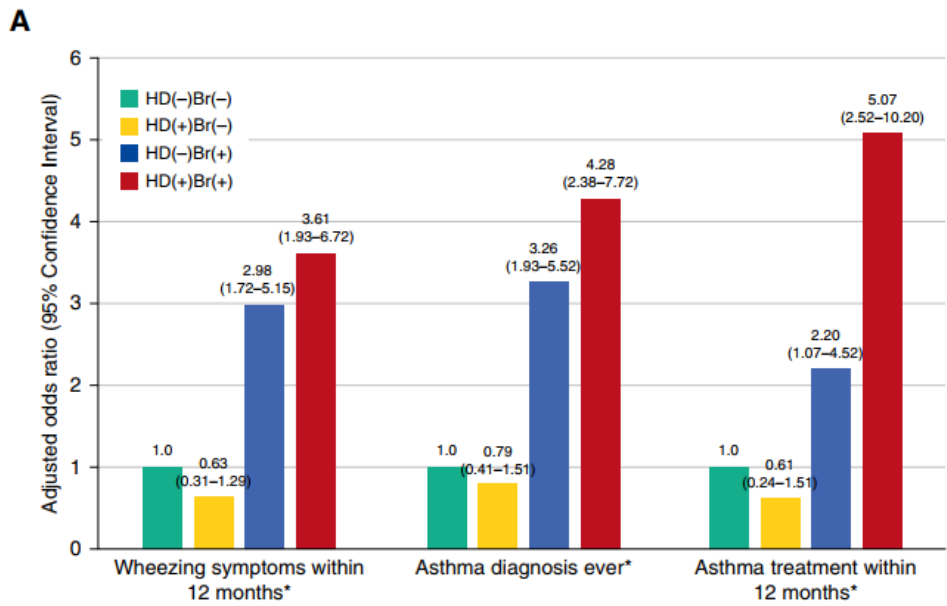
- Gene expression: MMP2 and ECM related gene
 - Methylation: CpG
 - Genotypic variation
 - Animal study
- : Fetal weight loss, delay of ossification,
Decreased birth weights



HD associated health problem: Asthma



HD associated health problem: Asthma



HD associated health problem: Non-pulmonary

- Rhinitis?
- Dermatitis?
- Bronchitis?
- Pneumonia?
- Hepatitis or Hepatopathy?
- Ocular?

→ not definite data

Epidemiologic approach of HD associated disease

표 19. 가습기 살균제 사용자의 병원진료 시 진단명(복수 응답)

진단명	N	%
호흡기	224	55.6
비염	131	32.5
천식	69	17.1
폐렴	29	7.2
기관지염	12	3.0
두통	5	1.2
폐암	4	1.0
안질환	3	0.7
신장질환	3	0.7
간질환	3	0.7
기타(뇌심혈관질환, 오한, 암, 혈소판 감소증, 심장병, 소화장애, 중이염 등)	25	6.2

Need of precise toxicologic data according to the suspicious disease

국정조
별, 연도 및 월별, 지역별 구분

그림 2. 노출계수와 용량-반응관계를 통한 추정 모식도

HD related disease: Big data analyses

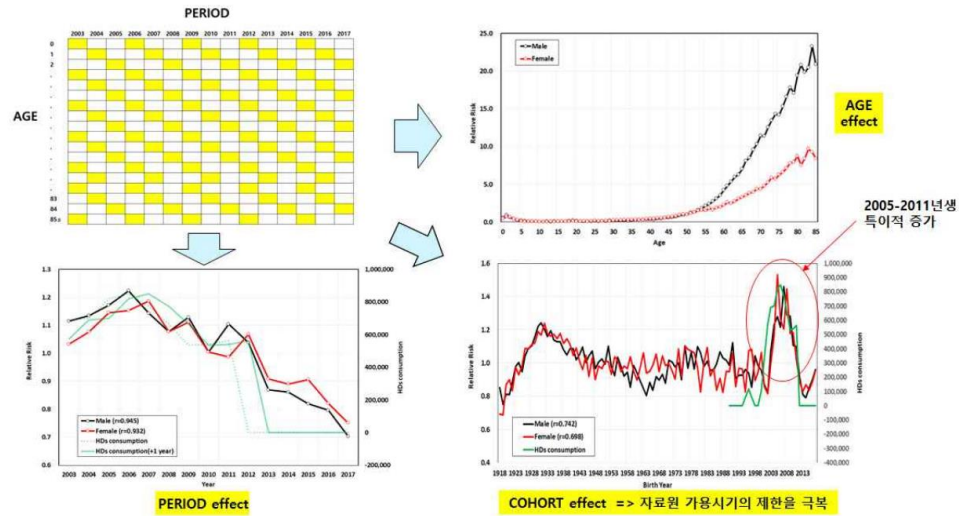


그림 2-20. APC 분석의 기본 개념



그림 2-42. 전후 비교분석 방법별 가슴기살균제 사용시기와 입원발생 측정시기

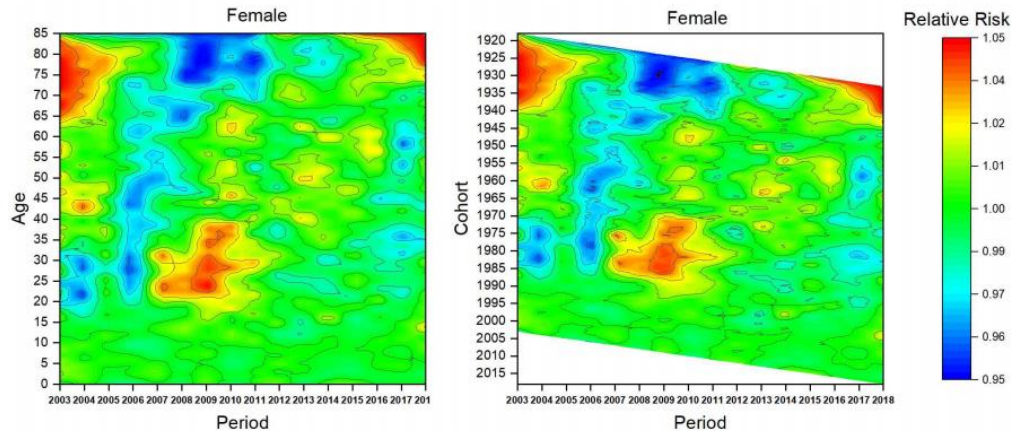


그림 2-30. 여성의 연령×연도별 및 출생년도×연도별 사망 DID 분석 예시

- Mixed effect model (age, period, cohort effect)
- Before and after
- Difference in difference

HD related disease: Big data analyses

표 3. 가슴기살균제 성분별 유의한 교차비와 비교기간(호흡기계)

	질병군	전체 사용자	PHMG/PGH 단독 사용자	CMIT/MIT 단독 사용자	기타성분 단독 사용자
호흡기	호흡기 결핵	4.16 (5년)	4.58 (3년)	-	-
	급성 인두염 및 급성 편도염	2.47 (5년)	-	-	-
	기타 급성 상기도 감염	3.55 (5년)	3.24 (5년)	-	-
	인플루엔자	10.13 (3년)	13.16 (3년)	-	-
	폐렴	7.39 (5년)	8.71 (3년)	4.18 (5년)	3.42 (5년)
	급성 기관지염 및 급성 세기관지염	4.57 (3년)	4.66 (3년)	-	-
	만성 부비동염	2.55 (5년)	3.72 (5년)	-	-
	기타 코 및 비동의 질환	2.05 (3년)	2.46 (3년)	5.36 (3년)	-
	기관지염, 폐기종 및 기타 만성폐색성 폐질환	3.48 (5년)	3.74 (5년)	8.74 (5년)	-
	천식	4.23 (3년)	5.10 (5년)	8.74 (5년)	-
	기관지확장증	5.31 (3년)	12.13 (3년)	-	-
	기타 호흡기계통의 질환	11.98 (3년)	11.94 (3년)	9.47 (1년)	8.79 (3년)
	기타 간질성폐질환	17.26 (5년)	20.40 (5년)	-	-

가습기살균제 피해구제 제도

Comprehensive decision of HD exposure correlation

Judgement of environmental exposure

Object evidence of purchase, Degree of exposure

Judgement of clinical possibility

Histopathology, Radiology, Clinical relationship

Comprehensive decision

```
graph LR; A[Judgement of environmental exposure] --- B[Object evidence of purchase, Degree of exposure]; C[Judgement of clinical possibility] --- D[Histopathology, Radiology, Clinical relationship]; B --- E[Comprehensive decision]; D --- E;
```

Currently,

(2021. 08. 20기준)

● 신청·접수 현황

(단위 : 명)

구분	계	생존	사망	소관부처	비고
합계	7,535	5,848	1,687	-	-
1차 피해조사 (11.11~13.6)	361	247	114	보건복지부 질병관리본부	판정완료
2차 피해조사 (14.4~14.10)	169	120	49	환경부, 환기원	판정완료
3차 피해조사 (15.2~15.12)	752	658	94	환경부, 환기원	판정완료
4차 피해조사 (16.4.25~20.09.24)	5,598	4,254	1,344	환경부, 환기원	판정 중
5차 피해조사 (20.09.25~)	655	569	86	환경부, 환기원	접수 · 판정 중

피해구제제도 소개

- **건강피해**

- 독성 화학물질을 함유한 가습기살균제에 노출됨으로써 발생하거나 악화된 생명 또는 건강상의 피해(후유증 포함)

- **가습기살균제 피해자**

- 독성 화학물질을 함유한 가습기살균제에 의하여 사망하거나 건강피해를 입은 사람으로서 제10조제2항에 따라 환경부장관에게 구제급여 지급결정을 받은 사람

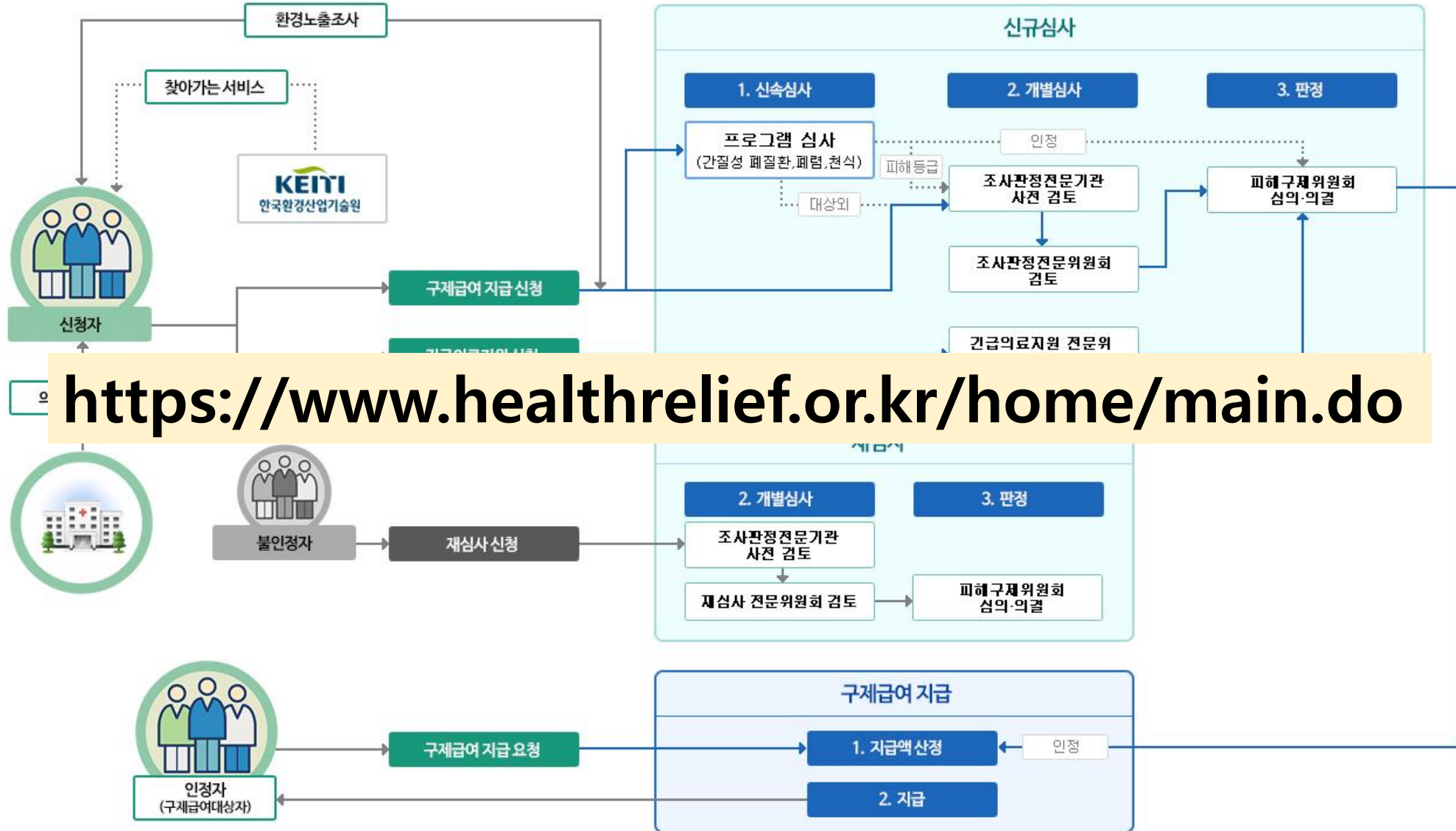
- **가습기살균제 노출확인자**

- 가습기살균제 사용 환경, 사용 기간 및 사용 제품 등을 조사하는 환경노출조사를 거쳐 환경부령으로 정하는 바에 따라 가습기살균제에 노출된 사실이 확인된 사람

- **구제급여**

- 가습기살균제 피해자 또는 유족에게 요양급여, 요양생활수당, 장의비, 간병비, 장해급여, 특별유족조위금, 특별장의비, 구제급여조정금 등을 지원

피해구제제도 소개 - 가슴기살균제 피해인정 및 급여지급 흐름도



<https://www.healthrelief.or.kr/home/main.do>

Future direction of academic study

- Long-term monitoring analysis of victims by Humidifier Disinfectant (HD)
 - Activation of Health damage monitoring
- Development of evidence of HD associated disease
 - Systemic approach, Psychological approach
- Pulmonary rehabilitation
 - Return to normal life of HD victims
- Biomarker development for monitoring or assessing HD related disease

Thank you