Supplemental Data

Figure S1

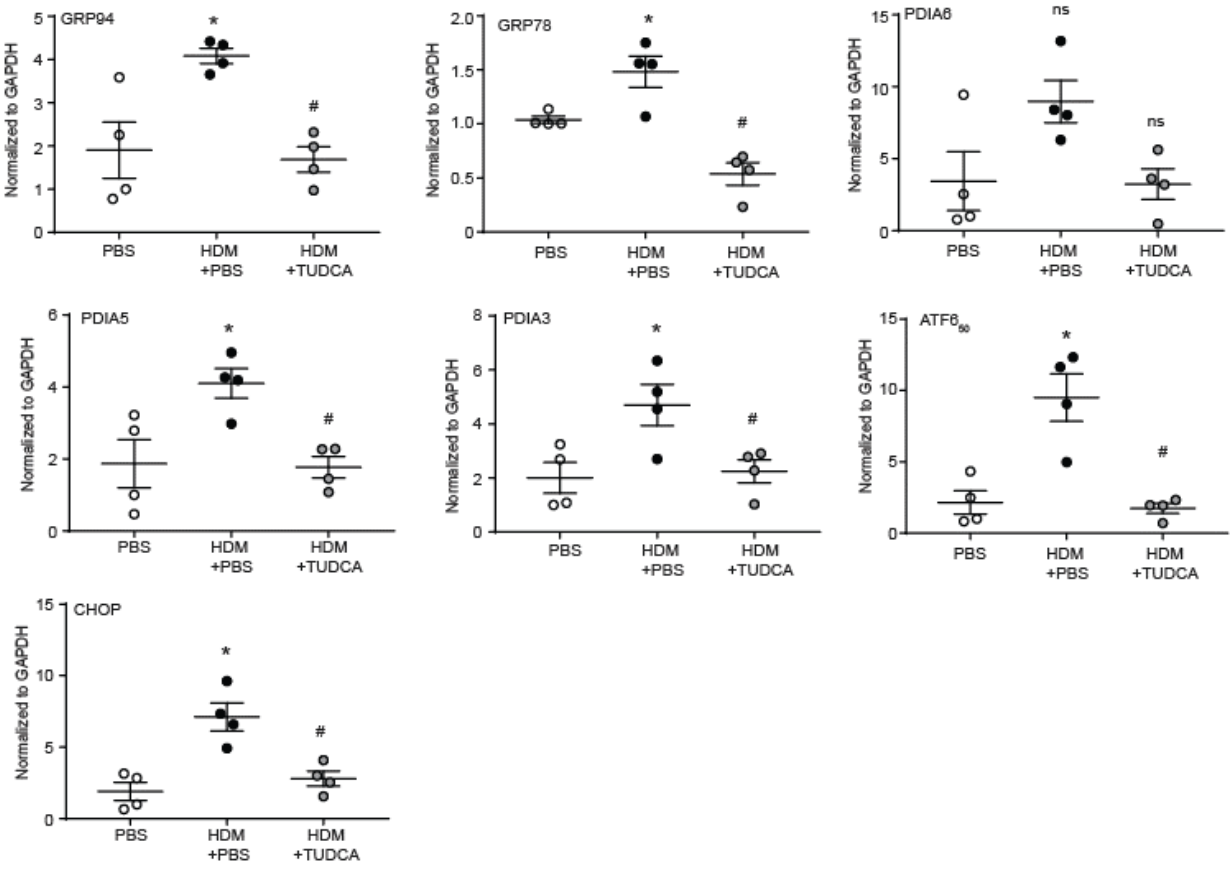


Figure S1. TUDCA attenuates HDM-induced UPR. Densitometry of bands from Western blots from figure 1L. One-way ANOVA, Tukey's post hoc test. *$p<0.05$ vs PBS vehicle control, #$p<0.05$ vs HDM positive control. n=4 mice/group. ns=not significant. Error bars represent ± SEM.

Figure S2

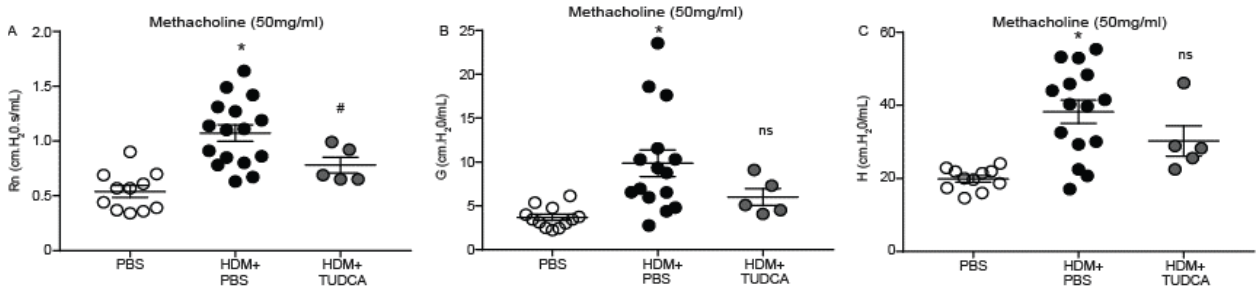


Figure S2. Absolute values for AHR measurement represented in figure 2 A, B and C. One-way ANOVA, Tukey's post hoc test.*$p<0.05$ vs PBS group; $^{\#}p<0.05$ vs HDM group (mice removed due to non-compliance to COD value Rn, G and H; HDM+TUDCA n=2). ns=not significant. Error bars represent ± SEM.

Figure S3

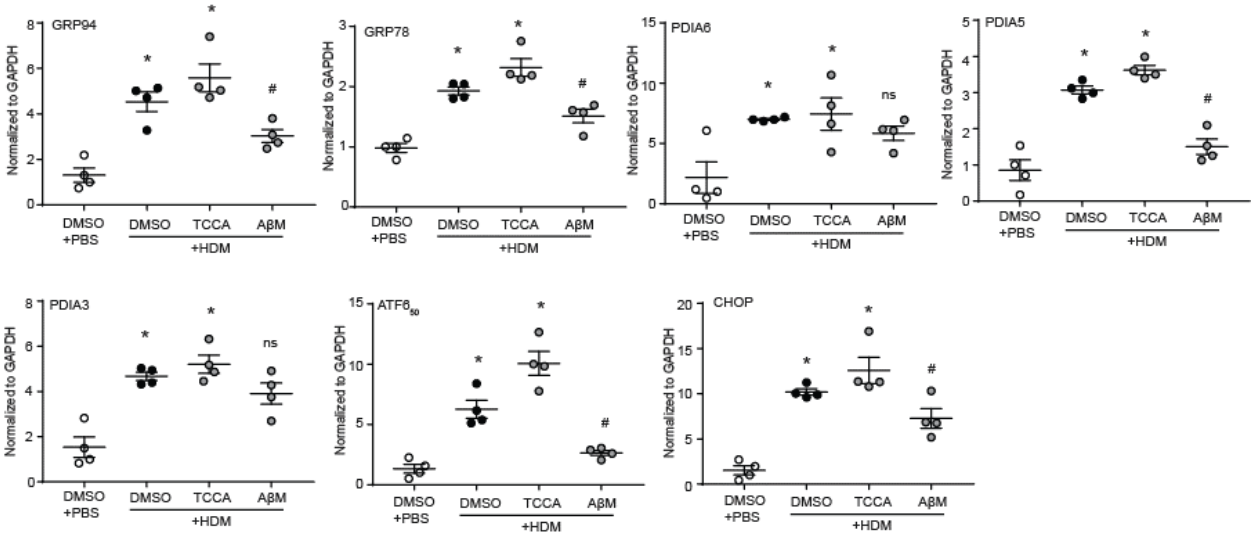


Figure S3. CBAs attenuate the HDM-induced UPR. Densitometry of bands from Western blots from figure 3M. One-way ANOVA, Tukey's post hoc test. *p<0.05 vs DMSO+PBS control. #p<0.05 vs DMSO+HDM control. n=4 mice/group. ns=not significant. Error bars represent ± SEM.

Figure S4

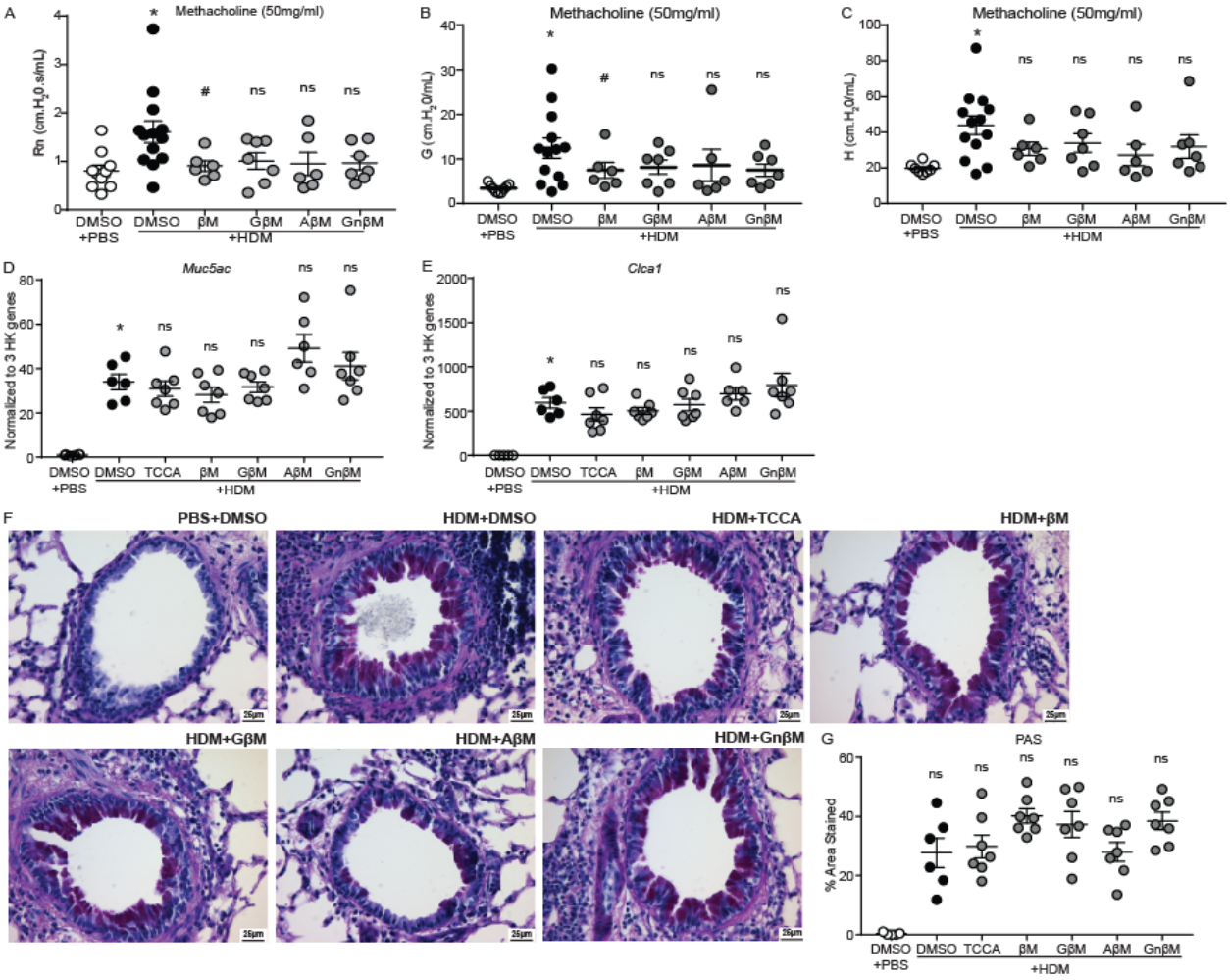


Figure S4. Additional CBAs AHR and HDM-induced mucus production. (A-C) Absolute values for AHR measurement represented in figure 4 A, B and C. One-way ANOVA, One-way ANOVA, Tukey's post hoc test for Rn and Kruskal-Wallis, two-stage linear step-up procedure of Benjamini, Krieger and Yekutiel post hoc test for G and H. *p<0.05 vs PBS group; #p<0.05 vs HDM group *p<0.05 vs PBS+DMSO mice, #p<0.05 vs HDM+DMSO mice. PBS+DMSO n=10, HDM+DMSO n=13, βM/GβM/AβM/GnβM+HDM n=7 from 2 experiments (mice removed due to non-compliance to COD value Rn/G/H βM: n=1, AβM: n=1)**. (D & E)** *Muc5ac* and *Clca1* expression in the lungs assessed by RT-qPCR. n=6-7 mice. (**F)** Representative images of PAS stained lungs. **(G)** Quantification of PAS stained lungs. n=4-7 mice. One-way ANOVA, Tukey's post hoc test. *p<0.05 vs DMSO+PBS mice, #p<0.05 vs DMSO+HDM mice. Data are from 2 experiments. HK= housekeeping. ns=not significant. Error bars represent ± SEM.

Table S1

	Healthy control subjects	Asthmatic patients	P value
Sample size	10	20	
Age (y)	34 ± 7	32 ± 13	0.57
BMI (kg/m²)	26 ± 3	28 ± 6	0.13
Sex (% female)	40	50	0.6
Ethnicity			
Hispanic	2	5	
Black	1	1	
Islander	0	1	
Native American	1	1	
Asian	2	4	
Caucasian	4	8	
FEV_1 (% predicted)	98 ± 11	85 ± 13	0.009
Δ FEV_1 with albuterol (% baseline)	5.4 ± 4.6	14.8 ± 9.3	0.001
FEV_1/FVC ratio	0.75 ± 0.06	0.73 ± 0.08	0.46
Methacholine PC_{20} (mg/ml)	>10	0.6 (0.1-4.4)	<0.0001
IgE (IU/ml)	28 (9-357)	232 (21-6556)	0.007
Blood eosinophils (x 10^9/L)	0.09 (0.05-0.30)	0.32 (0.05-0.75)	0.003
FeNO	15 (9-34)	49 (14-158)	0.008
Positive skin prick response (no.)	1 (1-5)	4 (1-9)	0.017

Table S1. Profiles and baseline characteristics of human subjects. Values are reported as means ± SD or median (range). All data are from the baseline visit, except spirometric data, which are reported from visit 2 (immediately before initiation of inhaled corticosteroids and pre-bronchodilator). *P* values are based on the Welch *t* test (mean ± SD), the χ^2 test for proportions (sex), or the Wilcoxon rank sum test (median [range]). FEV_1= forced expiratory volume in 1 second; FVC= forced vital capacity; FeNO= fraction of exhaled nitric oxide.

Table S2. ELISA kits used in this manuscript.

ELISA	Company	Catalog Number
KC	R&D	DY453
IL33	R&D	DY3626
IL25	R&D	DY1399
IL17	Invitrogen eBioscience	50-173-77
IL13	Invitrogen eBioscience	50-172-61
IL6	R&D	DY406
IL5	R&D	DY405
IL4	Invitrogen eBioscience	50-112-8931
Eotaxin	R&D	DY420
CCL20	R&D	DY760
IgE	Invitrogen	88-50460-88

Table S2. Details of the ELISA kits used in this study.

Table S3. Antibodies used in this manuscript

Serial No.	Antibody	Company	Catalog No.
1	GRP94	Enzo LifeSciences	ADI-SPA-850-F
2	GRP78	Abcam	ab21685
3	PDIA6	Abcam	ab83456
4	PDIA5	Novus Biologicals	NBP1-92252
5	PDIA3	LifeSpan Bioscience	LS-B9768
6	ATF6$_{50}$	Invitrogen	PA5-20216
7	CHOP	Novus Biologicals	NB600-1335
8	GAPDH	BioLegend	919501
9	IRE1α	abcam	ab37073
10	ATF6α	abcam	ab62576
11	PERK	CST	3192S

Table S3. Details of the antibodies used in this study.

Table S4. Primers sets to detect mouse mRNAs in this study

Mouse	
Genes	Primer sequences
Gpbar1	FW 5'-GTCAGCTCCCTGTTCTTTGC-3'
	RV 5'-CAGGAGGCCATAAACTTCCA-3'
Nr1h4	FW 5'-GGCCTCTGGGTACCACTACA-3'
	RV 5'-ACATCCCCATCTCTTTGCAC-3'
Nos3	FW 5'-GGGCTGGGTTTAGGGCTG-3'
	RV 5'-TACAGGGCCCATCCTGCT-3'
Dio2	FW 5'-AGACTTGCTGATCACCCTGC-3'
	RV 5'-CACCCAGTTTAACCTGTTTGTAGG-3'
Abcb4	FW 5'-GATGGATCTTGAGGCAGCGA-3'
	RV 5'-TTCTCTGCCTTGGTTGCTGA-3'
Abcc2	FW 5'-GATGGACGAATTCTGCAACTCT-3'
	RV 5'-ACACACAACGAACACCTGCT-3
Nr0b2	FW 5'-CGAATCCTCCTCATGGCCTC-3'
	RV 5'-TCCCATGATAGGGCGGAAGA-3'
Muc5ac	FW 5'-CAGTGAATTCTGGAGGCCAACAAGGTAGAG-3'
	RV 5'-CTAAGCTTAGATCTGGTTGGGACAGCAGC-3'
Clca1	FW 5'-ACTAAGGTGGCCTACCTCCAA-3'
	RV 5'-GGAGGTGACAGTCAAGGTGAGA-3'
Gapdh	FW 5'-CGACCACTTTGTCAAGCTCA-3'
	RV 5'-AGGGGTCTACATGGCAACTG-3'
Pp1	FW 5'-TTTTCATCTGCACTGCCAAG-3'
	RV 5'-TCGAGTTGTCCACAGTCAGC-3'
Rp2	FW 5'-TTGCCAGCAATTTCGTGTGA-3'
	RV 5'-CCAGTTGAGCTCTCCTGACA-3'

Table S4. Primer sequences. Mouse lung primer sequences. 3 housekeeping (HK) genes (*Gapdh*, *Pp1* & *Rp2*).

Table S5 Primers and probe sets to detect human mRNAs in this study

Primer and probe sets for human transcripts

PDIA4

Outer forward	AAACTGAAGCCAGTCATCAAATCC
Outer reverse	CCATCACAATGGAGTCAAAGGTCT
Inner forward	TCATCAAATCCCAGCCAGTG
Probe 5'-FAM 3'BHQ-1	CAAGAACAACAAGGGACCCGTCAAGG
Inner reverse	AAAGGTCTTTCCCACCACGA

PDIA5

Outer forward	AACCGAGCTGTGACATTTAAGTCC
Outer reverse	GGCTTCTCTTCCTTCTTCAGGA
Inner forward	CCACTGTGGGAGGAAGATCC
Probe 5'-FAM 3'BHQ-1	TCAAGGTGGACAACATCTTTGGCTCCA
Inner reverse	CAGGAGCCGTCTGAAGTCCT

PDIA6

Outer forward	GTTCTTCTGAAGTTGGCAGACAAA
Outer reverse	AAATTTCATCTTGCGTGCATTG
Inner forward	GCTGTGGACAGAAGCTGGAG
Probe 5'-FAM 3'BHQ-1	CCCAACGCGGTCTCAAGTTCAGACTG
Inner reverse	GGGTACCCAAACCCTCCAAT

HSPA5

Outer forward	AAGACAGCACAGACAGATTGACCT
Outer reverse	ACAGCGCAATTTCCGACTTG
Inner forward	GGTGTTTCGCGAGTGTGAGA
Probe 5'-FAM 3'BHQ-1	TACAGGCCGCGGCGCTTCC
Inner reverse	GCGAAGGGCAGGTCTAGAAA

RABAC1

Outer forward	TTACATTCTCTATCTGCGCACCTT
Outer reverse	GGGAAGGAGATGCCTCCAG
Inner forward	TCCAAGCTTGTGCTCTTTGG
Probe 5'-FAM 3'BHQ-1	ATGCGCTGGGCTCACCTCTCG
Inner reverse	CCTCCAGCCAGAGCATACTG

EDEM1

Outer forward	CAGCTACTGCTATGGTTTCAGGAG
Outer reverse	TTACAGGATGAAAGGCAAAGACTG
Inner forward	TGGTTTCAGGAGGCCTGTTT
Probe 5'-FAM 3'BHQ-1	TCACCACGGTCTCACCATGTGGC
Inner reverse	ACTGGCCAAGCAATTTCCAT

COPE

Outer forward	CATCCCTTCATCAAGGAGTACCAG
Outer reverse	CTCTGTCCTGGCTTCATGGTC
Inner forward	ACGACTTTGACAGGCTGGTG
Probe 5'-FAM 3'BHQ-1	TACGCTCCCAGCGCCTGAGGC
Inner reverse	CATGGTCCTGACAGCTCTGG

TXN

Outer forward	TTTGGTGCTTTGGATCCATTT
Outer reverse	CAAGGCTTCCTGAAAAGCAGTC
Inner forward	CCATTTCCATCGGTCCTTACA
Probe 5'-FAM 3'BHQ-1	CGCTCGTCAGACTCCAGCAGCCA
Inner reverse	GCTCTCGATCTGCTTCACCAT

CREB3

Outer forward	TGCTATGTACTCCTCTGACACAAGG
Outer reverse	CTGTCTTTCGGCACTTCTGACTG
Inner forward	CCAGCTGAGCATGGAGTGTT
Probe 5'-FAM 3'BHQ-1	CCCGCCAGCTTCGTGCCCT
Inner reverse	TCCAGCTGGTAAGGGTCCTC

ERP44

Outer forward	AAACTGCACAGAGAATTCCATCAT
Outer reverse	ATTCACTGGGTGCTAGTTTCTGG
Inner forward	CATCATGGACCTGACCCAACT
Probe 5'-FAM 3'BHQ-1	TTGCTACATCTTGGGCTTGCTCTCCTG
Inner reverse	GGAAGGAGCTCTCAGGTGGA

XBP1

Outer forward	ACCTGTAGAAGATGACCTCGTTCC
Outer reverse	AAGCAGAGAGGACATGTCACTGAA
Inner forward	CCGGAGCTGGGTATCTCAAA
Probe 5'-FAM 3'BHQ-1	ATCCAGCCACTGCCCAAAGCCA
Inner reverse	GCATCCAGTAGGCAGGAAGA

House Keeping Genes

PPIA

Outer forward	ATGAGAACTTCATCCTAAAGCATACG
Outer reverse	TTGGCAGTGCAGATGAAAAACT
Inner forward	ACGGGTCCTGGCATCTTGT
Probe 5'-FAM 3'BHQ-1	ATGGCAAATGCTGGACCCAACACA
Inner reverse	GCAGATGAAAAACTGGGAACCA

RPL13A

Outer forward	GGACCGTGCGAGGTATGCT
Outer reverse	TTCAGACGCACGACCTTGAG
Inner forward	TATGCTGCCCCACAAAACC
Probe 5'-FAM 3'BHQ-1	CAGAGCGGCCTGGCCTCGCT
Inner reverse	TGCCGTCAAACACCTTGAGA

EEF1A1

Outer forward	TGCTAACATGCCTTGGTTCAAG
Outer reverse	TTGGACGAGTTGGTGGTAGGAT
Inner forward	CCTTGGTTCAAGGGATGGAA
Probe 5'-FAM 3'BHQ-1	CACTGGCATTGCCATCCTTACGGG
Inner reverse	GCCTCAAGCAGCGTGGTT

Table S5 Additional human primer and probe sets for human transcripts. Primer and probe sets for human transcripts used in experiments with human bronchial brushings from UCSF.