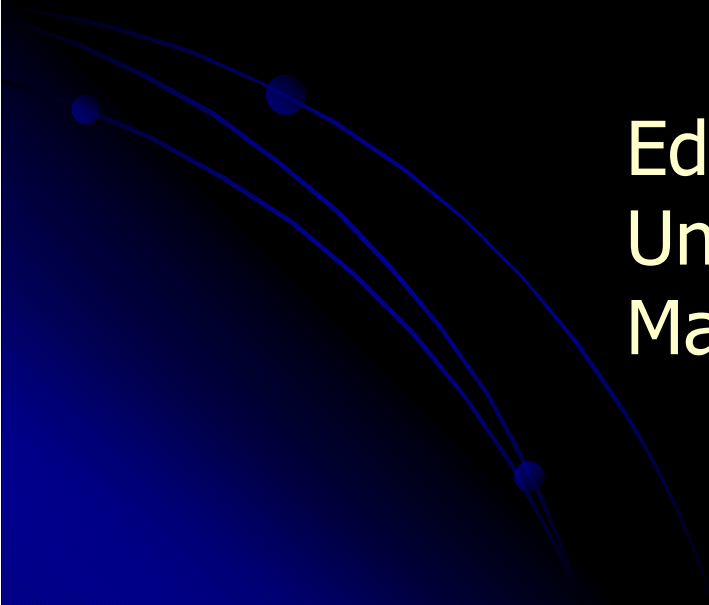
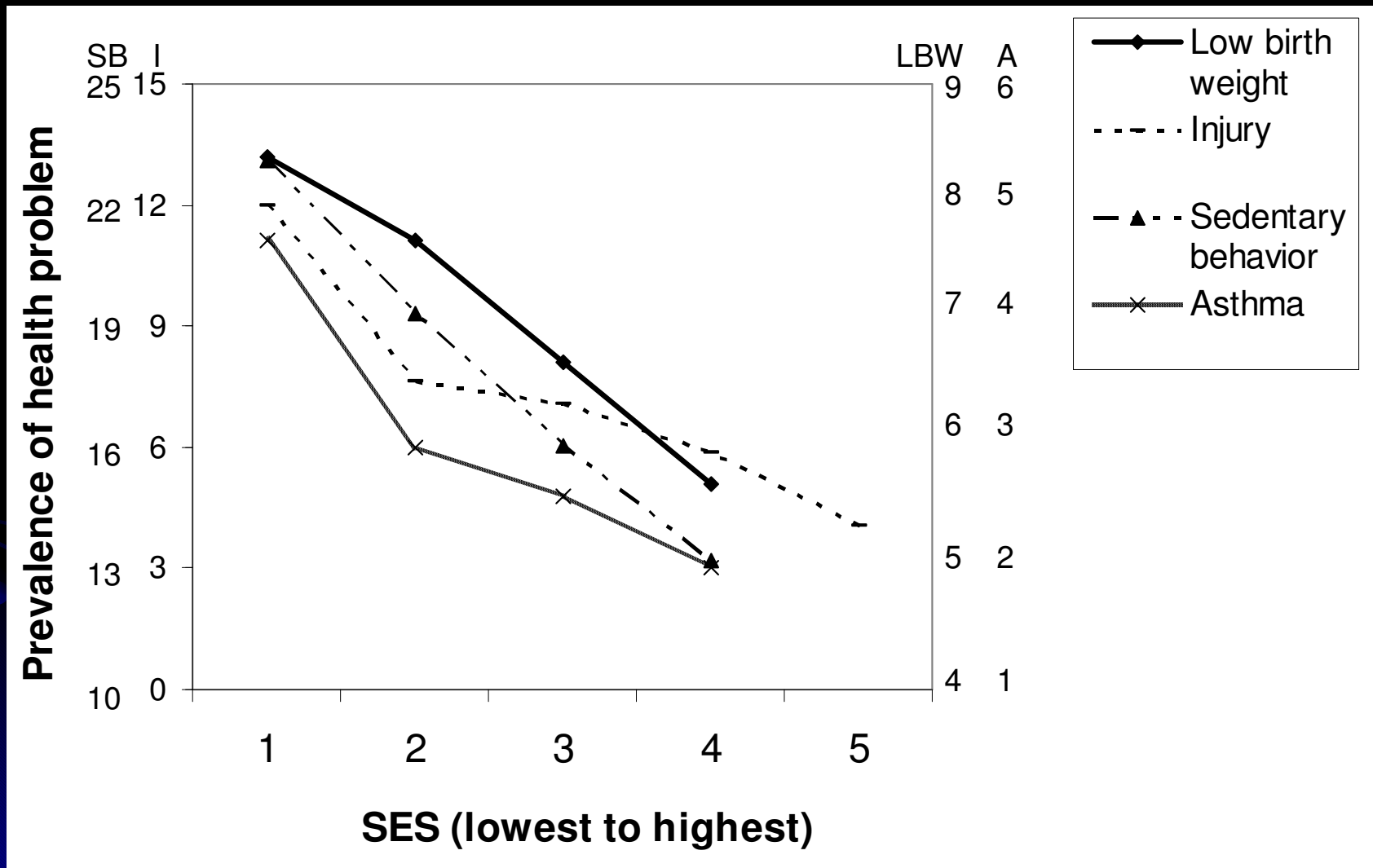


# How Socioeconomic Status Affects Health in Children



Edith Chen, Ph.D.  
University of British Columbia  
March 2009

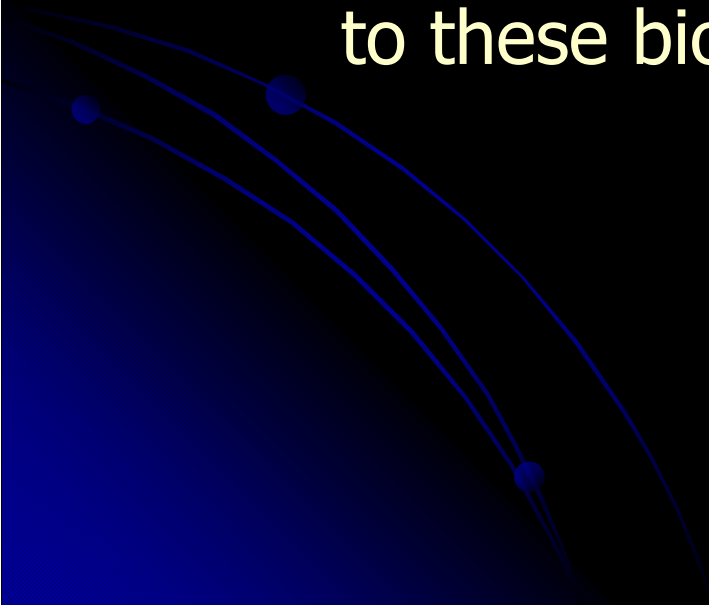
# SES & Childhood Health



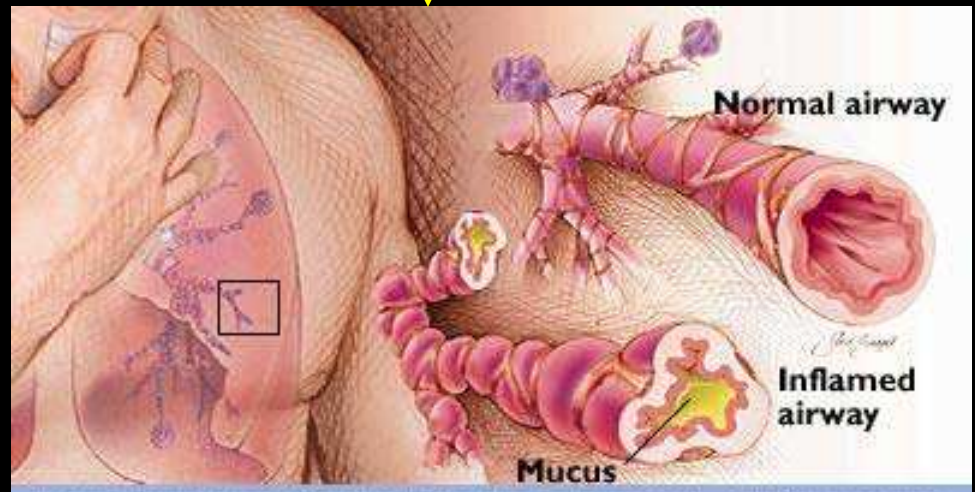
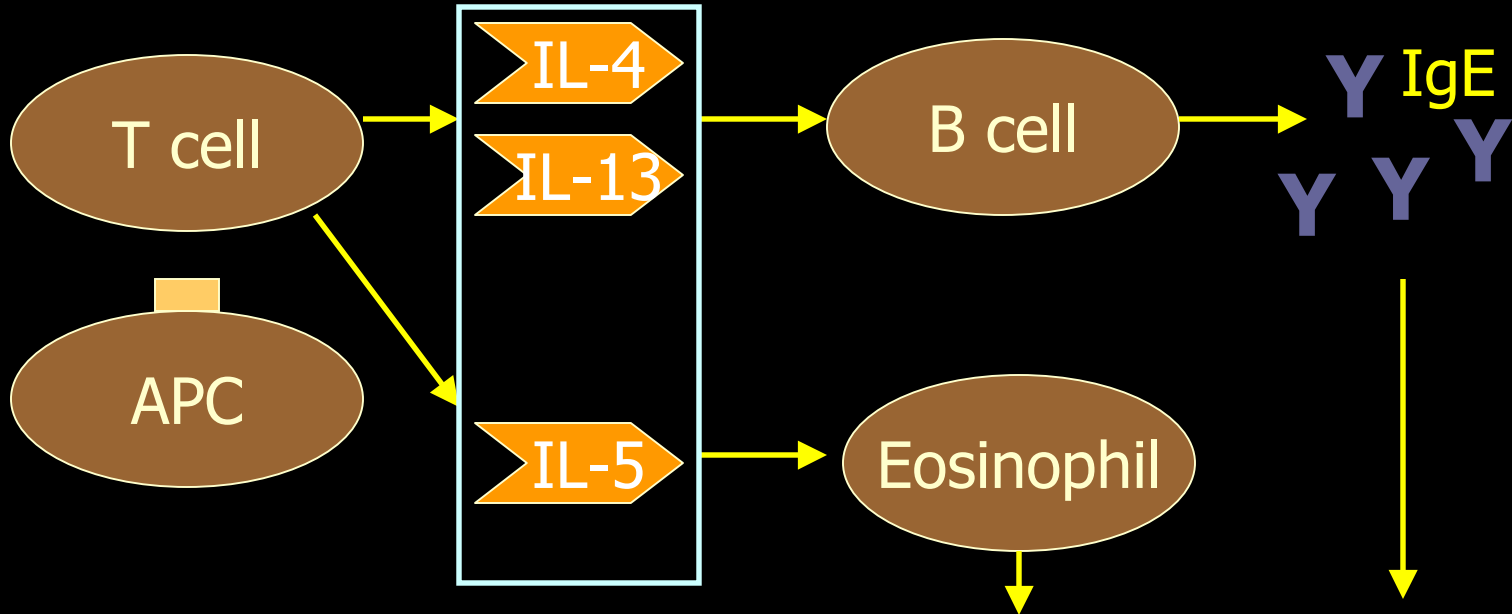
(Chen et al., Psych Bull, 2002)

# Research Questions

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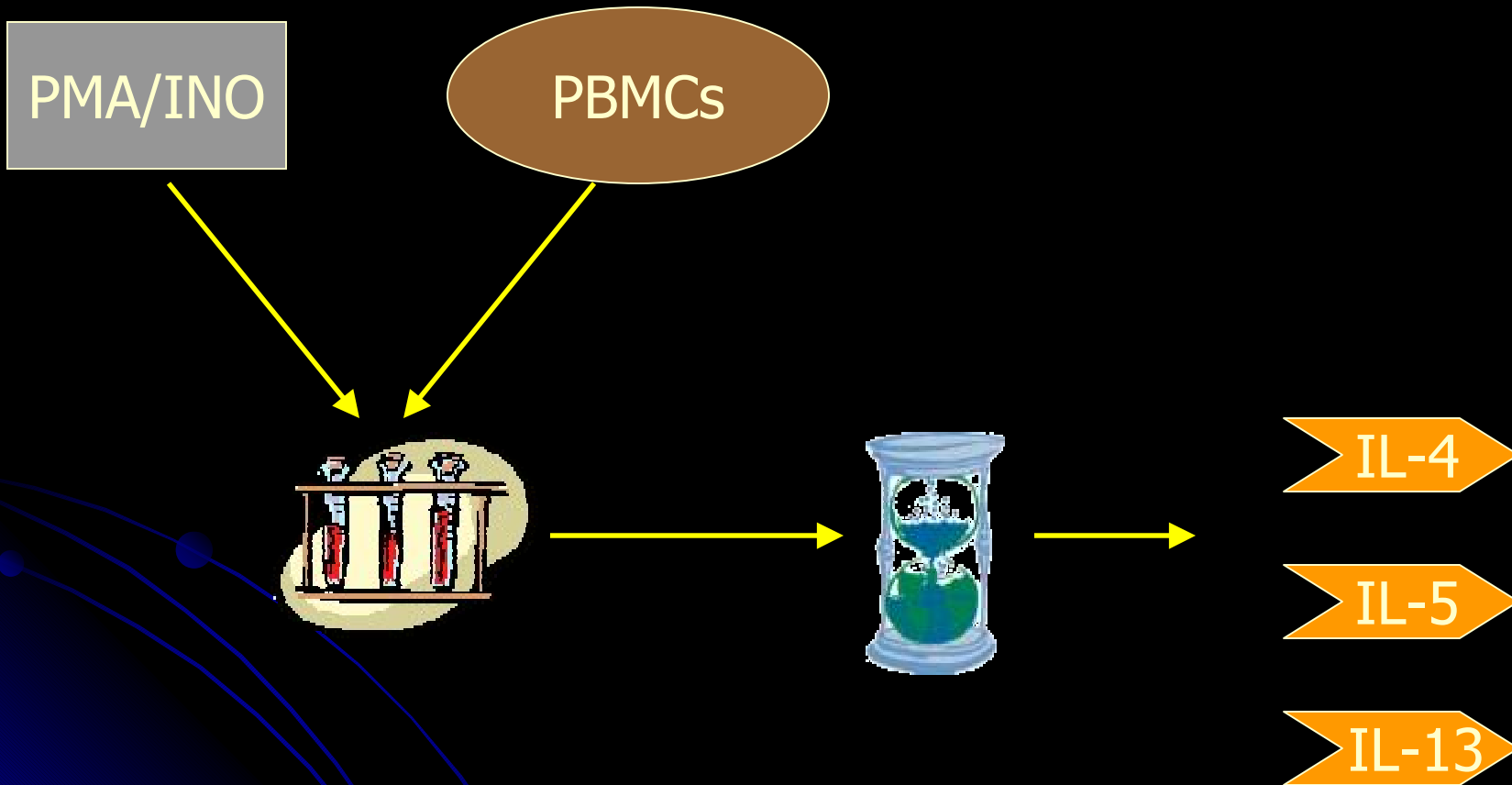
- 1) What are the biological pathways through which low SES comes to affect childhood health?
  - 2) What psychosocial processes connect SES to these biological markers?
- 

# Asthma as an Inflammatory Disease

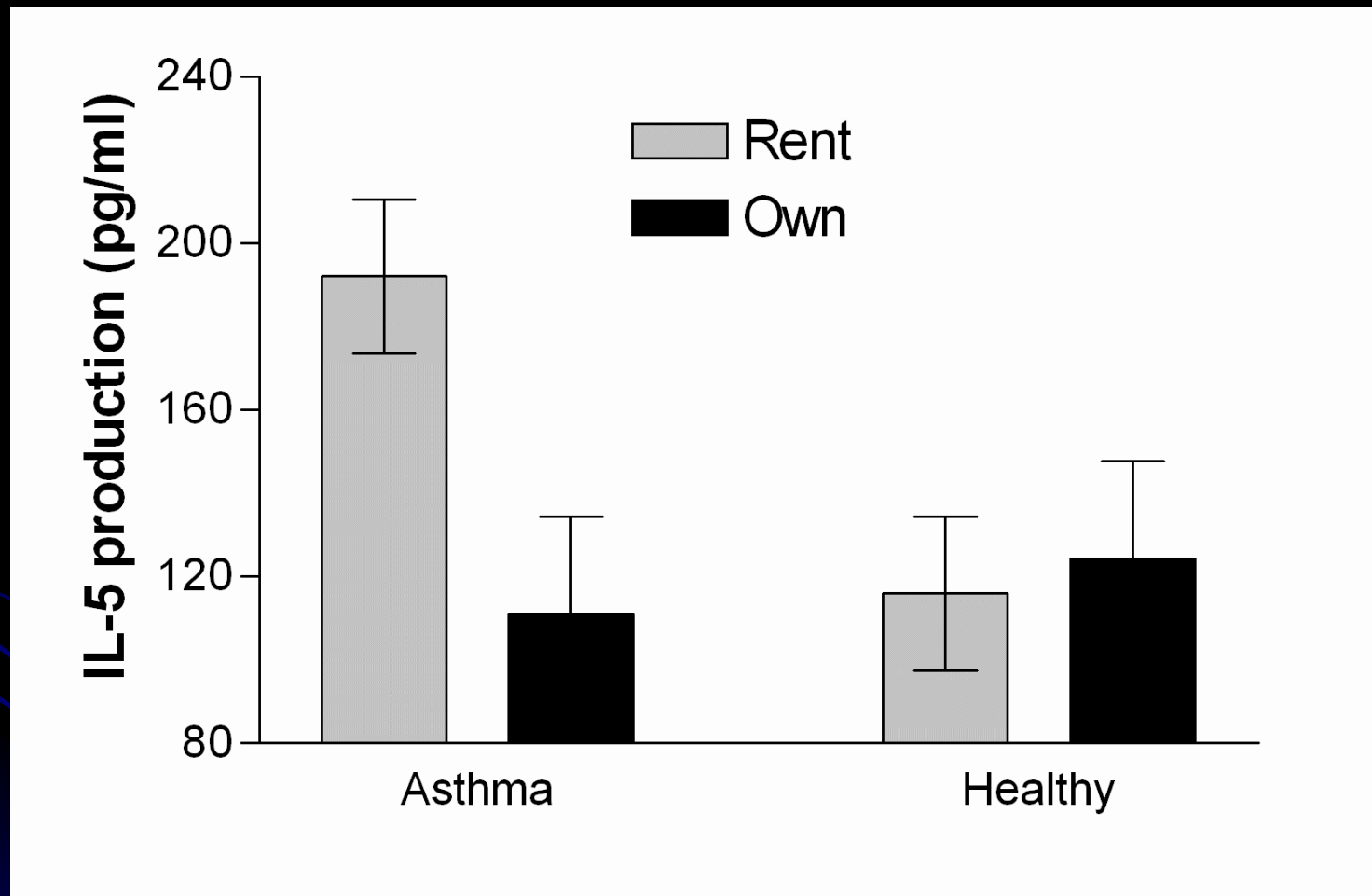


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# Testing in a Controlled Setting

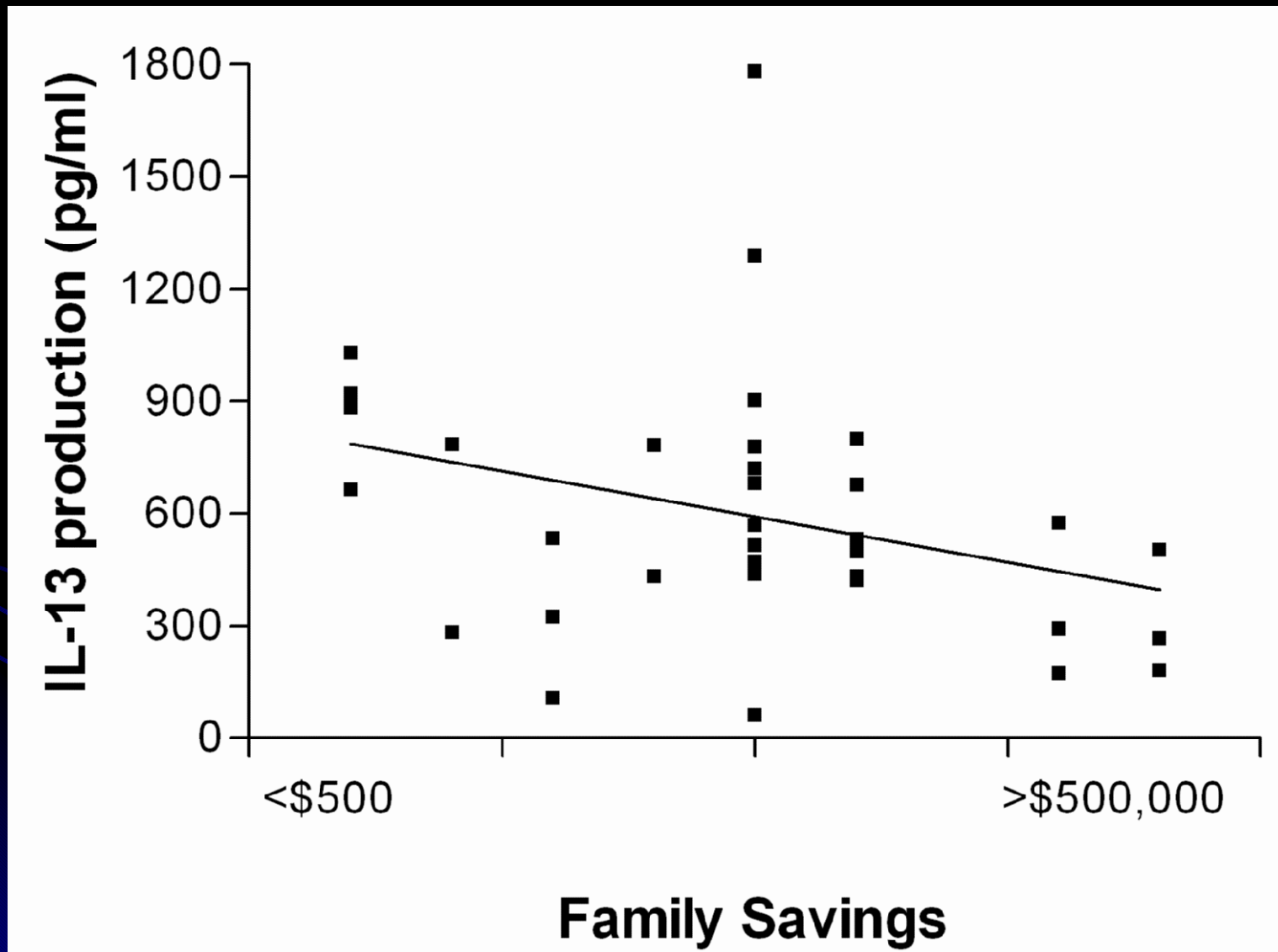


# Cytokine Production Differs by SES in Asthma Group



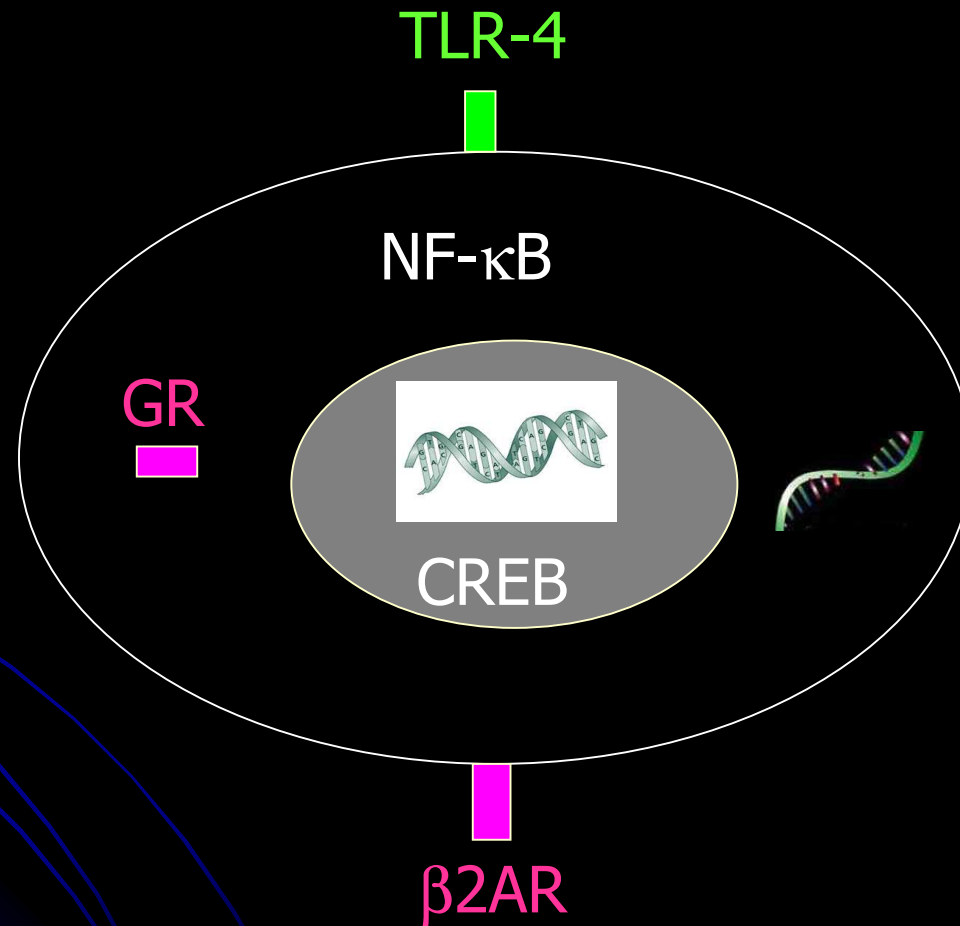
(Chen et al., J Allergy & Clin Immunol, 2006)

# SES – Immune Relationship is Linear



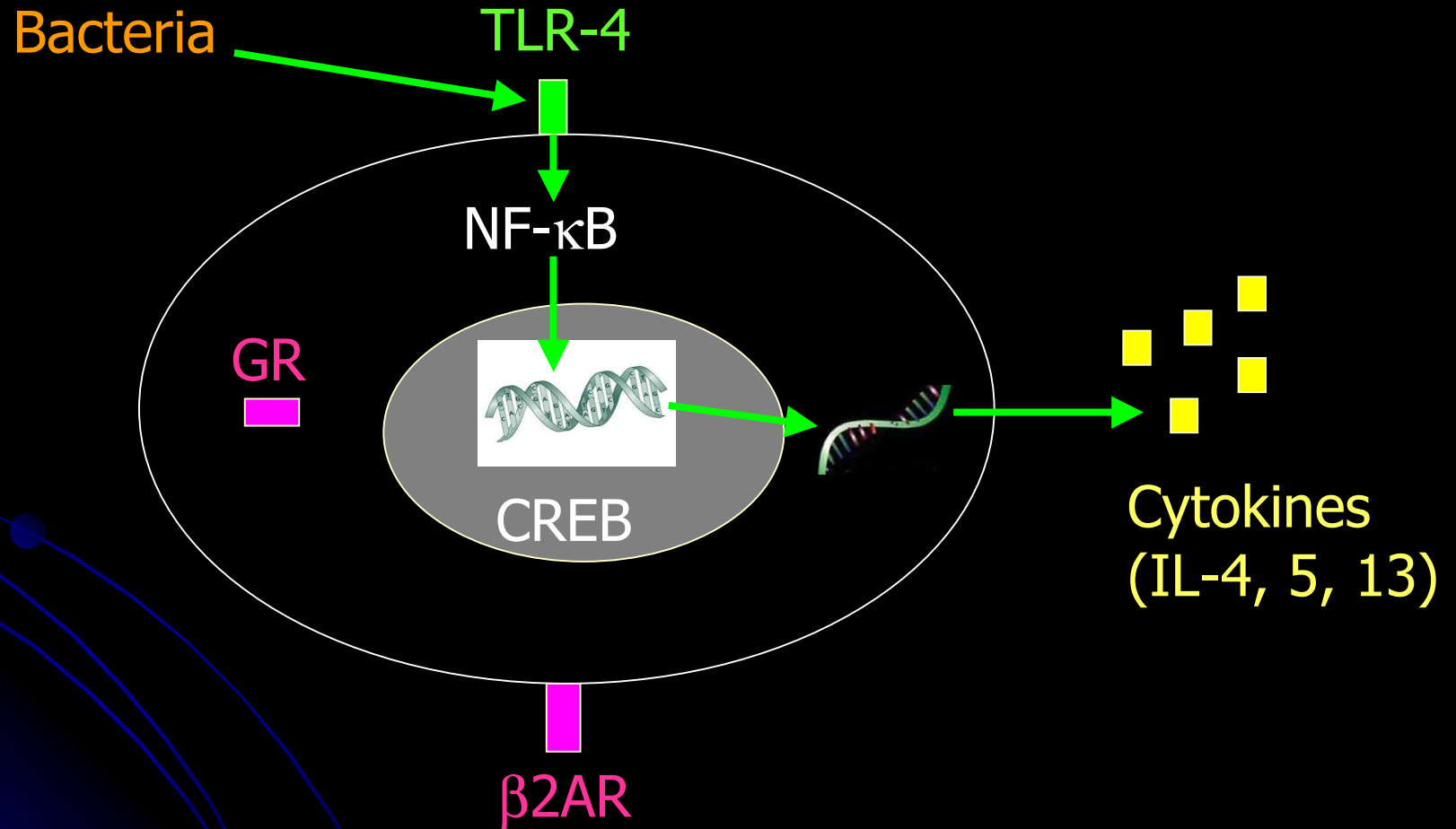
# Inflammation

---

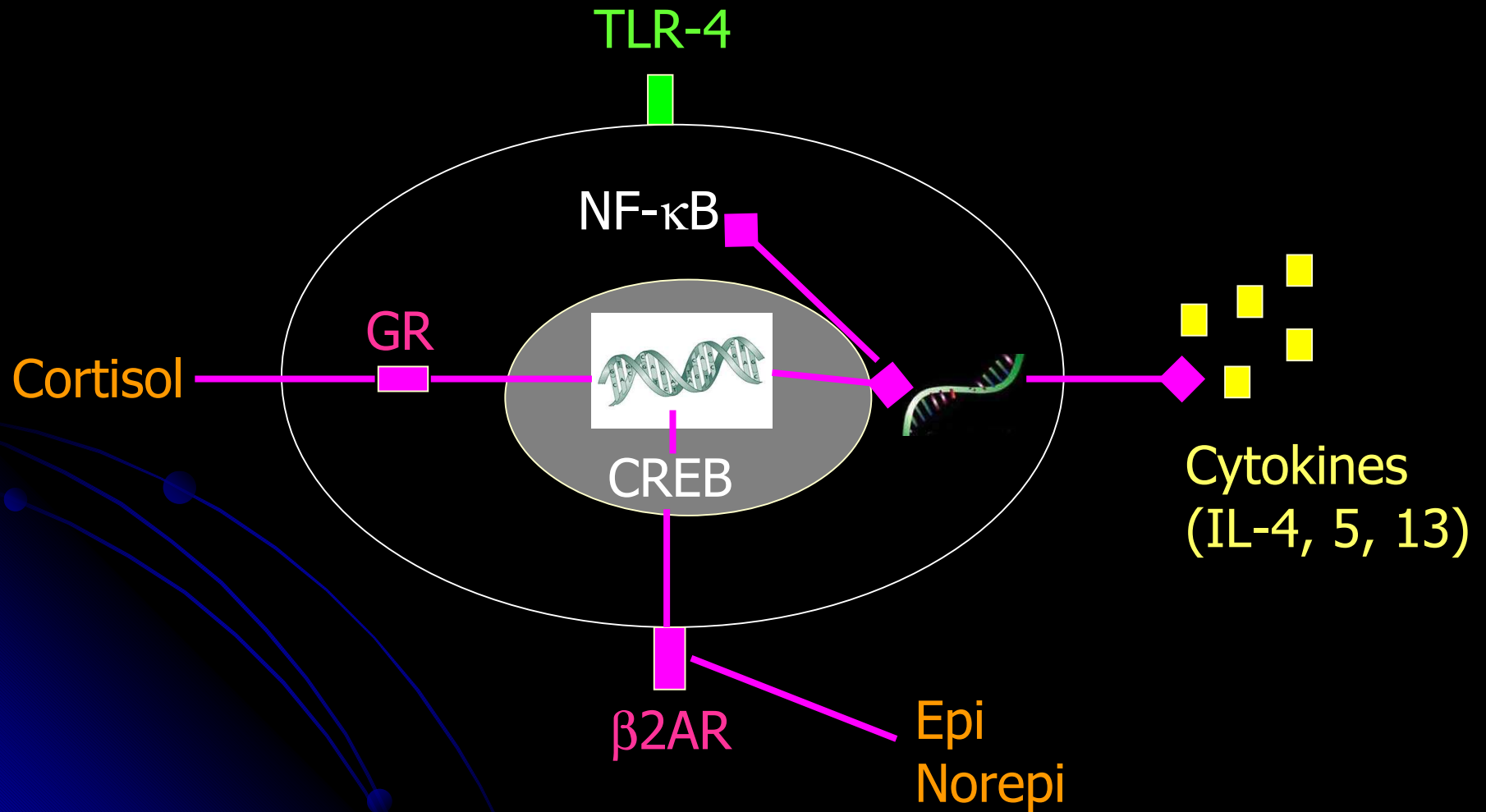


↑ Cytokines  
(IL-4, 5, 13)

# Inflammation



# Inflammation



# Microarrays & Bioinformatics

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Subgroup of low (n=16) and high (n=15) SES youth with asthma

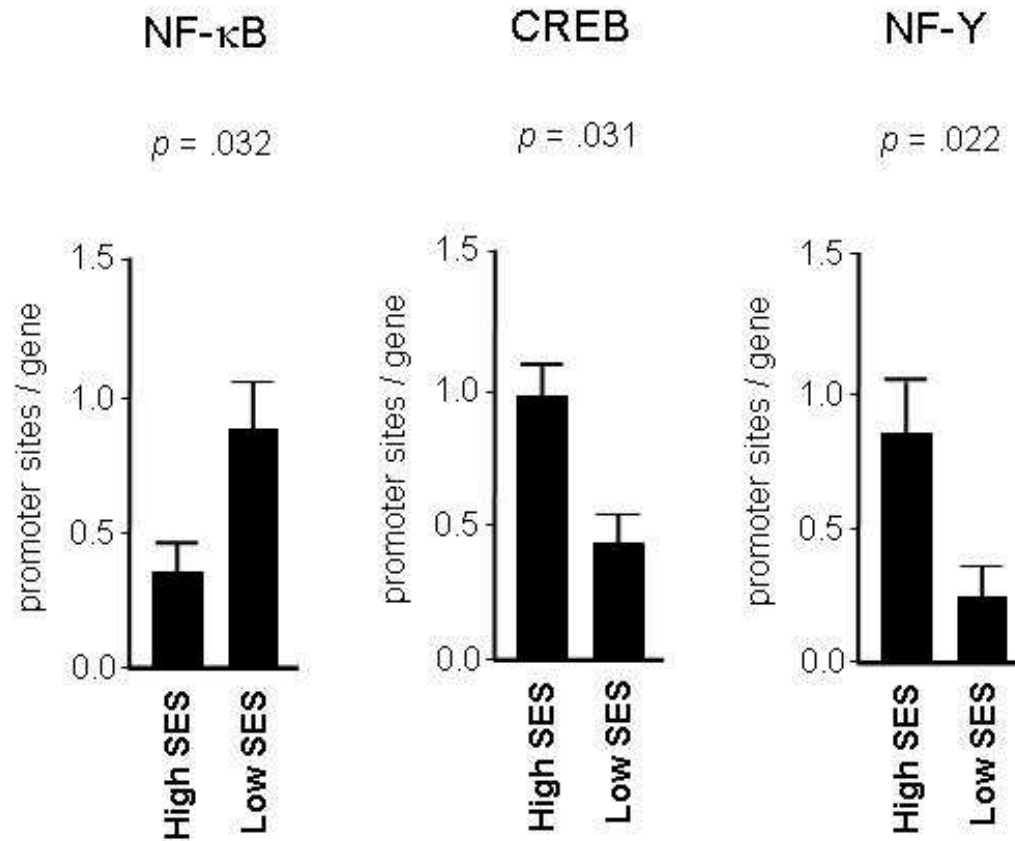
Genome-wide transcriptional profiling done with microarrays on T cells

Robust multiarray averaging quantifies expression of ~14,500 genes

Identifies differentially expressed genes ( $\geq 1.3$ -fold expression disparity between groups)

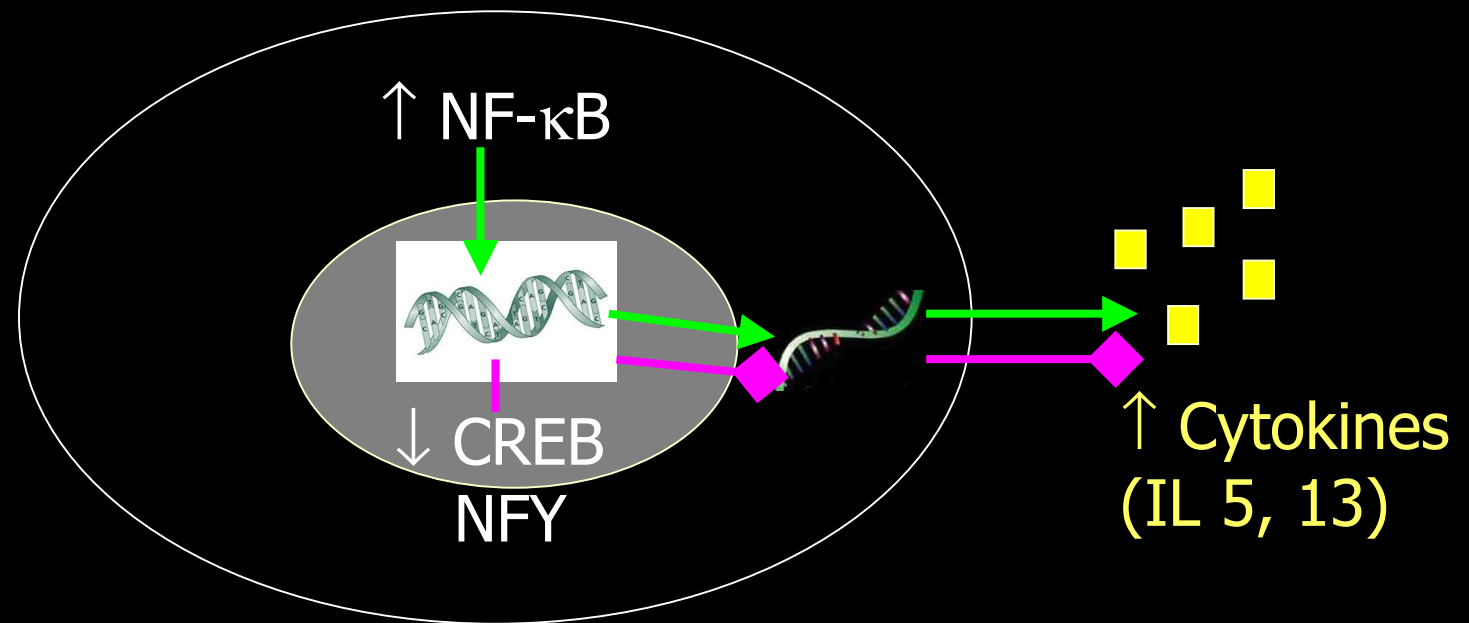
Define common features of genes using TELiS, bioinformatics software, to detect differences in prevalence of transcription factor binding motifs in promoters of differentially expressed genes

# SES Associated with Differential Transcription Factor Activity



(Chen et al., Thorax, 2009)

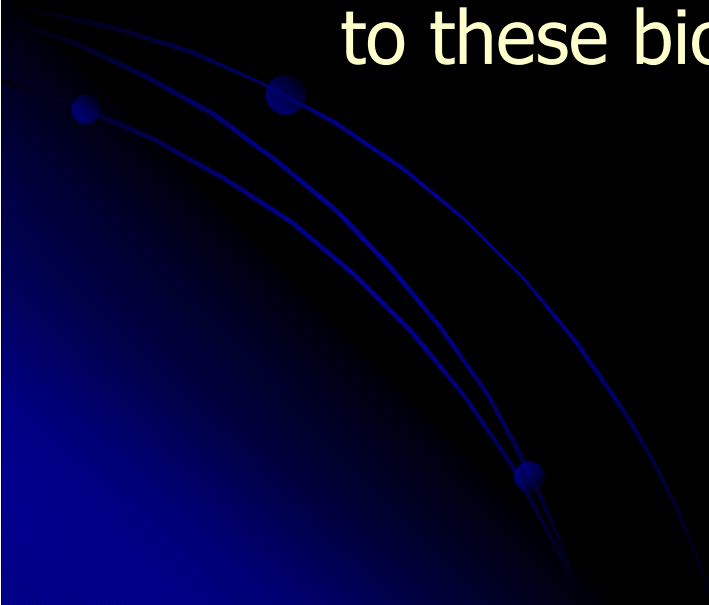
# Inflammation



NF-κB could suggest alteration of signaling pathway shifting to >inflammatory phenotype  
CREB/NFY could suggest diminished signaling of pathway that counter-regulates inflammation

# Research Questions

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- 1) What are the biological pathways through which low SES comes to affect childhood health?
  - 2) What psychosocial processes connect SES to these biological markers?
- 

# Individual: Cognitive Appraisals

---

Low SES children grow up in environments where negative events happen unpredictably

Develop a tendency toward interpreting the world as a threatening place that requires heightened vigilance

Low SES associated with greater appraisals of threat during ambiguous social situations

TRACKING



# Measuring Threat Interpretations: Video Coding

---

**-2**

Very  
Benign

**-1**

**0**

Mixed

**+1**

**+2**

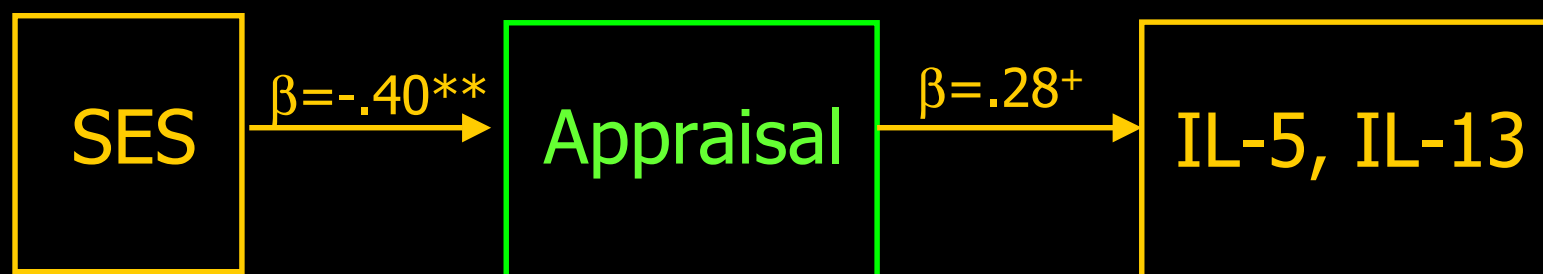
Very  
Threatening

Very benign: "Maybe it was about the homework assignment. Or maybe he thought I could help him figure out who the cheaters were."

Very threatening: "He's going to accuse me of cheating. He probably didn't believe that I could do as well on the test as I did, so I must have cheated."

# Cognitive Appraisal Forms One Pathway Between SES and Cytokine Production

---



Indirect pathway: Z's from .98-1.17,  $p < .05$

Statistical Mediation: Sobel Test,  $Z > .97$ ,  $p < .05$  using distributional properties recommended by MacKinnon.  $^{+}p < .10$ ,  $^{**}p < .01$

(Chen et al., J Allergy & Clin Immunol, 2006)

# Controlling for Cognitive Appraisal Reduces SES Differences in Transcription Factor Signaling Pathways

---

	t	p	Controlling Appraisal t	p
SES – CREB	<b>2.22</b>	<b>.031</b>	1.16	.25
SES – NF- $\kappa$ B	<b>2.18</b>	<b>.032</b>	1.58	.12

---

(Chen et al., Thorax, 2009)

# Individual + Family: Stress

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Stress implicated in SES-health relationships

Different types of stress: Chronic, Acute

Clinical research shows that the combination of acute + chronic stress is detrimental to asthma (Sandberg, 2000)

• Tested effects on:

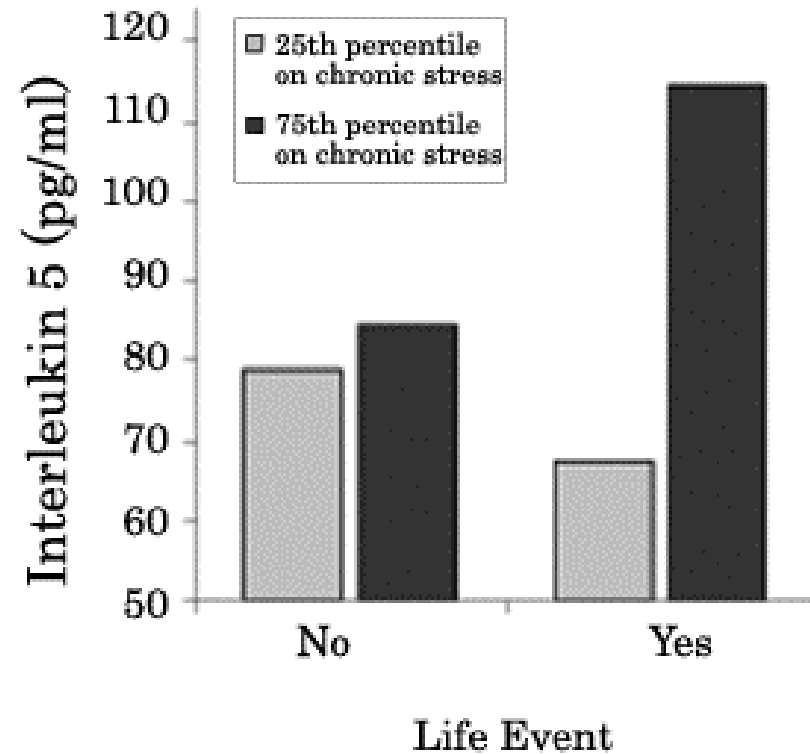
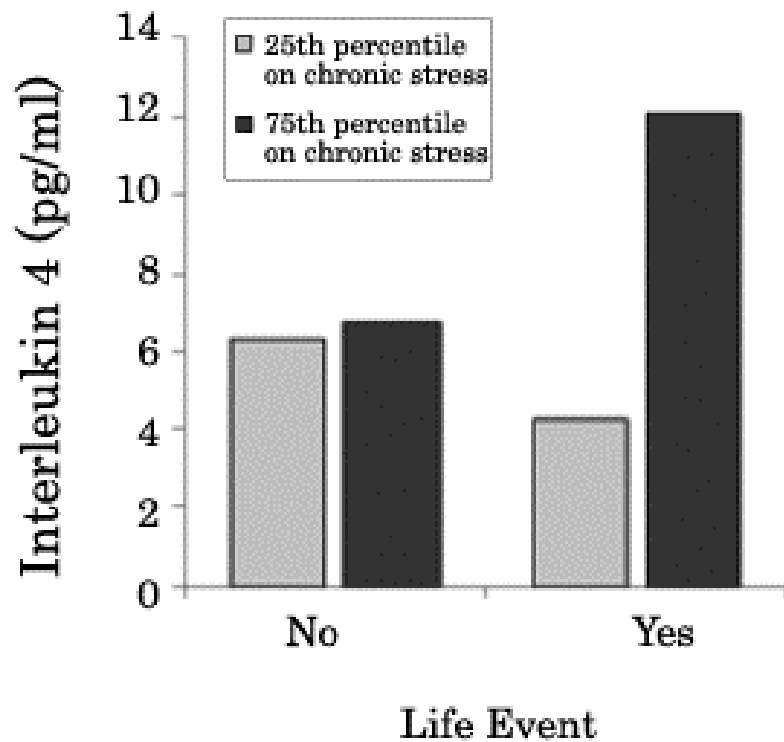
• Asthma-relevant cytokine production

• Gene expression (mRNA) for

• glucocorticoid receptor (GR)

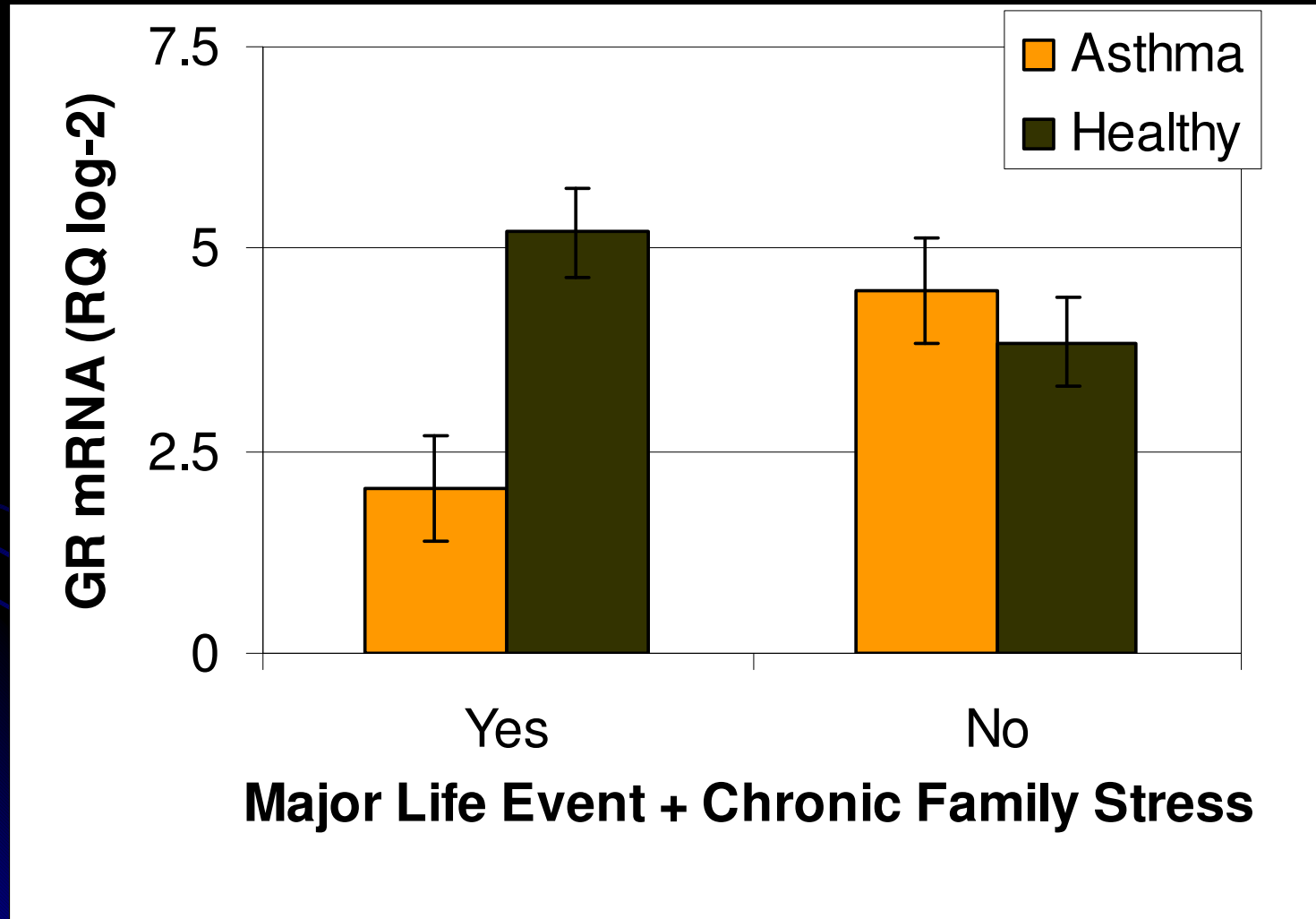
• beta 2 adrenergic receptor ( $\beta$ 2AR)

# Acute + Chronic Family Stress Increases Cytokine Production



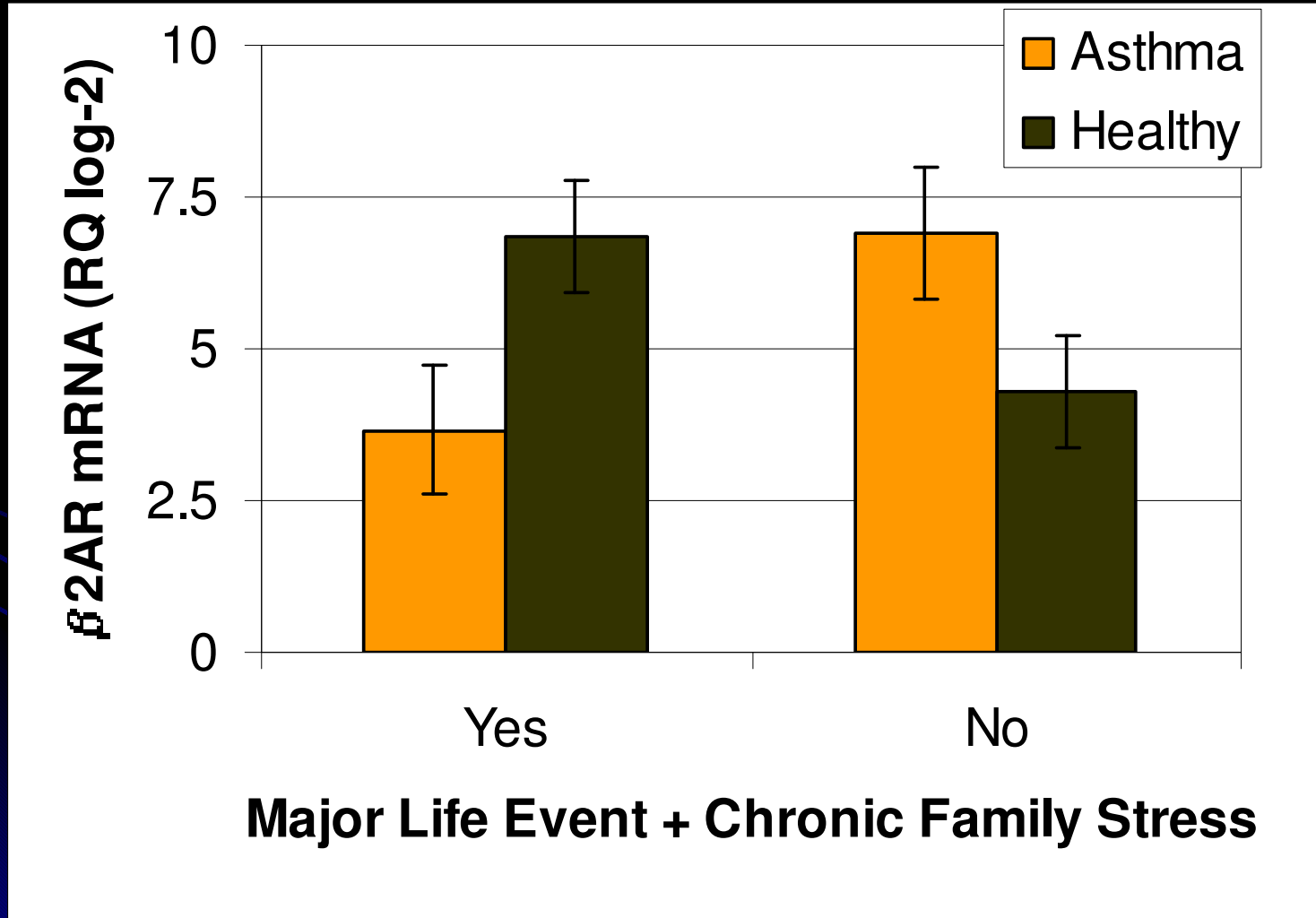
(Marin et al., Psychosomatic Medicine, 2006)

# Acute + Chronic Stress Reduces GR Gene Expression in Asthma



(Miller & Chen, PNAS, 2006)

# Acute + Chronic Stress Reduces $\beta$ 2AR Gene Expression Asthma



(Miller & Chen, PNAS, 2006)

# Family Level: Routines

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Family routines reflect the extent to which organized roles and behaviors are part of daily family practices

Greater family routines linked to:

- fewer asthma symptoms (Sawyer, 2001)
- lower likelihood of continued atopic illness (Gustafsson, 2002)

Baseline  
Routines

6 months

12 months

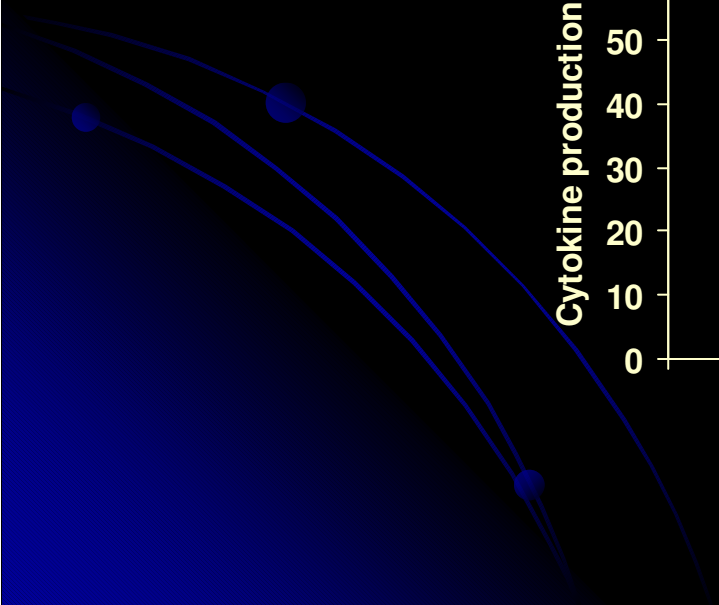
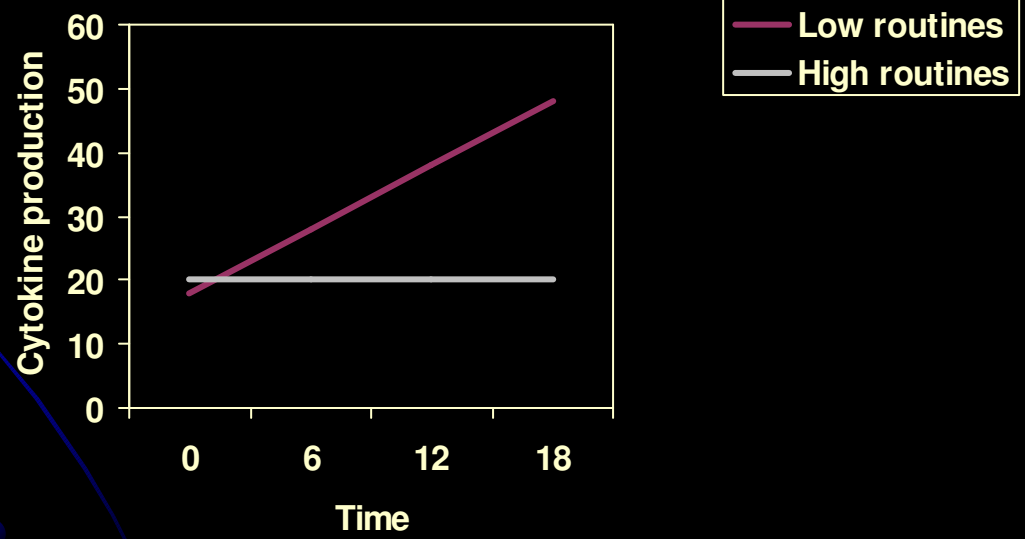
18 months

Blood

Blood

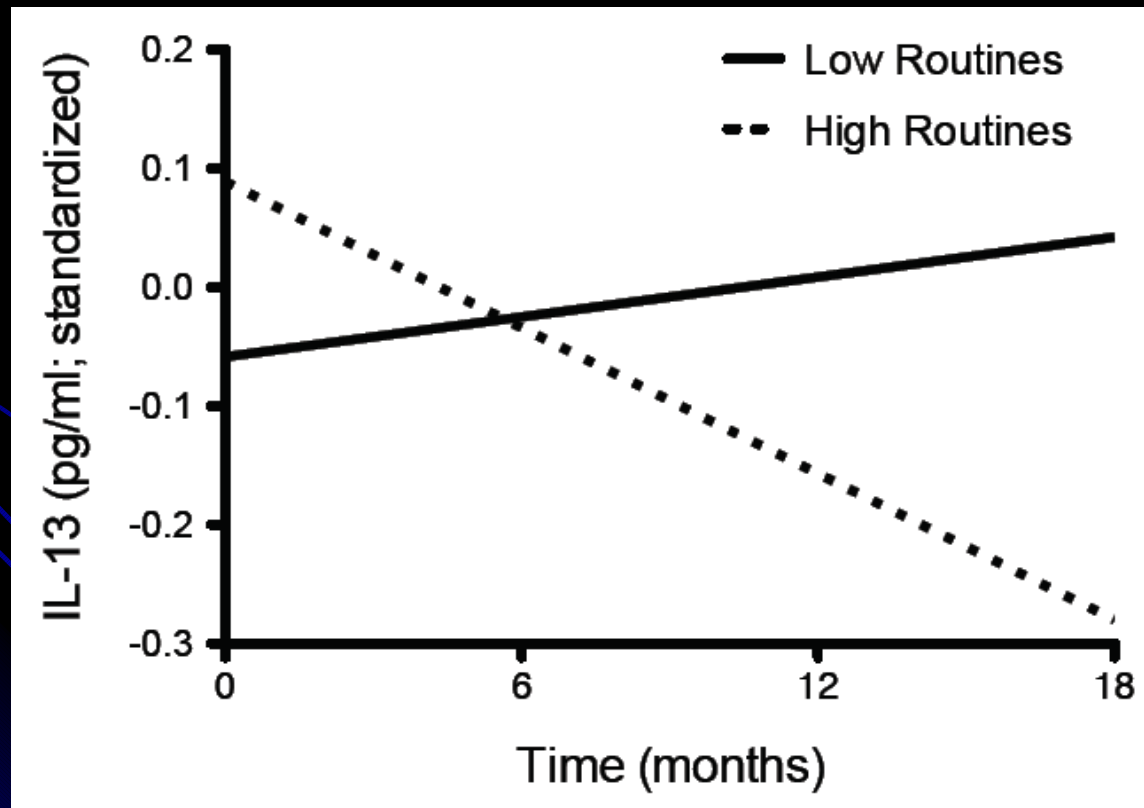
Blood

Blood



# Family Routines Predict Trajectories of Stimulated IL-13 Production

	B	SE	<i>p</i>
Severity	-.0007	.0373	.98
Family Routines	-.0196	.0067	.005



# Routines – IL 13 Relationship Not Due to Other Psychosocial Factors

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	B	SE	<i>p</i>
Severity	-.0002	.0363	.99
Parent Depression	-.0040	.0048	.41
Family Routines	-.0196	.0067	.005
Severity	-.0011	.0362	.98
Parent Perceived Stress	-.0057	.0063	.37
Family Routines	-.0223	.0068	.002
Severity	-.0003	.0382	.99
Family Functioning	.0046	.0148	.76
Family Routines	-.0180	.0086	.04

# Summary

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- 1) Lower SES is associated with heightened inflammatory profiles in terms of gene expression, transcription factor activity, and inflammatory proteins, in a direction that helps explain poorer clinical morbidity in asthma
- 2) Psychosocial factors that may play a role in SES-biology relationships in asthma include individual-level variables (e.g., cognitive appraisals, life stress), as well as family-level variables (e.g., family routines).