TEDX
The Endocrine Disruption Exchange

Ambient BTEX levels: Do they pose a threat to public health?

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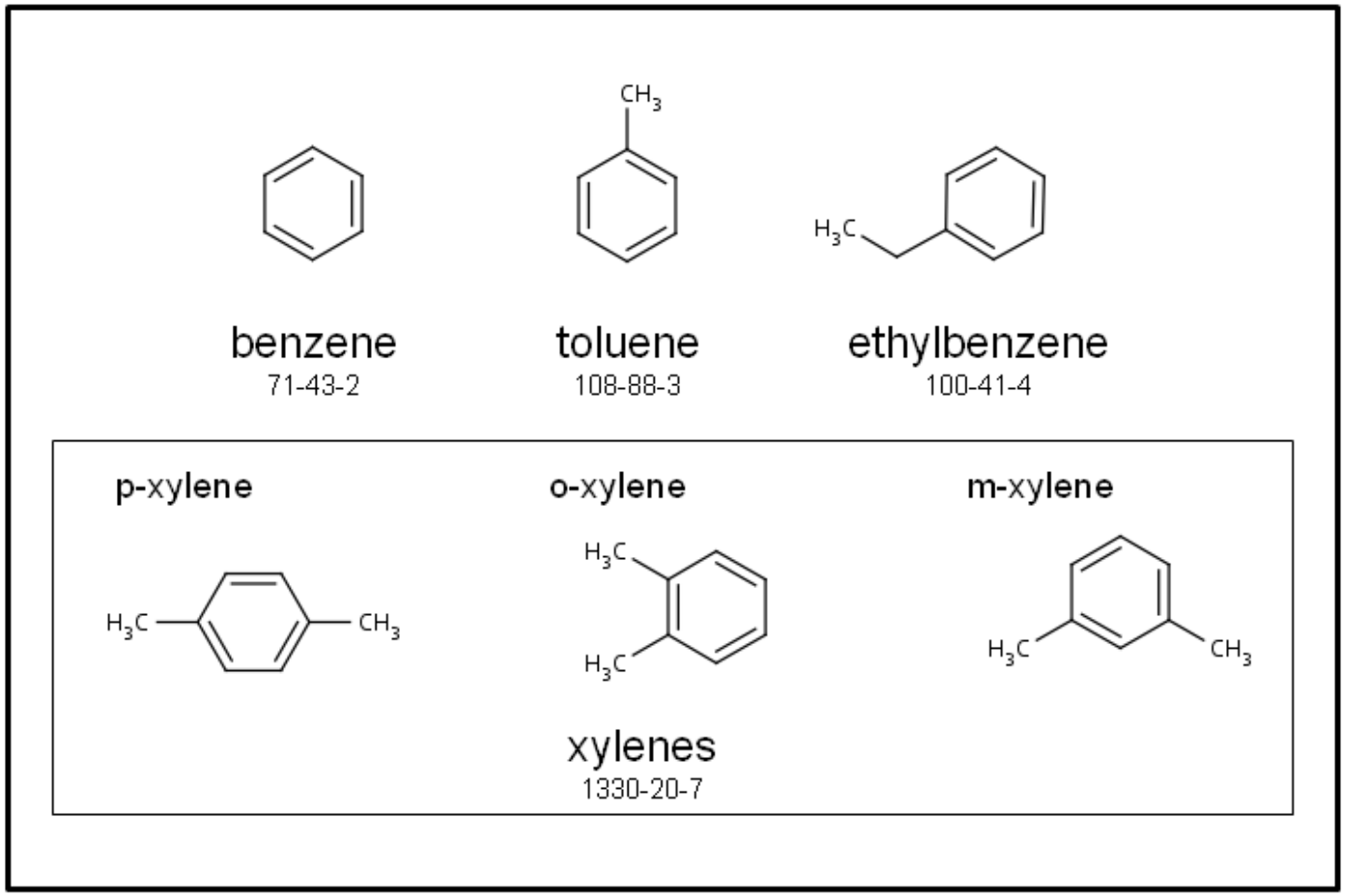
The Endocrine Disruption Exchange

What are BTEX?



Why study BTEX?

- Common air pollutants detected indoors and outdoors
- BTEX are associated with oil and gas development and production sites
- Typically not studied at low concentrations
- BTEX are precursors to other air pollutants (PAHs, ozone, PM) connected to adverse health effects

How do BTEX get into our air?

- Various household products
- Combustion of fossil fuels from gasoline and diesel vehicles
- During oil and gas extraction
- Gas pump emissions
- Cigarette smoke

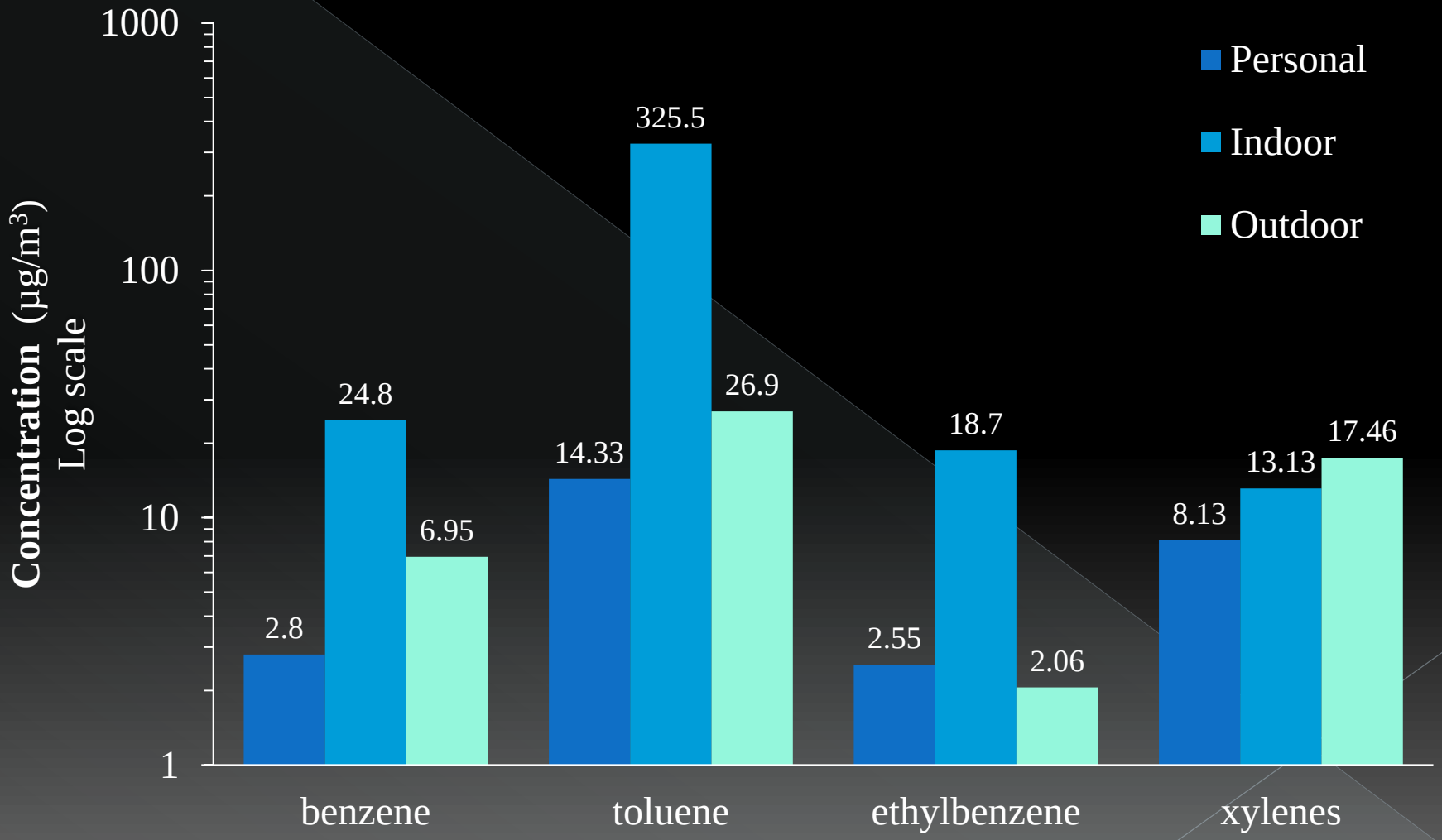
Evidence of BTEX exposure

- BTEX leave our bodies relatively quickly
- Found in blood, cord blood, and as metabolites in urine
- Exposure is happening continuously

More support for BTEX exposure

- Typically detected greater than 90% of the time in indoor and outdoor air
- On average we spend greater than 87% of our time indoors
- BTEX levels outdoors near oil and gas development and production much higher than typical levels indoors

Highest average concentrations measured in review



Objectives of the review

- Identify all the studies in humans at non occupational (ambient) exposure levels
- Summarize the findings
- Explore if endocrine signaling could be involved in the health outcomes

How did we conduct the review?

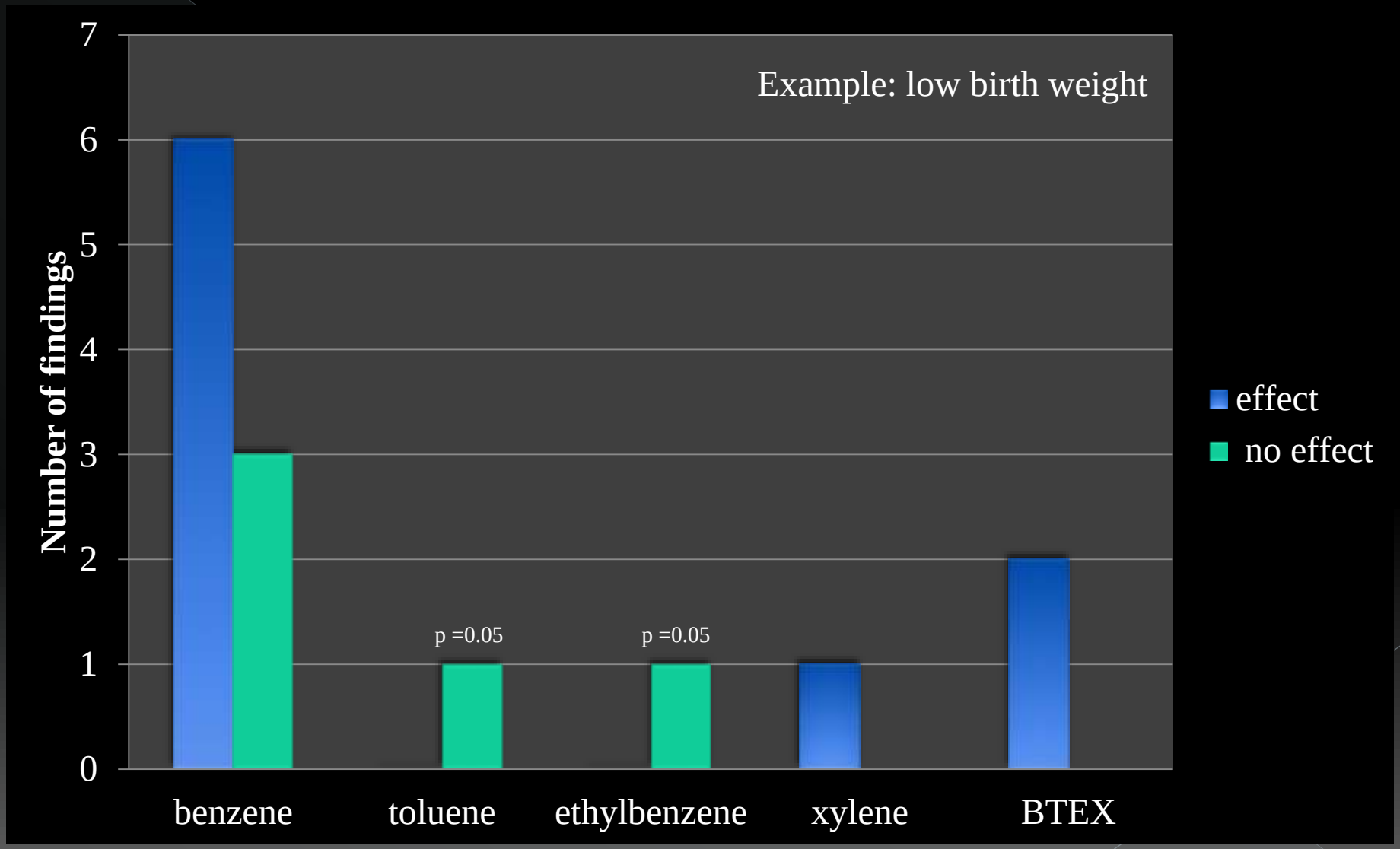
- Performed searches using PubMed
- Used Distiller SR to identify potential studies
- Assessed the quality of the studies using the OHAT approach

National Toxicology Program
U.S. Department of Health and Human Services

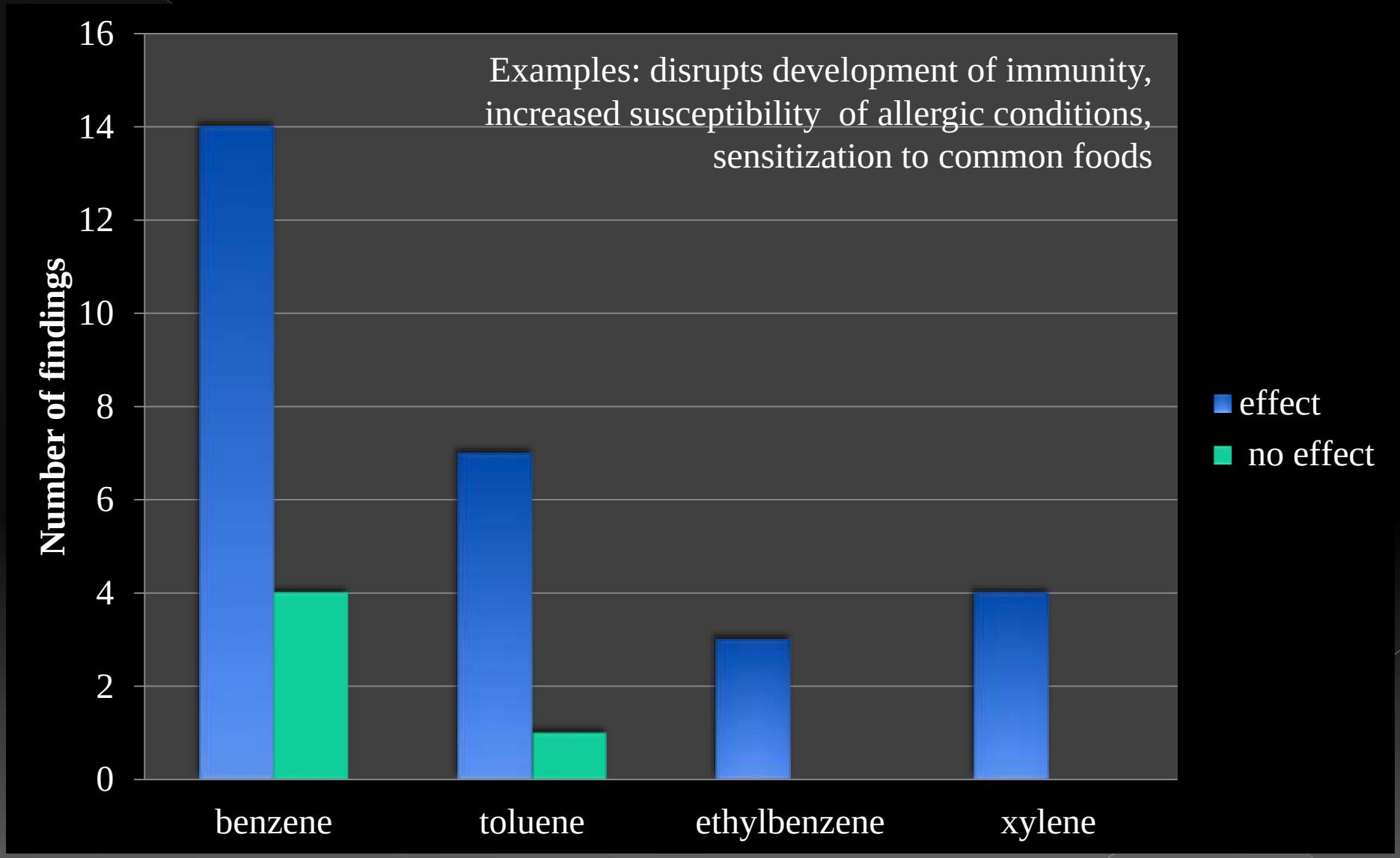
What did we find?

- Identified a total of 42 studies
- Fetal, childhood, adolescence, adulthood
- Indoor, outdoor, and personal air, blood, and urinary metabolite levels
- Prospective, cross-sectional, case-control, and retrospective studies

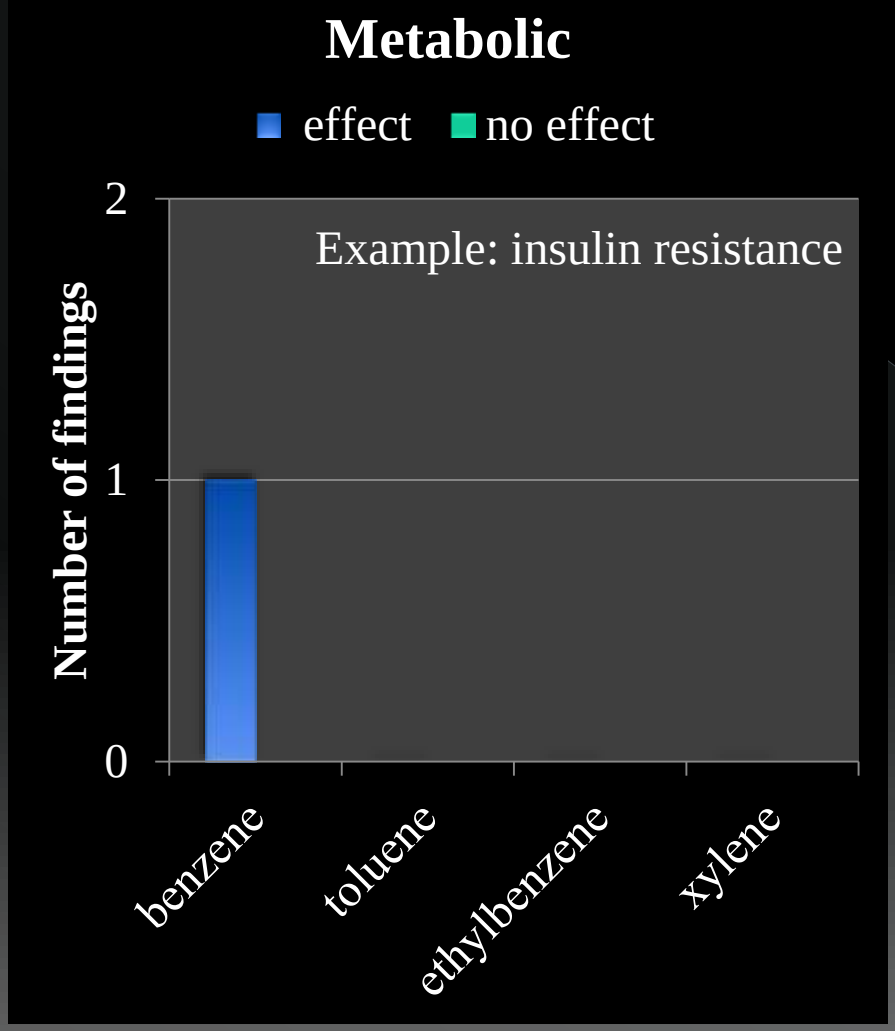
Developmental

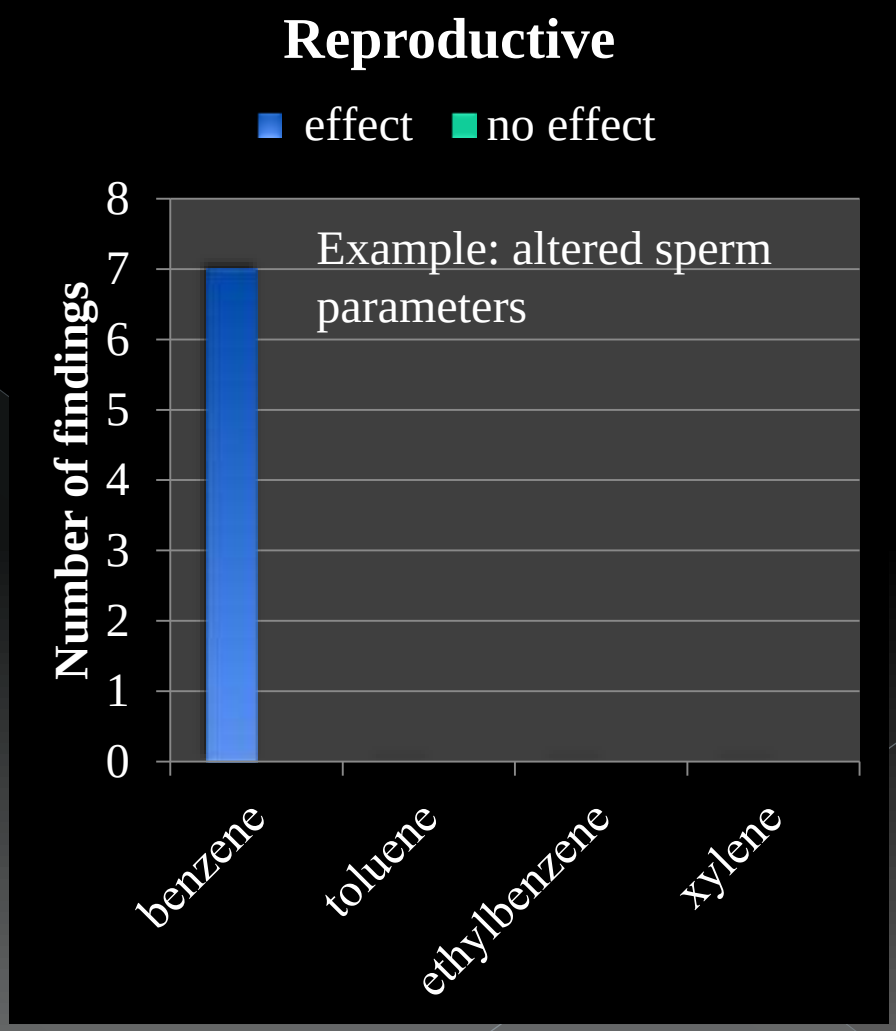


Immune

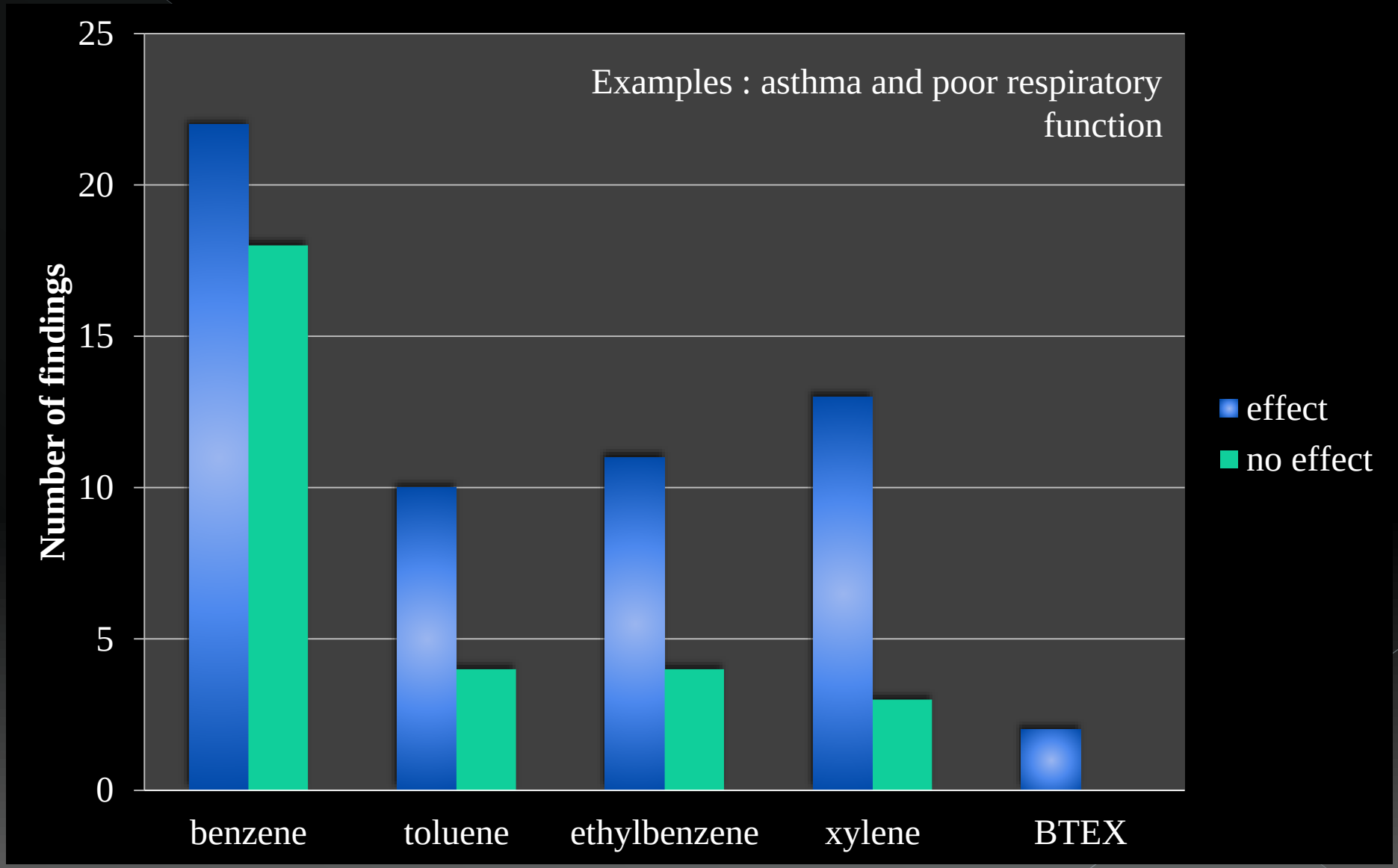

Examples: disrupts development of immunity, increased susceptibility of allergic conditions, sensitization to common foods
Number of findings
16
14
12
10
8
6
4
2
0
benzene
toluene
ethylbenzene
xylene
effect
no effect

Metabolic/Reproductive

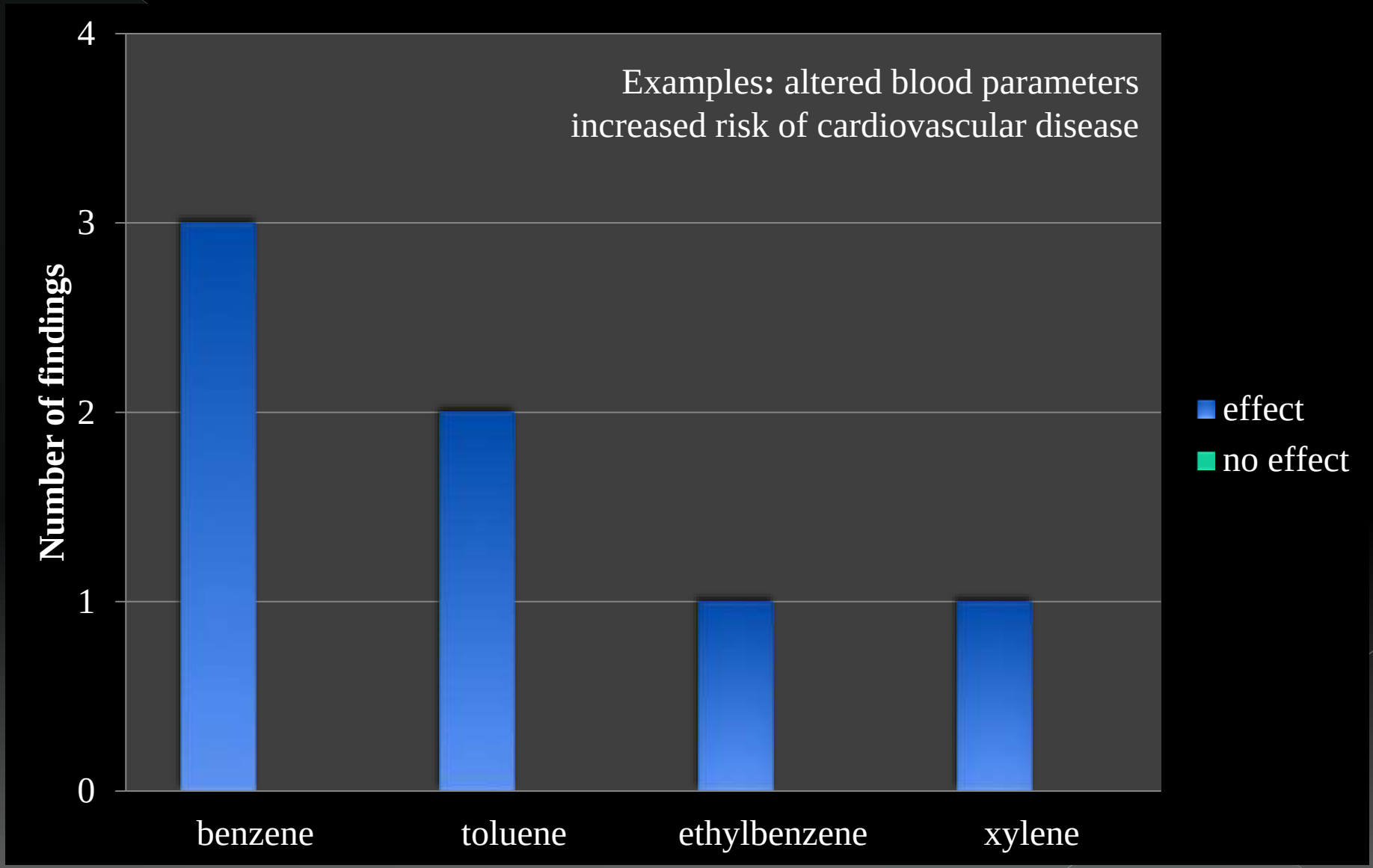




Respiratory



Cardiovascular and blood



Connecting health effects to endocrine signaling

- Occupational evidence of endocrine disruption
- Health effects can have origins in early development
- Exposure to endocrine disruptors at lower levels can result in adverse health impacts

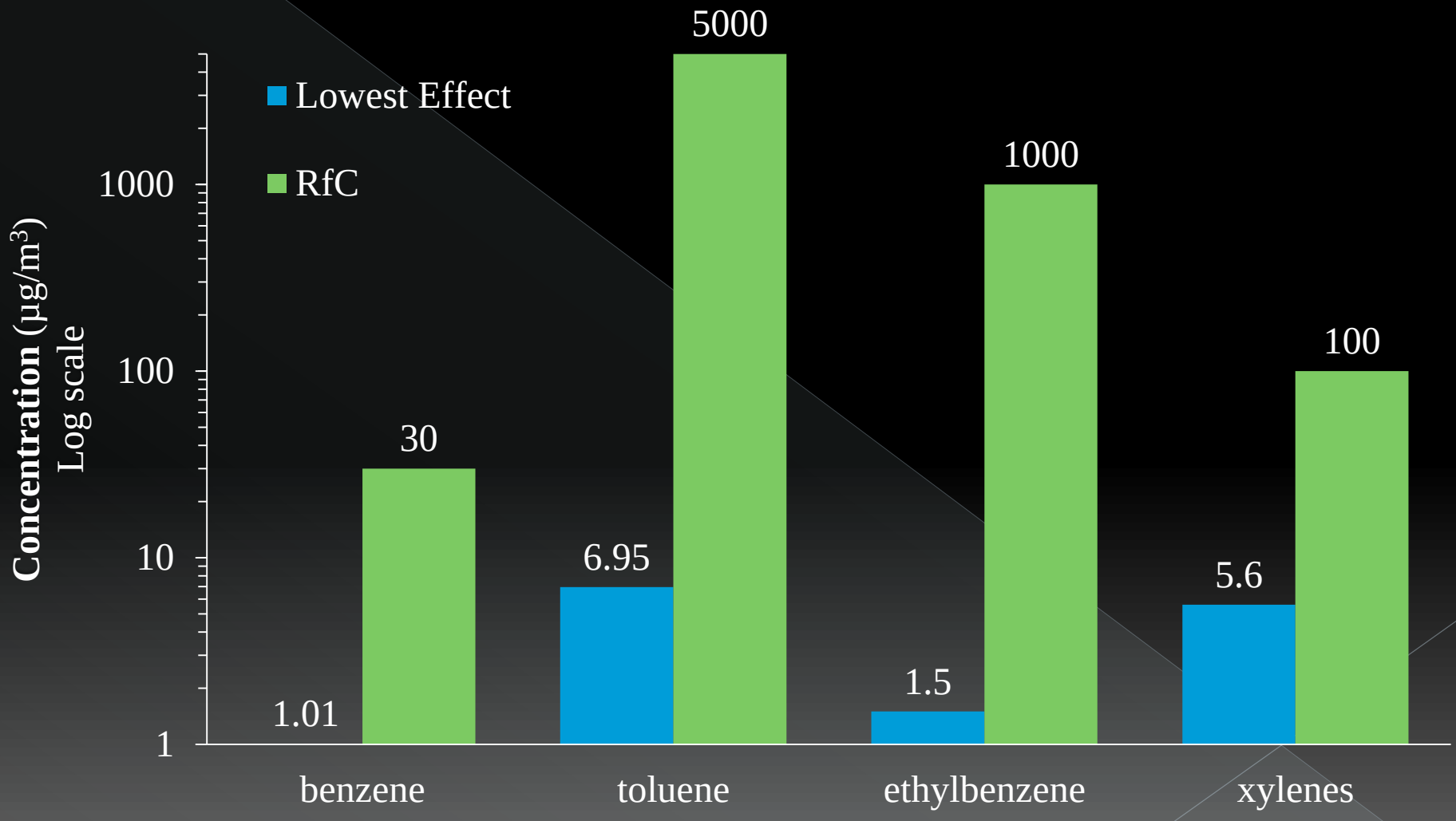
Occupational studies

- At higher exposure levels
- Disrupted abnormal sperm production and altered menstrual cycles
- Altered reproductive hormone levels (LH and FSH)
- Disrupted fertility and spontaneous abortion

The involvement of hormones

- Hormones are involved in the programming of growth patterns and development of immunity
  - insulin-like growth factor, thyroid hormone, cortisol, estrogens, and androgens
- Hormones regulate immune function throughout life
  - glucocorticoids, estrogens, and progesterone

Health effect levels compared to EPA safe concentrations



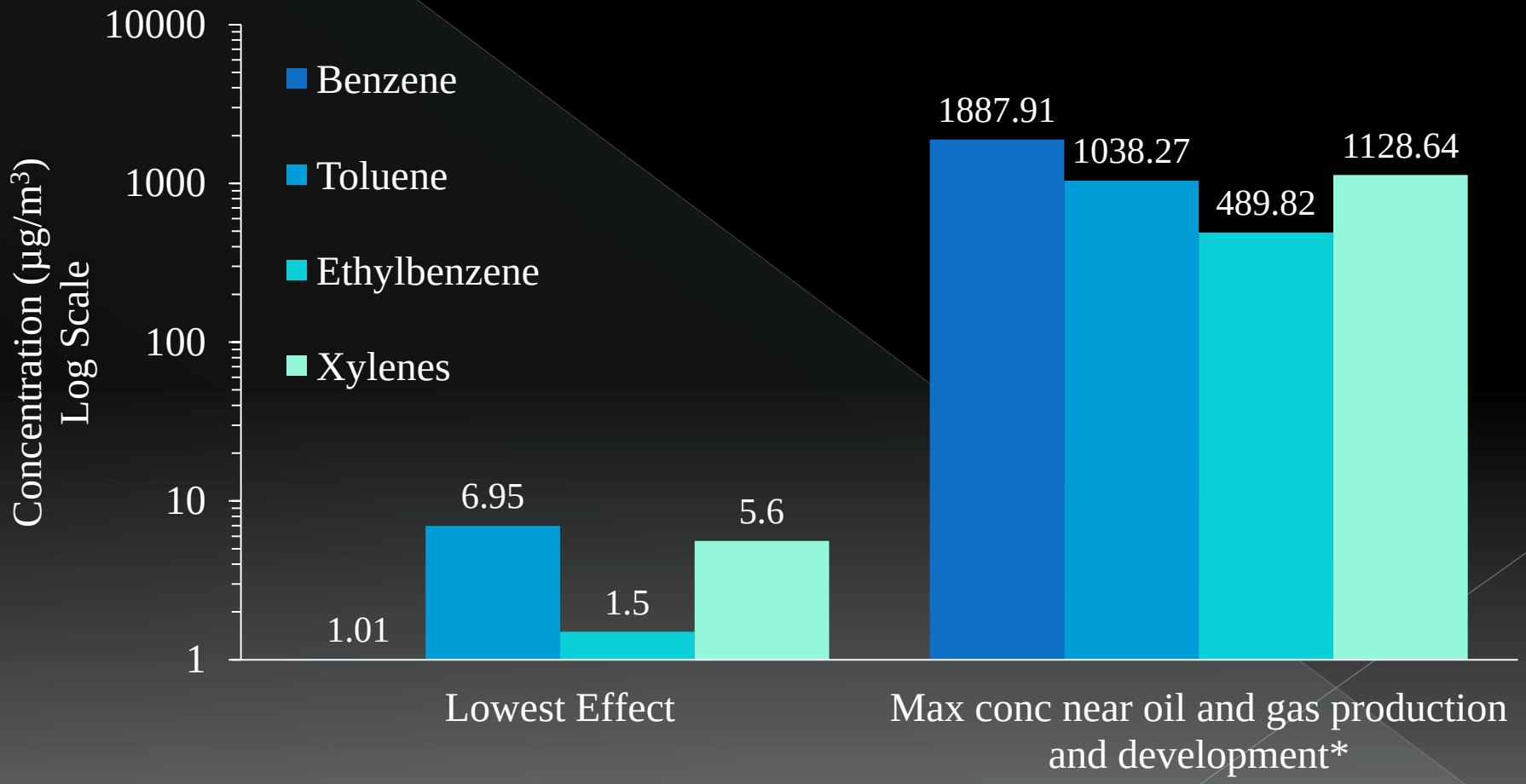
Conclusions and recommendations

- Health effects were associated with levels of BTEX that are considered safe by the US EPA
- The methods used to assess and regulate chemicals with effects at low concentrations should be reevaluated

To reduce exposure…

- BTEX should be removed or limited in consumer and industrial products
- They should be replaced with chemicals that do not have biological activity

Concentrations of BTEX in outdoor air near oil and gas impacted areas



*Rich, A.; Grover, J. P.; Sattler, M. L. *J. Air Waste Manag. Assoc.* ***2014, 64, (1), 61-72.***

Conclusions and recommendations

- Air near oil and gas development can be orders of magnitude higher than exposures for which we found health effects, sometimes exceeding EPA safe levels
- Measures should be taken to protect citizens from unsafe exposure

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