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SHORT TERM EFFECTS ON SYMPTOMS OF ATOPIC DERMATITIS IN CHILDREN BY WEATHER AND POLLUTION

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Chemistry 101-007 | Fall Semester 2017 | Dr. Carlson



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BACKGROUND AND INTRO

- What is atopic dermatitis? (AD)
 - An inflammatory skin disease that mainly affects young children (Kim et al, 1)
 - It affects the ability of your skin to hold moisture and causes skin to become irritated, itchy, and dry (“Atopic Dermatitis (Eczema) – Topic Overview”)
 - The cause is unclear but there are conditions that can make it worse
 - The effects that air pollution and weather have on the condition have yet to be thoroughly investigated (Kim et al, 1)



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WHY THIS IS IMPORTANT

- AD is increasing across the world. This abundance of the disease makes it a hot topic of interest for the health of the public
- As the changing climate of the planet has become more recognized as a major problem, the effects of certain factors of this change have become more of a concern when considering many diseases
- A panel study was done in Korea to find out what the short term effects of certain weather and pollution conditions are on the symptoms of AD in children



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(Kim et al, 2)

METHODOLOGY

- 177 young patients from the Seoul area who had AD were enrolled in the study
- Between August of 2013 and December of 2014 they were followed and symptoms were recorded
- Weather variables such as average daily temperature, humidity, temperature range, and rainfall
- Pollutants such as nitrogen dioxide, ozone, and particulate matter (objects with diameter $\leq 10 \mu\text{g}$, known as PM_{10})

These were the weather and pollution factors estimated for their effects on AD symptoms

(Kim et al, 1)



([https://www.google.com/search?q=seoul+korea&rlz=1C1GGRV_enUS751US751&source=lnms&tbn=isch&sa=X&ved=0ahUKEwiYkbn49YTXAhVGRyYKHaxSDj8Q_AUICyGC&biw=1366&bih=662#imgre=iOgl4BSofJ3EPM](https://www.google.com/search?q=seoul+korea&rlz=1C1GGRV_enUS751US751&source=lnms&tbn=isch&sa=X&ved=0ahUKEwiYkbn49YTXAhVGRyYKHaxSDj8Q_AUICyGC&biw=1366&bih=662#imgre=iOgl4BSofJ3EPM;).)

FINDINGS

- Weather and pollution conditions were as follows:
 - Average daily mean temperature: 15.0 °C
 - Average daily humidity: 64.9%
 - Average diurnal temperature range: 8.9 °C
 - Average rainfall: 2.7 mm/day
 - Average concentration of PM_{10} : 45.2 $\mu\text{g}/\text{m}^3$
 - Average concentration of nitrogen dioxide (NO_2): 32.4 parts per billion (ppb)
 - Average concentration of ozone (O_3): 38.1 ppb

(Kim et al, 4)

Table 2. Summary of meteorological variables and air pollutant levels during the study period.

Variable		Mean \pm SD ^a	Minimum	Maximum
Meteorological variable	Temperature (°C)	15.0 \pm 9.7	-11.2	32.0
	DTR ^b (°C)	8.9 \pm 3.0	1.6	22.2
	Relative humidity (%)	64.9 \pm 14.3	26.0	100.0
	Rainfall (mm/day)	2.7 \pm 9.7	0.0	157.5
Air pollutant	PM ₁₀ (µg/m ³)	45.2 \pm 26.4	3.6	193.7
	NO ₂ (ppb)	32.4 \pm 13.4	1.0	104.5
	O ₃ (ppb)	38.1 \pm 20.3	1.1	123.0

^aSD: standard deviation;

^b DTR: diurnal temperature range.

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This table shows averages as well as standard deviation and extreme values recorded (Kim et al, 5)

FINDINGS

- When daily mean temperatures increased, a decrease in symptoms were associated
 - An increase in relative humidity was associated with a decrease in the risk of symptoms
 - An increase in the temperature range was found to bring about an increase in symptoms
 - AD symptoms increased with rainfall amounts
 - All pollutants were associated with an increase in symptoms
- (on next slide)

(Kim et al, 4-5)

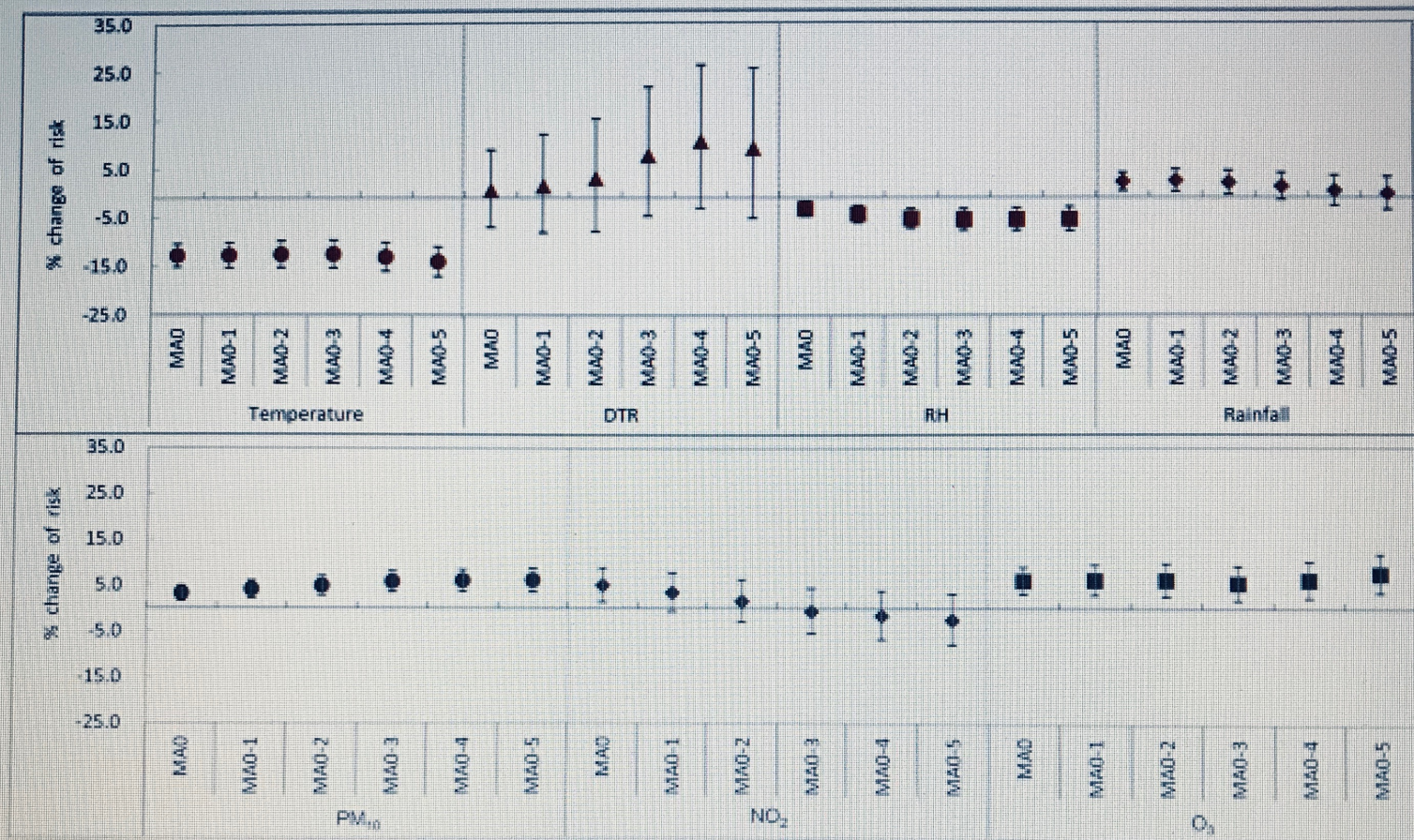


Fig 2. Effects of meteorological variables and air pollution on Atopic Dermatitis (AD) symptoms by moving average. Data represent percent changes and 95% confidence intervals in AD symptoms per 5-unit increase in daily mean temperature ($^{\circ}\text{C}$), relative humidity (%), diurnal temperature range ($^{\circ}\text{C}$) and 10-unit increase in PM₁₀ ($\mu\text{g}/\text{m}^3$), NO₂ (ppb), and O₃ (ppb). RH: relative humidity; DTR: diurnal temperature range; MA: moving average.

<https://doi.org/10.1371/journal.pone.0175229.g002>

% change of risk on the y-axis shows the influence of various weather and pollution factors on symptoms (Kim et al, 6)

CONCLUSION

There is a strong correlation between AD symptoms and these weather and pollution variables

- Increases in temperature and relative humidity had the affect of reducing AD symptoms while increases in rainfall and temperature range aggravated the symptoms
- All air pollutants aggravated the symptoms of AD
- The relationship between AD and daily temperature change had not been reported yet and in this study, it was found that symptoms of AD increased by 284.9% for every 5 °C increase when above 14 °C

CONCLUSION

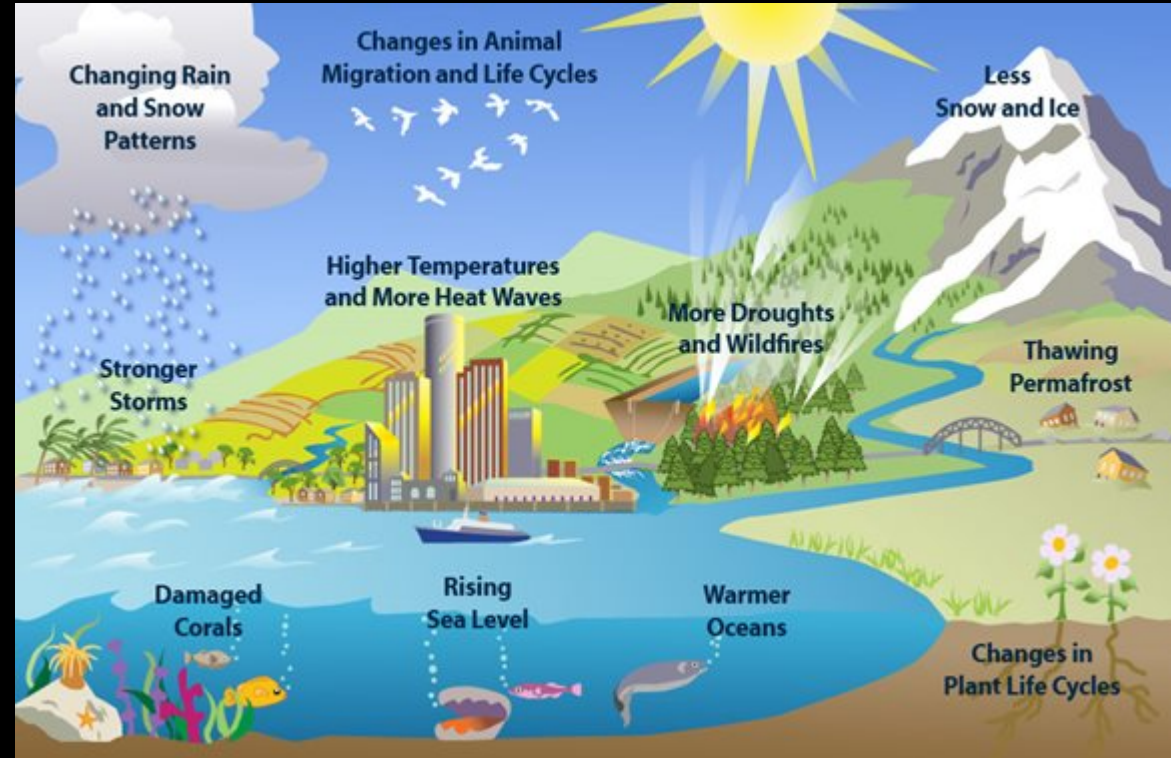
- The recommendation that humidity and temperature should be considered for the alleviation of symptoms is supported by these results. Other studies have presented opposing findings, however
- Region and time of year may have something to do with results
- In order to come to a more confident conclusion, more studies will need to be done

(Kim et al, 8)

THE FUTURE

- Thanks to climate change, more extreme weather events are expected as we move forward in time
- Human activity will continue to increase the number of pollutants in the air
- This will not be good for those who suffer from AD and makes this issue a very important one that should continue to be studied

(Kim et al, 9)



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