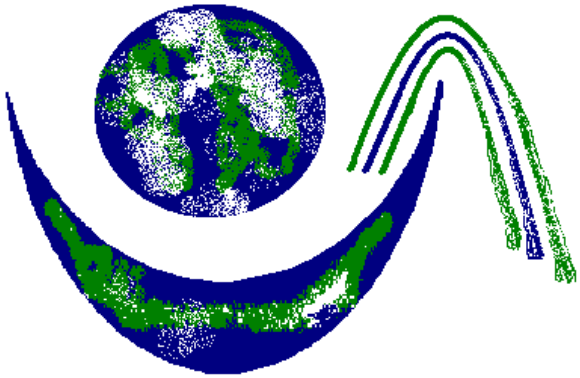
Training for health professionals



Allergies and Asthma

Stephan Böse-O'Reilly

Objective

- Environmental changes
  - Air pollution
  - Pollen
- Health effects
  - Asthma and allergies
- Health Impact

Climate-TRAP

Climate change - ↑ exposures

- ↑ Ozone – higher ozone ground levels
- ↑ Pollen – earlier start of the season, more pollen, alternated pollen
- ↑ Common Ragweed (*Ambrosia artemisiifolia*)
- ↑ Oak Processionary Moth (*Thaumetopoea processionea*)
- In higher altitudes ↑ house dust mite

Climate-TRAP

Climate change – changes !

- Δ time spent indoor/outdoor
  -> Δ exposure to various air pollutants
- Δ pattern of infectious diseases
- Δ different ventilation rates -> mold
- Δ behaviour e.g. outdoor sports

Climate-TRAP

Climate change - pollen

- ↑ CO_2 -> ↑ plant biomass & pollen production
- ↑ temperature -> ↑ earlier flowering and longer pollen seasons for some plants
- ↑ ambient CO2 -> some plant products ↑ allergenic

Shea KM, Truckner RT, Weber RW, Peden DB. Climate change and allergic disease. J Allergy Clin Immunol. 2008 Sep;122(3):443-53; quiz 54-5

Climate-TRAP

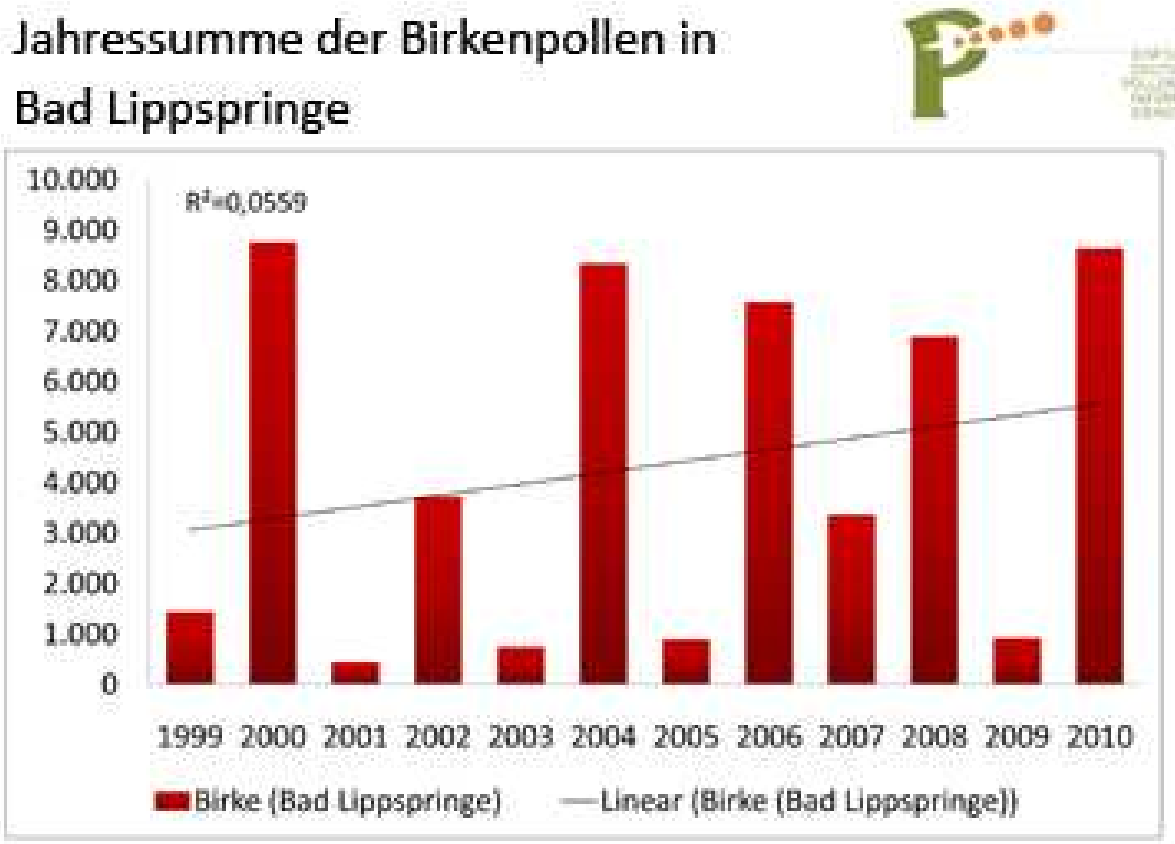
Climate change - pollen

- Pollen season -> longer (6 to 19 days)
  - Trees (birch) earlier
  - Herbs longer
- Due to expected temperature rise
  -> pollen season can become even longer

Eis D, Helm D, Laussmann D, Stark K. [Climate change and health]. Berlin: Robert Koch Institut; 2010.

Climate-TRAP

Climate change – birch pollen



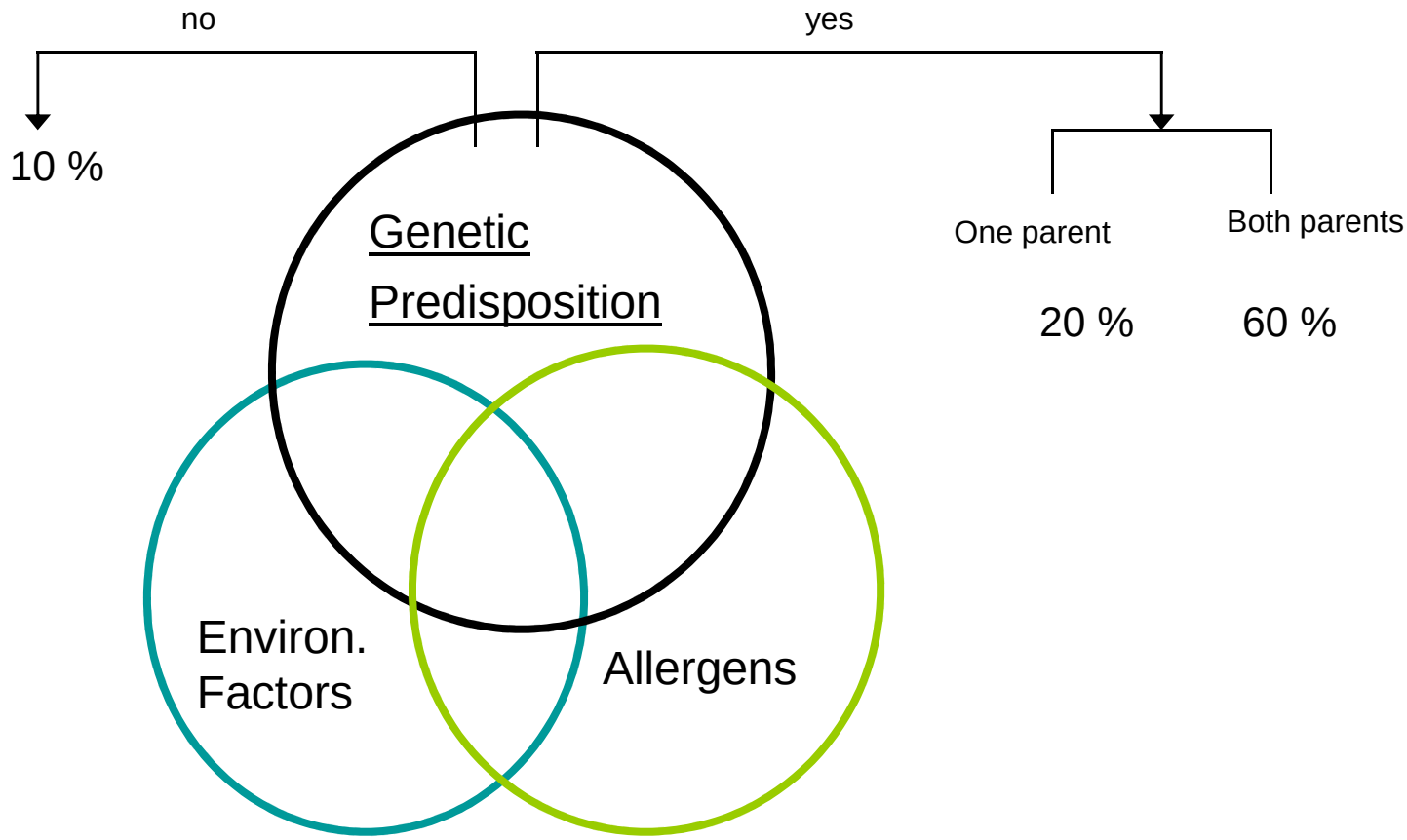
http://www.pollenstiftung.de/literaturvortraege/studienanalysen/ Karl-Christian Bergmann, Aufkommen der allergologisch wichtigsten Pollen in Deutschland von 1999 bis 2010, Berlin, 01.02.2011

Climate-TRAP

Health effects
- allergens

- **Allergens** are natural substances, e.g. pollen
- **Allergens** are usually well tolerated by the immune system
- **Allergy** is the pathological answer of the immune system against allergens

Health effects - risk factors for atopic diseases



Bjorksten B.: Risk factors in early childhood for the development of atopic diseases. Allergy. 1994 Jul;49(6):400-7.

Climate-TRAP

Health effects
- atopic diseases

- Asthma
- Allergic rhinitis /„hay fever “
- Allergic conjunctivitis
- Atopic dermatitis
- Food allergies

Climate-TRAP

Health effects - asthma

- Chronic inflammatory lung disease
- Wheezing, coughing, breathlessness
- Triggers:
  - Allergens (pollen, animal hair, house dust)
  - Infections
  - Exposure to molds
  - Exercise, changes in the weather
  - Exposure to airway irritants (tobacco smoke, ozone, and other air pollutants)

Ebi KL, Paulson JA. Climate change and child health in the United States. Curr Probl Pediatr Adolesc Health Care. 2010 Jan;40(1):2-18.

Climate-TRAP

Health effects –possible changes in triggers

- Triggers related to climate change
  - Allergens (pollen, animal hair, house dust)
  - Infections
  - Exposure to molds
  - Exercise, changes in the weather
  - Exposure to airway irritants (tobacco smoke, ozone, and other air pollutants)

Climate-TRAP

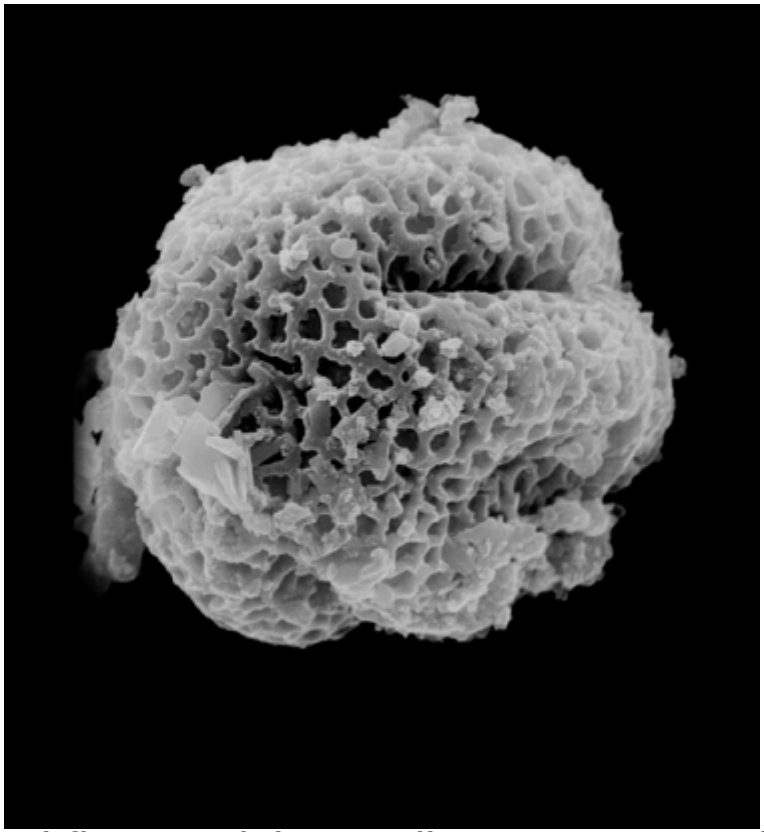
Ozone levels and asthma

- Warmer air temperature –>
  ↑ ground levels of O_3
- O_3: pulmonary irritant -> inflammation
  -> pneumonia, allergic rhinitis, asthma
- ↑ long term and short term asthma

- Ebi KL, Paulson JA. Climate change and child health in the United States. Curr Probl Pediatr Adolesc Health Care. 2010 Jan;40(1):2-18.
- D'Amato G, Cecchi L, D'Amato M, Liccardi G. Urban air pollution and climate change as environmental risk factors of respiratory allergy: an update. J Investig Allergol Clin Immunol. 2010;20(2):95-102.

Climate-TRAP

Fine particles and pollen



Airborne allergens bind fine particles – allergen – aerosols derive, which have an additional allergenic potential

Foto: Prof. Heidrun Behrendt/Helmholtz Zentrum München, Klinische Kooperationsgruppe Umweltdermatologie und Allergologie, aus http://www.helmholtz-muenchen.de/fileadmin/FLUGS/PDF/Themen/Allergien/Klimawandel_und_Allergien.neu.pdf

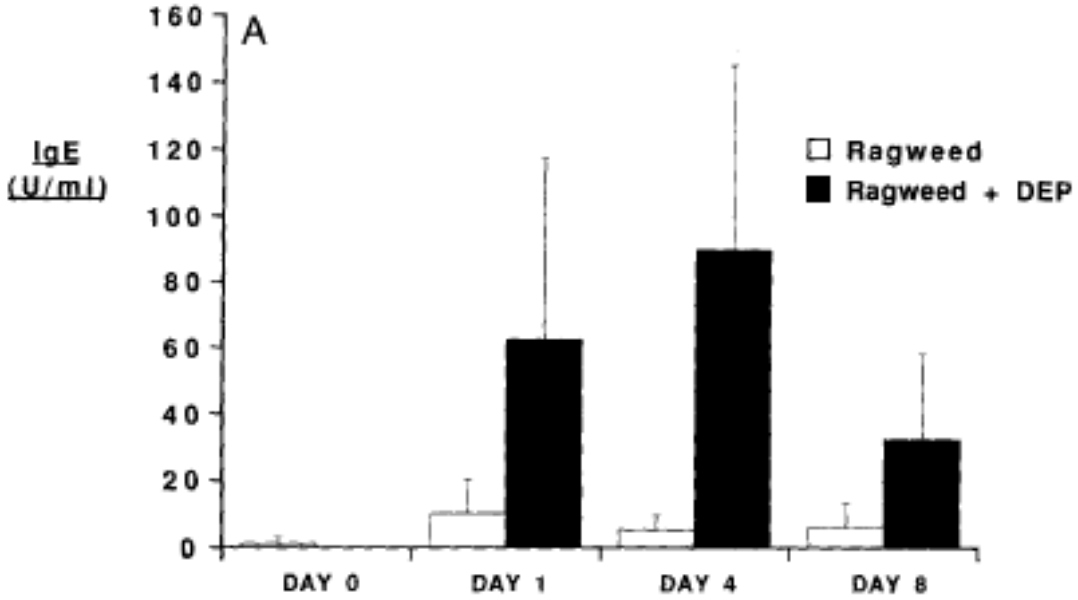
Climate-TRAP

Particles and asthma

- Warmer air temperature –>
  ↑ levels of PM (particulate matter)
- PM penetrate lower airways
  -> ↑ wheezing, bronchitis, LRTI, asthma
- Esp. diesel exhaust particles (DEP)
- -> interaction between DEP & aeroallergens -> ↑ ↑ ↑ IgE

Climate-TRAP

Health effects – ragweed plus diesel exhaust particles



Effect of ragweed or ragweed plus DEP on IgE levels in nasal washes over time.

Diaz-Sanchez D, Tsien A, Fleming J, Saxon A. Combined diesel exhaust particulate and ragweed allergen challenge markedly enhances human in vivo nasal ragweed-specific IgE and skews cytokine production to a T helper cell 2-type pattern. J Immunol. 1997 Mar 1;158(5):2406-13.

Climate-TRAP

Invasive plants – allergens – e.g. Ragweed (Ambrosia)

Ragweed likes dry and sunny places, e.g. roadsides

- flourishing July to October
- per plant up to 1 Mio. pollen
- highly sensitizing
- asthma rate twice as high compared to other pollen
- cross reaction common

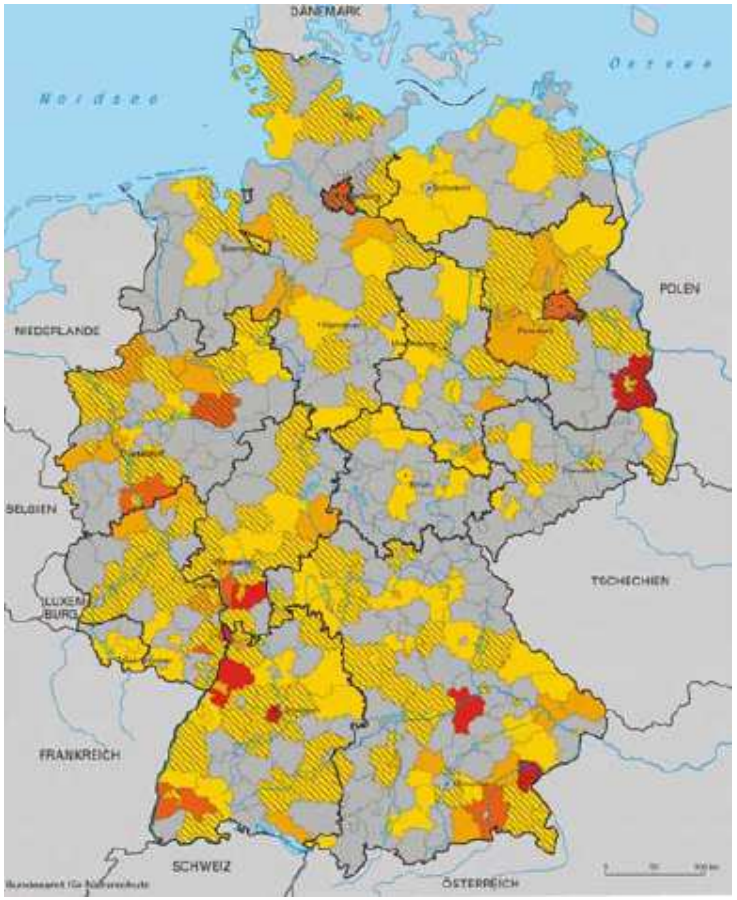
Vorkommen der Ambrosia artemisiifolia an einem Autobahnabschnitt
Bildautor: S.Nawarath & B. Alberternst, Projektgruppe Biodiversität, J.W. Goethe-Universität Frankfurt, www.lgl.bayern.de/.../ambrosia_strassenrand.jpg

Climate-TRAP

Invasive plants – allergens – e.g. Ragweed (Ambrosia)

Ragweed does spread in Germany due to improving living conditions, mainly warming

Ragweed in Germany

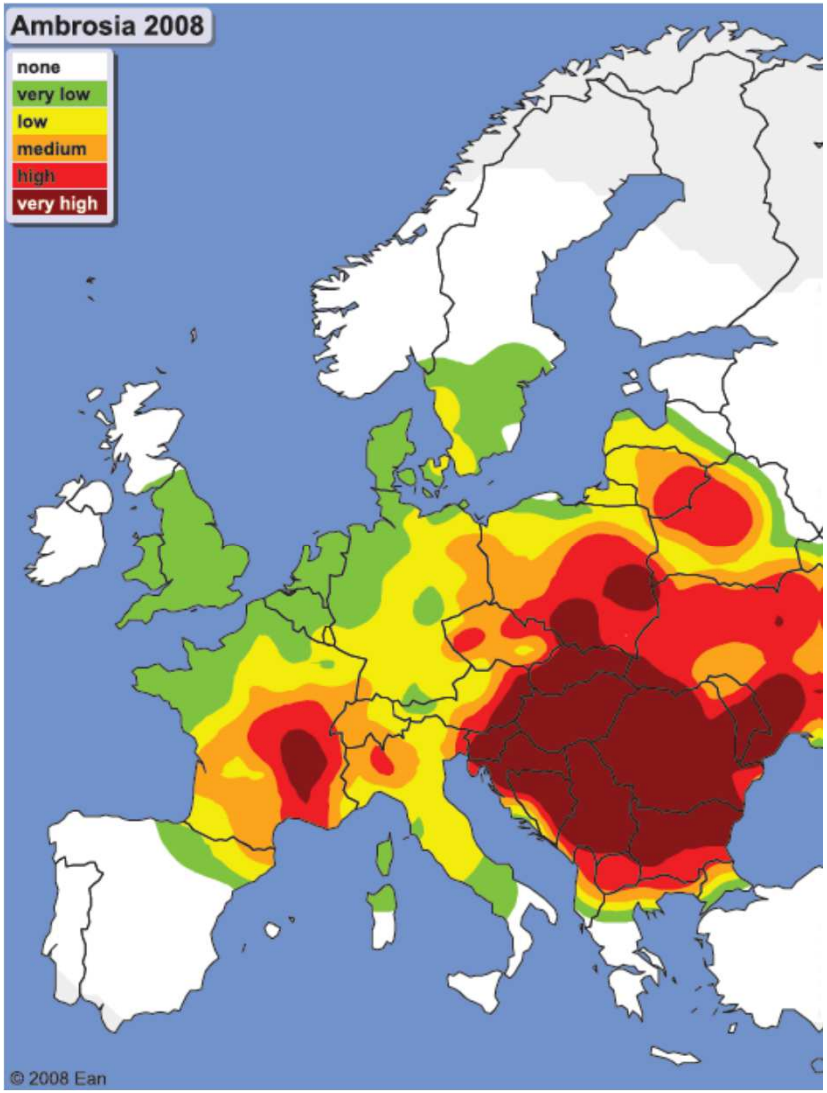


Einzelpflanzen (1–9 Pflanzen
kleine Bestände (10–100 Pflanzen)
mittelgroße Bestände (100–1.000 Pflanzen)
große Bestände (> 1000 Pflanzen)
keine Vorkommen gemeldet oder keine Information vorhanden
Angaben von Alberternst und & Nawrath aus dem Jahr 2006 und bis 10/2007 im BfN bekannte Vorkommen

Abb.:
http://www.umweltbundesamt.de/umid/archiv/umid0309.pdf

Climate-TRAP

Invasive plants – allergens – e.g. Ragweed (Ambrosia)

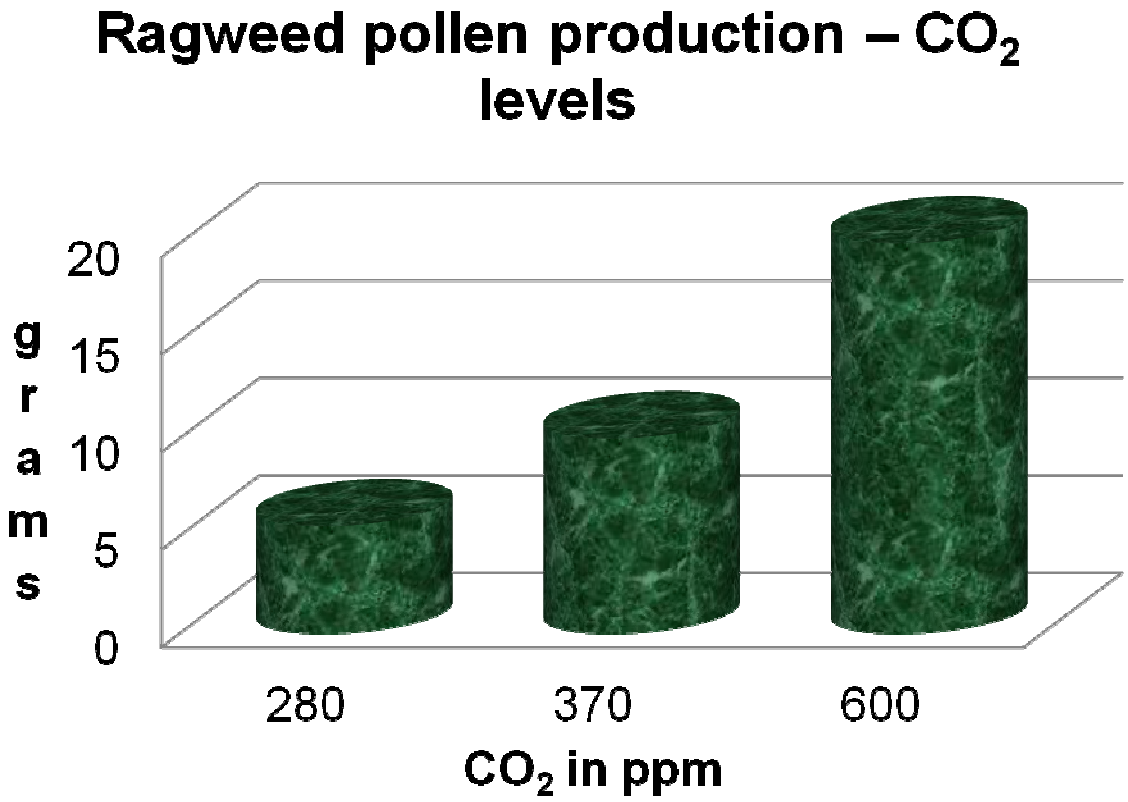


Distribution of ragweed pollen 2008

EAN (European Aeroallergen Network https://ean.polleninfo.eu/Ean) and epi (European Pollen Information http://www.polleninfo.org).

Climate-TRAP

Increased aero-allergens



Pollen production in common ragweed

Ziska L, Caulfield FA. Rising CO2 and pollen production of common ragweed (Ambrosia artemisiifolia), a known allergy-inducing species: implications for public health. Aust J Plant Physiol. 2000;27:893–8.

Climate-TRAP

New airborne allergens – Oak Processionary Moth

- Insects preferring warmer temperatures -> New airborne allergens advancing

- Oak Processionary moth
  - Caterpillars live in oak trees
  - Poisonous setae (hairs)
  - Skin irritation, asthma

.

Climate-TRAP

New airborne allergens – Oak Processionary Moth

- Skin reaction
  - strong itchiness
  - contact urticaria
  - dermatitis
- Conjunctivitis
- Allergic reactions of airways
- Anaphylactic shock
- Fever, feeling unwell

Climate-TRAP

Increased aero allergens, increased illness

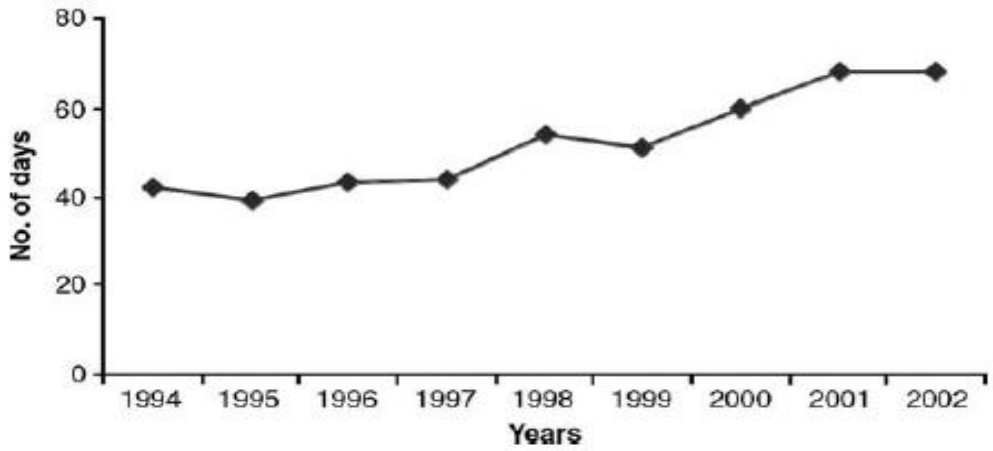


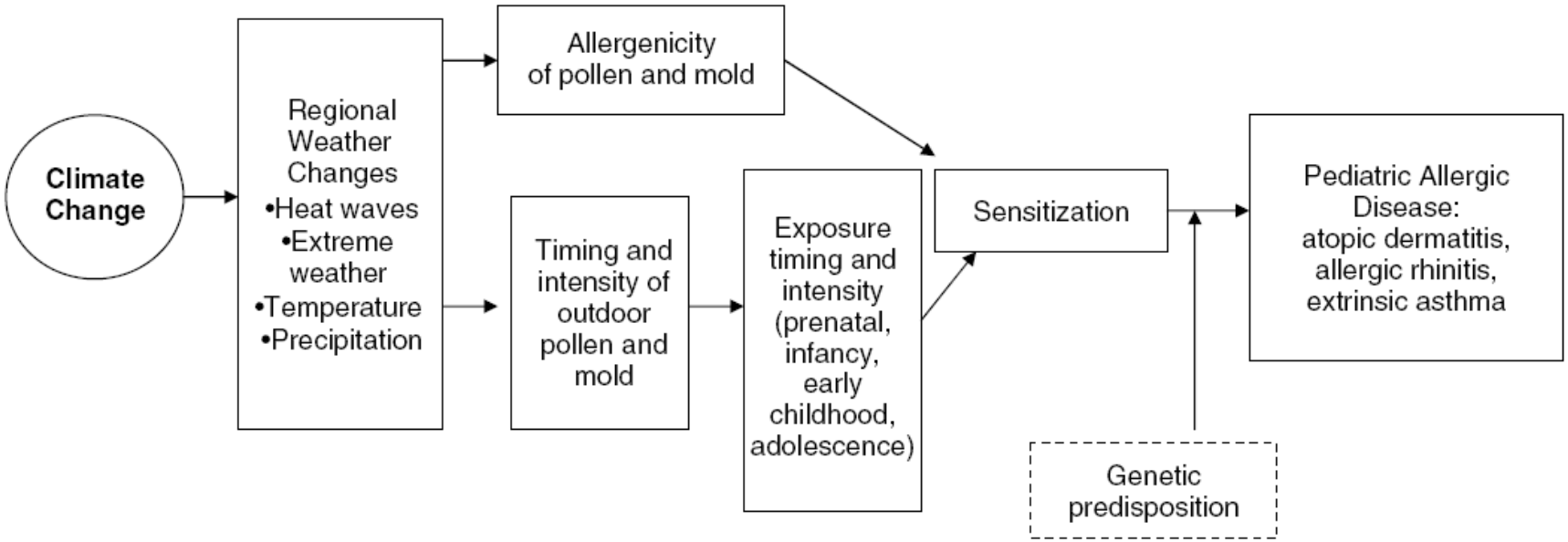
Fig. 4. Length of the *Ambrosia* pollen season for the Montreal region between 1994 and 2002.

- Length of pollen season increasing significantly
- Seeking medical consultation
  - OR 2.69 (1.32-5.52) day of high pollen counts
  - OR 2.48 (1.26-4.88) 5 days after high pollen counts

Breton, Sci Tot Envr (2006) 370:39-50

Climate-TRAP

Climate change impact on allergies



Potential mechanism by which climate change could impact pediatric allergic disease

Sheffield PE, Weinberger KR, Kinney PL. Climate change, aeroallergens, and pediatric allergic disease. Mt Sinai J Med. 2011 Jan-Feb;78(1):78-84.

Climate-TRAP

Impact on health care

- Rare diseases will become more common
  - Ambrosia related allergy
  - Oak Processionary Moth dermatitis
- Asthma incidence will increase
  - related costs as well
  - health care systems need to be prepared for this increase

What actions are needed?

- Training of health care professionals – new emerging diseases
- Greening the health care system

Climate-TRAP