MINISTERO della SALUTE Workshop "Clima e Salute" Roma 16 giugno 2016

Piano nazionale per la prevenzione degli effetti del caldo sulla salute, Estate 2016"

Cambiamenti climatici, Esposizioni Ambientali e Malattie Respiratorie

Gennaro D'Amato



University Professor of Respiratory Medicine

Chairrman WAO committee and task force on Climate Change, Asthma and Respiratory Allergy

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Centro Nazionale Prevenzione e Controllo Malattie

WORKSHOP **CLIMA E SALUTE**

Piano Nazionale per la prevenzione degli effetti del caldo sulla salute Estate 2016



Roma, 16 giugno 2016 Ministero della Salute, Via G. Ribotta 5 SALA AUDITORIUM

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SCENARIOS

Major natural and anthropogenic processes and influences on the climate system addressed in scenarios



U.S. Climate Change Science Program, 2003

Why the trend to increased allergy and asthma in the population?

- Hereditary
- "Hygiene" hypothesis
 - Rates of immunization; early antibiotic use
- Indoor pollution-changes in air exchange
- Dietary factors
- Exposure to allergens in early life
- Outdoor air pollution and global warming.

D'Amato G "Respiratory allergy, Aeroallergens and other trigger factors (climate change ad air pollution)." Publ Momento Medico 2016



Global Warming Basics



INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE



IPCC 4th ASSESSMENT REPORT ON CLIMATE CHANGE (2007):

2500+ SCIENTIFIC EXPERT REVIEWERS 800+ CONTRIBUTING AUTHORS AND 450+ LEAD AUTHORS FROM 130+ COUNTRIES 6 YEARS WORK 1 REPORT



WINNER OF THE

"Most of the observed increase in globally averaged temperatures since the mid-20th century is *very likely* [at least 90%] due to the observed increase in anthropogenic greenhouse gas concentrations."

CO2 is the most important anthropogenic greenhouse gas and about 75% of CO2 emissions during the past 20 years resulted from fossil fuel burning Source: IPCC, 2007 (Working group I)

Climate Change

Solomon et al., 2007,

IPCC.

Increased atmospheric concentrations of CO₂ and other greenhouse gases:



- changes in the amount, distribution, and intensity of precipitation events
- increases in the intensity and frequency of certain extreme weather events (heat waves, floods, thunderstorms and hurricanes)

Anthropogenic activities play a key role

Anthropogenic CO₂ input

CO₂ concentration



Long-term effects of CO₂: time to stabilization After CO2 emissions are reduced and atmospheric concentrations stabilize, surface air temperature continues to rise slowly for a century or more



Potential Health Effects of Climate Change



Source: Dr. Howard Frumkin

Effects of climate change on environmental factors in respiratory allergic diseases

G. D'Amato* and L. Cecchi^{†,‡}

* Division of Respiratory and Allergic Diseases, Department of Chest Diseases, High Speciality Hospital 'A Cardarelli', Napoli, Italy, [†] Interdepartmental Centre of Bioclimatology, University of Florence, Florence, Italy and [‡]Allergy Clinic, Azienda Sanitaria 10 Firenze, Florence, Italy



D'Amato & Cecchi, Clin Exp Allergy, 2008

EFFECTS ON ASTHMA AND RESPIRATORY ALLERGY OF CLIMATE CHANGE AND AIR POLLUTION.

D'AMATO GENNARO, VITALE CAROLINA, DE MARTINO ANNAMARIA, VIEGI GIOVANNI, LANZA MAURIZIA, MOLINO ANTONIO, SANDUZZI ALESSANDRO, VATRELLA ALESSANDRO, ANNESI-MAESANO ISABELLA, D'AMATO MARIA. MULTIDISCIP RESPIR MED. 2015 DEC 22;10:39. DOI: 10.1186/S40248-015-0036-X. ECOLLECTION 2015. REVIEW.

PMID: 26697186 FREE PMC ARTICLE





Meteorological Conditions, Climate Change, New Emerging Factors and Asthma. A Statement of the World Allergy Organization WAO Journal 2015

Gennaro D'Amato, Stephen T. Holgate, Ruby Pawankar, Dennis K. Ledford, Lorenzo Cecchi, Mona Al-Ahmad, Fatma Al-Enezi, Saleh Al-Muhsen, Ignacio Ansotegui, Carlos E. Baena-Cagnani, David J. Baker, Hasan Bayram, Karl Christian Bergmann, Louis Philippe Boulet, Jeroen T.M. Buters, Maria D'Amato, Sofia Dorsano, Jeroen Douwes, Sarah Elise Finlay, Donata Garrasi, Maximiliano Gómez, Tari Haahtela, Rabih Halwani, Youssouf Hassani, Dennis Ledford, Basam Mahboub, Guy Marks, Paola Michelozzi, Marcello Montagni, Carlos Nunes, Jae-Won Oh, Todor Popov, Jay Portnoy, Erminia Ridolo, Nelson Rosário, Menachem Rottem, Mario Sánchez-Borges, Elopy Sibanda, Juan José Sienra-Monge, Carolina Vitale, Isabella Annesi-Maesano



Pyramid of Health Effects of PM



<u>short-term</u> vs. <u>long-</u> <u>term</u> effects

although there is probably a continuum of effects in the time scale, which are not yet fully understood

PM can affect both the respiratory and cardiac systems.

Ozone



Ozone is a colorless, odorless gas formed when nitrogen oxides and volatile organic compounds react in the presence of intense sunlight.

OZONE FORMATION

Ozone is formed when nitrogen oxides (from fuel burning sources like utilities and automobiles) and volatile organic compounds (from sources such as gasoline, paints, inks and solvents) react in the presence of sunlight. The formation of ozone is dependent on the volume of air available for dilution, air temperature and the amount of sunlight.

Ozone Increases with Higher Temperatures



Acute Effects of Ozone

Respiratory symptoms
Acute decreases in lung function
Increased airway responsiveness
Airway injury and inflammation
Systemic oxidative stress



Hospital Admissions and ED visits for Asthma due to Ozone

- Brisbane, Australia
 - Petroeschevsky et al; 13,246 hospital admissions for asthma showed a strong association between O_3 exposure and asthma exacerbations
- Atlanta
 - White et al 1994 showed that among black children from lowincome families, asthma may be exacerbated following periods of high ozone pollution
 - Tolbert et al 2000 looked at pediatric emergency room visits from 1993-1995 and found ozone (>100 ppb vs. <50 ppb: odds ratio = 1.23, p = 0.003) with pediatric asthma exacerbations
- Toronto
 - Thurston et al-Correlation in admissions to the hospital during the summer and ozone levels
- Sydney
 - Jalaludin et al 2008-Increased ED visits from air pollution including ozone in children

Health Effects of Exposure to Ozone and PM_{2.5}

- coughing
- nose and throat irritation
- chest pain
- reduced lung function
- increased susceptibility to respiratory illness
- •aggravation of asthma
- children with chronic lung disease are particularly at risk

- increased risk of cardiac arrest and premature death
- aggravation of asthma
- respiratory related hospital visits
- reduced lung function and chronic bronchitis
- work and school absences
- children with chronic lung disease are particularly at risk

WHO: More than 7 million air pollution deaths

each year

Kuehn BM. JAMA. 2014 Apr 16;311(15):1486. doi: 10.1001/jama.2014.4031.

Clinical & Experimental Allergy

The Official Journal of the British Society for Allergy & Clinical Immunology edited by A B Kay and S T Holgate



www.blackwell-science.com/cea

de Marco R. et al.: The impact of climate and traffic-related NO_2 on the prevalence of asthma and allergic rhinitis in Italy. Clin. Exp. Allergy 2002; 32: 1405-1412.

D'Amato G.: Editorial: Outdoor air pollution, climate and allergic respiratory diseases: evidence of a link. Clin. Exp. Allergy 2002; 32: 1391-1393

Climate interacts with outdoor exposure to NO₂ increasing the risk for allergic rhinitis and asthma in people exposed to high stable temperature.

Climate Change and Allergens

- Increase plant growth
- Increase the amount of pollen produced by each plant
- Increase the amount of allergenic proteins contained in pollen
- Increase the start time of plant growth and therefore the start of pollen production
- D'Amato G et al Position paper of EAACI "Allergenic pollen and pollinosis" Allergy 2007

The Possible Ways by which Atmospheric Pollution may Increase Allergy



The "urban climate effect"

The plants flower earlier in urban areas than in the corresponding rural areas with <u>earlier pollination</u> of about 2-4 days



Emberlin et al CEA 1999; Beggs CEA 2002; D'Amato et al ERJ2002; Allergy2007; CEA2008; JIACI 2010;CEA2016









Production of allergenic pollen by ragweed (*Ambrosia artemisiifolia*) is increased in CO2 enriched atmospheres

Wayne P. et al Ann Allergy Asthma Immunol. 2002

A doubling of the <u>atmospheric</u> <u>CO2</u> concentration stimulated ragweed-pollen production by 61%





J Investig Allergol Clin Immunol 2007 Air pollution and allergens

J Bartra,¹ J Mullol,² A del Cuvillo,³ I Dávila,⁴ M Ferrer,⁵ I Jáuregui,⁶ J Montoro,⁷ J Sastre,⁸ A Valero¹

Environmental pollution influences pollen allergenicity



Pollen in heavily polluted zones expresses a larger amount of proteins described as being allergenic, compared with areas characterized by lesser pollution.

In the presence of high CO_2 concentrations, plants increase their photosynthetic activity, water requirements, reproductive effort and biomass .

- High CO₂ concentrations increase both its biomass and pollen output (between 60-90%).
- High CO₂ concentrations and temperatures induce increased pollen production (synergism between CO₂ and T).

Volume 7 Monograph 21, August 2002

The Impact of Air Pollution on Respiratory Health

Edited by G. D'Amato and S.T. Holgate

Current knowledge of effects of climate change on respiratory allergy is provided by epidemiological and experimental studies on the relationship between asthma and environmental factors, such as meteorological variables, airborne allergens and air pollution.

Elevated Atmospheric Carbon Dioxide Concentrations Amplify Alternaria alternata Sporulation and Total Antigen Production

Mould Spores

Wolf J,et al Environ. Health Perspect 2010

At 500 and 600 mol/mol CO2 concentrations, *A. alternata* produced nearly 3 times the number of spores and more than twice the total antigenic protein per plant than at lower concentrations



Effect of increasing leaf C:N on the natural log of *A. alternata* spores



Effect of increasing *P. pratense* leaf C:N on the *A. alternata* spore antigen conten

Air Pollution Episodes

Isabella Annesi-Maesano (Section Leader), Tari Haahtela, Stephen T Holgate, Juan José Sienra-Monge, Hasan Bayram, Gennaro D'Amato

Thunderstorm-related Asthma

Gennaro D'Amato (Section Leader), Lorenzo Cecchi, Nelson Rosário, Guy Marks, Isabella Annesi-Maesano

Sandstorm

Saleh Al-Muhsen (Section Leader), Mona Al-Ahmad, Rabih Halwani, Basam Mahboub, Fatma Al-Enezi, Hasan Bayram

Climate Change and Respiratory Allergy

Gennaro D'Amato (Section Leader), Lorenzo Cecchi, Isabella Annesi-Maesano, Karl Christian Bergmann

Pollen Allergy and Meteorological Factors

Lorenzo Cecchi (Section Leader), Jeroen TM Buters, Jae-Won Oh, Ignacio Ansotegui, Carlos Nunes, Gennaro D'Amato

Molds, Rain, Humidity, Dampness

Jeroen Douwes (Section Leader), Maximiliano Gomez, Jay Portnoy

Allergy and Asthma in the Tropics

Carlos E Baena-Cagnani (Section Leader), Dennis Ledford, Ruby Pawankar, Mario Sánchez-Borges, Elopy Sibanda

Migration and Urbanization

Nelson Rosário (Section Leader), Menachem Rottem

The Role of Air Filtration as an Environmental Control Measure for Allergic Respiratory Disease

Gennaro D'Amato (Section Leader), Carolina Vitale, Maria D'Amato

Cold Weather

Todor A. Popov (Section Leader), Louis-Philippe Boulet, Paola Michelozzi

Wildfires and Asthma

Isabella Annesi-Maesano (Section Leader), Sarah Elise Finlay, Youssouf Hassani, David J Baker

Violent Conflict and Asthma

Donata Garrasi

Economical Aspects of Climate Change

Erminia Ridolo (Section Leader), Marcello Montagni

D'Amato et al. World Allergy Organization Journal (2015) 8:25 DOI 10.1186/s40413-015-0073-0



REVIEW



CrossMark



Gennaro D'Amato^{1*}, Stephen T. Holgate², Ruby Pawankar³, Dennis K. Ledford⁴, Lorenzo Cecchi⁵, Mona Al-Ahmad⁶, Fatma Al-Enezi⁷, Saleh Al-Muhsen⁸, Ignacio Ansotegui⁹, Carlos E. Baena-Cagnani¹⁰, David J. Baker¹¹, Hasan Bayram¹², Karl Christian Bergmann¹³, Louis-Philippe Boulet¹⁴, Jeroen T. M. Buters¹⁵, Maria D'Amato¹⁶, Sofia Dorsano¹⁷, Jeroen Douwes¹⁸, Sarah Elise Finlay¹⁹, Donata Garrasi²⁰, Maximiliano Gómez²¹, Tari Haahtela²², Rabih Halwani²³, Youssouf Hassani²⁴, Basam Mahboub²⁵, Guy Marks²⁶, Paola Michelozzi²⁷, Marcello Montagni²⁸, Carlos Nunes²⁹, Jay Jae-Won Oh³⁰, Todor A. Popov³¹, Jay Portnoy³², Erminia Ridolo²⁸, Nelson Rosário³³, Menachem Rottem³⁴, Mario Sánchez-Borges³⁵, Elopy Sibanda²⁶, Juan José Sienra-Monge³⁷, Carolina Vitale³⁸ and Isabella Annesi-Maesano^{39,40}





Fig. 3 Possible effects of climate change on respiratory allergy. Source: Lorenzo Cecchi, original drawing

Meteorological Conditions, Climate Change, New Emerging Factors and Asthma. A Statement of the World Allergy Organization WAO Journel 2015 (in press)

Gennaro D'Amato, Stephen T. Holgate, Ruby Pawankar, Dennis K. Ledford, Lorenzo Cecchi, Mona Al-Ahmad, Fatma Al-Enezi, Saleh Al-Muhsen, Ignacio Lorenzo Cecchi, Mona Al-Ahmad, Fatma Al-Enezi, Saleh Al-Muhsen, Ignacio Lorenzo Cecchi, Mona Al-Ahmad, Fatma Al-Enezi, Saleh Al-Muhsen, Ignacio Christian Bergmann, Louis Philippe Boulet, Jeroen T.M. Buters, Maria D'Amato, Christian Bergmann, Louis Philippe Boulet, Jeroen T.M. Buters, Maria D'Amato, Christian Bergmann, Louis Philippe Boulet, Jeroen T.M. Buters, Maria D'Amato, Christian Bergmann, Louis Philippe Boulet, Jeroen T.M. Buters, Maria D'Amato, Sofia Dorsano, Jeroen Douwes, Sarah Elise Finlay, Donata Garrasi, Maximiliano Sofia Dorsano, Jeroen Douwes, Sarah Elise Finlay, Donata Garrasi, Maximiliano Gómez, Tari Haahtela, Rabih Halwani, Youssouf Hassani, Dennis Ledford, Basam Gómez, Tari Haahtela, Rabih Halwani, Youssouf Hassani, Dennis Ledford, Basam Mahboub, Guy Marks, Paola Michelozzi, Marcello Montagni, Carlos Nunes, Jae-Mahboub, Guy Marks, Paola Michelozzi, Barcello Montagni, Carlos Nunes, Jae-Won Oh, Todor Popov, Jay Portnoy, Erminia Ridolo, Nelson Rosário, Menachem Rottem, Mario Sánchez-Borges, Elopy Sibanda, Juan José Sienra-Monge, Carolina Vitale, Isabella Annesi-Maesano



11:05

Gennaro D'AMATO, Italy

EAAC

EAACI Congress 2015 6-10 June, Barcelona, Spain

Weather changes with Climate Change

- More extreme weather patterns, such as increase in thunderstorms
- High number of thunderstorms in spring and summer as same time at high pollen counts
- Pollen grain rupture with thunderstorms with higher levels of respirable allergens; also increase in ozone
- More asthma outbreaks

– UK, Australia, and Italy

Davidson et al BMJ 1996; Bellomo et al, Med J Aust 1992; Girgis et al, Eur Resp J 2000; D'Amato et al , BMJ 2005; Clin Exp Allergy 2005 (Michael Blaiss in WAO J 2015)



Due to climate change, changes are also occurring in the amount, intensity, frequency and type of precipitation as well as the increase of extreme events, like heat waves, droughts, floods and hurricanes

The thunderstorm asthma

<u>Clin Exp Allergy.</u> 2016 Jan 14. doi: 10.1111/cea.12709. Thunderstorm related asthma: what happens and why. <u>D'Amato G¹, Vitale C², D'Amato M², Cecchi L³, Molino A², Vatrella A⁴, Sanduzzi A², Maesano</u>

C⁵, Annesi Maesano I⁵

Possible mechanisms for thunderstorm-related asthma. Is there a causal link between thunderstorm and asthma attacks? Is it possible to predict thunderstorm related asthma?



London 25 June 1994

Celenza A et al. Thunderstorms associated asthma: A detailed analysis of environmental factors. BMJ 1996;312:604-607

Thames Regions Accident and Emergency Trainer Association. A major outbreak of asthma associated with a thunderstorm: experience of accident and emergency departments and patients characteristics BMJ 1996;312:601-4



Bellomo R et al. Two consecutive thunderstorm associated epidemics of asthma in Melbourne. Med J Aust 1992; 156: 834-7


Napoli 4 June 2004 (D'Amato G et al BMJ 2005; Clin Exp 2005; Allergy2007) 6 patients received treatment in emergency departments for severe asthma and one was admitted to an intensive care unit for acute respiratory insufficiency.



Napoli 4 June 2004 All subjects were allergic to *Parietaria*. Five subjects had a history of asthma, whereas one had a history of only rhinitis.





All patients were allergic to Parietaria pollen with symptoms during Spring-Summer months. The extraordinarily long persistence in the atmosphere of *Parietaria* pollen in southern Mediterranean area is responsible for a multiseasonal symptomatology.

Thunderstorm - associated asthma epidemics: observational evidence

Table 1. Examples of thunderstorm-associated asthma outbreaks				
Year	Country	Observations		
1983	UK	26 sudden cases of asthma attacks in relation to thunderstorms		
1992	Australia	Late spring thunderstorms in Melbourne can trigger epidemics of asthma attacks (five to 10-fold rise)		
1997	UK	Asthma or other airways disease hospital visits. 640 cases who attended during a 30-h period on June 1994, nearly 10 times expected number		
1992-2000	Canada	18 970 hospital ED asthma visits among children 2–15 years of age. Summer thunderstorm activity was associated with an OR of 1.35 (95% CI 1.02–1.77) relative to summer periods with no activity		
1993–2004	USA	215 832 asthma ED visits; 24 350 of these visits occurred on days following thunderstorms. Significant association between daily counts of asthma ED visits and thunderstorm occurrence. Asthma visits were 3% higher on days following thunderstorms.		
2000	Australia	Asthma visits during thunderstorms		
		History of hayfever and allergy to ryegrass are strong predictors for asthma exacerbation during thunderstorms in spring		
2001	Australia	The incidence of excess hospital attendances for asthma during late spring and summer was strongly linked to the occurrence of thunderstorm outflows		
2002	UK	A case-control study of 26 patients presenting to Cambridge University Hospital with asthma after the thunderstorm		
		Alternaria alternata sensitivity is a compelling predictor of epidemic asthma in patients with seasonal asthma and grass pollen allergy and is likely to be the important factor in thunderstorm-related asthma		
2004	Italy	Six cases of thunderstorm-related asthma because of pollen (Paretaria)		
2010	Italy	20 cases of thunderstorm-related asthma because of pollen (olive tree)		
2010	Australia	Epidemics of 'thunderstorm asthma' that occurred in Melbourne during spring 2010 The approach of spring, together with high winter rainfall in and around Melbourne that heralds another severe pollen season, raises the risk of allergic rhinitis and asthma in pollen-sensitive individuals		

Pollen structure



Hydrated pollen on a wet surface





Submicronic and/or paucimicronic particles in atmosphere







Pollen grains fragmented and dispersed in atmosphere



Climate Changes favour production also of Airborne Small Allergen-carrying Particles

D'Amato G et al Allergy 2007; Clin Exp Allergy 2008,2016; JIACI 2010; ERR 2012;

Pollen fragments

- Starch granules and other cytoplasmic granules
- Non-pollen plant parts (from inflorescences, leaves or Ubisch bodies)
- Non-plant particulate matter (allergens transferred through physical contact or by leaching from the surface of the pollen grain to other airborne small particles).







Pollen grains fragmented and dispersed in atmosphere during Thunderstorms

The potential role of orbicules (Ubish bodies) as vector of allergens.

D'Amato G - Z Erkrank Atm Org 1981 Pacini E Franchi GG - Plant Syst Evol 1993 Vinckier S Smets E - Allergy 2001 D'Amato G - Allergy 2001 D'Amato G et al Clin Exp Allergy 2005 D'Amato G et al Allergy 2007;JIACI 2010;ERR 2014;CEA 2016

Thunderstorm related epidemics of rhinitis and asthma exacerbations

Under wet conditions or during thunderstorms pollen grains may, after rupture by osmotic shock, release part of their cytoplasmic content into the atmosphere. *D'Amato G, et al BMJ 2005; ClinExpAllergy2005;Allergy 2007;JACI2008;JIACI2010*





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Thunderstorm-related asthma: what happens and why

G. D'Amato¹, C. Vitale², M. D'Amato², L. Cecchi^{3,4}, G. Liccardi¹, A. Molino², A. Vatrella⁵, A. Sanduzzi², C. Maesano⁶ and I. Annesi-Maesano⁶

Clinical & Experimental Allergy 2016

D'Amato G et al.- Environmental risk factors and allergic bronchial asthma. Clin Exp Allergy 2005;35:1113-1124.

CLINICAL & Experimental Allergy

BSACI Annual Conference, 10–12 July 2006, Loughborough, UK



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> **Blackwell** Publishing

D'Amato G et al .Thunderstorm related asthma: what happens and why. Clin Exp Allergy 2016 Jan 14 doi: 10.1111/cea.12709

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EUROPEAN RESPIRATORY *review*

THE RESPIRATORY PROFESSIONAL'S QUARTERLY UPDATE On Medicine, science and surgery

Editorial / Topics in acute respiratory distress syndrome: the patient needs our tender loving and care *page 157* European Respiratory Update/ Climate change and respiratory diseases *page 161* Reviews / Haemoptysis due to pulmonary venous stenosis *page 170 /* Is pesticide exposure a cause of obstructive airways disease? *page 180 /* Diagnosis and management of idiopathic pulmonary fibrosis: French practical guidelines *page 193* Series / Prone ventilation in acute respiratory distress syndrome *page 249*





EUROPEAN RESPIRATORY UPDATE ENVIRONMENTAL LUNG DISEASE

Climate change and respiratory diseases

Gennaro D'Amato¹, Lorenzo Cecchi², Mariella D'Amato³ and Isabella Annesi-Maesano^{4,5}

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@ERSpublications Climate change represents a threat to respiratory health by acting on respiratory diseases or their risk factors http://ow.ly/v6JEl

Weather changes with climate change:

High number of thunderstorms in spring and summer at the same time at high pollen counts
Pollen grain rupture with thunderstorms with higher levels of respirable allergens;
More asthma outbreaks

-

Epidemic asthma and the role of the fungal mold *Alternaria alternata*

Thomas B. Pulimood, MBBS, MRCP,^a Julie M. Corden, BSc,^b Clare Bryden, MA, MSc, FRMetS,^c Linda Sharples, PhD,^d and Shuaib M. Nasser, MBBS, MD, FRCP^a Cambridge, Derby, and Exeter, United Kingdom





FIG 2. A, Alternaria alternata spores. B, Broken Alternaria spore adjacent to an intact spore.

(Pulimood TB et al. J Allergy Clin Immunol 2007;120:610-17)

Pulimood et al suggest sensitization to Alternaria species to play a key role in thunderstorm-related asthma.

Thunderstorm-related asthma: Not only grass pollen and spores

To the Editor:

Gennaro D'Amato, MD^a Lorenzo Cecchi, MD^b Gennaro Liccardi, MD^a

From "the Division of Respiratory and Allergic Diseases, Department of Respiratory Diseases, High Specialty Hospital A. Cardarelli, Naples, Italy, and ^bthe Interdepartmental Centre of Bioclimatology, University of Florence, Florence, Italy.

Disclosure of potential conflict of interest: The authors have declared that they have no conflict of interest.

(D'Amato G et al. J Allergy Clin Immunol 2008;121:537-38)



Grass pollens



Parietaria pollens



Olea pollens

/



Alternaria





Thunderstorm-related asthma outbreaks and relapse. Gennaro D'Amato et al ERR 2014

Is there a causal link between thunderstorms and asthma attacks?

Hill's criteria	Application to the thunderstorm-related asthma
Strength The stronger the relationship between the independent variable and the	Increased risk of asthma attacks in relation to thunderstorms
dependent variable, the less likely it is that the relationship is due to an extraneous variable	
Consistency	Association between thunderstorm and asthma found in different studies and different populations
Multiple observations, of an association, with different people under	
different circumstances and with different measurement instruments	
increase the credibility of a finding	
Specificity	Scantily demonstrated by experimental data (also sparse and
Causation is likely if a very specific population at a specific site and	heterogeneous)
disease with no other likely explanation. The more specific an association	
between a factor and an effect is, the bigger the probability of a causal	
relationship is [1]	
Temporality	Thunderstorms always precede asthma attacks
The effect has to occur after the cause	
Dose-response relationship	Increased amount of pollen and mould spores at the beginning of
There should be a direct relationship between the risk factor (i.e. the	the thunderstorm associated with increased probability of asthma
independent variable) and people's status on the disease variable (i.e.	attacks in pollen patients and other allergic patients
the dependent variable)	

Thunderstorm –associated asthma epidemics: evidence based-knowledge

There is a close temporal association between the start of the thunderstorm and the onset of asthma epidemics Asthma epidemics related to thunderstorms are limited to pollen (and outdoor mould) seasons

There are not high levels of gaseous and particulate components of air pollution during thunderstorm-related asthma outbreaks Subjects with pollen allergy who stay indoors with the window closed during thunderstorms are not involved

There is a major risk for subjects who are not receiving antiasthma treatment but subjects with allergic rhinitis and without previous asthma can experience severe bronchoconstriction

Non-allergic subjects are not involved in thunderstorm-related asthma

EUR ANN ALLERGY CLIN IMMUNOL

G. D'Amato¹, A. Corrado², L. Cecchi³, G. Liccardi¹, A. Stanziola⁴, I. Annesi-Maesano⁵, M. D'Amato⁴

A relapse of near-fatal thunderstorm-asthma in pregnancy

¹Division of Respiratory and Allergic Diseases, Department of Respiratory Diseases; High Speciality Hospital A.Cardarelli Napoli Italy - E-mail: gdamatomail@gmail.com ²Division of Respiratory Diseases, Hospital "Careggi" Florence Italy ³Allergy and Clinical Immunology Section, Azienda Sanitaria di Prato, Prato Italy ⁴Division of Respiratory Diseases, Medical School "Federico II", University Hospital "Dei Colli" Napoli, Italy ⁵INSERM, UMR S 707: EPAR, Paris, F-75012 France



D'Amato G et al. Eur Ann Allergy Clin Immunol , June 2013

A young lady who experienced near fatal asthma in concomitance with a thunderstorm in June 2004 was admitted again in the emergency room department of Cardarelli hospital in Naples on 24 May 2011 and on 28 May 2012 for other two attacks of near fatal asthma (the last, in 2012, in pregnancy).



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 ✓ Federico Peluso : Diagnosis: Allergic bronchial asthma (sensitization to grasses) oculorhinits and oral allergic syndrome.













✓ Early-onset asthma with sensitization to grasses.
 ✓ During spring oculorhinitis and episodes of exercise-induced asthma.
 ✓ Treated in adolescence with SCIT with good results for four years .

✓ Thunderstorm Just at the end of the first time .
 ✓ 25/3/2014: Atalanta-Bologna 2-0 (Gabbiadini-Tiribocchi)









Now rhinitis and asthma are well controlled during Spring months with antihistamines, montelukast 10 mg daily and spray (association of LABA(Salmeterol 25 mcg)-fluticasone 250 mcg 2 puffs morning and 2 evening)



Take home message:

Subjects affected by pollen allergy should be alert to the danger of being outdoors without correct treatment of rhinitis and asthma during a thunderstorm in the pollen season.



Policies measures: ADAPTATION



What can we do?

Decreasing use of fossil fuels and controlling vehicle emissions. Reducing the private traffic in towns. Increased use of public transport,Cyclinga nd walking. Planting in cities non-allergenic trees Minimize outdoor activity on days with high pollution Suggest patients live in remote areas from heavy traffic Reduction in meat consumption



WORLD ALLERGY ORGANIZATION

Two for the price of one: climate change mitigation measures also reduce air pollution

76 Millions of tons of CO2 produced by Internet in 2002 750 Millions of tons in 2015

facebook.

THE LANCET 32 Jamestown Road London NW1 7BY UK

D'Amato G, et al Facebook. A new trigger for asthma? The Lancet, Vol 376;Nov20,2010 p1740

D'Amato G, et al Social Networks : a new source of psychological stress or a way to enhance self-esteem? Negative and positive implications in bronchial asthma. JIACI 2012

D'Amato G, Cecchi L, Social Networks and bronchial asthma. Curr Opin Allergy Clin Immunol. Feb 13 (1) 87-91;2013

D'Amato G et al PAI 2016





Each year 13 millions of forests ' hectares are destroyed or deteriorated.



In the last 50 years 50% of pluvial forests of our Planet have been destroyed.

Food cultivation on wasted areas of tropical pluvial forests determined about 35% of deforestation in South America, 70% in African and 50 % in Asian countries



WAOJ-D-16-00018

Climate change and allergy, the contribution of forests of Brazil to a clean atmosphere. Gennaro D'Amato; Carolina Vitale; Nelson Rosario; Herberto Jose Chong Neto; Debora Carla Chong-Silva; Francisco Mendonça; Josè Perini; Loraine Landgraf; Dirceu Solé; Mario Sanchez; Ignacio Ansotegui; Maria D'Amato

World Allergy Organization Journal, in press



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Norway Is The First Country To Ban Deforestation "This is an important victory in the fight to protect the rainforest."


Tiglio (Tilia cordata)



Robinia pseudoacacia





Platano (Platanus occidentalis)

Olmo (Ulmus)



Pino (*Pinus*)

ALBERI A BASSO RISCHIO ALLERGICO E BUON ASSORBIMENTO INQUINANTI



ERS EAACI Task Force on Climate Change, Air Pollution and Respiratory Diseases





WAO Committee on Climate Change and Allergic Diseases

Strategies to reduce climate changes and air pollution are political in nature, but citizen and in particular health professionals and societies must raise their voices in the decision process to give strong support for clean policies on both national and international levels.

Thanks gela matomail@gmail.com

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Global Warming

- Warming will not be evenly distributed around the globe
 - Land areas will warm more than oceans in part due to water's ability to store heat.
 - High latitudes will warm more than low latitudes in part due to positive feedback effects from melting ice
 - Most of North America; all of Africa, Europe, northern and central Asia; and most of Central and South America are likely to warm more than the global average.
- The warming will differ by season, with winters warming more than summers in most areas.





Also this phenomenon was followed by a rapid increase in hospital or general practitioner visits for asthma. No unusual levels of air pollution were noted at the time of these epidemics but there was a strong association with grass pollen.