



**LABORATORY FOR INTEGRATIVE
AND TRANSLATIONAL RESEARCH
IN POPULATION HEALTH**



André Moreira Research Group

Epidemiology of Allergic Diseases Lab

How it started

- Our past research interests were directed at **non-pharmacological interventions in allergy and asthma**. Our goal was to apply healthier environment and lifestyle interventions to be part of the health management, thereby improving patient care for common medical conditions, such as asthma and other allergic diseases.
- Non-pharmacological treatment approaches **that focus on manipulation of dietary and physical activity factors** are of major interest since they could potentially reduce the dose requirements of pharmacological medications and their side effects and reduce the burden of the disease.
- Additionally, **tackling sedentary lifestyle, preventing obesity and thereby enhancing health and quality of life well being is currently a public health challenge with benefits further beyond allergic diseases.**

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Our main findings were:

- i. reporting for the **first time a negative association between body mass index and airway inflammation** in overweight or obese asthmatics countering the inflammatory hypothesis and further supporting the mechanical link between obesity and asthma;
- ii. for the first time, in **asthmatic subjects we have shown that high adherence to Mediterranean diet and to some of their typical foods, such as fresh fruits and nuts, have a protective role in asthma control and lung function**; iii) specifically a novel protective effect of **dietary intake of alfa-linolenic acid in asthma control, independent of marine n-3 fatty acids was shown**;
- iii. we conducted the **first human clinical trial assessing the impact of training on asthma inflammation in children** clinical trial that showed physical training does not increase inflammation in children with persistent asthma and decreases both total and allergen specific IgE levels.
- iv. under the auspices of the European Academy of Allergy and Clinical Immunology (EAACI) we published the **first chapter of the Evidence Based Clinical Guidelines on Lifestyle and Asthma**.
- v. we suggested a novel link to explain the association between obesity and asthma – **“the neurogenic hypothesis”**. We have gathered evidence of the role **of tachykinin receptors antagonism in asthma as well as their potential to regulate some airway functions**. Furthermore, in a **mice model of obesity and allergic asthma, we have shown increased serum levels of substance P to result from an interaction between obesity and asthma on substance P release**. These findings reveal that neurogenic inflammation might be a previously unrecognized link between obesity and asthma.
- vi. we went further on a **trial of the efficacy of NK1-R antagonism to shown it to be effective in reducing metabolic and allergic inflammatory parameters in obese-asthma phenotype in mice**. This was possible related to increased expression of NK1-R on adipose tissues and lung epithelium, reflecting that substance P released during inflammation may act directly on adipose tissues and lungs.



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How it is going

- i. we reported for the first time, **a role for endocrine-disrupting chemicals in asthma development**. We have shown that **even low levels of indoor exposure may influence the risk of asthma, respiratory symptoms and obesity in school aged children**.
- ii. we shown for the first time **the effects of the environment surrounding schools on the lung function of its students may be partially mediated by the autonomic nervous system**
- iii. we shown for the first time **the present the role of diet's inflammatory characteristics modulating the effects of indoor air pollution on asthma**
- iv. within the school's classroom environmental exposure, **we have shown that higher fungal diversity may be protective against allergic sensitization**
- v. Lastly, data from the GeracaoXXI birth cohort has shown **that living in close proximity to a greener environment at birth has a protective effect on the development of allergic diseases and asthma at the age of seven**. Conversely, living in neighborhoods with a high number of fauna species appears to be associated with a higher risk for allergy, asthma and wheezing. : i) **species richness in school surroundings impact lung function development in children**;
- vi. Taken together above mention observations support the rewiring of public health and urban planning as an opportunity to understand the effect of urbanization and many other urban exposures on allergic health, providing information to build up successful community-based disease prevention efforts.

Urban exposure and allergic health



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How it is going

i. With about 1 to 18% of the population worldwide being affected, wheeze and asthma are the most prevalent chronic respiratory diseases during childhood and adulthood. As such, many children each day will enter an outpatient clinic or a paediatrician's office needing diagnostic tests for suspected asthma. If it were only that simple! Individuals with suspected asthma symptoms vary substantially in their complaints and clinical manifestations despite common pathophysiological factors that lead to the final common pathway of variable airway obstruction due to a range of triggers, which results in symptoms such as wheeze, difficulty breathing, chest tightness, and cough.

What is the best way then to diagnose asthma during childhood?

ii. We were the first to show **miRNAs can be measured in exhaled breath condensate of school age children and may be used as potential biomarkers of asthma, assisting asthma endotype establishment.** The analysis of miRNAs by principal component analysis revealed the existence of two clusters, one of them associated with children with asthma defined by positive bronchodilation or self-reported medical diagnosis with reported symptoms in the previous year and the other with higher small airways response to salbutamol. Moreover, the **analysis of individual miRNAs revealed associations with asthma phenotypes, namely symptomatic and positive bronchodilation without symptoms, lung function parameters and symptoms in the previous three months.**

iii. Using an **electronic nose, we have shown in a real-life clinical setting, the ability of the exhaled VOC analysis as a fast and noninvasive complementary assessment tool for the detection of uncontrolled asthma symptoms.** Furthermore, **in children, analysis of the exhaled breath condensate volatilome allowed the distinction of paediatric individuals with a medical diagnosis of asthma, identifying those in need of corticosteroid therapy**

iv. Taken together our findings provide support for the use of exhaled breath for diagnosis, monitoring or phenotyping diseases according to specific breathprints, therefore, hopefully, contributing to improved asthma care.

Members

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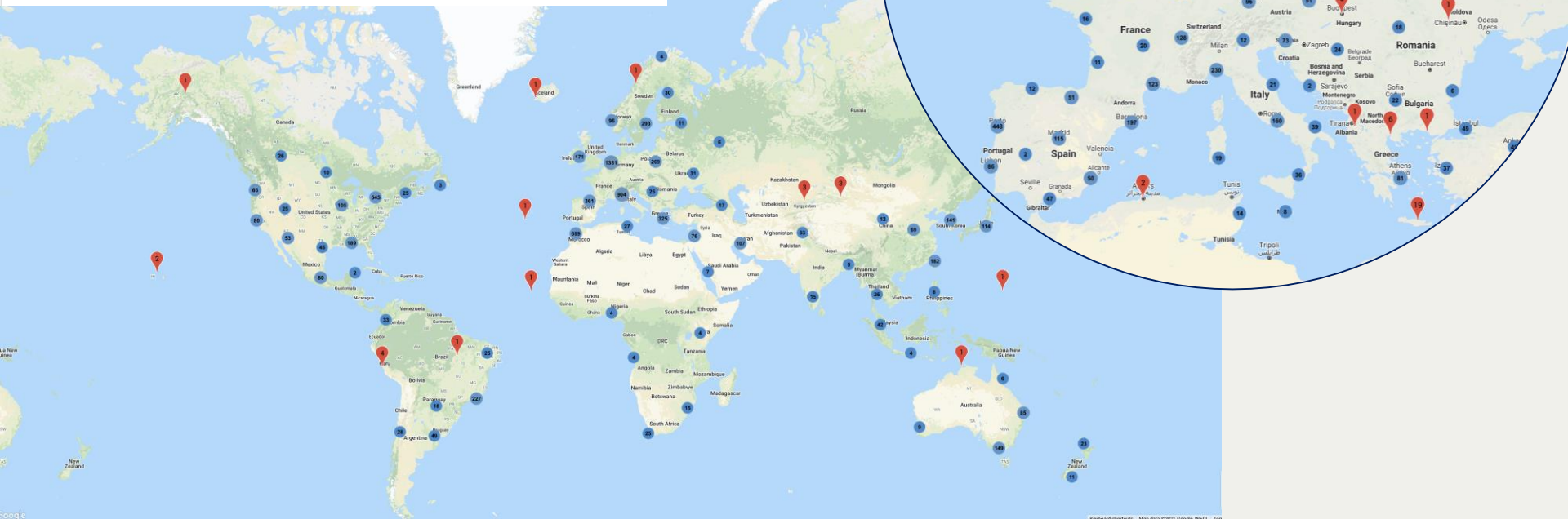
Rita Rocha



Citation map & metrics

Publication metrics

PUBLICATIONS IN WEB OF SCIENCE	SUM OF TIMES CITED	H-INDEX	AVERAGE CITATIONS PER ITEM	AVERAGE CITATIONS PER YEAR
199	1979	26 [®]	9.9	109.9



Publications [?]

(80) Allergy	(11) Journal of Allergy and Clinical Imm...
(9) Journal of Investigational Allergolog...	(8) Pediatric Allergy and Immunology
(6) European Respiratory Journal	(4) International Journal of Obesity
(3) Acta Médica Portuguesa	(3) Clinical and Translational Allergy
(3) European Annals of Allergy and Clini...	(3) European Journal of Clinical Nutrition

selected publications last 2 years

More information related to <https://orcid.org/0000-0002-7294-9296>

Pediatric Allergy and Immunology

is the world's leading journal in pediatric allergy ranks # 4 out of 26.

- **Exhaled breath condensate pH determinants in school-aged children: a population-based study.** Rama TA, Paciência I, Cavaleiro Rufo J, Silva D, Cunha P, Severo M, Padrão P, Moreira P, Delgado L, Moreira A. *Pediatr Allergy Immunol.* 2021 May 21. doi: 10.1111/pai.13564. Online ahead of print. PMID: 34018256
- **Higher diversity of vegetable consumption is associated with less airway inflammation and prevalence of asthma in school-aged children.** Mendes FC, Paciência I, Cavaleiro Rufo J, Farraia M, Silva D, Padrão P, Delgado L, Garcia-Larsen V, Moreira A, Moreira P. *Pediatr Allergy Immunol.* 2021 Jan 4. doi: 10.1111/pai.13446. Online ahead of print. PMID: 33394508
- **Bronchodilator responsiveness in healthy children: insights from a cross-sectional study.** Rama TA, Martins C, Paciência I, Cavaleiro Rufo J, Silva D, Mendes FC, Severo M, Padrão P, Moreira P, Delgado L, Moreira A. *Pediatr Allergy Immunol.* 2021 Feb;32(2):371-373. doi: 10.1111/pai.13326. Epub 2020 Nov 1. PMID: 32748993 The influence of species richness in primary school surroundings on children lung function and allergic disease development. Cavaleiro Rufo J, Ribeiro AI, Paciência I, Delgado L, Moreira A. *Pediatr Allergy Immunol.* 2020 May;31(4):358-363.
- **The inflammatory potential of diet impacts the association between air pollution and childhood asthma in children.** de Castro Mendes F, Paciência I, Cavaleiro Rufo J, Silva D, Cunha P, Farraia M, Delgado L, Garcia-Larsen V, Severo M, Moreira A, Moreira P. *Pediatr Allergy Immunol.* 2019 Dec 9. doi: 10.1111/pai.13185. [Epub ahead of print]
- **Development and validation of exhaled breath condensate microRNAs to identify and endotype asthma in children.** Mendes FC, Paciência I, Ferreira AC, Martins C, Rufo JC, Silva D, Cunha P, Farraia M, Moreira P, Delgado L, Soares ML, Moreira A. *PLoS One.* 2019 Nov 8;14(11):e0224983. doi: 10.1371/journal.pone.0224983. eCollection 2019.
- **Setting definitions of childhood asthma in epidemiologic studies.** Silva D, Severo M, Paciência I, Rufo J, Martins C, Moreira P, Padrão P, Delgado L, Moreira A. *Pediatr Allergy Immunol.* 2019 Nov;30(7):708-715. doi: 10.1111/pai.13111. Epub 2019 Aug 16.

Allergy

is the world's leading journal in allergy ranks # 1 out of 26 (IF 14.110)

- **The neighbourhood natural environment is associated with asthma in children: A birth cohort study.** Cavaleiro Rufo J, Paciência I, Hoffmann E, Moreira A, Barros H, Ribeiro AI. *Allergy.* 2021 Jan;76(1):348-358. doi: 10.1111/all.14493. Epub 2020 Aug 3 PMID: 32654186
- **Human volatilome analysis using eNose to assess uncontrolled asthma in a clinical setting.** Farraia M, Cavaleiro Rufo J, Paciência I, Castro Mendes F, Rodolfo A, Rama T, Rocha SM, Delgado L, Brinkman P, Moreira A. *Allergy.* 2020 Jul;75(7):1630-1639.
- **Exposure to indoor endocrine-disrupting chemicals and childhood asthma and obesity.** Paciência I, Cavaleiro Rufo J, Silva D, Martins C, Mendes F, Farraia M, Delgado L, de Oliveira Fernandes E, Padrão P, Moreira P, Severo M, Barros H, Moreira A. *Allergy.* 2019 Feb 11. doi: 10.1111/all.13740. [Epub ahead of print]
- **Exhaled breath condensate volatilome allows sensitive diagnosis of persistent asthma.** Cavaleiro Rufo J, Paciência I, Mendes FC, Farraia M, Rodolfo A, Silva D, de Oliveira Fernandes E, Delgado L, Moreira A. *Allergy.* 2019 Aug 29. doi: 10.1111/all.13596

ISPUP integra o consórcio do programa This is Public Health



O Instituto de Saúde Pública da Universidade do Porto (ISPUP) integra o consórcio do **This is Public Health (TIPH) Global Grant Program**, um programa global de financiamento que premeia iniciativas relacionadas com a divulgação e promoção da importância da saúde pública.

O projeto **AlergiaPT**, promovido pelo Instituto, foi um dos selecionados no âmbito da iniciativa This is Public Health (TIPH), criada pela Association of Schools and Programs of Public Health (ASPPH).

O TIPH conta com a parceria de associações de escolas de saúde pública de todo o mundo, incluindo a Association of Schools of Public Health in the European Region (ASPHER).



Scientific Program Chairs



Domingo Barber



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Edward KNOL
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EAACI Hybrid Congress 2021



EAACI Hybrid Congress 2021
#EAACI2021



*Harmonizing Research and Patient care
in Allergy, Asthma and Clinical Immunology*

André Moreira

SPC Coordinator 2020-2022

Domingo Barber

SPC Coordinator 2020-2022



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**Where are we
going?**

Biomarkers – exhaled air - particularly in children

Development profiles allergic sensitization and their implications on allergic multimorbidity – allergic multimorbidities prediction tool

