



# Can SARS-CoV-2 trigger a food allergy?

*O SARS-CoV-2 poderá ser um trigger para desenvolver uma alergia alimentar?*

Inês Falcão<sup>1</sup>, Leonor Cunha<sup>1</sup>

## ABSTRACT

Due to COVID-19 we are facing unprecedented challenging times in Science, facing the uncertain and the unknown, almost daily facing ourselves with new questions and discoveries. The clinical case described below presents yet another challenge to Science, regarding the interaction between the virus and the immune system. May it be possible that SARS-CoV-2 acts as a trigger factor in a food allergy? The authors report the clinical case of a young man who, upon recovering from COVID-19, developed food allergy to mammalian and poultry meat that he previously tolerated. This pandemic has pushed to the limit the health systems of the entire world, and the fight against it remains far from over. Perhaps only now has it truly begun.

**Keywords:** COVID-19, SARS-CoV-2, food hypersensitivity.

## RESUMO

Os tempos são de pandemia e o percurso da ciência incerto e desconhecido, assim o é desde que apareceu o SARS-CoV-2. O caso clínico a seguir descrito é mais um desafio à Ciência sobre a interação entre o vírus e o sistema imunológico. Será possível que o SARS-CoV-2 seja um fator desencadeante para uma alergia alimentar? Os autores apresentam o caso clínico de um jovem que após recuperar-se da COVID-19 desenvolveu alergia alimentar a carne de mamíferos e aves, que previamente tolerava. Esta pandemia põe à prova diariamente os sistemas de saúde de todo o mundo, e a luta contra este vírus está longe de terminar.

**Descritores:** COVID-19, SARS-CoV-2, hipersensibilidade alimentar.

## Introduction

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is transmitted by respiratory droplets, aerosols, and direct contact with fomites. To a considerable degree, the tissue damage in coronavirus disease (COVID-19) is caused by an excessive immune response to infection.<sup>1,2</sup> This occurs due to B and T cells recruitment – exhibiting a predominance of type 1 T helper (Th1) with production of interferon (IFN)-gamma, interleukin (IL)-1, IL-2, IL-6, IL-8, IL-12, IL-10, and tumor necrosis factor (TNF)-alpha –, and also the recruitment of neutrophils, monocytes/macrophages, dendritic and endothelial

cells, Th1/Th17 lymphocytes, and the production of specific antibodies.<sup>1,2</sup>

Might this intense SARS-CoV-2-infection-provoked inflammatory cascade, known in the scientific community as “cytokine storm”, together with the deregulation of the innate and adaptive immune system, trigger either a food allergy in a patient with pre-existing sensitivity or a new allergy, this is, in a patient without previous sensitivity?

In general, meat allergy is rare when compared to other food allergies and typically happens during childhood, proving scarce in adults.<sup>3</sup> It can be

1. Centro Hospitalar e Universitário do Porto, Serviço de Imunoalergologia - Porto - Porto - Portugal.

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separated into two great groups: poultry meat allergy and mammalian meat allergy. Though uncommon, poultry meat allergy assumes a greater frequency than mammalian meat allergy.<sup>5</sup>

Simultaneous allergy to several meats may occur. However, it is more frequent amongst the various types of mammals or poultry than between mammals and poultry at the same time.<sup>5</sup> In meat allergy, the immunoglobulin E (IgE)-mediated form proves to be the most common, representing an immediate reaction that usually begins in the first 30 minutes to 2 hours after exposure. Clinical presentation can encompass a wide spectrum, ranging from urticaria, angioedema, and oral allergy syndrome to respiratory, gastrointestinal, and cardiovascular symptoms, in rare cases culminating in anaphylaxis.<sup>5,6</sup>

The pathophysiology of any IgE-mediated mechanism takes place after contact with the implicated antigen and consequent IgE-mediated degranulation of immune effector cells, such as mast cells and basophils, resulting in the rapid manifestation of symptoms. The food allergen-derived epitopes link themselves with IgE molecules bound to the Fc RI receptors on the surface of those effector cells; then the epitope-specific reticulation of IgE-related receptors occurs, leading to the release of pre-formed histamine and other inflammatory mediators of the immediate allergic reaction.<sup>7</sup> Following this early phase reaction, the allergic inflammation is maintained by the production of leukotrienes, activating factor of platelets and cytokines.<sup>7</sup>

## Methods

Systematic review of scientific articles found in the data base of National Library of Medicine/ Medical Literature Analysis and Retrieval System Online (PubMed/MEDLINE) and Scientific Electronic Library Online (SciELO) from January 2020 to April 2022. The following medical subject headings (MeSH) terms were used: “Cytokine storm”; “COVID-19”; “food allergy”; “Meat allergy”; “SARS-CoV-2”.

## Case report

The authors present the case of a 32-year-old male patient with documented history of allergic rhinitis to house dust mites and storage mites, under prescribed as-needed (p.r.n.) medication as a means to control histaminergic symptoms. The patient denied family history of atopy.

He was referred to the Allergy and Clinical Immunology (ACI) service due to suspicion of food allergy to poultry and mammalian meat.

The patient was infected with SARS-CoV-2 in April 2020 (positive nasopharyngeal swab on 21st April 2020). He reported anosmia, headache, and myalgias that resolved in 3 weeks using only symptomatic medication (paracetamol), with documented cure on 15th May 2020 (nasopharyngeal swab). He denied respiratory, gastrointestinal, cardiovascular, or other neurologic symptoms.

Three weeks after the cure he began experiencing episodes of general discomfort, abdominal colic, and too-soft, sometimes liquid feces after ingesting chicken, turkey, pork, and rabbit. He immediately opted for an eviction diet for the mentioned meats and was directed to the ACI service of Centro Hospitalar e Universitário do Porto by his assistant physician. He denied complaints associated with the ingestion of beef. Previously, he ingested all types of mammalian and poultry meat without any symptoms.

He had no recent history of insect bites, namely tick bites, as well as no history of recent outdoor activities.

From the consequent study emphasis must be placed on the skin prick tests conducted with Leti® commercial allergen extract (mm): (histamine 10), chicken meat 8, rabbit meat 7, beef meat negative, and pork meat 6. Skin prick tests for aeroallergens were also run, appearing positive for *Dermatophagoides teronyssinus* 13, *Dermatophagoides farinea* 8, *Lepidoglyphus destructor* 9, and dog 7. From the analytic study it is important to highlight the following: total IgE of 195 KU/L, beef meat 0.02 kUA/L, pork meat 1.21 kUA/L, chicken meat 2.03 kUA/L, turkey meat 0.97 kUA/L, and alpha-gal 0.01 kUA/L.

The performed hemogram showed no significant alterations. Both the kidney function test and the ionogram also displayed measurements within the reference values.

Oral food challenge was performed, and 20 minutes after ingesting approximately 15 mg of cooked chicken meat, the patient developed facial erythema and pruritus, eyelid angioedema, followed by diffuse abdominal pain. Similar signs and symptoms were documented after the ingestion of 20 mg of cooked pork meat. As the patient did not like eating rabbit meat, he refused to perform the oral food challenge.

## Conclusion

The temporal frame reported by the patient is unequivocal, and food allergy to mammalian and poultry meat has been confirmed. Nonetheless, the immunologic mechanisms for this allergy potentially triggered by SARS-CoV-2 require further investigation.

This case report aims to alert allergists and immunologists as well as professionals from other medical fields to the possibility of encountering an increasing number of patients with symptoms consistent with food allergy after infection with SARS-CoV-2. It hopes to prevent such cases from being disregarded, so that we may understand the true extent of COVID-19 impact on our immune system.

The way this virus triggered a food allergy remains a hypothesis. Did it happen due to the “cytokine storm” or “a cross-reactivity mechanism”? The answer is imperative, as is the ability to control this pandemic, which surprises us daily with new sequelae. It is most likely that the patient was already sensitized to the referred meats and that COVID-19 acted as a trigger to develop allergy (becoming symptomatic) by dysregulating the immune system,

The patient keeps the eviction diet for chicken, turkey, pork, and rabbit meats, and also for egg. He has p.r.n. medication for accidental exposure, namely antihistamine and corticosteroid. He is still being followed in the ACI service for medical surveillance.

Apart from the hypothesis that SARS-CoV-2 triggered this allergy, the case proves outstandingly peculiar, because the patient exhibits a simultaneous allergy to poultry and mammalian meat.

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Corresponding author:  
Inês Falcão  
E-mail: inesffalcao@hotmail.com