



Original / Deporte y ejercicio

Unusual antibiotic presence in gym trained subjects with food intolerance; a case report

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Abstract

Introduction: Great interest is raising in food intolerances due to the lack, in many cases, of a particular sensitizing agent.

Objective: We investigated the serum level of possible new haptens in 15 heavy meat consumers for sport fitness affected by various kinds of food intolerance and who had ever been administered antibiotics in their life for clinical problems.

Methods: Forty ml of blood were drawn from each patient and analyzed, by means of an ELISA test, in order to possibly identify the presence of an undue contaminant with hapten properties.

Results: Four out of fifteen subjects (26%) showed a serum oxytetracycline amount > 6 ng/g (which is considered the safety limit), 10 of 15 (66%) a serum doxycycline amount > of 6 ng/g and 3 out of 15 (30%) subjects had high serum level of both molecules.

Conclusions: Although a direct ratio between body antibiotics remnant storage in the long run and chronic gut dysfunctions and/or food allergy did not reached the evidence yet, the blood traces of these compounds in a food intolerant otherwise healthy population might be considered the preliminary putative step of a sensitizing pathway. Our next goals foresee a deeper insight into the sensitizing trigger from human chronic antibiotic exposure via the zootechnical delivery of poultry food.

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Key words: Poultry. Oxytetracycline. Doxycycline. Food intolerances.

PRESENCIA DE ANTIBIÓTICOS INUSUAL EN EL GIMNASIO ENTRENADO SUJETOS CON INTOLERANCIA A LOS ALIMENTOS; INFORME DE UN CASO; ESTUDIO PRELIMINAR

Resumen

Introducción: La falta, en muchos casos, de un agente sensibilizador está despertando un enorme interés en la tolerancia a los alimentos.

Objetivo: Investigamos el nivel sérico de posibles nuevos haptenos en 15 grandes consumidores de carne para entrenamiento deportivo afectados por diversos tipos de intolerancia a los alimentos y que habían recibido antibióticos en algún momento de sus vidas por problemas médicos.

Métodos: Se realizaron extracciones de sangre de 40ml a cada paciente y se analizaron empleando un test ELISA, para identificar la posible presencia de un elemento contaminante indebido con propiedades de hapteno.

Resultados: 4 de 15 sujetos (26%) mostraron una cantidad de oxitetraciclina en suero > 6 ng/g (considerado el límite de seguridad); 10 de 15 (66%) sujetos presentaron una cantidad de doxiciclina > 6 ng/g; y 3 de 15 (30%) sujetos presentaron un alto nivel sérico de ambas moléculas.

Conclusiones: Aunque no se llegó a obtener evidencia de una relación directa entre la acumulación de antibióticos corporales a largo plazo y una disfunción intestinal crónica y/o alergias a los alimentos, las trazas en sangre de estos compuestos en una población con alguna intolerancia a los alimentos pero por lo demás sana, podría considerarse el primer paso de una vía de sensibilización. Nuestros próximos objetivos prevén un estudio más profundo del desencadenante sensibilizador a partir de la exposición crónica a antibióticos en humanos por medio de la administración zootécnica de comida avícola.

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Palabras clave: Aves. Oxitetraciclina. Doxiciclina. Intolerancia a los alimentos.

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Abbreviations

APC: Antigen-presenting cells.

ELISA: Enzyme-linked immunosorbent assay.

Introduction

Food intolerances and food allergies are two different gut pathology chapters. In fact while the first involve nonimmunologic adverse reactions to food and include conditions such as lactase deficiency, dietary protein-induced enterocolitis syndromes and eosinophilic gastrointestinal disease, the second are considered adverse health effects arising from a specific immune response that occurs on exposure to a given food.^{1,2}

Loss of tolerance to foods leads to induction of type I hypersensitivity reactions which are influenced by several factors including genetic susceptibility, the nature of antigen which initiates the disease and challenge with infections and bacteria.³ Depending on the stimulus naive T cells are activated by professional antigen-presenting cells (APC) and differentiate into Th1, Th2, Th17 or Th9 cells.⁴ Once Th2 response is established, the mechanism of allergic disease is divided in two main phases: first sensitization, and development of memory and later followed by effector phase and tissue injury. In the first phase, which regards IL-4 and IL-13 production by allergen-specific CD4⁺Th2 cells, a B cell class-switch induction into the antibody isotypes of ϵ immunoglobulin heavy chain and allergen-specific IgE antibody production are observed. Subsequently, allergen-specific IgE, binds to high affinity receptor for IgE on the surface membrane of mast cells and basophils leading to the sensitization of the patients to a specific allergen. Once patient is newly exposed to the sensitized allergen the aggregation of receptor-bound IgE molecules occurs and first the activation and then the release of mediator lead to the development of clinical symptoms⁵ of type I hypersensitivity reactions.^{6,7}

In testing for food sensitivity, blood samples are exposed to a panel of both foods and food components and the degree of total immunoglobulin G antibody binding to each food is quantified by means of an enzyme- or fluorescence- linked immunosorbent assay (ELISA).⁸ Another well established test is that based on the IgG subclass 4 (IgG4) binding (measured in lieu of total IgG).⁹ The causes of food allergy can be related both to genetic factors and environmental exposure^{10,11} and prevention policy¹² would significantly reduce the morbidity and the costs of managing this disorder.¹³ Updates on this issue didn't add any effective therapeutic strategy to overwhelm the problem, except the deprivation diet,¹⁴ dietary supplementation with zinc and copper¹⁵ or the pharmacological approach with disodium cromoglycate,¹⁶ steroids, azathioprine and cyclosporin.¹⁵

The hypothesis that heavy and prolonged eating of antibiotic treated poultry might promote somehow the food intolerance seems worth to be investigated.

Methods

We investigated 15 gym trained subjects (10 males and 5 females, mean age \pm SEM 30.4 \pm 2.65 years) with clear cut clinical food intolerance symptoms (i.e. itching, nausea, vomiting, eczema, weakness)^{2,17} admitted to our clinic for proper diagnosis and treatment. A history of "healthy" nutrition (i.e. reach in fibers and poor in carbohydrates) was reported as well as an overall exceeding daily intake of white meat ranging from 300 to 600 gr/day. Forty ml of blood were drawn from each patient and analyzed, by means of an enzyme-linked immunosorbent assay (ELISA) test, in order to possibly identify the presence of an undue contaminant with hapten properties.

In table I the antibiotic remnants levels in each patient serum have been summarized.

Results

Results indicate that although oxytetracycline serum levels of 11 out of 15 subjects (73%) are below the safety level (< 6 ng/g), 4 out of 15 (27%) present alarming serum levels of such molecule. Conversely,

Table I
Schematic representation of serum concentrations of two antibiotics (oxytetracycline and doxycycline)

Subject	Oxytetracycline amount (ng/g)	Doxycycline amount (ng/g)
1	1.97	1.26
2	1.73	8.93*
3	2.09	8.68*
4	1.99	6.60*
5	4.53	6.62*
6	8.19*	6.71*
7	7.17*	5.39
8	3.60	1.78
9	3.16	5.71
10	5.56	7.56*
11	3.30	7.40*
12	4.24	7.85*
13	7.24*	9.40*
14	8.32*	7.40*
15	4.51	4.28

*Means a value which is above the safety limit (6 ng/g).

doxycycline serum levels are above the safety allowed level in 10 out of 15 (66%) subjects and below in 5 out of 15 (33%) subjects. Interestingly, high serum levels of both molecules were observed in 3 out of 15 (30%) subjects.

Further, the IgG-mediated foodstuffs intolerance analysis revealed that all the subjects were intolerant to chicken, 14 out of 15 subjects (93%) were also intolerant to pork, soybean, flax seeds, eggs and corn; 13/15 (86%) also to oat; 12/15 (80%) also to yeast and peas; 11/15 (73%) also to rabbit; 10/15 (73%) also to potato; 9/15 (60%) also to rice; 3/15 (20%) also to salmon, turkey and wheat; 2/15 (13%) also to beef and cheese and 1/15 (6,5%) also to lamb, deer and tuna (fig. 1).

Discussion

Our preliminary clinical investigation opens a possible work hypothesis about the causes of multiple food intolerance, based on a possible haptenic toxic sensitizing mechanism due to prolonged subliminal oral intake of meat from animals grown under chronic tetracycline administration regime.

The bioavailability of this antibiotic, administered accordingly to the international health protocols, encloses, in the long run schedule, a final storage in the animals bone, fat and muscles that theoretically might be transferred to the final consumer and, finally, act as hapten-inducing specific intolerance to a wide range of different foods and molecules such as vegetables, fruits, carbohydrates, and proteins.

As matter of fact in our pilot trial group only 26% of subjects showed normal serum levels of both antibiotic molecules, while the remaining 74% had higher concentrations of at least one form of antibiotic molecule in the blood.

Obviously the small sample of recruited cases is inadequate to draw statistical conclusions about the significance of tetracycline contamination in an healthy hyper-nourished athletes population, but we can open the debate about indirect consequences of long term exposure to this antibiotic molecule, whose structure is basically still provided with sensitizing properties (for instance to the sun light and UV- irradiated skin).

Conclusions

Our next study is going back to the *in vitro* human cells model, adding minimal doses of tetracycline in the culture medium, in order to detect the lowest concentration able to induce some biochemical imbalance via oxidative stress activation, or reducing the concentration of energy releasing molecules from mitochondria. This cells biology insight is supposed to be very helpful in supporting the clinical explanation, in terms of gut mucosal disorder and wide food sensitization.

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Declaration of interest statement

The authors certify that there is no conflict of interest with any financial organization regarding the material discussed in the manuscript.

The authors hereby certify that all work contained in this article is original.

The authors claim full responsibility for the contents of the article.

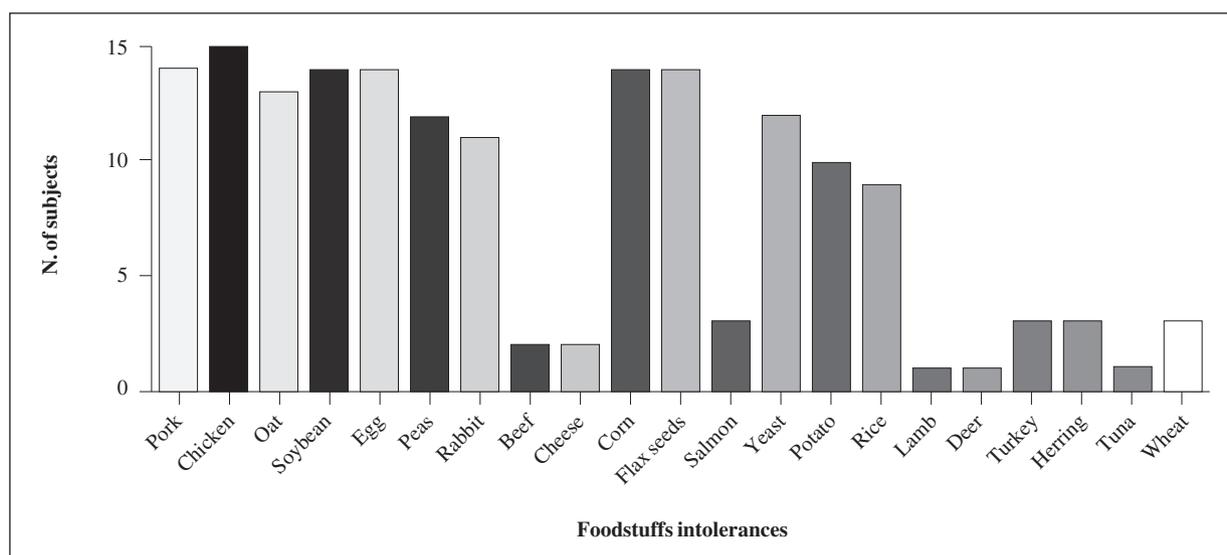


Fig. 1.—Schematic representation of ELISA test of foodstuffs intolerances of gym trained subjects.

Consent

Written informed consent was obtained from the patient for publication of this Case report and any accompanying images. A copy of the written consent is available for review by the Editor of this journal.

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