

Practical aspects of preparation of foods for double-blind, placebo-controlled food challenge

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D. Noè, L. Bartemucci, N. Mariani, D. Cantari

Department of Clinical Nutrition, "Niguarda" Hospital, Milan, Italy

Recipes for double-blind, placebo-controlled food challenge developed and tested in our department are presented. The taste and smell of offending foods were disguised by using substances with a strong taste and flavor. The texture of active foods was more difficult to simulate in the placebo food.

Key words: double-blind, placebo-controlled food challenge; food allergy; recipes for double-blind, placebo-controlled food challenge.

Donatella Noè
Via Senigallia 11
20161 Milan
Italy

Double-blind, placebo-controlled food challenge (DBPCFC) is the only reliable method to confirm a suspected diagnosis of food allergy (1). A convenient method of DBPCFC is to use capsules as the vehicle for the active food and glucose in the placebo (2, 3). In capsules, the suspected agent can be given in natural, purified, or freeze-dried form. However, purifying and freeze-drying the active food to be hidden in capsules can decrease or even destroy the allergenic activity of agents (4). One should therefore minimize the processing of foods.

In addition, a DBPCFC may not be feasible in other circumstances; e.g., when a patient cannot swallow capsules, or when the amount of the suspected agent necessary to cause symptoms is too large for encapsulation (5, 6). Thus, the suspected agent has to be hidden in food.

The purpose of this paper is to report the recipes developed and tested in our department for DBPCFC purposes. Some practical aspects of hiding the suspected agent in food are also outlined.

Preparation of recipes for DBPCFC

Recipes for DBPCFC were developed in the dietetic kitchen by experienced dietitians. In developing recipes for DBPCFC, some general principles are to be observed (7): the concentration

of the suspected agent hidden in the food should be as high as possible without being detectable; the use of any ingredient, other than the active agent, that could provoke any undesirable reaction should be avoided; the same ingredients should be used in both the active and placebo food.

Although the physical properties of both the active and placebo food may not be exactly the same, it should not be possible to detect the offending food. Substances with a strong taste such as roasted coffee powder, bitter cocoa powder, peppermint syrup, and saffron can be used to disguise foods containing the suspected agent. The same substances are useful in hiding the natural colors of some foods. Although the taste of fresh fruit and several vegetables was easily disguised by adding these masking agents, it was not possible to hide the strong flavor of raw celery and onion.

Beside taste and smell, the texture of offending foods, i.e., granularity, fibrousness, and fluidity, should also be taken into account. Fibrousness in the active food may be difficult to simulate in the placebo food; thus, the thin fibers of raw celery and fennel or the tiny pips of kiwi should be removed before use. Milled rice grains, boiled for only 3 min, can be used to mimic the granularity of ground hazelnuts or roasted peanuts. Texture properties can be commonly modified by mixing the suspected foods in a single vegetable purée.

Table 1 List of ingredients in recipe for DBPCFC with fresh fruit

Active food		Placebo food	
Fresh fruit pulp	100 g		
Sugar	13 g (1 tbs)	Sugar	13 g (1 tbs)
Wheat meal	11 g (1 tbs)	Wheat meal	22 g (2 tbs)
Peppermint syrup	12 ml (1 tbs)	Peppermint syrup	12 ml (1 tbs)
Coffee	50 ml	Coffee	100 ml
Saffron	amount on point of knife	Saffron	amount on point of knife

Fruits tested: raw apple, pear, peach, plum, tomato, banana, kiwi, orange. Tiny seeds of kiwi were eliminated; orange was squeezed. Fennel deprived of thin fibers was processed in same manner

Table 2. List of ingredients in recipe for DBPCFC with green leafy vegetables

Active food		Placebo food	
Spinach or beets	70 g		
Vegetable marrow pulp	50 g	Vegetable marrow pulp	60 g
Wheat meal	22 g (2 tbs)	Wheat meal	22 g (2 tbs)
Water	100 ml	Vegetable marrow peel	100 g
Coffee	30 ml (2 tbs)	Coffee	100 ml
Peppermint syrup	24 ml (2 tbs)	Peppermint syrup	24 ml (2 tbs)
Saffron	amount on point of knife	Saffron	amount on point of knife

Spinach and beets were squeezed after cooking. Vegetable marrow pulp and peel were cooked.

Table 3. List of ingredients in recipe for DBPCFC with nuts

Active food		Placebo food	
Ground hazelnuts/peanuts	25 g (2 tbs)		
Water	100 ml	Water	100 ml
Sugar	13 g (1 tbs)	Sugar	26 g (2 tbs)
Peppermint syrup	48 ml (4 tbs)	Peppermint syrup	42 ml (4 tbs)
Rice flour	11 g (1 tbs)	Rice flour	11 g (1 tbs)
Cocoa powder	10 g (1 tbs)	Cocoa powder	10 g (1 tbs)
Saffron	twice amount on point of knife	Saffron	twice amount on point of knife
Milled rice grains	(1 tbs)	Milled rice grains	(2 tbs)

Recipes for DBPCFC

Recipes were developed by avoiding any other food that could provoke an adverse reaction, as determined by dietary assessment and medical investigation. To ensure that the active food could not be detected, all recipes were tested blindly by normal volunteers.

Most recipes were developed in the form of a vegetable purée. Wheat meal or rice flour was cooked in water or coffee until they thickened. Other ingredients, with or without the active food, were added, mixed in a blender, and whisked. Both active and placebo foods were served cool. Table 1 shows a recipe for DBPCFC with fresh fruit.

The texture and color of spinach and beets were mimicked by using cooked vegetable marrow peel (Table 2). The granular texture of ground hazelnuts and peanuts was mimicked by using milled rice grains after cooking for only 3 min (Table 3).

The herbs most commonly used in Italy as

seasoning, sage and rosemary, have a flavor that is hard to hide (Table 4).

Recipes for DBPCFC with legumes such as beans or soy flour, and vegetable roots or tubers such as carrots and potatoes were also developed. Mashed potato texture was mimicked by using rice flour pudding, and the taste was masked by adding peppermint syrup. Soy flour, unlike wheat meal, retains a bitter aftertaste which could not be hidden.

Recipes for DBPCFC with animal foods were easier to make. Egg and tuna or cod may be hidden in a hamburger. As proposed by Bock et al. (3), milkshakes and applesauce are good vehicles for hiding the same active foods (Table 5).

Discussion

Since dehydrated or dried foods for DBPCFC in the form of capsules were not available, we have adopted a method of challenge based upon mixing

Table 4. List of ingredients for DBPCFC with herbs used as seasoning

Active food		Placebo food
Sage or rosemary	3 g	Same ingredients
Rice flour	11 g (1 tbs)	without sage or
Sugar	13 g (1 tbs)	rosemary
Cocoa powder	10 g (1 tbs)	
Coffee powder	5 g (1 teaspoon)	
Peppermint syrup	12 ml (1 tbs)	
Lemon syrup	12 ml (1 tbs)	
Saffron	1 teaspoon	

suspected foods in a single vegetable purée. The method allows the administration of the amount of the suspected agent necessary to provoke symptoms; in addition, the agents come into direct contact with mucous membranes to elicit eventual symptoms.

Although the smell, flavor, and texture of vegetable foods are often hard to hide, both active and placebo foods were made available in a form which could easily be tested on patients. Since 1996, DBPCFCs with our recipes have been used on 47 adult patients, and since 1997 on 17 children. Undesirable reactions to any ingredients other than the active agent were avoided by choosing with great care ingredients for the recipes. Saffron, peppermint syrup, bitter cocoa powder, and ground coffee were used to mask the smell and flavor of the suspected food without any adverse reaction.

The texture of suspected foods was hidden by the preparation of the ingredients of both the active and placebo food as a vegetable purée.

The use of capsules as the vehicle for the suspected agent and in the placebo has been extensively reported (2, 3, 6). However, data on the development of masked foods in food challenge are scanty.

The preparation of recipes and the method of hiding the taste, smell, color, and texture of ingredients to be used were carefully examined in an exhaustive paper (7); however, only four recipes

Table 5. List of ingredients in recipes for DBPCFC with milk and buttermilk curd

Active food		Placebo food	
1) Whole milk	100 ml	Water	100 ml
Banana	120 g	Banana	120 g
Sugar	13 g (1 tbs)	Sugar	13 g (1 tbs)
2) Buttermilk curd	80 g		
Banana	60 g	Banana	120 g
Applesauce	100 g	Applesauce	150 g
Sugar	13 g (1 tbs)	Sugar	13 g (1 tbs)

were shown, three of them in the form of a liquid food. A test juice or capsules were also used by Leinhas et al. (2) in performing DBPCFC on 12 children with atopic dermatitis.

The problem of masking foods for DBPCFC purposes requires professional dieticians with ability and imagination as well as the necessary experience in the preparation of new dishes and meals.

Developing new recipes takes a very long time.

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