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***Brief Communication***

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## *Brief Communication*

# CORRELATION OF APPLIED KINESIOLOGY MUSCLE TESTING FINDINGS WITH SERUM IMMUNOLOGOBULIN LEVELS FOR FOOD ALLERGIES*

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The pilot study attempted to determine whether subjective muscle testing employed by Applied Kinesiology practitioners, prospectively determine those individuals with specific hyperallergenic responses. Seventeen subjects were found positive on Applied Kinesiology (A.K.) muscle testing screening procedures indicating food hypersensitivity (allergy) reactions. Each subject showed muscle weakening (inhibition) reactions to oral provocative testing of one or two foods for a total of 21 positive food reactions. Tests for a hypersensitivity reaction of the serum were performed using both a radio-allergosorbent test (RAST) and immune complex test for IgE and IgG against all 21 of the foods that tested positive with A.K. muscle screening procedures. These serum tests confirmed 19 of the 21 food allergies (90.5%) suspected based on the applied kinesiology screening procedures. This pilot study offers a basis to examine further a means by which to predict the clinical utility of a given substance for a given patient, based on the patterns of neuromuscular response elicited from the patient, representing a conceptual expansion of the standard neurological examination process.

*Keywords:* Applied Kinesiology; muscle testing; allergies; hypersensitivity; provocative testing; IgE; IgG; immune complexes; functional neurological assessment

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## INTRODUCTION

Applied Kinesiology procedures involve muscle testing as a functional evaluation of patterns that are assumed to be related to inhibition and facilitation in the nervous system (Walther, 1981; Leisman, Zenhausern, Ferentz, Tefera and Zemcov, 1995). Many factors have been subjectively found to affect neuromuscular function and result in patterns of inhibition that may induce reversible weakness of muscles to standard testing procedures (Walther, 1981; Leisman *et al.*, 1995; Leisman, Shambaugh and Ferentz, 1989; Goodheart, 1977; Schmitt, 1984a; 1984b).

One factor that has been noted to affect changes in muscle strength is the oral insalivation of allergic foods (Goodheart, 1977; Schmitt, 1984a; 1984b; Scopp, 1978). Applied Kinesiology procedures involve a particular type of provocative testing for food hypersensitivity that is based on the subject insalivating a food substance and the clinician performing muscle testing of various muslces. The nature of the testing procedures has been reported elsewhere (Leisman *et al.*, 1995). A weakening (inhibitory) reaction of the muscle associated with the subject's insalivation of the food is suggested to be indicative of a neuromuscular hypersensitivity (allergic) reaction to that food.

Although this type of provocative testing procedure to identify food allergies or hypersensitivities has been widely employed, (Roitt and Brostoff, 1985; Hyde and Patnode, 1987; Stites and Rogers, 1987; Terr, 1987) only one study has been performed to test this hypothesis. Scopp (1978) showed a significant correlation between muscle testing findings and specific subject food sensitivities, but few details of the study were reported. Other studies relating muscle testing findings to oral food stimulation have reported mixed findings (Triano, 1982; Leaf, 1985; Kenny, Clemens and Forsythe, 1988).

Triano (1982) found no correlation between *weak* (inhibited) and *strong* muscles with and without oral stimulation with glandular food extracts, though the study design failed to follow the testing principles of Applied Kinesiology as reported by Walther (1981). The study's conclusions were based on the false assumption that all subjects should respond to a given stimulus in an identical, predetermined way.

In contrast to Triano's study, Leaf (1985) demonstrated a positive relationship between *weak* muscles becoming *strong* with thyroid glandular supplements in subjects with hypothyroid symptoms, compared with subjects whose *weak* muscles did not strengthen with these supplements. Kenny and his colleagues (1988) called Applied Kinesiology unreliable as a means of nutrient assessment, in a very flawed study that used non-experienced

muscle testers and examined parameters not considered part of the body of Applied Kinesiology practice (Walther, 1981).

This project was designed as a pilot study to identify if the reported muscle weakness on provocative, oral testing of foods is associated with food allergy or hypersensitivity as identified by measurements of standard immune system blood assays.

The four classic hypersensitivity reactions that describe allergic reactions to foods, airborne, and other antigens are called the Gell-Coombs Types I (IgE, anaphylactic type); II (IgG and IgM, cytotoxic responses); III (immune complexes, cell-mediated immunity-T cells and macrophages); IV (delayed hypersensitivity responses).

In hypersensitivity reactions of the Gell-Coombs Types I and II, higher than normal amounts of IgE (Type I) or IgG (Type II) are produced by plasma cells when they encounter antigens (Terr, 1987). (IgM or IgA can also be produced in a Type II reactions). Immune complexes are large chains of Ig molecules bound together by antigens. Immune complexes that are produced and are not adequately broken down (by the liver and/or the spleen) will be elevated in Type III reactions (Terr, 1987). A typical Type IV reaction, such as a tuberculin skin test, will not be discussed further in this paper as this was not measured in the study.

The rate of formation and diminution of IgG immune complexes effects both the levels of IgG and its immune complex (Hyde and Patnode, 1987; Stites and Rogers, 1987; Terr, 1987). In other words, IgG may be rapidly produced, but just as rapidly converted to immune complex form. This can result in low IgG while IgG immune complexes may be significantly elevated (Stites and Rogers, 1987; Terr, 1987). Likewise, IgG may be elevated while IgG immune complexes may be adequately diminished. This explains the necessity of measuring as many parameters as possible before ruling out immune hypersensitivity reactions (IgG subtypes may also be measured but only total IgG was measured in this study).

The Type I reactions result in rapid (anaphylactoid) type responses. Histamine release by mast cells is the major symptom-producing factor (Stites and Rogers, 1987; Terr, 1987). The half-life of IgE is 2(1/2) days (Stites and Rogers, 1987). The Type II IgG reaction is complement-mediated and results in a slower onset of symptoms (a type of delayed hypersensitivity) (Stites and Rogers, 1987). IgG has a half-life of 21 days, hence its effects are much longer lasting than an IgE reaction (Stites and Rogers, 1987; Terr, 1987).

Immune complex formation is the most potentially destructive. These complexes settle in tissue and may cause microthrombi formation

complement cascade that can result in tissue damage and leukocyte chemotaxis with the subsequent release of inflammatory mediators (Stites and Rogers, 1987; Terr, 1987). Immune complexes have also been implicated in autoimmune disease processes. (Stites and Rogers, 1987; Terr, 1987; Theofilopoullos, 1987).

## MATERIALS AND METHODS

### Subjects

Seventeen subjects were employed in the study of whom eleven were female and six were male. They ranged in age from 16 to seventy-four with a mean age of 41.59 and $\sigma$ of 743.29. The subjects had a plethora of presenting symptoms including five with back pain, two with chronic cephalagia, 11 with joint pain of arms, wrists, hips, and extremities, seven with skin complaints including eczema, burning, and itchiness, two with diabetes mellitus one of whom was medicated with insulin and the other not, one subject with muscular dystrophy, and one with multiple sclerosis in remission. Informed consent was obtained from each subject with a protocol approved by the second author's Institutional Review Board.

### Procedure

Subjects were pre-tested using food allergy screening tests developed by Lebowitz (1989) and Schmitt (1984a; 1984b). These included: (1) examination of muscle strength upon insalivation of *Yakriton* (*Antronex*® – Standard Process Laboratories); (2) examination of muscle strength upon insalivation of a copper supplement pill (*Copper-S*® – Nutri West); (3) a control test in which each subject touches a body location associated with muscle changing strength (*e.g.*, the thymus area over the angle of Louis on the sternum); (4) a control test with the copper supplement pill in the mouth and/or; (5) a control test while a copper antagonist supplement (*Cop Out*® – Nutri West) is in the mouth.

Subjects who demonstrated positive results on one or more of these tests were further tested for *strong* or *weak* muscle reactions (Leisman *et al.*, 1995) to common food allergens. These included whole-wheat flour, cornmeal, soy flour, brewer's yeast, cow's milk powder, powdered egg, potato flour, and others.

While the food was placed in the subject's mouth, various *strong* muscles were tested to observe changes in strength. A weakening of *strong* muscles

were tested to observe for changes in strength. A weakening of *strong* muscles to oral food challenge is a commonly used procedure employed by Applied Kinesiology practitioners and is suggestive of hypersensitivity to that food.

When a weakening response to oral food challenge was observed, blood was drawn before further testing. The blood was centrifuged and the serum was separated and analyzed by an independent laboratory. The subject's serum was then analyzed for levels of IgE (RAST Test), IgG (RAST Test, IgE-immune complexes, and IgG-immune complexes, for several foods, only IgE and IgG were available. Subjects were included in the study only when all four tests were available. for the food(s) to which they showed sensitivity by neuromuscular hypersensitivity testing.

The laboratory reported results as reactive in categories of mild, moderate, severe, or non-reactive and are included in Table I under "Laboratory Results".

TABLE I Laboratory results with introduction of food in mouth

| *Patient* | *Food* | *IgE* | *IgG* | *E-IC* | *G-IC* |
|---|---|---|---|---|---|
| 1. | SOYBEAN | 1 | 1 | 0 | 0 |
| 2. | MILK | 3 | 3 | 0 | 0 |
| 3. | BR. YEAST | 0 | 3 | 0 | 1 |
| 4A. | WHEAT | 0 | 2 | 0 | 1 |
| 4B. | MILK | 3 | 2 | 0 | 0 |
| 5. | MILK | 0 | 2 | 0 | 2 |
| 6. | BR. YEAST | 0 | 3 | 0 | 2 |
| 7. | BR. YEAST | 0 | 3 | 0 | 0 |
| 8. | BR. YEAST | 0 | 3 | 0 | 0 |
| 9A. | CORN | 0 | 2 | 0 | 0 |
| 9B. | MILK | 2 | 3 | 0 | 1 |
| 10. | BR. YEAST | 0 | 3 | 0 | 1 |
| 11. | CORN | 0 | 0 | 0 | 3 |
| 12. | CORN | 0 | 0 | 0 | 0 |
| 13. | CORN | 0 | 0 | 0 | 0 |
| 14A. | MILK | 1 | 0 | 0 | 0 |
| 14B. | CORN | 0 | 1 | 0 | 0 |
| 15. | WHEAT | 0 | 2 | 0 | 0 |
| 16. | BR. YEAST | 0 | 0 | 0 | 2 |
| 17A. | CORN | 0 | 0 | 0 | 3 |
| 17B. | WHEAT | 0 | 0 | 0 | 3 |
| Total 0(%) | | 16(*76*) | 7(*33*) | 21(*100*) | 11(*52*) |
| Total 1(%) | | 2(*09*) | 2(*09*) | 0 | 4(*19*) |
| Total 2(%) | | 1(*04*) | 5(*24*) | 0 | 3(*14*) |
| Total 3(%) | | 2(*09*) | 7(*33*) | 0 | 3(*14*) |
| TOTAL | | 21 | 21 | 21 | 21 |

LABORATORY RESULTS: IgE = IgE RAST test; IgG = IgG RAST test; E-IC = IgE Food Immune Complex Assay; G-IC = IgG Food Immune Complex Assay.
REACTIONS: 0 = Non-reactive; 1 = Mild positive reaction; 2 = Moderate positive reaction; 3 = Severe positive reaction.

## RESULTS

Seventeen subjects with positive muscle testing findings had their blood tested for all four immune parameters. Four subjects demonstrated two positive foods by muscle testing findings that were compared with blood testing. Therefore, there were 21 foods associated with conjoint muscle and blood testing. Nineteen of the foods that were positive to neuromuscular hypersensitivity provocative muscle testing also showed positive (reactive) blood tests. The results are shown in Table I.

Of the 21 foods tested, the following positive reactions were found: IgE – 5, IgG – 14, IgE immune complexes – 0, IgG immune complexes – 10. The total number of positive blood reactions is 29 because a number of subjects had multiple positive reactions (*e.g.*, both IgG and IgG-immune complexes). The severity of the reactions was as follows: mild – 8, moderate – 9, severe-12. These findings are summarized in Table II.

Of the food substances that yielded a positive laboratory result, 90.5 percent (19 of 21) demonstrated significant correlation with provocative muscle testing procedures (Leisman *et al.*, 1995) employing the following confidence limits:

$$\frac{y}{n} \pm 2\sqrt{\frac{y}{n}\left(\frac{n-y}{n}\right)\frac{1}{n}}$$

Cochron's Q was found to be significant (Q = 18.36, df, 3 $p < .0001$) and was obtained by scaling all positive serum responses as 1 and no response as 0 from the data reported in Table I.

## DISCUSSION

The results suggest that Applied Kinesiology muscle testing procedures may be of value as part of a screening test for positive IgE (Type I), IgG (Type

TABLE II Summary of severity of reactions

| *Severity of Reaction* | *Type of Reaction* | | | | *Totals* |
|---|---|---|---|---|---|
| | IgE | IgG | E-IC | G-IC | |
| MILD | 2 | 2 | 0 | 4 | 8 |
| MODERATE | 1 | 5 | 0 | 3 | 9 |
| SEVERE | 2 | 7 | 0 | 3 | 12 |
| TOTALS | 5 | 14 | 0 | 10 | 29 |

II), and IgG immune complex (Type III) mediated hypersensitivity reactions to foods. Further controlled study is indicated beyond these preliminary results. Three directions are recommended. First, a controlled study using muscle testing to identify both positive and negative hypersensitivity testing foods is necessary. This can determine whether muscle testing can predict only positive or if it can be used to identify non-reactive foods as well. Secondly, a multi-center study is required especially with inter-rater reliability data for muscle testing used with oral food sensitivity testing although the muscle testing data has been previously published (Leisman *et al.*, 1995). Thirdly, follow up studies on subjects who have already been tested as positive with both muscle testing and blood testing should be performed after treatment.

The study indicates a relationship between demonstrated muscle *weakness* (inhibition) (Leisman *et al.*, 1995) and ingested food substances to which patients are allergic. The muscle inhibitory behavior that may be mediated through yet not completely understood neurological pathways has profound effects on neuromusculoskeletal integrity.

It is recommended that patients whose neuromusculoskeletal problems are slow to respond to traditional methods of treatment should be examined for the possibility of food allergies as complicating factors in their cases. Such identification, accompanied by elimination and/or desensitization (Stites and Rogers, 1987; Terr, 1987) of allergens, may be most helpful in hastening recovery in many difficult cases.

One implication of this study is that patients with food hypersensitivities will demonstrate neuromuscular inhibition upon gustatory receptor stimulation of the foods to which they are allergic. While the precise neuroanatomical details of the central nervous system influence of gustatory afferents is a matter of some disagreement, the fact that changes in motor function do occur as a consequences of gustatory stimulation is evident from common examples in which gustatory stimulation yields clear and immediate changes in motor function, such as with the administration of syrup of ipecac, which induces immediate and violent vomiting. Changes in motor function yielding patterns of neuromuscular inhibition have profound effects on the neuromusculoskeletal integrity that clinicians employing manual manipulation therapies attempt to restore. When present, these food allergies are a major source of neurological interference that becomes an obstacle to the successful application of manipulation and other manual methods.

In addition to neuromuscular dysregulation, the hyperimmune state itself is also relevant to the prognosis of patients with neuromusculoskeletal

problems. The hyperimmune state is known to be associated with increased nitric oxide synthase, and increased nitric oxide. The result is an increase in the inflammatory process, exacerbating neuromusculoskeletal complaints.

A further implication of the study is that gustatory receptor stimulation may have a more general application as a means for introducing chemoreceptor based sensory challenges, the results of which allow the clinician to assess the impact of chemical substances on patient neurophysiology. Such an approach would allow clinicians an interactive means by which to predict the clinical utility of a given substance for a given patient, based on the patterns of neuromuscular response elicited from the patient in response to gustatory receptor challenge with the substance in question. This would represent a significant conceptual expansion of the standard neurological examination process.

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