Acupuncture for Chronic Asthma: A Controlled Trial with Six Months Follow-Up

Peter Mitchell, M.B., B.S., Acupuncture Practitioner*
J. Elisabeth Wells, Ph.D.†
*P.O. Box 7351, Christchurch, New Zealand
† Biostatistics Unit, Department of Community Health, Christchurch School of Medicine, Christchurch, New Zealand

Abstract: This study was undertaken to evaluate the effects of acupuncture on chronic asthma. Twenty-nine volunteer chronic asthmatics were randomly allocated to receive a course of acupuncture at either correct or incorrect points. After a baseline pre-treatment monitoring period of one month, subjects received eight treatments over a 12-week period and were followed-up for six months. The results of daily monitoring indicated that both groups were stable during the baseline period, improved during the treatment stage, and were stable for five months subsequently. On analysis no statistically significant differences showed between the groups on these variables. However, the correctly treated group had no asthma episodes during the treatment period in contrast to the control group which had four (P=0.11). This could suggest that correct acupuncture may have had a prophylactic effect. A review of trials of other asthma therapies indicates that the improvement seen in both groups was greater than that usually obtained with a placebo and may suggest that acupuncture generally has an enhancing effect on homeostasis.

THERE has been a growing interest in the use of acupuncture, commonly for treating pain conditions, although it can be used to treat a wide variety of other ailments.[1] Asthma is one of the conditions which is said to respond, as described in several clinical reports.[2-4] Being a drugless therapy it offers another treatment dimension which may well be complementary and not necessarily an alternative to conventional therapies. Although there have been several trials demonstrating acupuncture to be more effective than controls in reversing acute bronchoconstriction,[5-9] as yet there has been no conclusive evidence that it is effective in the treatment of chronic asthma.[10-12] This study was undertaken to further investigate the effects of acupuncture on this condition.

Key Words: Acupuncture, asthma, pulmonary obstruction, bronchospasm, bronchoconstriction.

Subjects and Methods

Thirty-one volunteer chronic asthmatics were recruited from the community for the trial which was conducted within the Department of Respiratory Medicine in the Outpatient Department of Princess Margaret Hospital. The study was approved by the hospital's Ethics Committee and all subjects gave their informed consent. Subjects fulfilled the following criteria: aged 15-55 years; non-smokers; a daily fluctuation in peak expiratory flow rate (PEFR) of greater than 20%[13] on at least seven of 14 consecutive days; no hospital admissions for asthma in the previous three months; and not using oral steroids or high-dose steroid aerosols, although other steroid aerosols were allowed. General practitioners were informed of their patients' participation and were requested to continue their day-to-day management as usual. The trial was independently randomized, controlled and single blind, in that all subjects assumed they were receiving acupuncture specifically for asthma.

The study was in three parts: A pre-treatment period of baseline monitoring for four weeks, followed by a treatment stage of 12 weeks, with a follow-up of 26 weeks (see Figure 1). After an initial two weeks of 3-4 times daily PEFR recording, subjects monitored themselves twice daily, at minimum and maximum times, which in all but one case in each group, were in the morning and evening respectively. Daily medication (number of doses of aerosols and tablets), asthma symptoms, wheezing, shortness of breath, and chest tightness (1-3 mild, 4-6 moderate, 7-9 severe) were also recorded. The other variable monitored was asthma episodes. These were defined as:

a) Any episode that required additional treatment e.g. Prednisone or a nebulizer, and

b) Deterioration that resulted in the general practitioner changing their maintenance medication. This latter situation was a trial end point.

Two different acupuncture formulae given bilaterally were compared. One group (A) received acupuncture at correct points on the chest at CV-17 (Shanzhong), BL-13 (Feishu), Extra-17, and LV-3 (Taichong) on the foot.[14] The control group (B) received acupuncture at incorrect points SP-8 (Diji), K-9 (Zhubin), GB-37 (Guangming), which are all below the knees. The same needling technique was used for both groups with the particular acupuncture sensation of *de-qi (teh-chi)* being observed in the deep tissues at each point. The needles were left in place for 15 minutes and briefly stimulated after seven minutes and also upon removal. Subjects received a total of eight treatments given once per week for the first four treatments, then once per fortnight for the four remaining treatments. Subjects were recruited into both groups over a six month period.

Subjects returned to the hospital for a questionaire two weeks after the final treatment and at three and six months of the follow-up. The questionaires were administered by either the senior respiratory nurse or senior technician, both of whom were "blind" to the type of acupuncture given. They evaluated subjects' responses to treatment and general condition, including any asthma episodes, in the previous three months.

Statistical Analysis: Apart from Fisher's exact probability test, all analyses were carried out using BMD-P Statistical Software,[15] particularly programs P1D, P3D, P2V, and P1L. The results analyzed for the baseline and treatment periods were weekly averages of the variables monitored daily including PEFR fluctuation, and for the follow-up period, fortnightly averages at six week intervals, of the same variables. If a subject had more than one set of data missing or had information missing at the beginning or end of the stage being analyzed, that subject's results were not included in the analysis. If only one set of data was missing, this information was estimated by averaging the data before and after. However, the mean of all available pre-treatment values was taken for use as a co-variate. Comparison of groups at baseline was carried out using Hotellings T^2 to compare on all variables at once, and also with *t*-tests on individual variables. To detect change from baseline, the pre-treatment and average post-treatment values were compared using analysis of variance with repeated measures. For comparison of groups during treatment or during the post-treatment period, analysis of variance with repeated measures was used with the mean pre-treatment values as co-variate. Morning and evening peak flows were analyzed together as repeated measures. Other variables were analyzed separately. Elapsed time to the first significant asthma episode since the start of treatment was analyzed by survival analysis with the generalized Wilcoxon test to compare the two groups.

Results

Thirty-one subjects entered the trial but two subjects in Group B were withdrawn. One was admitted to the hospital with asthma during the baseline period and one had a vaso-vagal reaction to the first treatment and was considered unsuitable for the study. The results of the remaining 29 subjects, 16 in group A and 13 in group B (see Table 1), have been analyzed, although not all of the data was available for all subjects, particularly in the

Table 1.

Patient characteristics.
(Week 1 of the baseline period)

	Groups*	
	Correct Acupuncture	Incorrect Acupuncture
	(A)	(B)
Number of subjects	16	13
Males, Females	7M, 9F	5M,8F
Age(yrs): mean and range	29 (15-43)	28 (15-38)
PEFR morning L/min.† §	297±93	315±99
PEFR evening L/min.‡ §	371±118	360±65
% PEFR fluctuation‖ §	24±10	21±9
PEFR % predicted §	63±17	65±10
History of asthma(yrs) mean and range	23 (5-38)	26 (10-38)
Significant asthma episodes, pretrial year	32	33
Beta-2 agonist aerosol doses/24 hours § ¶	5.6±3.4	6.5±4.9

* No statistically significant difference between the groups
† Usual daily minimum PEFR but includes one subject in each group whose minimums were at other times.
‡ Usual daily maximum PEFR but includes one subject in group B whose maximum was at another time.
§ Mean and standard deviation.
‖ (PEFRmax–PEFRmin)/PEFRmax.
¶ See Table 2 for other medication.

Table 2.

Medication other than beta-2 agonist aerosol. Average daily number of doses, tablets and capsules taken.

	Number of subjects		Baseline weeks 1-4		Treatment week 15		Follow-up weeks 17-36	
Group	A	B	A	B	A	B	A	B
Steroid aerosol	6*	2.0	6.1	4.2	5.0	5.0	4.0	5.4
Theophylline tablets	2*	3†	1.9	1.3	1.5	1.0	2.0	1.1
Cromoglycate aerosol	2	2‡	6.0	6.6	5.4	3.4	6.5	4.1
capsules	...	1	...	1.3§	...	...	...	...
Salbutamol tablets	1*	2	1.6	3.0	1.0	2.0	...	1.7

*One subject withdrew at week 17.
† One subject withdrew at week 26
‡ Subject stopped medication at week 6.
§ Subject ended trial at week 9.

follow-up period. The variables analyzed were morning and evening PEFR, daily fluctuation in PEFR (PEFRmax–PEFRmin)/PEFRmax, daily symptoms and medication, and asthma episodes. Medication was analyzed only according to subjects' use of their beta-2 agonist aerosol, as this was the only medication common to all and used regularly. Their use of other medication has been listed in Table 2.

Baseline Period (n=number of subjects: Group A, n=14; Group B, *n*=12). Comparison of the mean baseline values of the two groups showed no significant differences overall (Hotellings T^2=4.4, F=0.7, *P*=0.6) or for any variables considered individually (minimum *P*=0.31). Further analyses of week-by-week values showed no trend overall nor were there different trends in the two groups. The results for the variables monitored daily are shown in Figures 2 and 3. Data for the two groups have been combined for these figures.

Treatment Period (Group A, n=15; Group B, n=12). The monitoring results of week 16 for both groups were excluded because several subjects had data missing. Analyses of weeks 5-15 showed no differences between the groups. PEFRs increased significantly (*P*<0.0003) during the treatment period and this increase was largely linear with morning peak flows improving more than those of the evening. Daily PEFR fluctuation showed a very significant corresponding decline which was also largely linear (*P*=0.001). There was a significant (*P*=0.04) linear decline in the number of doses of bronchodilator used and, in all but one subject in group A taking other medication, this was associated with reductions of those medications (Table 2). Symptoms also decreased significantly (*P*=0.04) over this time.

Follow-up Period (Group A, n=12; Group B, n=9). Five subjects in group A and two in group B withdrew from the trial during this period for various reasons with the result that there was insufficient data for analysis at six months. Two subjects in group A and one in group B withdrew because of changes in their medication. However, the results of 21 subjects with data to weeks 35-36 have been analyzed with mean baseline values as the covariate and show that all measures were stable over this time (minimum *P*=0.34). There were no differences between groups (minimum *P*=0.27).

Baseline Period (weeks 1-4) *versus Follow-up Period* (weeks 17-36) (n=21). Peak flows increased significantly (*P*=0.002) with morning values increasing more than those of the evening (*P*=0.02). These changes resulted in a significant decline (*P*=0.0005) in the daily fluctuation in PEFR from 25% to 17%. There was a marginally significant decline in daily bronchodilator doses from 6.2 to 5.3 (*P*=0.07). Mean daily symptom scores also declined (3.4 to 3.1) but not significantly (*P*=0.10). The change from baseline to follow-up did not differ between the groups for any of these variables (minimum *P*=0.3.).

Asthma Episodes (Group A, n=16; Group B, n=13). During the 12 weeks of treatment no subject in group A had an episode compared with four subjects in group B (*P*=0.11) (Table 3). The groups were not able to be compared during the follow-up because subjects in both groups withdrew from the trial. The median time from the start of treatment to the first significant asthma episode was 32.2 weeks for the correctly treated group and 25.4 weeks for the incorrectly treated group, but this was not significant (*P*=0.17).

Discussion

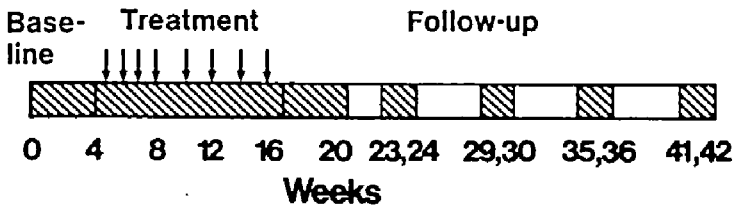
The aim of this trial was to evaluate the effect of acupuncture on chronic asthma. The results suggest that in this group of young adults, with mild to moderate asthma and relatively labile airways, acupuncture stabilized the asthma during the period of treatment. The correctly treated group required no therapeutic intervention for exacerbations over this time in contrast to the control group. However, both groups did improve significantly throughout the course of treatment and in those subjects who remained in the study, improvement was maintained for five months after treatment finished. We have considered three possible explanations for these results in terms of Western concepts, as a discussion involving traditional Chinese medicine is beyond the scope of this article.

Table 3.
Numbers of asthma episodes.

	Pre-Trial Year	Base-line	Treatment			Follow-up*					
Months		1	2	3	4	5	6	7	8	9	10
Group A	32 (10)	●				●●		(5)		●	●●
Group B	33 (9)	●	●	●● (4)	●	●	●	● (3)	●		●●

●Denotes each episode.
*Seven subjects withdrew from the trial during this period.
Number of subjects having episodes appears in parentheses.

Fig. 1.
Design of the trial.



↓ Denotes each treatment.
▨ Represents daily monitoring of medication, symptoms and peak flow rates.

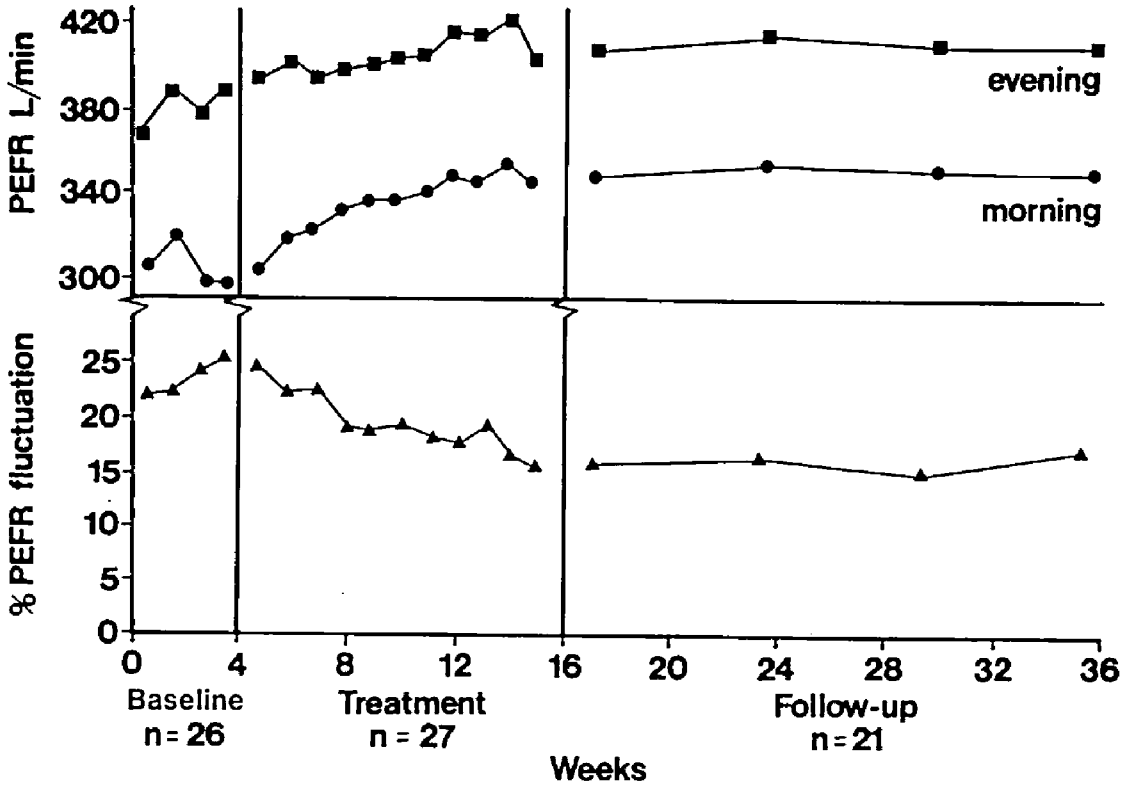


Fig. 2.
Combined results for both groups for peak expiratory flow rates and peak expiratory flow fluctuations.

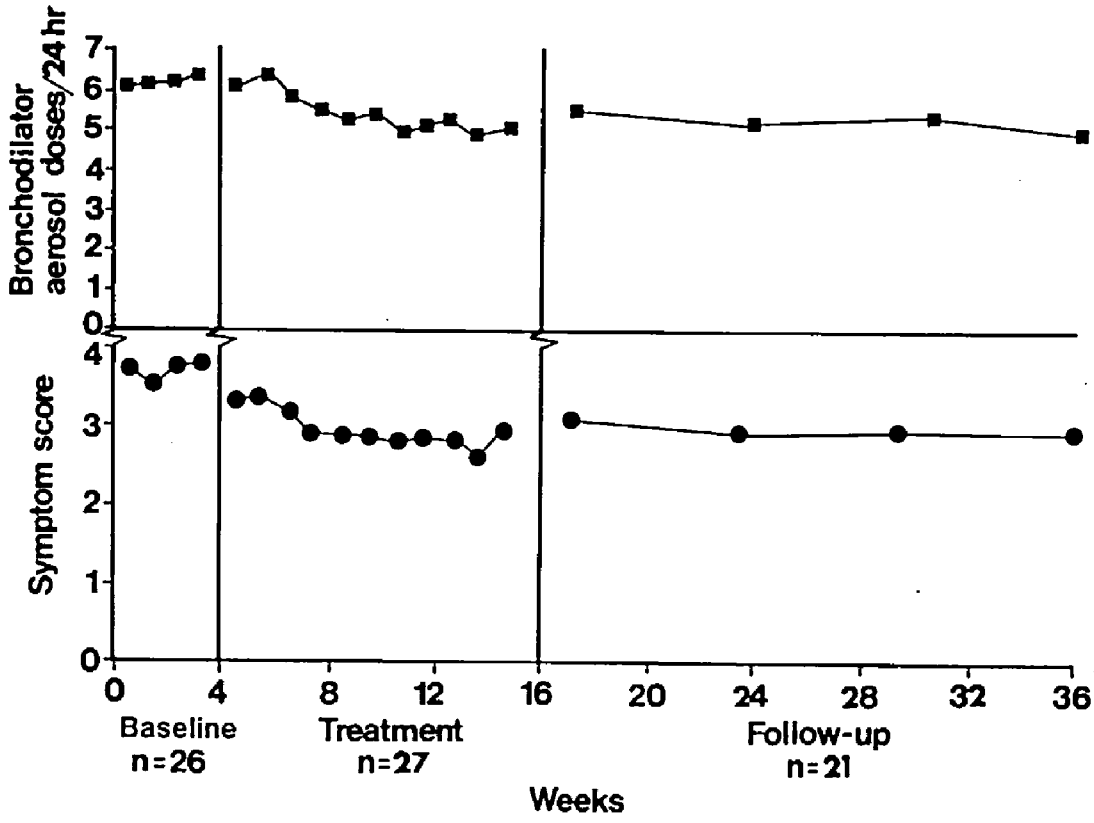


Fig. 3.
Combined results for both groups for medication and symptoms.

The first explanation is that with the onset of monitoring, subjects' compliance with medication improved and as a consequence, their asthma was better controlled. Evidence against this is that during the one month baseline period there was no trend for improvement in any of the variables monitored daily. Furthermore, during the three months of treatment, which was in winter for 62% of the subjects, and during the five months of follow-up, subjects in the correctly treated group actually took less medication compared with during the baseline period. Of the six subjects in the correctly treated group using a steroid aerosol, only one had commenced it in the previous 12 months. That change of medication constituted her only significant asthma episode for the year.

The second possible explanation is that acupuncture was just an effective placebo. This is a reasonable suggestion and cannot be excluded, particularly since the subjects were volunteers and the trial was single blind. However, the results may be due to more than this because they were consistent and clinically significant. If we accept an increase in average morning PEFR of greater than 15% as indicating a clinically significant improvement, at the end of treatment, 50% of the subjects in the correctly treated group had improved with an average increase of 29% and 54% of subjects in the control group had improved with an average increase of 40%. Overall, the increase was 16%. In recent trials of ketotifen[16-18] and in studies on hyposensitization by injection[19-23] which is perhaps the closest therapy, for comparison, to acupuncture, the results of the placebo groups at three months or at the assessment nearest that time have generally been small and not significant. Although in one ketotifen trial[24] there was an increase in the morning PEFR in the placebo group of 19% during the first four weeks of placebo therapy, this had fallen to 13% after four months of treatment. Apart from that initial improvement no other consistent changes were seen. This response tends to confirm Shapiro's comment in his extensive review[25] of placebos when he states that "reactions to placebos are generally not uniform, constant or predictable." In contrast to this, subjects in both groups in our trial showed a very uniform and largely linear increase in morning peak flows throughout the treatment period.

There have been several controlled studies on the acute bronchodilating effect of acupuncture[5-9] showing it to be statistically better than placebo acupuncture i.e., needling of incorrect or non-acupuncture points. Acupuncture has also been shown to be effective in reducing exercise bronchospasm[26] although three long term studies[10-12] on chronic asthma which used placebo acupuncture as the control have obtained only marginal or negative results. However in one of these studies,[10] which showed no response to either type of acupuncture, most of the subjects were heavily medicated with 70% on oral steroids. In another study[11] the correctly treated group improved significantly during the trial, but only statistically better than the control group after two weeks of therapy. This highlights the difficulty which acupuncture trials have of achieving statistically significant results when placebo acupuncture is used as the control because it may be that any needling has a beneficial effect. This has been reviewed elsewhere[27] in regard to pain studies and has emerged also as a problem in our trial.

This leads to the third possible explanation for the improvement and that is that both treatments may have had a real effect with the correct treatment possibly being more effective only in reducing the incidence of asthma exacerbations. The response of the control group may have been part of a more generalized enhancement of homeostasis that can occur with some acupuncture as suggested by previous research.[28,29] Some of the improvement in the correctly treated group may also have been due to a non-specific homeostatic response as the improvement in the variables monitored daily was similar in both groups. However, the trend for a difference between the groups in the number of asthma episodes may have been due to another mechanism, i.e. one that reduced the responsiveness of the airways, an effect seen sometimes with cromoglycate[30] and steroids.[31] Subjective evidence in support of this is that eight (50%) subjects in

the correctly treated group compared with four (31%) in the control group (*P* not significant) reported a marked improvement in asthma induced by either exercise, cold air, allergies or viral infections. This tends to contrast with studies evaluating the effect of medication[30,32] and hyposensitization[21,23] on airways responsiveness in which the placebo therapies had no effect. Any reduction in hyper-reactivity in the correctly treated group may have been due to cutaneo-visceral reflexes[33] particularly if, as has been recently suggested[34,35] the mechanisms of asthma have a major neural component. A similar process, but to a lesser extent, may have been mediated via intersegmental reflexes[33] in the control group, but further studies would be necessary to evaluate these and other hypotheses[26,36-38] which have been proposed to explain how acupuncture may work in asthma.

Acknowledgements:

We wish to thank the staff of the Respiratory Department of Princess Margaret Hospital for their cooperation, particularly Mrs. Margaret Eckman and Mrs. Lois Nobbs for conducting the follow-up questionnaires, and Mrs. Gwen Naisbitt and the outpatient staff for their assistance.

The study was funded by the Canterbury Medical Research Foundation.

References

1. Anonymous. Use of acupuncture in modern healthcare (Editorial). *WHO Chronicle,* 1980, 34:294-301.
2. Calehr, H. Acupuncture treatment of the asthmatic patient. *Am. J. Acupunct.* 1973, 1:41-51.
3. Shao, J., Ding, Y. Clinical observation on 111 cases of asthma treated by acupuncture and moxibusion. *J. Trad. Chin. Med.* 1985, 5:23-25.
4. Weh, H.L., Chau, K. Status asthmaticus treated by acupuncture and electro-stimulation. *Asian J. Med.* 1973, 9:191-5.
5. Yu, D.Y.C., Lee, S.P. Effect of acupuncture on bronchial asthma. *Clin. Sci. Mol. Med.* 1976, 51:503-9.
6. Tashkin, D.P., et al. Comparison of real and simulated acupuncture and isoproterenol in methacholine-induced asthma. *Ann. Allergy* 1977, 39:379-387.
7. Berger, D., Nolte, D. Acupuncture in bronchial asthma: Body plethysmography measurements of acute bronchospasmolytic effects. *Comp. Med. East West* 1977; 5:265-269.
8. Virsik, K. et al. The effect of acupuncture on pulmonary function in bronchial asthma. *Prog. Resp. Res.* 1980, 14:271-5.
9. Takishima, T. et al. The bronchodilating effect of acupuncture in patients with acute asthma. *Ann. Allergy* 1982, 48:44-9.
10. Tashkin, D. et al. A controlled trial of real and simulated acupuncture in the management of chronic asthma. *J. Allergy Clin. Immunol.* 1985, 76:855-864.
11. Christensen, P.A. et al. Acupuncture and bronchial asthma. *Allergy* 1984, 39:379-385.
12. Dias, P.L.R. et al. Effects of acupuncture in bronchial asthma: Preliminary communication. *J. Roy. Soc. Med.* 1982, 75:245-8.
13. Hetzel, M.R. The pulmonary clock (Editorial) *Thorax* 1981, 36:481-6.
14. Anonymous. *Essentials of Chinese acupuncture,* 1st ed. Foreign Languages Press, Beijing 1980.
15. Dixon, W.J. Ed. *BMD-P Statistical Software 1981.* University of California Press, Berkeley, 1981.
16. Mattson, K. et al. Comparison of ketotifen, disodium cromoglycate and placebo in the treatment of adult patients with mild extrinsic asthma. *Clin. Allergy* 1981, 11:237-42.
17. Podleski, W.K. et al. Long term trial of ketotifen in bronchial asthma. *Ann. Allergy* 1984, 52:406-410.
18. Tinkleman, D.G. et al. A multicenter trial of the prophylactic effect of ketotifen, theophylline and placebo in atopic asthma. *J. Allergy Clin. Immunol.* 1985, 76:487-97.
19. Smith, A.P. Hyposensitization with dermatophagoides pteronyssinus antigen: Trial in asthma induced by house dust. *Br. Med. J.* 1971, 4:204-6.
20. Gaddie, J. et al. Hyposensitization with house dust mite vaccine in bronchial asthma. *Br. Med. J.* 1976, 2:561-2.
21. Newton, D.A.G. et al. House dust mite hyposensitization. *Br. J. Dis. Chest* 1978, 72:21-8.
22. Mite allergy subcommittee of the research committee of the British Thoracic Association. A trial of house dust mite extract in bronchial asthma. *Br. J. Dis. Chest* 1979, 73:260-70.
23. Sundin, B. et al. Immunotherapy with partially purified and standardized animal dander extracts. *J. Allergy Clin. Immunol.* 1986, 77:478-87.
24. Connolly, C.K. Ketotifen has no additional effect on morning dipping in patients with asthma on conventional treatment. *Br. J. Clin. Prac.* 1985, 39:432-433.
25. Shapiro, A.K. Placebo effects in medicine, psychotherapy and psychoanalysis. In: Bergin, A.E. et al. eds. *Handbook of Psychotherapy and Behavior Change.* Wiley & Sons, New York 1971, 439-73.
26. Fung, K.P, et al. Attenuation of exercise-induced asthma by acupuncture. *Lancet* 1986, 2:1419-22.
27. Lewith, G.T., Machin, D. On the evaluation of the clinical effects of acupuncture. *Pain* 1983, 16:111-127.
28. Xie, Q-W. Endocrinological basis of acupuncture. *Am. J. Chin. Med.* 1982, 9:298-304.
29. O'Connor, J., Bensky, D. Summary of the research on the effects of acupuncture. *Am. J. Chin. Med.* 1975, 3:377-394.
30. Griffin, M. et al. Short and long-term effects of cromolyn sodium on the airway reactivity of asthmatics. *J. Allergy Clin. Immunol.* 1983, 71:331-8.
31. Kraan J. et al. Changes in bronchial hyper-reactivity induced by four weeks of treatment with anti-asthmatic drugs in patients with allergic asthma. A

comparison between budesonide and terbutaline. *J. Allergy Clin. Immunol.* 1985, 76:628-36.

32. Arkins, J.A. et al. The effect of corticosteroids on methacholine inhalation in symptomatic bronchial asthma. *J. Allergy* 1968, 41:209-16.
33. Mann, F. *Scientific aspects of acupuncture.* Heinemann Medical Books, London 1977.
34. Barnes, P.J. Asthma as an axon reflex. *Lancet* 1986, 1:242-5.
35. Anonymous. NANC nerves in airways (Editorial). *Lancet* 1986, 2:1253-4.
36. Kim, S.S. The mediator theory of acupuncture and its practical application in bronchial asthma and myasthenia gravis. *Am. J. Acup.* 1981, 9:101-116.
37. Hayhoe, S. Effects of acupuncture in bronchial asthma (letter). *J. Roy. Soc. Med.* 1982, 75:917.
38. Anonymous. Acupuncture, asthma and breathlessness (Editorial). *Lancet* 1986, 2:1427-8.