Nicotine and cotinine replacement when nicotine nasal spray is used to quit smoking

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Abstract
Nicotine nasal spray (NNS) is generally considered to be an effective smoking cessation aid, but all studies to date of NNS effectiveness have also utilized group therapy sessions or frequent laboratory visits to support their subjects’ stop smoking efforts. We studied 50 volunteers before they attempted to quit smoking and again at 1, 2 and 3 months after they received NNS to assist them in quitting smoking. No other stop smoking intervention was used, which more closely mimics the common practice of many individuals trying to stop smoking with the aid of a nicotine replacement product but without other supportive interventions. We found that 50% of the subjects quit smoking for the first month, 34% were still abstinent after 2 months and 32% quit smoking for 3 months. Those who quit smoking for the entire 3 months and who continued regular NNS use throughout had 67% cotinine replacement at the end of the first month, while another group which quit smoking for only the first month with the aid of NNS had 42% cotinine replacement at the end of that month. Our data confirm that NNS is an effective smoking cessation aid, but our abstinent rate at 3 months is slightly lower than in other studies in which group therapy was provided. Our data also indicate that higher NNS-induced cotinine replacement during the first month of quitting smoking (suggesting more frequent use of NNS) is associated with longer term quit-smoking success rate.

Key words
Nicotine nasal spray · Smoking cessation · Nicotine replacement · Cotinine replacement · Expired carbon monoxide

Introduction
Effective nicotine replacement therapy diminishes withdrawal symptoms during smoking cessation by producing a venous blood nicotine concentration which is approximately two-thirds the level accustomed to while smoking (Russell 1988). However, venous blood nicotine concentration can vary several fold between smokers (Benowitz et al. 1982), so the level of nicotine replacement needed by individual smokers can vary considerably. Therefore, an ideal nicotine replacement therapy would permit the user to adjust the nicotine intake to achieve a blood nicotine level which avoids the majority of withdrawal symptoms during smoking cessation.

Currently, nicotine-containing gum and skin patches are available in different strengths to satisfy the different needs of smokers in their attempts to quit smoking. However, it is difficult for patients to adjust the level of nicotine over the short term with these products, since up to 6 h is required to reach a therapeutic level of nicotine when using the skin patch (Srivastava et al. 1991) and increasing the strength and/or the amount of gum chewed causes many side effects involving the mouth and gastrointestinal tract (Russell et al. 1980). A combination therapy (Fagerström et al. 1993) which utilizes a skin patch to produce a steady blood nicotine level and nicotine gum to allow a response to short term nicotine requirements is promising. This combination method emphasizes the need for high blood nicotine levels with a fast-acting component to nearly eliminate withdrawal symptoms. A nicotine vapor inhaler has been introduced recently, but it provides relatively little nicotine replacement (Schuh et al. 1997).

An ideal nicotine replacement therapy should permit titration of blood nicotine to minimize withdrawal symptoms and it should be easy to use and fast acting, so that fine control can be achieved. Nicotine nasal spray (NNS) is such a therapy, since peak venous nicotine concentration occurs 7–10 min after taking a
Materials and methods

Seventy-two smokers who had a smoking history of at least 20 cigarettes/day for 20 years were recruited for a study of the effects of quitting or reducing smoking for 3 months on lung inflammation and sputum rheology, we also obtained data on the effectiveness of NNS as a nicotine replacement therapy, which will be the focus of this paper. In previous studies by Sutherland et al. (1992), Sutherland and Stapleton (1994) and Hjalmarson et al. (1994) NNS was combined with behavioral therapy sessions, and in the study by Schneider et al. (1995), ten laboratory visits were required for the baseline studies and during 3 months of NNS therapy. Our study did not utilize any formal behavioral intervention and the subjects returned for post-NNS testing on only three occasions during the 3-month study. Therefore, we believe this study is especially relevant, since it resembles the usual situation when most smokers attempt to quit smoking with the aid of a nicotine replacement product.

Results

The anthropometric and baseline smoking and pulmonary function data are shown in Table 1. There were