Are biomarkers a useful aid in smoking cessation: a review and analysis of the literature

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Authors' objectives
To review the theoretical rationale and empirical evidence regarding the use of feedback about biomarkers in smoking cessation.

Searching
PubMed was searched from 1966 to May 2000, and PsycLIT from 1970 to November 1999, using the following search terms: 'biomarkers', 'biological feedback', 'counselling', 'smoking cessation', 'cotinine', 'carbon monoxide', 'environmental tobacco smoke (ETS)', 'genetic markers', 'genetic screening', 'pulmonary functioning', 'spirometry' and 'physiological testing'. The reference lists of pertinent articles were also handsearched.

Study selection
Study designs of evaluations included in the review
Randomised controlled trials (RCTs) and quasi-experimental studies were included.

Specific interventions included in the review
Explicit feedback on smokers' biomarker status as an intervention or treatment component for smoking cessation. Biomarkers refer to biological indices of smoking-related harm, harm exposure, or genetic susceptibility to increased smoking-related disease risk. Common biomarkers in smoking studies include the following: carbon monoxide levels (expired or carboxyhaemoglobin); cotinine levels (serum, saliva or urinary); pulmonary functioning tests such as spirometry, plethysmography, and the single-breath nitrogen washout test; thiocyanate levels; chest X-rays; and genetic testing for lung cancer susceptibility (e.g. the presence of the CYP2D6 enzyme).

Participants included in the review
Individuals who smoke were included.

Outcomes assessed in the review
The outcomes that appear to have been included in the review were: attempts to quit smoking; an intention to quit smoking; smoking-related cognitions; emotions and behaviour change; long- and short-term smoking abstinence rates; biomarker levels; increased birth-weight as a result of maternal smoking cessation; and depression.

How were decisions on the relevance of primary studies made?
The author does not state how the papers were selected for the review, or how many of the reviewers performed the selection.

Assessment of study quality
No formal assessment of quality was undertaken.

Data extraction
The author does not state how the data were extracted for the review, or how many of the reviewers performed the data extraction.

The data appear to have been extracted into the following categories: author; sample; whether the participants were seeking treatment; intended outcome; biomarker; feedback provider; design; treatment conditions; other cessation assistance; and results.
Methods of synthesis
How were the studies combined?
A narrative synthesis was undertaken, where the RCTs were given priority over the findings from quasi-experimental studies.

How were differences between studies investigated?
The discussion was divided into different intervention characteristics and outcomes.

Results of the review
According to the data extraction tables, a total of 13 studies reporting on 10,054 participants were included in the review. Nine were RCTs (N=4,458), and 4 were quasi-experimental studies (N=5,596).

The review of the RCTs provided support for the assertion that personalised biomarker feedback may increase motivation for quitting smoking and increase the likelihood of making a quit attempt. There was also some evidence that this approach may enhance the likelihood of cessation: a trend for increased abstinence was found in three trials. Interventions that combined markers of harm exposure with indicators of physical harm or genetic disease risk were more effective than those which fed-back on markers of harm exposure alone. The cessation rates were reported to have improved in studies that provided ongoing cessation assistance, but not in those that provided minimal or no assistance. Repeated assessment and feedback was effective for increasing both quit attempts and cessation attempts. The possibility that biomarker feedback can result in significant psychological distress cannot be ruled out, especially among already emotionally vulnerable individuals.

Authors' conclusions
Preliminary evidence suggested that the use of biomarker feedback may improve motivation to quit smoking and, when combined with best practices treatment, could aid the promotion of abstinence.

CRD commentary
The review question was clearly stated, although the criteria used by the author to select the studies for inclusion could have been defined more accurately. The search was also adequate although there were no attempts to identify unpublished material. No formal quality assessment was performed which threatens the validity of the review. The details of the included studies were reported poorly: the number of included studies reported in the text and tables differed, and there were also different numbers according to study design. The number of reviewers involved in selecting the papers and extracting the data was not reported, and therefore, it is not known whether some bias has been introduced here.

The author’s conclusions appear to follow from the review. However, these findings should be interpreted with a degree of caution given the discrepancies concerning the included studies.

Implications of the review for practice and research
Practice: The author did not state any implications for practice.

Research: The author states 'More research is needed before this practice can be advocated as a useful intervention. Moreover, we need research to delineate the conditions under which this approach is most effective, including type of feedback, the optimal frequency of testing and feedback, and who should provide the feedback. Cost-effectiveness and harmful iatrogenic counselling effects also warrant further investigation'.

Funding
The Robert Wood Johnson Foundation, grant number 37933; the National Cancer Institute, grant number K07CA85603-01.
Bibliographic details
McClure J B. Are biomarkers a useful aid in smoking cessation: a review and analysis of the literature. Behavioral Medicine 2001; 27(1): 37-47

PubMedID
11575171

DOI
10.1080/08964280109595770

Indexing Status
Subject indexing assigned by NLM

MeSH
Biomarkers /blood; Humans; Motivation; Randomized Controlled Trials as Topic; Smoking Cessation; Treatment Outcome

AccessionNumber
12001002341

Date bibliographic record published
30/11/2002

Date abstract record published
30/11/2002

Record Status
This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.