P.O. Box 144345 Austin, TX 78714-4345 ▪ 512.926.4900 ▪ Fax: 512.926.2345 ▪ www.herbalgram.org

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File: ■ Aloe Vera (*Aloe vera*, Xanthorrhoeaceae)
■ Blood Glucose
■ Type 2 Diabetes
■ Systematic Review/Meta-analysis

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RE: Meta-analysis Shows Aloe Vera Products Reduce Fasting Blood Glucose in Prediabetes and HbA1c in Type 2 Diabetes

Suksomboon N, Poolsup N, Punthanitisarn S. Effect of *Aloe vera* on glycaemic control in prediabetes and type 2 diabetes: a systematic review and meta-analysis. *J Clin Pharm Ther*. April 2016;41(2):180-188.

Prediabetes is characterized by glucose intolerance or a decrease in the ability to control plasma glucose. Prediabetes significantly increases the risk of developing type 2 diabetes. In type 2 diabetes, control of plasma glucose continues to decrease and insulin insensitivity develops. Glycemic control is not always achieved with antihyperglycemic medications in patients with type 2 diabetes. The efficacy of herbal treatments, including aloe vera (*Aloe vera*, Xanthorrhoeaceae), has been investigated for the treatment of type 2 diabetes. The goal of this systematic review and meta-analysis was to investigate the current research on the effect of aloe vera on fasting plasma glucose (FPG) and glycated hemoglobin (HbA1c) levels in people with prediabetes or type 2 diabetes.

The databases MEDLINE, CENTRAL, CINAHL, Scopus, clinicaltrials.gov, Web of Science, Proquest, LILACS, HerbMed, NAPRALERT, and CNKI were searched from their inception up to January 2016. The medical subject headings aloe, diabetes mellitus, and hyperglycaemia were searched. Keyword searches included aloe vera, aloe gel, aloe polysaccharide, acemannan, aloe phytosterols, or aloe elements in combination with prediabetes, impaired plasma glucose, or impaired glucose tolerance. Only randomized, controlled trials that compared aloe vera to placebo or to no treatment were eligible for inclusion in this review and meta-analysis. Studies included those in subjects with prediabetes or patients with type 2 diabetes in which FPG and/or HbA1c were reported. The quality of each study was assessed with the Jadad scale, which measures the quality of randomization, blinding, and patient attrition on a 0-to-5 scale. Studies with scores ≥ 3 were considered of high quality. Trials were separated into two groups depending upon whether individuals had prediabetes or type 2 diabetes. The pooled mean differences between treatment and placebo or no-treatment groups at the end of the study were compared for FPG and HbA1c, considered in this analysis to be the primary and secondary outcomes, respectively. Heterogeneity was measured with

chi-squared and I^2 analyses. Fixed-effects models were used to analyze non-heterogeneous data and random-effects models to analyze heterogeneous data. For a sensitivity analysis, analyses were repeated with low-quality studies excluded.

Six hundred and ten articles were returned from the database search. Once all criteria were applied, eight studies remained. Three studies were in subjects or patients with "prediabetes or early, non-treated diabetes," and five were in patients with type 2 diabetes. Results were heterogeneous. A wide range of aloe vera interventions were used, which included fresh crushed leaves, fresh leaf juice, dried gel powder, and leaf extract. The studies lasted two to three months and included between 24 and 122 patients. One study in subjects with prediabetes and two studies in patients with type 2 diabetes were of low quality. Two studies in subjects with prediabetes included three arms consisting of two aloe vera treatments and a placebo; in the meta-analysis, results from the two aloe groups were combined. The meta-analysis showed that FPG was reduced in subjects with prediabetes (−0.22 mmol/L; $P < 0.0001$) and in patients with type 2 diabetes (−1.17 mmol/L; $P = 0.05$). Aloe vera consumption did not affect HbA1c in subjects with prediabetes, but did result in a significant decrease in HbA1c in patients with type 2 diabetes ($P = 0.01$). When the low-quality studies were removed from the analysis, the effect of aloe vera on FPG in patients with type 2 diabetes was no longer significant, and the effect of aloe vera on HbA1c was weakened but remained significant ($P = 0.04$).

This meta-analysis found evidence that aloe vera consumption can have a positive effect on markers of impaired glucose control in people with prediabetes and type 2 diabetes. Aloe vera consumption appears to have a greater effect on HbA1c in patients with type 2 diabetes. Subjects with prediabetes tend not to have greatly elevated HbA1c levels, so the authors state that significant reduction was not expected. Hypothesized mechanisms of aloe vera action include a decrease in absorption of glucose in the gut, an increase in glucose catabolism, and an increase in glucose storage. Aloe vera has been shown to activate adenosine 5'-monophosphate (AMP) kinase in a manner similar to metformin, a commonly prescribed antihyperglycemic medication. The effect of metformin on FPG tends to increase for about six months. It is possible that the effect of aloe vera may follow a similar course of action. The authors suggest that studies of the effect of aloe vera on diabetes should last at least six months. In addition, the authors recommend that a standardized and well-quantified aloe vera preparation be used in future studies. Future studies should also include larger sample sizes and assessment of long-term safety.

—Cheryl McCutchan, PhD

The American Botanical Council has chosen not to include the original article.