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ORIGINAL RESEARCH

A Pilot Study to Evaluate the Antihypertensive Effect of a Celery Extract in Mild to Moderate Hypertensive Patients

Original research suggest celery extract may decrease blood pressure

by Doddabele Madhavi, PhD; Daniel Kagan, PhD; Venkatesh Rao, MD; and Michael T. Murray, ND
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Abstract

Objective: To evaluate the efficacy of a standardized extract of celery seed, 150 mg/d, supplying 85% 3-n-butylphthalide (3nB) in mild to moderate hypertensive patients. **Study Design:** A single-arm study of 30 mild to moderate hypertensive patients given the test medication following a 7-day wash out period. The primary clinical assessment was the effect on blood pressure at week 3 and week 6. Secondary measures were fasting blood levels of total cholesterol, LDL cholesterol, HDL cholesterol, VLDL cholesterol, free fatty acids, and serum electrolytes (ie, sodium, potassium, calcium). **Results:** There was statistically significant decrease in both systolic blood pressure (SBP) and diastolic blood pressure (DBP) at week 3 and week 6 compared to baseline. The change at week 6 for the SBP was 8.2 mmHg (SD=3.6, $P<0.005$) and for the DBP was 8.5 mmHG (SD=2.9, $P<0.005$). **Conclusions:** The results from this pilot study suggest that celery seed extract may have clinically relevant blood pressure–lowering effects, indicating that additional clinical research is warranted.

Introduction

Elevated blood pressure (high BP) or hypertension is a major risk factor for a heart attack or stroke. In fact, it is generally regarded as the most significant risk factor for stroke. More than 60 million Americans have high BP, including more than half (54.3%) of all Americans 65 to 74 years of age and almost three-quarters (71.8%) of all American blacks in the same age group.

A number of foods contain anti-hypertensive compounds. In particular, celery contains 3-n-butyl phthalide (3nB), a compound that is not only responsible for the characteristic odor of celery, but also has been found to lower BP in a preliminary study. In animals, a small amount of this compound lowered BP by 12% to 14% and cholesterol by about 7%. The researchers noted their interest was prompted when the father of one of them, who, after eating a quarter pound of celery daily for 1 week, observed that his BP had dropped from 158/96 to 118/82.[1]

The purpose of this pilot study was to evaluate the efficacy of an extract of celery seed supplying 85% 3nB in mild to moderate hypertensive patients in preparation for a larger, more conclusive double-blind study.

Study Design

After initial screening and signing of an informed consent approved by Sterling IRB and the internal IRB of the Prajna Kuttera Ayurveda Hospital in Mysore, India, 42 patients who met the inclusion criteria were analyzed for exclusion criteria. A total of 30 patients participated in a single-arm trial consisting of a 7-day run-in, followed by use of test medication and clinical assessment at weeks 1, 3, and 6. A trained nurse recorded upper-arm arterial blood pressure in triplicate at each visit, using auscultatory method aneroid sphygmomanometer with stethoscope. The 3 readings were taken in 5-minute intervals by the same nurse, and the mean of the 3 readings was used in the subsequent analyses. Secondary measures were fasting blood levels of total cholesterol, LDL-cholesterol, HDL-cholesterol, VLDL-cholesterol, free fatty acids, and serum electrolytes (ie, sodium, potassium, calcium).

Screening	Visit 1 (Week 1)	Visit 2 (Week 3)	Visit 3 (Week 6)
7 day run-in	Study supplement	Study supplement	Study completion

Table 1. Inclusion Criteria

Patients who are eligible and able to participate in the study, and who give written informed consent before any assessments are performed.
Men or women 18 years of age and older.
Hypertensive patients with mean SBP ≥ 120 but ≤ 150 and mean DBP ≥ 80 but ≤ 95 mm HG at screening and prior to initiating single-blind dosing.

Table 2. Exclusion Criteria

Subjects being treated with hypertensive medications within the past 30 days
History of any clinically significant heart disease (excluding mild to moderate hypertension) or, any gastrointestinal, or renal disease
Known allergy to celery or celery seed
BMI < 18.5 or > 35 kg/m^2
History of any form of arthritis
5 cups of coffee or 3–4 cups with 1–2 cans of soft drinks or 1–2 cups of tea per day
Any prescription or over the counter medication including supplements
Use of investigational drugs or participation in an investigational study within 30 days of the screening visit.
Alcohol intake ≥ 1 oz/day
History of smoking within the past 12 months
Strenuous aerobic exercise > 30 min/day
Any surgical or medical condition which might significantly alter the absorption, distribution, metabolism, or excretion of study supplement
History of hypersensitivity to celery or celery seed extract
History of drug or alcohol abuse within the past 12 months
Any surgical or medical condition, which in the opinion of the investigator, may place the patient at risk from his/her participation in the study, or is likely to prevent the patient from complying with the requirements of the study or completing the study
Any condition that in the opinion of the investigator or BioActives would confound the evaluation and interpretation of the study data

Table 3. Demographics of the 30 patients in the study

Factor	Mean (standard deviation)
Age	57.5 (10.3)
Gender	Male - 14 (47%) Female - 16 (53%)
BMI	22.6 (2.4)

Test medication

The celery extract intervention supplied 75 mg of a celery seed extract per capsule standardized to contain 85% 3nB. The celery seed extract was dispensed and subjects were told by the investigators that they may be receiving the active test medication or a placebo during the study, although no placebo arm was included in the investigation. The test medication was given at visit 1 and labeled only with the instructions to take 2 capsules daily, 1 in the morning and 1 in the evening. The total dose was 150 mg/d of the celery seed extract.

Statistical Analysis

Paired t-test analysis was performed using GraphPad Prism Statistical Software Version 5.0. Statistical significance was accepted as $P<0.05$.

Results

There was a decrease in systolic blood pressure (SBP) of 4.6 mmHg ($P<0.005$) and diastolic blood pressure (DBP) of 4.5 mmHg ($P<0.005$) at week 3 compared to baseline (Table 4). Similarly after 6 weeks of consumption, the decrease in SBP and DBP compared to baseline was 8.9 and 8.5 mmHg, respectively ($P<0.005$). There was no change in secondary measures of blood lipids or electrolytes.

Table 4. Summary of mean blood pressure readings at baseline and weeks 3 and 6 during the intervention

Measure	Baseline (sd)	Week 3	Week 6
Systolic blood pressure (mmHg)	139.4 (6.5)	134.8 (6.0) $P<0.005$	131.6 (6.1) $P<0.005$
Diastolic blood pressure (mmHg)	85.4 (5.8)	80.9 (5.7) $P<0.005$	76.9 (6.6) $P<0.005$

Table 5. Summary of changes in blood pressure from baseline to week 6

Measure	Mean (sd)	Paired t test	*P* value
Systolic blood pressure mmHg	8.2 (3.6)	12.6	<0.005
Diastolic blood pressure mmHg	8.5 (2.9)	15.6	<0.005

Discussion

Celery is a member of the Umbelliferous family, which also includes carrots, parsley, and fennel. Modern celery originated from wild celery native to the Mediterranean, where its seeds were once highly valued as a medicine. The chief compound responsible for the characteristic odor and flavor of celery is 3nB. Researchers identified this compound as celery's active component of celery when seeking to explain the effects of celery in lowering of blood pressure. 3nB first drew significant scientific attention when researchers at the University of Chicago Medical Center identified it as the factor in celery responsible for celery's blood pressure–lowering effects.[1]

In animals, 3nB appears to lower blood pressure by acting as both a diuretic and vasodilator through impacting the production of prostaglandins, as well as acting in a similar manner to calcium-channel blockers.[2] 3nB has also been shown to lower blood cholesterol levels and reduce the formation of arterial plaque in preclinical studies (animal and in vitro studies).[3,4] This effect may increase the elasticity of the blood vessels and also lead to lower blood pressure readings. 3nB also appears to promote some effects on areas and systems of the brain that control vascular resistance.[5]

If effective, one possible advantage of celery extract over conventional drugs used in high blood pressure is that beta-blocker, angiotensin converting enzyme (ACE) inhibitors, and calcium channel blockers tend to significantly lower cerebral blood flow. While this effect is helpful in reducing the likelihood of stroke, it often leaves patients taking these drugs feeling tired, depressed, dizzy, and forgetful. In contrast, celery extract has been shown in animal studies to help prevent stroke, improve blood flow, and act to protect the brain and enhance energy production.[5–8] It has produced dramatic recovery in neurological and brain function in animals in studies that simulate a stroke.[6–10] Celery extract has also been shown to increase lifespan in spontaneously hypertensive rats.[11] The synthetic DL-3nB is being investigated in China as a possible therapeutic agent in aiding stroke recovery, preventing and treating vascular dementia, and preventing and treating Alzheimer's disease.[12,13]

The research on the blood pressure–lowering effect of celery and celery extracts is quite preliminary, and double-blind studies are necessary to confirm its clinical efficacy and safety.

Conflicts of Interest Statements

Doddabele Madhavi, PhD, and Daniel Kagan, PhD, are directors in BioActives LLC, the supplier of the celery extract used in this study. KL Venkatesh Rao, MD, has no financial conflict of interest to declare. Michael T. Murray, ND, is a director in BioMedica LLC and a consultant to Natural Factors Nutritional Products, Inc., companies that sell and distribute BioActives celery extract.

About the Authors

Doddabele Madhavi, PhD, is a managing partner at BioActives, LLC, where she provides the scientific expertise for new product development, process development, and scientific/experimental strategies. She has also served as a visiting assistant professor in the Department of Natural Resources and Environmental Sciences at the University of Illinois, Urbana. Madhavi received her doctorate in biochemistry from the Central Food Technological Research Institute in Mysore, India and also holds a master of science in botany and a bachelor of science in biology, both from the University of Mysore. She has published extensively in books and scientific journals.

Daniel Kagan, PhD, is a managing partner with BioActives, LLC, where he is responsible for strategic planning, policy development, alliance building, and investor relations. He earned his doctorate degree in business/entrepreneurial studies from Union Institute, Cincinnati, Ohio, his master of arts in psychology from University of Colorado at Boulder, and his bachelor of science in mathematics from Worcester Polytechnic Institute, Worcester, Mass.

Venkatesh Rao, MD, is an orthopedic surgeon affiliated with Prajna Kuteera Ayurveda Hospital, Mysore India. He served as the attending physician for the study.

Michael T. Murray, ND, is president and CEO of Dr. Murray Natural Living and is director of product development and education for Natural Factors, a major manufacturer of nutritional and herbal supplements. Murray is a graduate, faculty member, and serves on the Board of Regents of Bastyr University, where he received his doctorate in naturopathic medicine. He is coauthor of *A Textbook of Natural Medicine* and the *Encyclopedia of Natural Medicine*. He has also written more than 20 other books, including *Dr. Murray's Total Body Tune-Up*, *The Pill Book Guide to Natural Medicines*, and *The Encyclopedia of Healing Foods*.

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