

Exercise May Help Cut Colon Cancer Risk in Men

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BOSTON — An exercise program consisting of moderate to vigorous aerobic activity 6 hours per week was associated with reduced incidence of precancerous colon changes in men who participated in a year-long clinical trial looking at the effect of exercise on cancer biomarkers in colon tissue, Kristin Campbell, Ph.D., said at the annual international confer-

ence of the American Association for Cancer Research.

The same exercise intervention did not produce comparable results among women, suggesting that physical activity may play a stronger role in colon cancer risk reduction in men than in women, Dr. Campbell noted.

Alterations in the proliferation and apoptosis of colon crypt cells—the highly programmed cells in the indentations, or crypts, of the colon wall—are thought

to play a crucial, early role in the development of colorectal neoplasia. In a previous study, Dr. Campbell and colleagues at Seattle's Fred Hutchinson Cancer Research Center showed that colon crypt cell proliferation decreased with exercise in men but not in women.

In the current study, which was funded by the National Cancer Institute and the National Institutes of Health, the investigators sought to determine the effect of an aerobic exercise intervention on both the

proliferation and apoptosis of colon crypt cells. To do this, they measured colon cancer biomarkers—the apoptosis-stimulating Bax protein and the apoptosis-inhibiting bcl-2 protein—in 101 men and 98 women aged 40-75 years. Participants were randomized to a usual-lifestyle control group or the exercise intervention comprising 1 hour of aerobic activity 6 days per week.

All of the patients underwent flexible sigmoidoscopy to obtain stained tissue samples from the mucosal lining of the colon at baseline and 12 months.

For analysis purposes, the crypt was divided into three regions: bottom, middle, and top. Cellular proliferation in the bottom region is normal, but overproliferation can occur when apoptosis goes awry and cells are not dying on schedule and instead

Among women patients, the same exercise intervention did not produce comparable results, though reasons for this discrepancy were not clear.

migrate up the sides of the crypt to the surface. Such overproliferation is linked to the development of precancerous and cancerous growths, said Dr. Campbell.

Among men in the study, significant increases in Bax density at the bottom

of the crypt and significant decreases in cellular proliferation in the upper crypt were seen in the exercise group, compared with controls, Dr. Campbell reported. The changes represented “a substantial increase in the potential for cellular apoptosis in the area of the colon most vulnerable to colon cancer,” she said.

Although men who exercised for the full 6 hours per week or more appeared to benefit the most, “even those who worked out an average of 4 or more hours per week, and those with the most robust aerobic fitness levels, demonstrated beneficial changes,” Dr. Campbell said.

In contrast, there were no notable between-group changes in cellular proliferation or apoptosis markers among the women, she said.

It is unclear why female exercisers do not seem to reap the same benefits as men. Dr. Campbell reported having no conflicts of interest with respect to her presentation.

AMITIZA™
(lubiprostone) soft gelatin capsules

BRIEF SUMMARY OF PRESCRIBING INFORMATION—Please see package insert for complete prescribing information
720-03565

AMITIZA™
(lubiprostone)
Soft Gelatin Capsules

INDICATIONS AND USAGE

AMITIZA™ is indicated for the treatment of chronic idiopathic constipation in the adult population.

CONTRAINDICATIONS

AMITIZA™ is contraindicated in those patients with a known hypersensitivity to the drug or any of its excipients, and in patients with a history of mechanical gastrointestinal obstruction.

WARNINGS

Patients with symptoms suggestive of mechanical gastrointestinal obstruction should be evaluated prior to initiating AMITIZA™ treatment.

The safety of AMITIZA™ in pregnancy has not been evaluated in humans. In guinea pigs, lubiprostone has been shown to have the potential to cause fetal loss. AMITIZA™ should be used during pregnancy only if the potential benefit justifies the potential risk to the fetus. Women who could become pregnant should have a negative pregnancy test prior to beginning therapy with AMITIZA™ and should be capable of complying with effective contraceptive measures (see **Teratogenic Effects: Pregnancy Category C**).

PRECAUTIONS

Patient Information:

AMITIZA™ may cause nausea. If this occurs, concomitant administration of food with AMITIZA™ may reduce symptoms of nausea. AMITIZA™ should not be administered to patients that have severe diarrhea during treatment. If the diarrhea becomes severe consult your physician.

Drug Interactions:

Based upon the results of *in vitro* human microsomes studies, there is low likelihood of drug–drug interactions. *In vitro* studies using human liver microsomes indicate that cytochrome P450 isoenzymes are not involved in the metabolism of lubiprostone. Further *in vitro* studies indicate microsomal carbonyl reductase may be involved in the extensive biotransformation of lubiprostone to M3. Additionally, *in vitro* studies in human liver microsomes demonstrate that lubiprostone does not inhibit cytochrome P450 isoforms 3A4, 2D6, 1A2, 2A6, 2B6, 2C9, 2C19, or 2E1, and *in vitro* studies in primary cultures of human hepatocytes show no induction of the cytochrome P450 isoforms 1A2, 2B6, 2C9, and 3A4. No additional drug–drug interaction studies have been performed. Based on the available information, no protein binding–mediated drug interactions of clinical significance are anticipated.

Carcinogenesis, Mutagenesis, Impairment of Fertility:

Two 2-year oral (gavage) carcinogenicity studies (one in Crl:B6C3F1 mice and one in Sprague-Dawley rats) were conducted with lubiprostone. In the 2-year carcinogenicity study in mice, lubiprostone doses of 25, 75, 200, and 500 mcg/kg/day (approximately 2, 6, 17, and 42 times the recommended human dose, respectively, based on body surface area) were used. In the 2-year rat carcinogenicity study, lubiprostone doses of 20, 100, and 400 mcg/kg/day (approximately 3, 17, and 68 times the recommended human dose, respectively, based on body surface area) were used. In the mouse carcinogenicity study, there was no significant increase in any tumor incidences. There was a significant increase in the incidence of interstitial cell adenoma of the testes in male rats at the 400 mcg/kg/day dose. In female rats, treatment with lubiprostone produced hepatocellular adenoma at the 400 mcg/kg/day dose.

Lubiprostone was not genotoxic in the *in vitro* Ames reverse mutation assay, the *in vitro* mouse lymphoma (L5178Y TK+/-) forward mutation assay, the *in vitro* Chinese hamster lung (CHL/IU) chromosomal aberration assay, and the *in vivo* mouse bone marrow micronucleus assay.

Lubiprostone, at oral doses of up to 1000 mcg/kg/day, had no effect on the fertility and reproductive function of male and female rats. The 1000 mcg/kg/day dose in rats is approximately 166 times the recommended human dose of 48 mcg/day, based on the body surface area.

Teratogenic Effects: Pregnancy Category C:

Teratology studies with lubiprostone have been con-

ducted in rats at oral doses up to 2000 mcg/kg/day (approximately 332 times the recommended human dose, based on body surface area), and in rabbits at oral doses of up to 100 mcg/kg/day (approximately 33 times the recommended human dose, based on body surface area). Lubiprostone was not teratogenic in rats and rabbits. In guinea pigs, lubiprostone caused fetal loss at repeated doses of 10 and 25 mcg/kg/day (approximately 2 and 6 times the human dose, respectively, based on body surface area) administered on days 40 to 53 of gestation.

There are no adequate and well-controlled studies in pregnant women. However, during clinical testing of AMITIZA™ at 24 mcg BID, four women became pregnant. Per protocol, AMITIZA™ was discontinued upon pregnancy detection. Three of the four women delivered healthy babies. The fourth woman was monitored for 1 month following discontinuation of study drug, at which time the pregnancy was progressing as expected; the patient was subsequently lost to follow-up.

AMITIZA™ should be used during pregnancy only if the potential benefit justifies the potential risk to the fetus. If a woman is or becomes pregnant while taking the drug, the patient should be apprised of the potential hazard to the fetus.

Nursing Mothers:

It is not known whether lubiprostone is excreted in human milk. Because many drugs are excreted in human milk and because of the potential for serious adverse reactions in nursing infants from lubiprostone, a decision should be made whether to discontinue nursing or to discontinue the drug, taking into account the importance of the drug to the mother.

Pediatric Use:

AMITIZA™ has not been studied in pediatric patients.

ADVERSE REACTIONS

In clinical trials, 1429 patients received AMITIZA™ 24 mcg BID or placebo. Table 1 presents data for the adverse experiences that were reported in at least 1% of patients who received AMITIZA™ and that occurred more frequently on study drug than placebo. It should be noted that the placebo data presented are from short-term exposure (≤4 weeks) whereas the AMITIZA™ data are cumulative data that were collected over 3- or 4-week, 6-month, and 12-month observational periods and that some conditions are common among otherwise healthy patients over a 6- and 12-month observational period.

Table 1. Adverse Events Reported for Patients Treated with AMITIZA™

System/Adverse Experience	AMITIZA™ 24 mcg QD n = 316		AMITIZA™ 24 mcg BID n = 1113		AMITIZA™ Any Active Dose* n = 1375	
	%	n	%	n	%	n
Gastrointestinal disorders						
Diarrhea	5.1	172	3.1	311	3.0	309
Nausea	0.9	10.3	13.2	132	13.2	132
Abdominal distension	2.2	0.0	7.1	71	6.8	68
Abdominal pain	2.8	3.4	6.7	67	6.8	68
Flatulence	1.9	3.4	6.1	59	5.9	59
Vomiting	0.9	0.0	4.6	44	4.4	44
Loose stools	0.0	0.0	3.4	32	3.2	32
Dyspepsia	1.3	0.0	2.9	27	2.7	27
Abdominal pain upper	1.9	0.0	2.2	21	2.1	21
Abdominal pain lower	0.6	0.0	1.9	18	1.8	18
Gastroesophageal reflux disease	0.6	0.0	1.8	17	1.7	17
Abdominal discomfort	0.0	3.4	1.5	15	1.5	15
Dry mouth	0.3	0.0	1.5	14	1.4	14
Constipation	0.9	0.0	1.1	10	1.0	10
Stomach discomfort	0.3	0.0	1.1	10	1.0	10
Infections and infestations						
Sinusitis	1.6	0.0	4.9	48	4.8	48
Upper respiratory tract infection	1.9	3.4	4.4	43	4.3	43
Lower respiratory tract infection	0.9	0.0	3.7	36	3.6	36
Nasopharyngitis	2.2	0.0	2.9	27	2.7	27
Influenza	0.6	0.0	2.0	19	1.9	19
Bronchitis	0.3	3.4	1.6	17	1.7	17
Gastroenteritis viral	0.0	3.4	1.0	10	1.0	10
Viral infection	0.3	3.4	0.5	5	0.6	6
Nervous system disorders						
Headache	6.6	3.4	13.2	130	13.0	130
Dizziness	1.3	3.4	4.1	40	4.0	40
Hypoaesthesia	0.0	3.4	0.5	5	0.6	6
General disorders and site administration conditions						
Edema peripheral	0.3	0.0	3.8	36	3.6	36
Fatigue	1.9	6.9	2.3	25	2.5	25
Chest discomfort	0.0	3.4	1.6	16	1.6	16
Chest pain	0.0	0.0	1.1	10	1.0	10
Pirrexia	0.3	0.0	1.1	10	1.0	10
Musculoskeletal and connective tissue disorders						
Arthralgia	0.3	0.0	3.1	30	3.0	30
Back pain	0.9	3.4	2.3	23	2.3	23
Pain in extremity	0.0	3.4	1.9	19	1.9	19
Muscle cramp	0.0	0.0	1.0	9	0.9	9
Respiratory, thoracic, and mediastinal disorders						
Dyspnea	0.0	3.4	2.4	25	2.5	25
Pharyngolaryngeal pain	2.2	0.0	1.7	16	1.6	16
Cough	0.6	0.0	1.6	15	1.5	15
Investigations						
Weight increased	0.0	0.0	1.0	9	0.9	9
Psychiatric disorders						
Depression	0.0	0.0	1.4	14	1.4	14
Insomnia	0.3	0.0	1.4	14	1.4	14
Vascular disorders						
Hypertension	0.0	0.0	1.0	9	0.9	9

*Includes patients dosed at 24 mcg QD, 24 mcg BID, and 24 mcg TID



AMITIZA™-induced Nausea:

Among constipated patients, 31.1% of those receiving AMITIZA™ 24 mcg BID reported nausea. Of those patients, 3.4% reported severe nausea and 8.7% discontinued treatment due to nausea. It should be noted that the incidence of nausea increased in a dose-dependent manner with the lowest overall incidence for nausea seen at the 24 mcg QD dose (17.2%). Further analysis of nausea has shown that long-term exposure to AMITIZA™ does not appear to place patients at elevated risk for experiencing nausea. In the open-label, long-term studies, patients were allowed to titrate the dose of AMITIZA™ down to 24 mcg QD from 24 mcg BID if experiencing nausea. It should also be noted that nausea decreased when AMITIZA™ was administered with food and that, across all dose groups, the rate of nausea was substantially lower among constipated men (13.2%) and constipated elderly patients (18.6%) when compared to the overall rate (30.9%). No patients in the trials were hospitalized due to nausea.

AMITIZA™-induced Diarrhea:

Among constipated patients, 13.2% of those receiving AMITIZA™ 24 mcg BID reported diarrhea. Of those patients, 3.4% reported severe diarrhea and 2.2% discontinued treatment due to diarrhea. The incidence of diarrhea did not appear to be dose-dependent. No serious adverse events were reported for electrolyte imbalance in the six clinical trials and no clinically significant changes were seen in serum electrolyte levels while patients were receiving AMITIZA™.

Other Adverse Events:

The following list of adverse events include those that were considered by the investigator to be possibly related to AMITIZA™ and reported more frequently (>0.2%) on AMITIZA™ than placebo and those that lead to discontinuation more frequently (≥0.2%) on AMITIZA™ than placebo. Although the events reported occurred during treatment with AMITIZA™, they were not necessarily attributed to dosing of AMITIZA™.

- **Gastrointestinal disorders:** watery stools, fecal incontinence, abnormal bowel sounds, frequent bowel movements, retching
- **Nervous system disorders:** syncope, tremor, dysgeusia, paraesthesia
- **General disorders and administration site conditions:** rigors, pain, asthenia, malaise, edema
- **Respiratory, thoracic, and mediastinal disorders:** asthma, painful respiration, throat tightness
- **Skin and subcutaneous tissue disorders:** hyperhidrosis, urticaria, rash
- **Psychiatric disorders:** nervousness
- **Vascular disorders:** flushing, palpitations
- **Metabolism and nutrition disorders:** decreased appetite
- **Ear and labyrinth disorders:** vertigo

Overdosage:

There have been two confirmed reports of overdosage with AMITIZA™. The first report involved a 3-year-old child who accidentally ingested 7 to 8 capsules of 24 mcg of AMITIZA™ and fully recovered. The second report was a study subject who self-administered a total of 96 mcg AMITIZA™ per day for 8 days. The subject experienced no adverse events during this time. Additionally, in a definitive Phase I cardiac repolarization study, 51 patients administered a single oral dose of 144 mcg of AMITIZA™, which is 6 times the normal single administration dose. Thirty-nine (39) of the 51 patients experienced an adverse event. The adverse events reported in >1% of this group included the following: nausea (45.1%), vomiting (27.5%), diarrhea (25.5%), dizziness (17.6%), loose or watery stools (13.7%), headache (11.8%), retching (7.8%), abdominal pain (5.9%), flushing or hot flush (5.9%), dyspnea (3.9%), pallor (3.9%), stomach discomfort (3.9%), syncope (3.9%), upper abdominal pain (2.0%), anorexia (2.0%), asthenia (2.0%), chest discomfort (2.0%), dry mouth (2.0%), hyperhidrosis (2.0%), skin irritation (2.0%), and vasovagal episode (2.0%).

DOSAGE AND ADMINISTRATION

The recommended dosage for AMITIZA™ is 24 mcg taken twice daily (BID) orally with food. Physicians and patients should periodically assess the need for continued therapy.

MARKETED BY:

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Drug Combination Targets *H. pylori*

Axcan's Pylera 3-in-1 capsules have been approved for the treatment of *Helicobacter pylori* infection, the main cause of gastric and duodenal ulcers. Each capsule contains 140 mg of bismuth citrate potassium, 125 mg of metronidazole, and 125 mg of tetracycline hydrochloride. The drug, formerly known as Helizide, is administered in combination with two daily doses of 20 mg of omeprazole. For more information, visit the Axcan Web site at www.axcan.com.