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COCAINE-INDUCED CORONARY-ARTERY VASOCONSTRICTION

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Abstract Intranasal cocaine is used frequently as a local anesthetic during many rhinolaryngologic procedures. Although its "recreational" use in high doses has been associated with chest pain and myocardial infarction, this association has not been established when cocaine is used in low doses as a topical anesthetic, and its effect on the coronary vasculature of humans is unknown.

We studied the effects of intranasal cocaine (10 percent cocaine hydrochloride; 2 mg per kilogram of body weight) on the blood flow in and dimensions of the coronary arteries and on myocardial oxygen demand in 45 patients (34 men and 11 women, 36 to 67 years of age) who were undergoing cardiac catheterization for the evaluation of chest pain. Heart rate, arterial pressure, blood flow in the coronary sinus (measured by thermodilution), and the dimensions of the epicardial left coronary artery (measured by quantitative arteriography) were measured before and 15 minutes after the intranasal administration of saline (in 16 patients) or cocaine (in 29).

No variables changed after the administration of saline. After cocaine was administered, the heart rate and arterial pressure rose, the coronary-sinus blood flow fell (from a mean [±SD] of 149±59 ml per minute to 124±53 ml per minute), and the diameter of the left coronary artery decreased by 8 to 12 percent ($P<0.01$ for all comparisons). No patient had chest pain or electrocardiographic evidence of myocardial ischemia after the administration of cocaine. Subsequently, the administration of the alpha-adrenergic blocking agent phentolamine caused all these values to return to base-line levels. There was no difference in response between the patients found to have disease of the left coronary artery (n = 28) and those without such disease (n = 17).

We conclude that the intranasal administration of cocaine near the dose used for topical anesthesia causes vasoconstriction of the coronary arteries, with a decrease in the coronary blood flow, despite an increase in myocardial oxygen demand, and that these effects are mediated by alpha-adrenergic stimulation. It is reasonable to assume that these effects would be more pronounced at the much higher doses associated with the recreational use of cocaine. (N Engl J Med 1989; 321:1557-62.)

TOPICAL cocaine anesthesia is used in over half the 370,000 rhinolaryngologic procedures performed annually in the United States, and more than 90 percent of otolaryngologists use cocaine routinely for anesthesia during nasal surgery.[1,2] The sympathomimetic effects of cocaine, with the resultant tachycardia and hypertension,[2] increase myocardial oxygen demand and may induce ischemia in patients with coronary artery disease. Indeed, numerous recent reports have linked the use and abuse of cocaine with angina pectoris and myocardial infarction.[3-26] Since, inevitably, some of the patients who receive topical cocaine anesthesia have coronary artery disease, it is important to understand the effects of cocaine on the coronary vasculature. In addition, some patients who have angina or myocardial infarction in association with cocaine abuse have minimal coronary artery disease or none at all.[12-18,22-25] In these patients, the pathophysiology of myocardial ischemia and infarction is unknown. In short, topical cocaine is used frequently as a local anesthetic, and its illicit use is widespread, yet little information is available about its effects on the coronary vasculature in persons with and without coronary artery disease. The present study, performed under strictly controlled conditions in our cardiac-catheterization laboratory, was undertaken to provide such information.

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METHODS

Patients

We studied 45 patients (34 men and 11 women, 36 to 67 years of age) who were undergoing cardiac catheterization for the evaluation of chest pain. The protocol was approved by the Human Subjects Review Committee of the University of Texas Southwestern Medical Center, and all the patients gave written informed consent. Each was told that cocaine might induce tachycardia, hypertension, arrhythmias, angina, or seizures, and each understood clearly that he or she had nothing to gain personally by participating in the study. Antianginal medications (beta-adrenergic–blocking agents,

calcium antagonists, and long-acting nitrates) were discontinued more than 12 hours before study. All patients were studied in the fasting state after premedication with 5 to 10 mg of diazepam, given orally.

Experimental Protocol

A thermodilution catheter (model CCS-7U-90A, Wilton Webster Laboratories, Altadena, Calif.) was advanced to the coronary sinus through a basilic vein, its position was confirmed both fluoroscopically and oximetrically, and it was secured in place for the duration of the protocol. Subsequent determinations of the coronary-sinus blood flow were performed by the thermodilution technique.[27] A 9-French arterial sheath was inserted percutaneously into the femoral artery, through which an 8-French Judkins catheter was advanced to the ostium of the left coronary artery. Systemic arterial pressure was measured through the sheath's side-port extension, and the heart rate was determined by electrocardiographic monitoring.

The base-line heart rate, arterial pressure (phasic and mean), and coronary-sinus blood flow were recorded; blood samples were obtained from the femoral artery and the coronary sinus for the measurement of oxygen content; and cineangiography of the left coronary artery was performed in orthogonal views. Once the base-line studies had been completed, each patient was randomly assigned to receive either intranasal saline (Group 1, the control group [n = 16]) or a 10 percent cocaine hydrochloride solution (Group 2 [n = 29]) at a dose of 2 mg per kilogram of body weight. In the cases of the first 25 patients randomly assigned, both the investigator and the patient were aware of which agent (saline or cocaine) was given. For the next 20 patients, neither the investigator nor the patient knew which agent was administered. Fifteen minutes after the administration of either saline or cocaine, the hemodynamic measurements and measurements of coronary-sinus blood flow and oxygen content were repeated; a second blood sample was obtained for the measurement of the serum cocaine concentration (by gas chromatography); and cineangiography of the left coronary artery was performed with the same orthogonal obliquities.

Subsequently, 5 of the patients in Group 1 and 19 of those in Group 2 were randomly assigned to receive a five-minute intracoronary infusion of saline (Group 2A [n = 6]) or phentolamine (Group 1A [n = 5] and Group 2B [n = 13]) at a rate of 0.4 mg per minute (total dose, 2 mg).[28] Neither the investigator nor the patient knew which agent was infused. After this infusion, measurements of the heart rate, arterial pressure, transcardiac (systemic arterial − coronary sinus) oxygen-content difference, and coronary-sinus blood flow were made, and cineangiography of the left coronary artery was repeated.

The cineangiograms were obtained with a General Electric L-U cineangiographic system (Milwaukee) with an image resolution of 3.8 line pairs per millimeter. Computer-assisted quantitative coronary analysis (Cardiovascular Angiography Analysis System, Rotterdam, the Netherlands) was performed on orthogonal projections (right anterior oblique with caudal angulation, and right anterior oblique with cranial angulation), according to methods described previously by Reiber et al.[29]

Statistical Analysis

All results are reported as means ±SD. All analyses of the hemodynamic and arteriographic data on the 45 patients were performed without knowledge of which pharmacologic agents were administered (intranasal saline or cocaine and intracoronary saline or phentolamine). For each group, measurements made at base line, after the intranasal administration of saline or cocaine, and after the intracoronary administration of saline or phentolamine were compared with a repeated-measures analysis of variance.

For comparisons of each variable between groups, a two-way analysis of variance for a design with repeated measures was used.[30] Since the results for the first 25 patients (in whom drug administration was not blinded) were similar to those for the next 20 patients (in whom drug administration was double-blinded), the data from all 45 patients were combined and analyzed together. For all analyses, a P value <0.05 was considered to indicate statistical significance.

Results

Of the 45 patients, 11 had angiographically normal coronary arteries, 21 had one-vessel coronary artery disease (defined as ≥70 percent narrowing of the luminal diameter of a large epicardial coronary artery), 6 had two-vessel disease, and 7 had three-vessel disease. Of the 21 patients with one-vessel disease, only the right coronary artery was narrowed in 6, so that a total of 17 patients had an angiographically normal left coronary artery. Two patients had a history of cocaine use.

Group 1

Among the 16 patients in Group 1 (11 men and 5 women, 43 to 65 years of age), the heart rate, arterial pressure, heart rate–arterial pressure product (heart rate times arterial pressure), coronary-sinus blood flow, coronary vascular resistance (the mean arterial pressure divided by the coronary-sinus blood flow), transcardiac oxygen-content difference, and diameter of the epicardial coronary artery were similar before and 15 minutes after the intranasal administration of saline (Table 1). No variables were altered by the subsequent intracoronary administration of phentolamine to five patients (Group 1A; Table 2).

Group 2

The 29 patients in Group 2 (23 men and 6 women, 36 to 67 years of age) received 2 mg per kilogram of intranasal cocaine (total dose, 110 to 210 mg). The serum cocaine concentration was 0.092±0.044 mg per liter (range, 0.03 to 0.22). After the administration of cocaine, the heart rate, arterial pressure, and heart rate–arterial pressure product increased, as did the transcardiac oxygen-content difference (Table 1). Despite an increase in myocardial oxygen demand (as reflected by the heart rate–arterial pressure product and transcardiac oxygen-content difference), the coronary-sinus blood flow decreased and coronary vascular resistance increased in all patients (Table 1), and diffuse constriction of the left anterior descending coronary artery and the circumflex coronary artery was observed (Table 1). No patient had chest pain or electrocardiographic changes suggestive of ischemia. In the 10 patients randomly assigned to receive cocaine in a double-blind fashion, the heart rate–arterial pressure product increased (from $11.3\pm3.3\times10^3$ to $12.4\pm3.6\times10^3$), the coronary-sinus blood flow decreased (from 153±70 ml per minute to 127±66 ml per minute), coronary vascular resistance increased (from 0.84±0.35 mm Hg per milliliter per minute to 1.11±0.55 mm Hg per milliliter per minute), and the diameter of the coronary arteries decreased by 3 to 19 percent ($P<0.05$ for all comparisons).

In the 29 patients in Group 2, cocaine induced a decrease of 17±12 percent in the coronary-sinus

Table 1. Hemodynamic and Arteriographic Measurements of the Response to the Intranasal Administration of Saline or Cocaine.*

VARIABLE	GROUP 1 (N = 16)		GROUP 2 (N = 29)	
	BASE LINE	AFTER INTRANASAL SALINE	BASE LINE	AFTER INTRANASAL COCAINE
Heart rate (beats/min)	71±10	70±10	76±12	78±13†
Systolic arterial pressure (mm Hg)	134±22	133±17	141±24	152±27†
Heart rate–arterial pressure product ($\times 10^3$)	9.5±2.2	9.3±1.8	10.6±2.4	11.9±2.8†
Mean arterial pressure (mm Hg)	94±11	94±10	101±15	110±16†
Coronary-sinus blood flow (ml/min)	131±51	131±51	149±59	124±53†
Coronary vascular resistance (mm Hg/ml/min)	0.81±0.29	0.83±0.34	0.79±0.36	1.05±0.49†
Transcardiac oxygen-content difference (ml/dl)	10.6±1.7	10.6±1.9	10.2±1.8	11.1±1.6†
Coronary-artery diameter (mm)				
Left anterior descending				
Proximal	3.01±0.95	3.02±1.07	2.96±0.67	2.67±0.66†
Middle	1.96±0.26	1.97±0.24	2.11±0.47	1.90±0.41†
Distal	1.58±0.31	1.61±0.33	1.59±0.41	1.40±0.38†
Left circumflex				
Proximal	3.23±0.70	3.26±0.71	2.86±0.81	2.63±0.78†
Middle	2.46±0.53	2.45±0.52	2.23±0.43	2.02±0.42†
Distal	1.64±0.49	1.67±0.49	1.69±0.29	1.49±0.27†

*Plus–minus values are means ±SD.

†$P<0.01$ for the comparison with the corresponding base-line value.

blood flow and an increase of 33±29 percent in coronary vascular resistance. The magnitude of these changes was similar in the 11 patients with an angiographically normal left coronary artery (a decrease of 19±8 percent in the coronary-sinus blood flow and an increase of 35±15 percent in coronary vascular resistance) and the 18 with atherosclerotic disease of the left coronary artery (a decrease of 16±14 percent in the coronary-sinus blood flow and an increase of 32±35 percent in coronary vascular resistance; P not significant). Similarly, cocaine induced a modest decline in the diameter of all segments of the left anterior descending and circumflex coronary arteries (left anterior descending coronary artery: proximal diameter, a decrease of 10±5 percent; middle, a decrease of 10±6 percent; distal, a decrease of 12±10 percent; circumflex coronary artery: proximal diameter, a decrease of 8±6 percent; middle, a decrease of 9±9 percent; distal, a decrease of 11±12 percent). The range of values for the decrease in these diameters was as follows: left anterior descending coronary artery: proximal, 3 to 23 percent; middle, −4 to 19 percent; distal, −5 to 30 percent; circumflex coronary artery: proximal, 0 to 25 percent; middle, −10 to 25 percent; distal, −7 to 37 percent. The magnitude of these changes was similar in the 11 patients with an angiographically normal left coronary artery and the 18 with left coronary artery disease. In those with coronary artery disease, the diameter of the coronary artery at the site of stenosis decreased 17±15 percent (from 1.15±0.27 mm to 0.95±0.26 mm; $P<0.01$).

In the six patients who received an intracoronary infusion of saline after the administration of cocaine (Group 2A), the hemodynamic and arteriographic values measured in response to cocaine were not altered (Table 3). In contrast, the cocaine-induced alterations in hemodynamic and arteriographic measurements were reversed in the 13 patients who received intracoronary phentolamine after receiving cocaine (Group 2B; Table 3).

DISCUSSION

Cocaine is a local anesthetic that produces central and adrenergic stimulation by blocking the presynaptic reuptake of norepinephrine and dopamine, thus increasing their postsynaptic concentrations.[31] This drug is commonly used during a variety of rhinolaryngologic procedures,[1,2,32] some of which, inevitably, are performed in patients with underlying coronary artery disease. Thus, it is important to elucidate cocaine's effects on the coronary vasculature. Cocaine use may induce tachycardia and hypertension,[33] and its abuse has been associated with several cardiovascular complications, including aortic dissection,[34] ventricular tachyarrhythmias,[3,4,8,31] pulmonary edema,[35,36] myocarditis,[37,38] and sudden death.[2,37] Although numerous recent reports[3-26] have described the temporal association of cocaine use and myo-

Table 2. Hemodynamic and Arteriographic Measurements of the Response to the Intranasal Administration of Saline Followed by the Intracoronary Infusion of Phentolamine (Group 1A; N = 5).*

VARIABLE	BASE LINE	AFTER INTRANASAL SALINE	AFTER INTRACORONARY PHENTOLAMINE
Heart rate (beats/min)	71±14	68±12	73±15
Systolic arterial pressure (mm Hg)	154±24	149±13	138±13
Heart rate–arterial pressure product ($\times 10^3$)	11.0±3.0	10.2±2.2	10.1±2.3
Mean arterial pressure (mm Hg)	101±11	101±8	97±10
Coronary-sinus blood flow (ml/min)	131±58	129±70	128±55
Coronary vascular resistance (mm Hg/ml/min)	0.91±0.42	1.00±0.53	0.90±0.38
Transcardiac oxygen-content difference (ml/dl)	11.1±2.0	11.3±2.4	11.1±1.8
Coronary-artery diameter (mm)			
Left anterior descending			
Proximal	3.18±1.29	3.21±1.45	3.23±1.19
Middle	2.06±0.32	2.03±0.29	2.12±0.50
Distal	1.65±0.34	1.69±0.36	1.78±0.28
Left circumflex			
Proximal	3.44±0.74	3.51±0.71	3.35±0.63
Middle	2.54±0.62	2.57±0.75	2.40±0.50
Distal	1.48±0.32	1.50±0.20	1.58±0.06

*Plus–minus values are means ±SD.

Table 3. Hemodynamic and Arteriographic Responses to Intranasal Administration of Cocaine Followed by Intracoronary Infusion of Saline or Phentolamine.*

VARIABLE	GROUP 2A (N = 6)			GROUP 2B (N = 13)		
	BASE LINE	AFTER INTRANASAL COCAINE	AFTER INTRACORONARY SALINE	BASE LINE	AFTER INTRANASAL COCAINE	AFTER INTRACORONARY PHENTOLAMINE
Heart rate (beats/min)	83±14	83±15	84±15	74±12†	77±12†	88±14†
Systolic arterial pressure (mm Hg)	139±23	149±25	144±21	145±25	153±31†	138±27
Heart rate–arterial pressure product ($\times 10^3$)	11.3±1.8	12.3±2.6	11.9±1.5	10.6±2.3†	11.8±3.0	12.1±3.0
Mean arterial pressure (mm Hg)	96±14†	106±14	102±10	103±16	110±20†	103±19
Coronary-sinus blood flow (ml/min)	147±71†	131±64	130±59	157±60	129±62†	173±83
Coronary vascular resistance (mm Hg/ml/min)	0.78±0.33†	0.97±0.43	0.92±0.34	0.74±0.31	1.03±0.53†	0.74±0.46
Transcardiac oxygen-content difference (ml/dl)	10.7±0.5	11.1±0.7	11.2±0.6	9.9±1.8	10.6±1.8†	9.4±1.5
Coronary-artery diameter (mm)						
Left anterior descending						
Proximal	3.30±0.74†	3.10±0.63	3.10±0.63	2.63±0.39	2.38±0.40†	2.63±0.44
Middle	1.99±0.25†	1.82±0.28	1.81±0.26	2.14±0.47	1.86±0.36†	2.04±0.35
Distal	1.47±0.29	1.29±0.27	1.26±0.35	1.50±0.46	1.28±0.30	1.49±0.30
Left circumflex						
Proximal	2.65±0.58†	2.26±0.45	2.26±0.40	2.63±0.96	2.44±0.90†	2.68±0.96
Middle	2.00±0.34	1.66±0.37	1.77±0.40	2.24±0.47†	1.99±0.42†	2.33±0.43†
Distal	1.56±0.31	1.39±0.12	1.36±0.17	1.70±0.32	1.58±0.27†	1.76±0.25

*Plus–minus values are means ±SD.

†P<0.05 for the comparison with the other values in the same patients.

cardial infarction, the pathophysiology of cocaine-induced ischemia and infarction is not understood. Therefore, this study was performed in a carefully controlled setting (a cardiac-catheterization laboratory) to assess the influence of cocaine on the coronary vasculature in patients with and without coronary artery disease.

Our data, obtained from studies of 45 patients at the time of cardiac catheterization, demonstrate that cocaine consistently increased myocardial oxygen demand (by increasing the heart rate and systemic arterial pressure) and reduced myocardial oxygen supply, as reflected by a decrease in the coronary-sinus blood flow (caused predominantly by vasoconstriction of the intramural resistance vessels) and the diameter of the coronary arteries and an increase in the transcardiac oxygen-content difference. Furthermore, this cocaine-induced decrease in myocardial oxygen supply was alleviated by the administration of the alpha-adrenergic blocking agent phentolamine. Thus, cocaine caused coronary vasoconstriction by stimulating alpha-adrenergic receptors in the coronary arteries. These data are in agreement with recently published observations in laboratory animals.[39,40]

In subjects without coronary artery disease, alpha-adrenergic stimulation induced by exercise,[41] cigarette smoking,[42] or exposure to cold[43] causes systemic vasoconstriction, but the coronary blood flow is preserved. Thus, the increase in myocardial oxygen demand is accompanied by an appropriate increase in the coronary blood flow, and as a result by no change in coronary vascular resistance. In contrast, in the 11 patients we studied who had angiographically normal left coronary arteries, cocaine caused a reduction in the coronary-sinus blood flow, an increase in coronary vascular resistance (as a result of vasoconstriction of the intramural resistance vessels), and diffuse epicardial coronary vasoconstriction at a time when myocardial oxygen demand was increased (as reflected by a rise in the heart rate–arterial pressure product and the transcardiac oxygen-content difference). The direct effects of cocaine on normal coronary arteries appear to overwhelm the local autoregulatory mechanisms that preserve the coronary blood flow during exercise, smoking, and exposure to cold, possibly because cocaine is a more powerful alpha-adrenergic stimulus.

In the present study, a 10 percent cocaine solution given intranasally in a dose of 2 mg per kilogram (half to two thirds the standard dose used for intranasal anesthesia) resulted in a serum cocaine concentration of 0.092±0.044 mg per liter (range, 0.03 to 0.22). In previously published studies of normal subjects and patients undergoing rhinolaryngologic procedures,[44-46] the direct intranasal application of cocaine or the intranasal instillation of cotton pledgets soaked with cocaine has resulted in similar serum concentrations. At this concentration, the coronary-sinus blood flow fell by 17±12 percent, coronary vascular resistance rose by 33±29 percent, and the diameter of the coronary arteries decreased by 8 to 12 percent. Although the direction of change in the coronary-sinus blood flow and coronary vascular resistance was the same for all patients, there was substantial variation among them in the magnitude of cocaine-induced coronary vasoconstriction. Some patients had marked vasoconstriction in response to this modest dose of cocaine: coronary vascular resistance rose by more than 50 percent in six patients (three with and three without disease of the left coronary artery). Previous studies of patients who had myocardial infarction or sudden death in close temporal proximity to recreational cocaine use have found that the amount of cocaine used

was often massive (more than 1000 mg) and that the serum cocaine concentration was often dramatically higher (up to 20 mg per liter)[9,13,47,48] than that attained in our patients, who received doses appropriate for intranasal surgery. We speculate that these persons may have had intense and sustained coronary vasoconstriction in response to a very high serum concentration of cocaine, which led in turn to myocardial ischemia and even infarction. In support of this possibility, some patients with angiographically normal coronary arteries have recurrent angina and infarction with continued cocaine use.[14,22,23] As our data indicate, this marked response to cocaine may occur in persons either with or without angiographic evidence of coronary artery disease.

Our study has certain strengths and limitations. We assessed the effects of cocaine on the coronary vasculature by measuring the coronary-sinus blood flow (by thermodilution), the transcardiac oxygen-content difference, and the diameters of the coronary arteries (the proximal, middle, and distal portions of the left anterior descending and circumflex coronary arteries) by quantitative coronary arteriography. All three techniques yielded complementary results; according to all three, cocaine caused a decrease in the coronary-sinus blood flow and the dimensions of the coronary arteries and an increase in the transcardiac oxygen-content difference. With these same techniques, we demonstrated that phentolamine, an alpha-adrenergic blocking agent, alleviated the effects of cocaine: the coronary-sinus blood flow and coronary-artery diameters increased, and the transcardiac oxygen-content difference decreased. In short, cocaine-induced coronary vasoconstriction and its alleviation by phentolamine were demonstrated hemodynamically, metabolically, and arteriographically. At the same time, our study has certain limitations. First, the thermodilution technique did not allow measurement of regional myocardial blood flow; thus, we assessed the effect of cocaine only on the total coronary flow. Second, we evaluated the effects of the intranasal administration of cocaine but did not assess its effects when administered by other routes. However, cocaine used as a local anesthetic is administered only intranasally, and most of the reported cocaine-associated myocardial infarctions have occurred after cocaine was taken by this method.[22] Its administration by other routes is likely to have a similar effect on the coronary blood flow.

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PREVALENCE OF *HELICOBACTER PYLORI* INFECTION AND HISTOLOGIC GASTRITIS IN ASYMPTOMATIC PERSONS

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Abstract We estimated the prevalences of *Helicobacter pylori* (formerly called *Campylobacter pylori*) infection and histologic gastritis in 113 asymptomatic persons, using endoscopic biopsy of the gastric antrum and corpus.

Unsuspected lesions, mainly mucosal erosions, were revealed at endoscopy in 16 subjects (14 percent). Gastritis was found in 42 subjects (37 percent), of whom 36 (32 percent of the total) were found to be infected with *H. pylori* on the basis of hematoxylin–eosin staining. *H. pylori* was not found in any of the 71 subjects with normal histologic features. Gastritis and *H. pylori* were noted in both the antrum and corpus in 75 percent of those infected (n = 27). The prevalence of *H. pylori* infection increased from 10 percent (2 of 20 subjects) in those between the ages of 18 and 29, to 47 percent (7 of 15) in those between the ages of 60 and 69, but the effect of age did not reach statistical significance. The prevalence of gastritis increased significantly with advancing age. Stepwise logistic regression analysis revealed that the relative risk for *H. pylori* infection associated with recent (within six months) antibiotic use was 5.8 (95 percent confidence interval, 1.5 to 22.1), whereas the relative risk was 6.5 (95 percent confidence interval, 1.4 to 29.2) for those who had never used bismuth compounds.

We conclude that histologic gastritis and *H. pylori* infection commonly occur in the stomach of apparently normal persons and increase in prevalence with advancing age. All the subjects with *H. pylori* infection had gastritis, suggesting a possible etiologic role for the bacterium in the histologic lesion. (N Engl J Med 1989; 321:1562-6.)

INFECTION with *Helicobacter pylori* (formerly called *Campylobacter pylori*) in the stomach and duodenum is highly associated with histologic gastritis and duodenal ulcer disease in patients with upper gastrointestinal symptoms.[1-6] Preliminary data[7-11] suggest that the bacterium is involved in the pathogenesis of these diseases. Indeed, *H. pylori* may be the etiologic agent in most cases of histologic gastritis.[1,2]

There are few data available on the prevalence of *H. pylori* infection in asymptomatic persons. Three recent studies[12-14] have reported prevalence rates of 13 to 25 percent among young asymptomatic persons (mean age, approximately 30 years). Interestingly, histologic gastritis was observed only in infected subjects.[12-14] We suspected that these studies might have underestimated the prevalence of *H. pylori* infection in asymptomatic persons, because surveys of persons living in Scandinavia and Colombia have found that the prevalence of gastritis increases progressively with increasing age.[15-18] Furthermore, doubt has been cast on the postulated pathogenic role of the bacterium by a report[19] that *H. pylori* is frequently found in asymptomatic persons with histologically normal stomachs, suggesting that the bacterium is a commensal of the stomach. We therefore attempted to estimate the prevalence of *H. pylori* infection in a group of asymptomatic adults of all ages and to correlate these findings with gastric histologic findings.

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In accordance with *Journal* policy, Drs. Blaser and Perez-Perez state that they have applied for a patent on the serologic technique described in this report.

METHODS

Subjects

Asymptomatic healthy adults were recruited from the general population by means of advertisements in local newspapers; sub-