



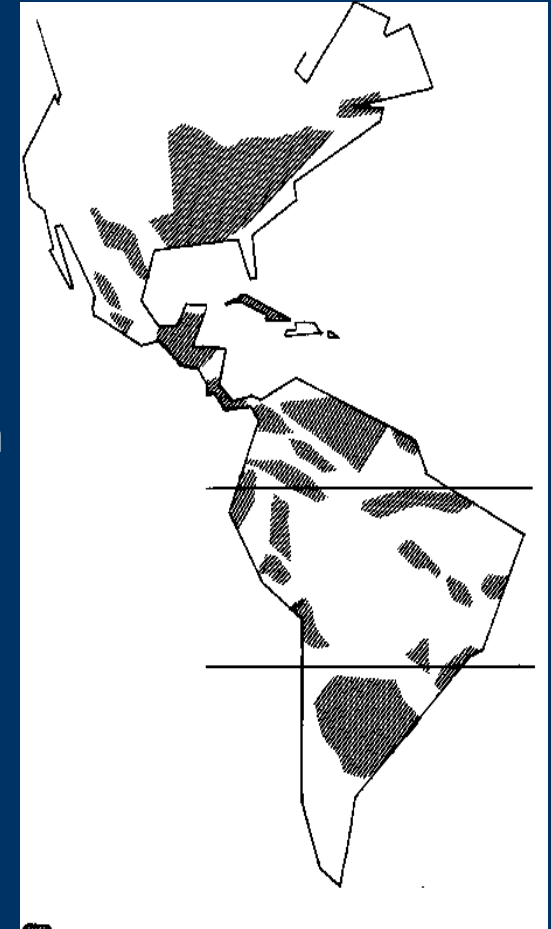
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Recurrent Histoplasmosis Outbreaks in Acapulco, Mexico

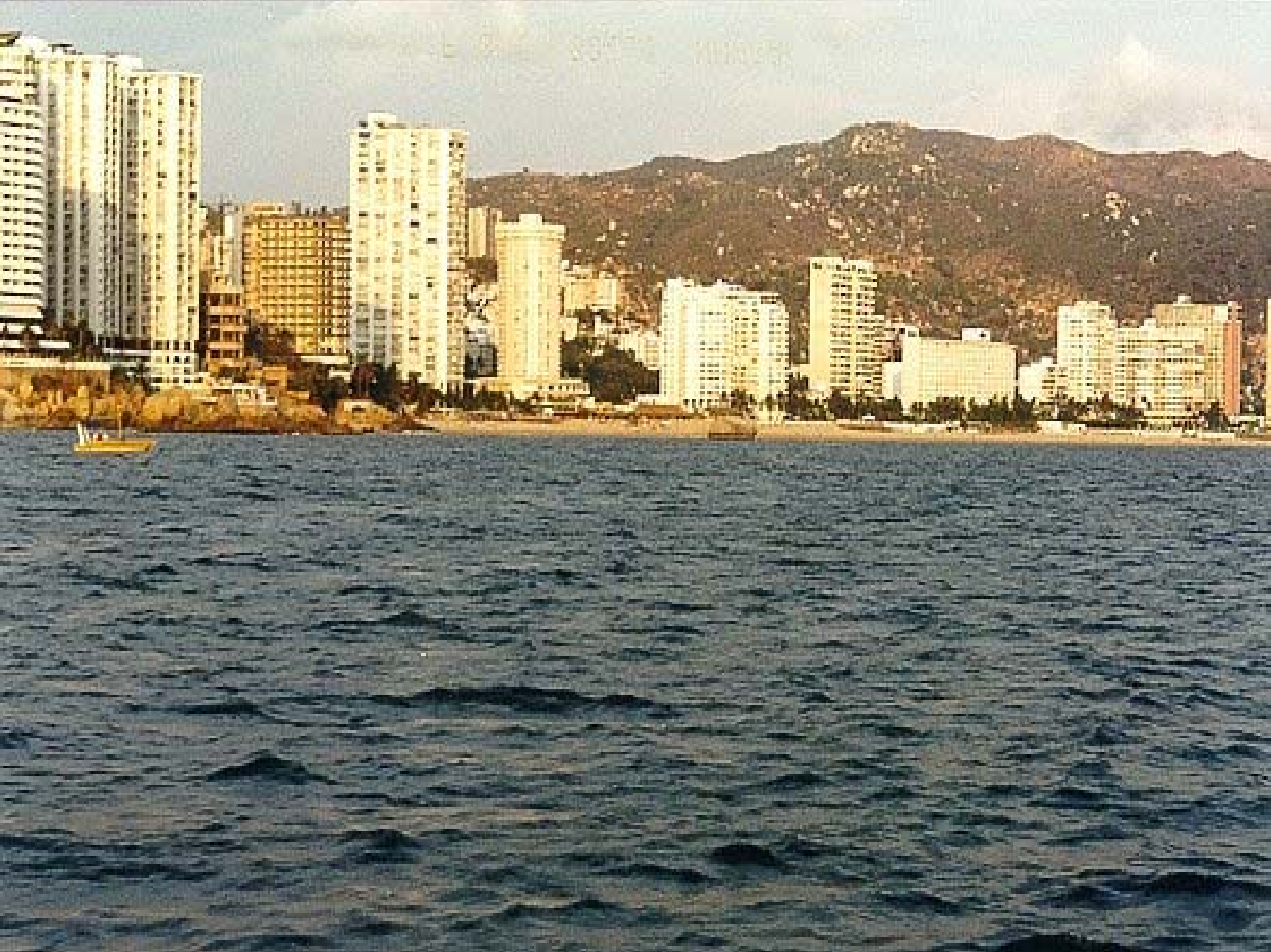
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Introduction

- Histoplasmosis has a worldwide distribution
- March 2001: 229 American students visiting Acapulco became ill with a febrile respiratory disease, strongly associated with staying at a beach hotel (RR=13.8, $p < 0.001$, CDC and Mexican Ministry of Health)
- 1 month before, an outbreak was reported in tourists from Monterrey, Mexico, staying at the same hotel



MMWR 2001;50:359-360



Methods

- **Population**

- 382 individuals attending two different meetings in September, 2001.

- **Case definitions**

- **Symptomatic case**: any case with documented fever and any other symptom known to be associated with histoplasmosis, with no other cause for the illness
- **Case**: any individual with or without symptoms and with positive serology for histoplasmosis
- **Control**: any individual with or without symptoms and a negative serology by the end of the study

Methods

- **Serology**
 - Serum samples from acute and/or convalescent phase
- **Risk factor study**
 - A questionnaire was administered to obtain information regarding illness and potential sources of infection
- **Environmental samples**
 - Collected from areas in and around the hotel
 - Intraperitoneal mouse inoculation
 - Direct exposure of sentinel BALB/C mice



Conventions Attendees
382

Group 1
Sept. 13-16
71 participants

Group 2
Sept. 18-21
311 participants

Patients seen at the
outpatient clinic
173 (45%)

Chest X-ray
147 (85%)

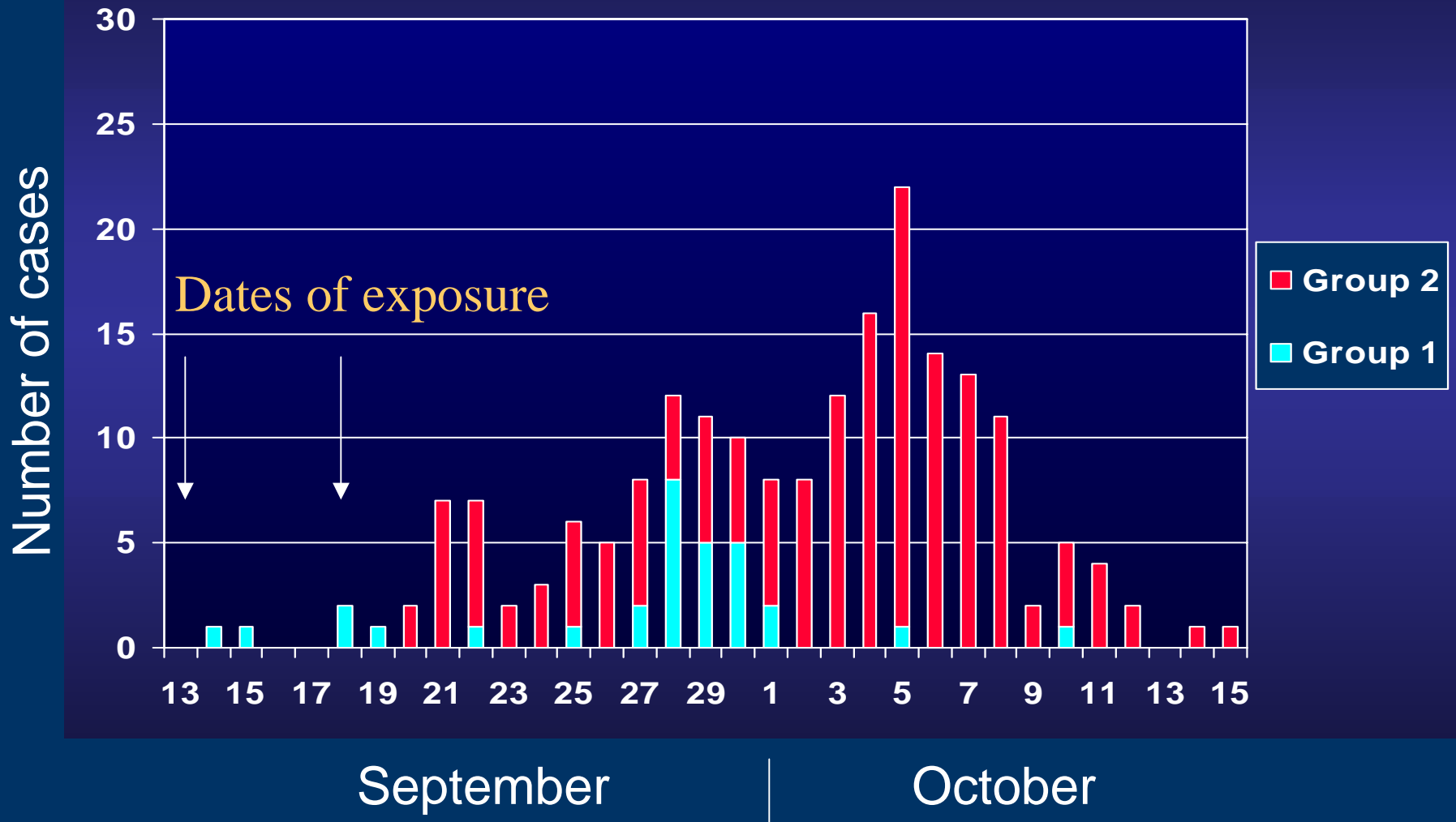
Abnormal
69 (46%)

Questionnaires
243 (63%)

Symptomatic
219 (90%)

Asymptomatic
24 (10%)

Epidemic curve by date of onset



Symptoms in 219 patients with Histoplasmosis

| Symptom | Present | % |
|-----------------------------|---------|----|
| Headache | 202 | 92 |
| Malaise | 186 | 84 |
| Fever | 185 | 84 |
| Night sweats | 177 | 80 |
| Chills | 161 | 73 |
| Cough | 144 | 65 |
| Chest pain | 126 | 57 |
| Anorexia | 118 | 53 |
| Weight loss (median 8.1 lb) | 97 | 44 |
| Diarrhea | 31 | 14 |

Patients seen at
outpatient clinic
173

Serology
173

Serology+ questionnaire
130 (75%)

Positive 144 (83%)
Negative 19 (11%)
Undetermine 10 (6%)

Cases: 113 subjects
Controls: 17 subjects

Risk Factor Analysis

Histoplasma Serology Results

- From 104 cases with paired sera, specific antibodies to *H. capsulatum* were found in 41% of acute sera and 89% of convalescent sera.
- Histoplasma antigen was found in 7/27 (26%) urine samples taken after 10 days of illness

Risk factors from Population and Indoor Areas

| Risk Factor | Patients (%) | Controls (%) | <i>P</i> |
|------------------------------------------|--------------|--------------|----------|
| Age | 40.5 ±10.2 | 43 ± 8.8 | 0.49 |
| 20-30 yrs. | 19 (90) | 2 (9) | 0.69 |
| >30-40 | 45 (88) | 6 (12) | |
| >40-50 | 24 (80) | 6 (20) | |
| >50 | 25 (89) | 3 (11) | |
| Gender | | | |
| Male | 75 (86) | 12 (14) | 0.73 |
| Female | 38 (88) | 5 (12) | |
| Hotel floor | | | |
| 0-10 | 43 (90) | 5 (10) | 0.77 |
| 11-20 | 57 (85) | 10 (15) | |
| >20 | 12 (86) | 2 (14) | |
| Hours in hotel room | | | |
| <1 - 4 | 11 (85) | 2 (15) | 0.88 |
| 5 - 8 | 67 (88) | 9 (12) | |
| > 9 | 35 (85) | 6 (15) | |
| Use of room air conditioning (h): | | | |
| 1 - 3 | 29 (85) | 5(15) | 0.47 |
| 4 - 8 | 27 (87) | 4(13) | |
| 9 - 24 | 37 (88) | 5(12) | |

Risk factors from Outdoor Areas

| Risk Factor | Patients (%) | Controls (%) | <i>P</i> |
|---------------------------------|-----------------|-----------------|----------|
| Swimming pool bar | | | |
| yes | 14 (93) | 1 (7) | 0.38 |
| no | 99 (86) | 16 (14) | |
| Gym | | | |
| yes | 11 (100) | 0 | 0.18 |
| no | 97 (85) | 17 (15) | |
| Swimming pool 4th. Floor | | | |
| yes | 9 (75) | 3 (25) | 0.20 |
| no | 101 (88) | 14 (12) | |
| Time in Lobby (min) | | | |
| < 30 | 50 (86) | 8 (14) | 0.52 |
| 30 – 60 | 34 (92) | 3 (8) | |
| > 60 | 24 (83) | 5 (17) | |
| Beach | | | |
| yes | 69 (90) | 8 (10) | 0.25 |
| no | 42 (84) | 8 (16) | |

Significant Risk factors for the acquisition of Histoplasmosis

| Risk Factor | Patients (%) | Controls (%) | RR | <i>P</i> |
|-------------|--------------|--------------|----|----------|
|-------------|--------------|--------------|----|----------|

Univariate Analysis

Visiting swimming pool area

| | | | | |
|-----|-----------|-----------|------|------|
| yes | 53 (92.9) | 4 (7.0) | 2.87 | 0.06 |
| no | 60 (82.1) | 13 (17.8) | | |

Time in Conference Hall

| | | | | |
|-------|---------|---------|------|------|
| < 8 h | 56 (81) | 13 (19) | 0.20 | 0.02 |
| > 8 h | 42 (95) | 2 (5) | | |

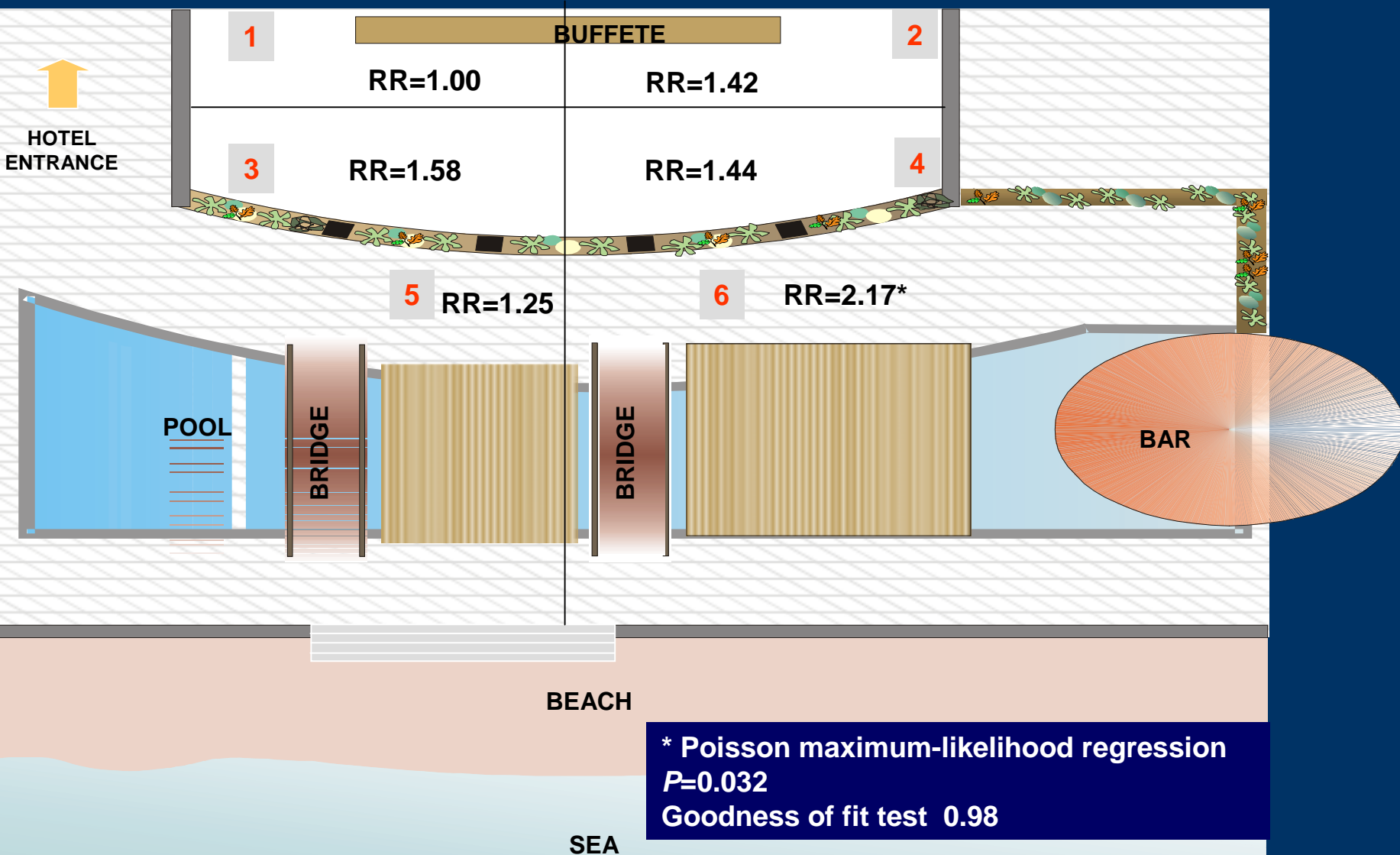
Multivariate Analysis*

| | | | | |
|-----------------------------|--|--|------|------|
| Visiting swimming pool area | | | 3.10 | 0.09 |
|-----------------------------|--|--|------|------|

| | | | | |
|-------------------------|--|--|------|------|
| Time in Conference Hall | | | 0.20 | 0.02 |
|-------------------------|--|--|------|------|

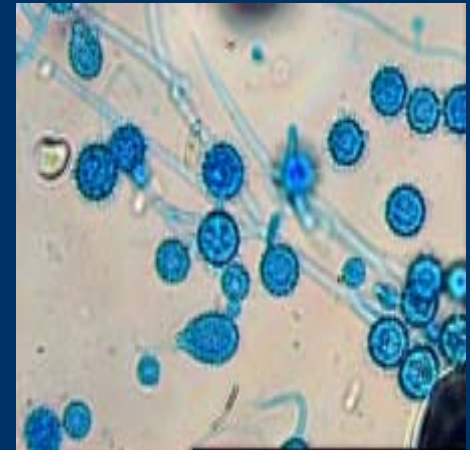
* Multivariate logistic regression; likelihood ratio test statistic (G) *P* = 0.01

Probability of becoming infected with *H capsulatum* by place of exposure

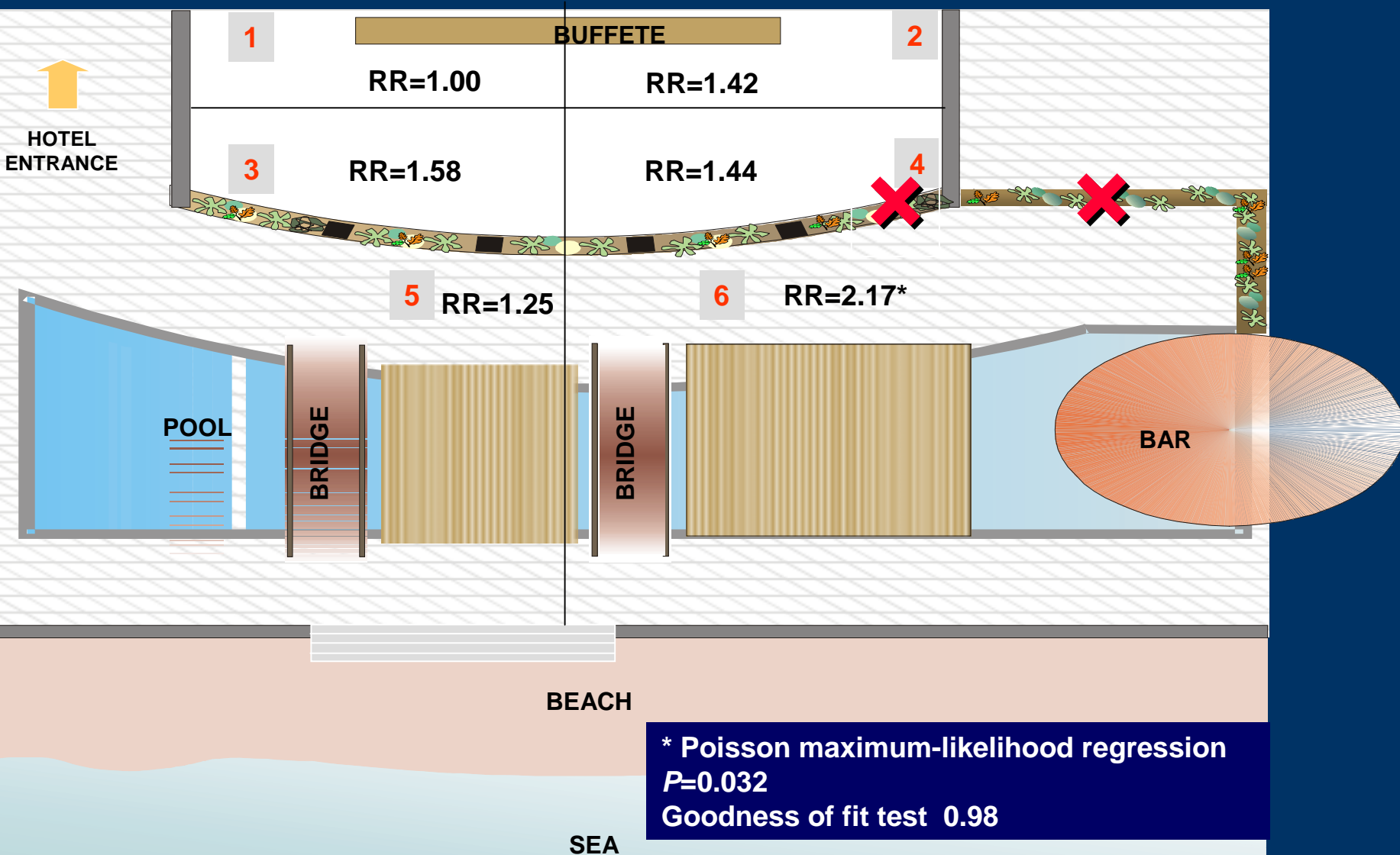


Source Identification

- *H. capsulatum* was isolated only from soil of planters located between the restaurant and the pool facing the ocean
 - Mice intraperitoneal inoculation
- Guano and a dead bat were found over the ceiling of the hotel's second floor restaurant, but no *Histoplasma* was isolated from them



Probability of becoming infected with *H capsulatum* by place of exposure



Conclusions

- Identification and elimination of the source of infection are essential for the control of histoplasma outbreaks
- Contaminated soil from planters from the beach restaurant was the infecting source for these outbreaks
- Histoplasmosis should be considered in the differential diagnosis of travelers with acute respiratory symptoms

Conclusions

- Acute and convalescent-phase serology are recommended, since over 50% of the acute sera were negative
- Among the recommendations made were to remove the soil and plants at the hotel, and the nursery was instructed not to use guano in the preparation of the composte
- No further cases have been reported for the last six months.

