

Biological peculiarities of *Y.pestis*
& *H.pylori* in Kazakhstan.

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Background

The two most recent studies of the Kazakh Medical University and the Kazakh center of Quarantine and Zoonotic infections describe biological features of *Y.pestis* and *H. pylori*.

1. Sporadic cases of plague are observed in Kazakhstan due to the presence of the natural foci and regular monitoring of biological features of *Y. pestis* is conducted.
2. Gastric and duodenal ulcers caused by *H. pylori* is increasing and occurrence of resistant strains complicates the treatment.

Plague - epidemiology

- 6 natural foci of plague, including 20 autonomous foci in deserts, steppes and mountain areas, that represent 40% of the territory of Kazakhstan.
- Routine surveillance, including research of biological features of strains is conducted by 10 regional antiplague stations
- During the last 10 years due to the anti-epidemic measures only sporadic case of plague (1 – 9 cases per year) are observed.

Biological features of *Y. pestis*

- Approx. 4 000 *Y.pestis* strains were isolated during the last 10 years.
- All the strains had features typical for their subtypes and circulated among marmots, sandpipers, ground squirrels and voles.
- Range of features for the wild strains correlated with ecological dependency and phases of epizootic process.

Activity of F1 antigen

- Approximately 5% of strains in Balkhash area were FI (−) and FI (±) with low virulence for white mice (LD50 - 10^6 KOE)
- Virulence in regard to the natural carriers was still high

Auxotrophy

- Requirement in amino acids at 37 °C. with mandatory need in glutamic acid is the basic indication of strains, isolated in plague “enzootic’s nucleus”.
- *Y. pestis* carry-over from enzooty area is accompanied by decrease of requirement level in amino acids.
- Strains of *Y. pestis*, extracted from secondary carriers, vectors, ticks and white mice have lower requirement level in amino acids.
- Strains isolated in “enzootic’s nuclei” are reference-strains of current *Y. pestis* population.

Sensitivity and resistance to antibiotics

- All the strains were sensitive to antibiotics used to treat plague when used in the following doses:
 - Streptomycin at 0.78 – 3.0 mgr/ml
 - Gentamicin at 0.78– 2,0 mgr/ml
 - Tetracyclines, chloramphenicol – less than 10 mgr/ml
 - Ciprofloxacin – less than 5 mgr/ml

Recommendations

- The following combination were identified as optimal for treatment:
 - streptomycin and ciprofloxacin
 - streptomycin and doxycycline
 - streptomycin and chloramphenicol
 - gentamicin and ciprofloxacin
- The single dose of streptomycin should be decreased from 0.5 gr. to 0.3 gr. and the frequency of uptake increased to allow the daily dose of 2,0 gr for adults.

Introduction H.pylori

- The first study of H. pylori infection in Kazakhstan was conducted during 2004-2007.
- Samples from 106 patients (age 17 – 73) with the following diagnoses were studied:
 - Erosive and catarrhal forms of chronic gastritis
 - Gastric ulcer
 - Duodenal ulcer

Methodology

- 2 biopsies from each patient were obtained during examination of gastric antrum and fundus.
- Biopsies were placed into the sterile tubes and delivered to the lab within one hour.
- Material was inoculated into one of the several mediums
- Cultivated in atmosphere containing 10% CO₂ and 5% O₂ at 37°C during 11 days.

Mediums used

- Basic - Columbia agar with 10% heparinized sheep blood
- Basic + selective H.pylori FD 090
- Basic + selective H.pylori FD 090 +elective FD 009 additives
- 4 Ready made mediums:
 - MP1553;
 - MP1554;
 - MP 1555;
 - alternative for helicobacter MP1556.

Effectiveness of medium

Medium Content	Number of patients	Number of patients with HP obtained	
		abs	%
Basic*	7	1	14,3±13,2
Basic + F090**	7	5	71,4±17,1
Basic + F090**	46	13	28±5,4
Basic + F090** + F009***	35	19	54,3±8,4

Basic - Columbia agar with 10% heparinized sheep blood

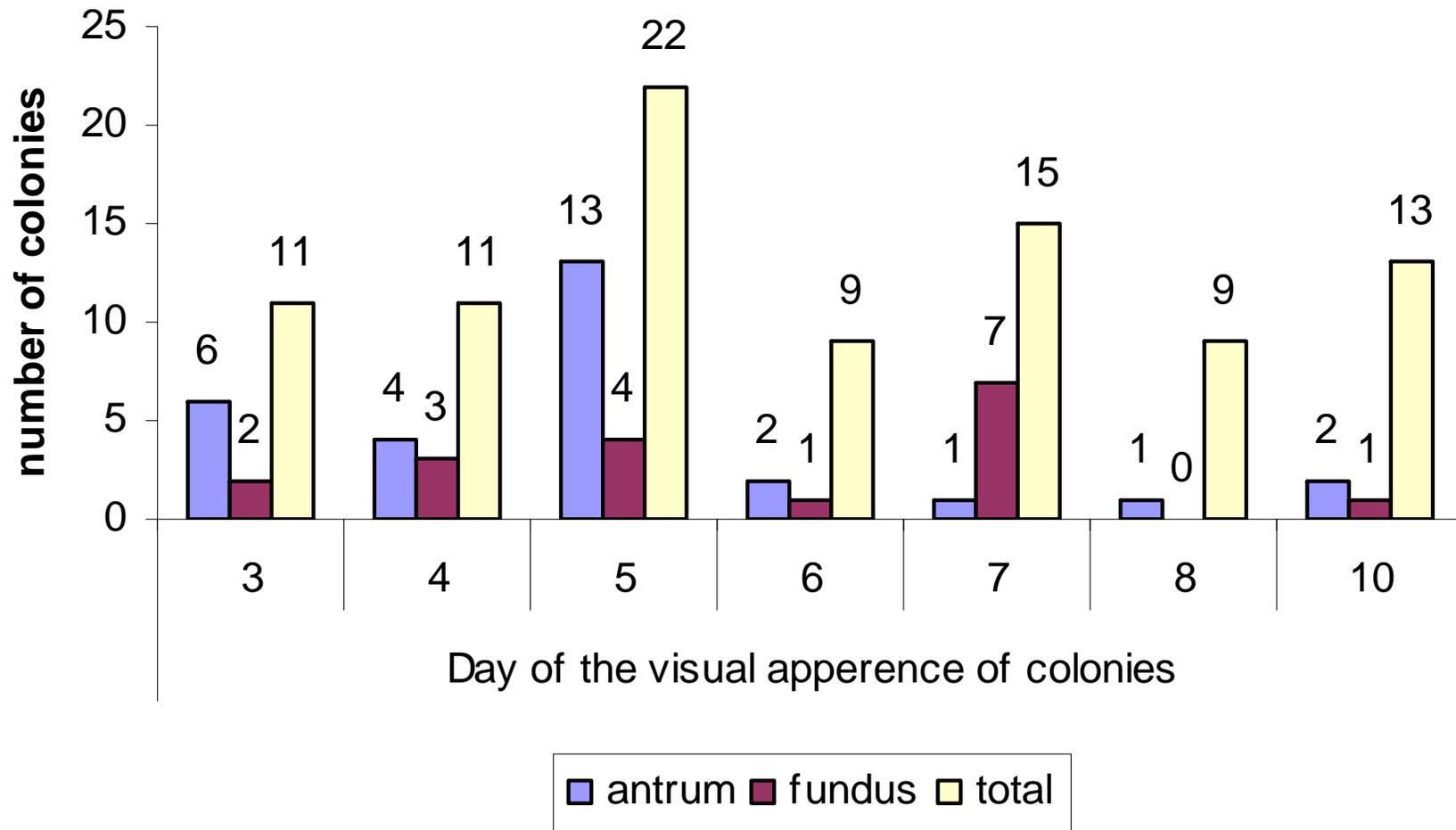
F090 – Selective additive

F009 – Elective additive

Effectiveness of medium

Medium	Number	Number of biopsies with HP obtained	
		abs.	%
Basic* + F090** + F009***	25	15	60,0±9,8
MP1553	25	16	64,0±9,6
MP1554	25	16	64,0±9,6
MP1555	25	17	68,0±9,3
MP1556	25	10	40,0±9,8

Time needed for the colonies to appear



Biological features

- Morphological and biochemical features of all the strains were typical:
 - Colonies: small in size, round with smooth edges, translucent and soft, rarely solid growth
 - Microscopy: Gram negative, elongated rods with the rounded ends were detected
 - Biochemical features: oxidase- and catalase positive, positive urea test, positive results on H₂S and were sensitive to nalidixic acid. Unable to ferment glucose, produce nitrates or form indol.

Sensitivity and resistance

- amoxicillin,
- clarithromycin,
 - pefloxacin,
 - gentamicin,
 - ampicillin,
 - oxacillin,
 - cefazolin,
- azithromycin and
 - metronidazole.

Sensitivity and resistance

- All the strains (100%) were highly sensitive to clarithromycin and resistant to ampicillin, oxacillin and cefazolin.
- 55% of strains were highly sensitive and 45% sensitive to pefloxacin.
- 96% of strains were sensitive and 4% resistant to gentamicin.
- 83% of strains were highly sensitive and 17% resistant to amoxicillin,
- 72% of strains were highly sensitive, 4% sensitive and 24% resistant to metronidazole.

Recommendations

- Analysis of the sensibility range shows relatively high level of resistance to amoxicillin (17%) and metronidazole (24%) which requires changes in the schemes of treatment used for patients with this pathology.
- Use of treatment schemes that include pefloxacin and azithromycin can be considered as promising during possible trials.

Thank you!

Questions:

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