

**A VACCINE AGAINST  
*PISCIRICKETTSIA SALMONIS***

9th APEC Workshop on  
Agriculture Biotechnology  
November 14-17, 2005  
Santiago – Chile

**CHILEAN ECONOMY  
CHALLENGE: TO MAINTAIN GROWTH**

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**TO DOUBLE EXPORTS IN THE NEXT  
FIVE YEARS**

US\$ 35 Billion  US\$ 70 Billion  
YEAR 2005 YEAR 2010

**TO DOUBLE AGAIN IN THE NEXT  
TEN YEARS**

US\$ 70 Billion  US\$ ~ 150 Billion  
YEAR 2010 YEAR 2020

## BIOTECHNOLOGY AND THE "COMPANY" CHILE

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### Innovation in the main export areas:

- Cooper mining (~ 15 billion USD)
- Hortifructiculture (~ 3 billion USD)
- Forestry / Cellulose (~ 3 billion USD)
- Aquaculture and fishing (~ 3 billion USD)
- Agroindustry & wines (~ 2 billion USD)
- Cattle / Poultry (~ 1 billion USD)
- Several other (~ 3 billion USD)

## SALMON FARMING INDUSTRY

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YEAR 2005

~ 500,000 tons

~ 1,500,000,000 \$ US

YEAR 2010

~ 1,000,000 tons

~ 3,000,000,000 \$ US

## AQUACULTURE

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- Pathogens (diagnostics, vaccines)
- Genetic breeding
- Accelerated growth / Food utilization
- Food: animal protein & oil in plants
- New species

## SALMON FARMING PATHOGENS

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Bacteria	<i>Piscirickettsia salmonis</i> (SRS) <i>Aeromonas salmonicida</i> (furunculosis) <i>Vibrio ordalii</i> (vibriosis) <i>Streptococcus phocae</i> (ulceration)
Virus	Infectious Salmon Anemia Virus (ISAV) Infectious Pancreatic Necrosis Virus (IPNV)

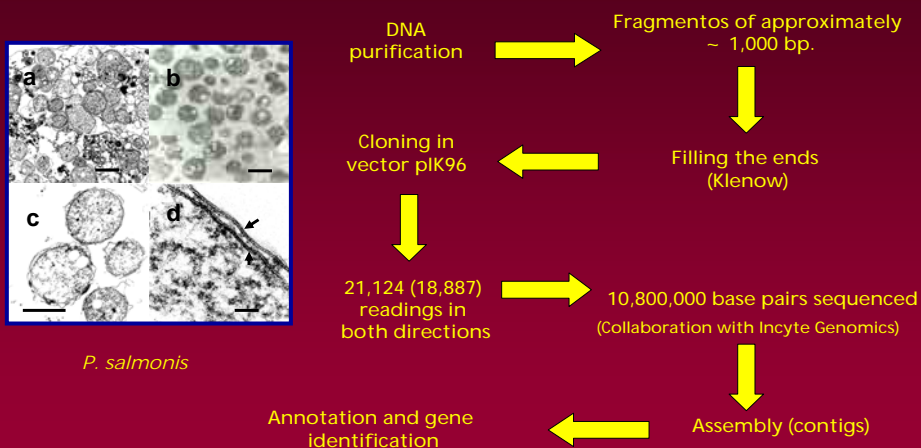
## PISCIRICKETTSIA SALMONIS

- Gram negative bacteria strict intracellular, coccoid, 0.5 - 1.5  $\mu$ m.
- Causative agent of Salmon Rickettsial Syndrome (SRS), extensive mortalities in salmon farming.
- *P. salmonis* is cytopathic for different salmon cell lines and salmon organs
- Discovered in 1989. Mostly a problem of the South Hemisphere. Little is known about its biology and the mechanisms of pathogenesis

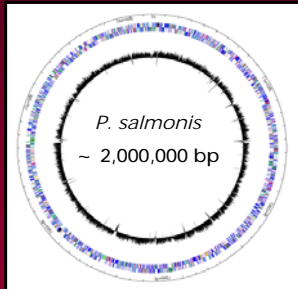


## *P. SALMONIS* VACCINES: A GENOMIC APPROACH

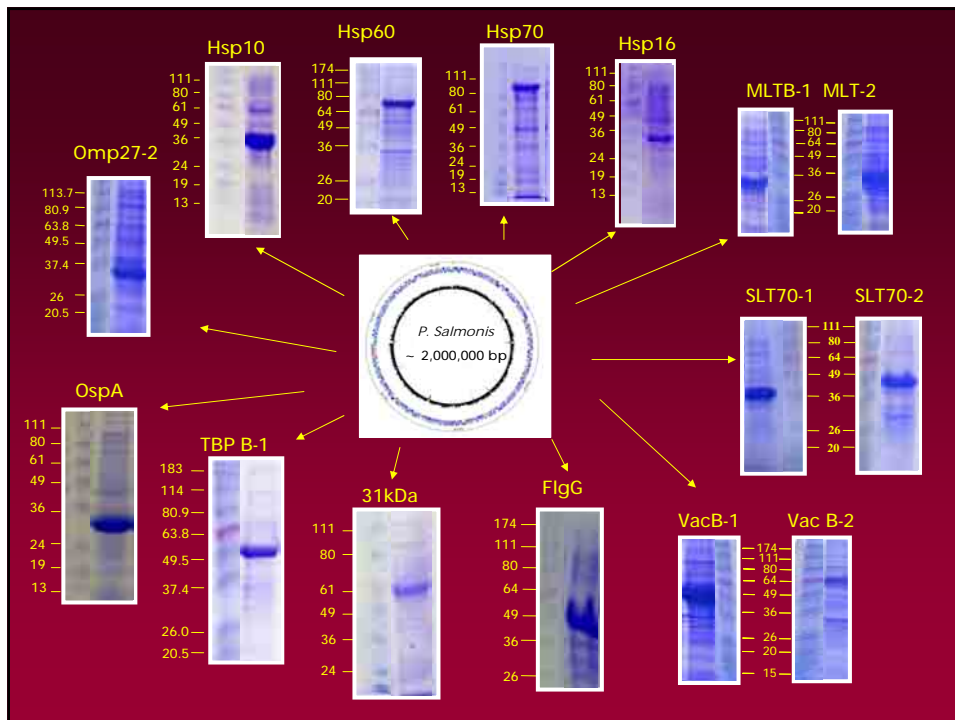
### *P. salmonis* genome sequencing



## P. SALMONIS GENOME SEQUENCING



- Approximately 95% of the genome has been sequenced (draft). The sequence is present in ~ 2,000 contigs of 1,000 to 10,000 base pairs each.
- Nearly 1,500 genes have been identified.

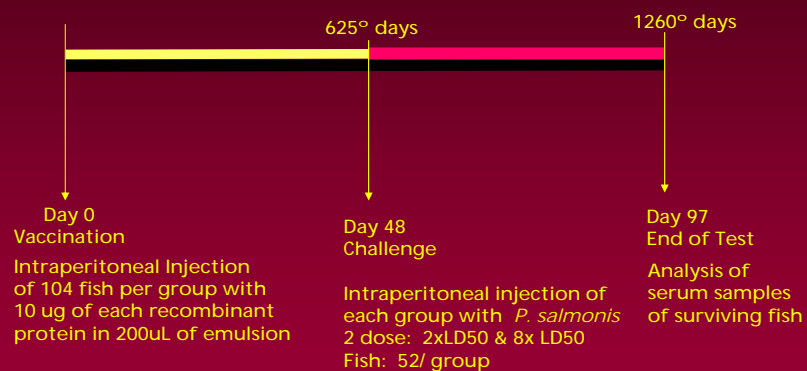


## COMPOSITION OF EXPERIMENTAL VACCINES ASSAYED FOR PROTECTION OF SALMON FROM *P. SALMONIS*

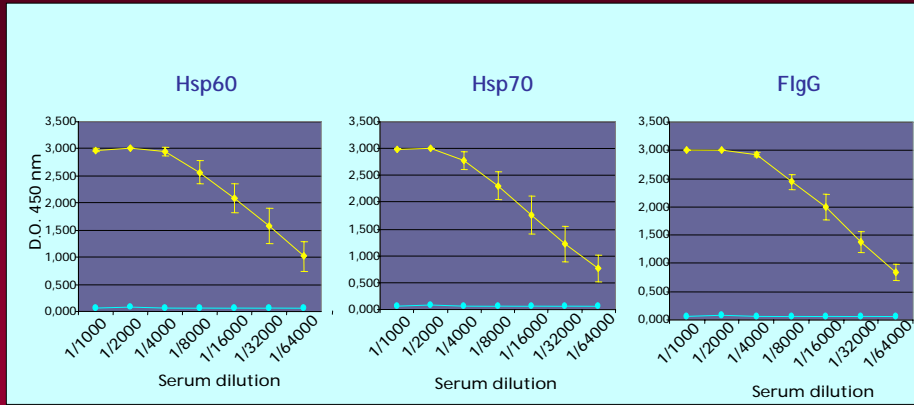
VACCINE COMPOSITION	VACCINE GROUP				
	V1	V2	V3	V4	V0
Hsp70	X				
Hsp60	X				
FlgG	X				
OspA		X			
31KDa		X			
MLTS1			X		
MLTS2			X		
TBPS1			X		
OMP27S2				X	
FlaA $\Delta$ 555				X	
PBS	X	X	X	X	X
<i>E. Coli</i> LPS	X	X	X	X	X

## CHALLENGE EXPERIMENT CHRONOGRAM

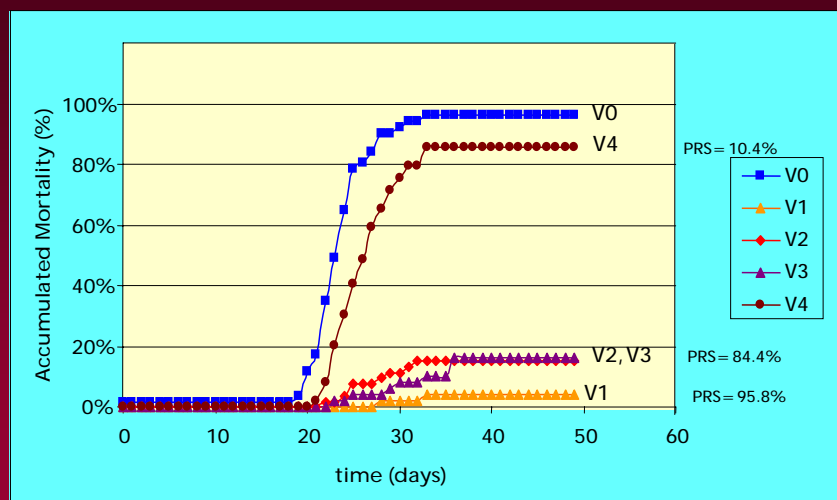
species: *Salmo salar*



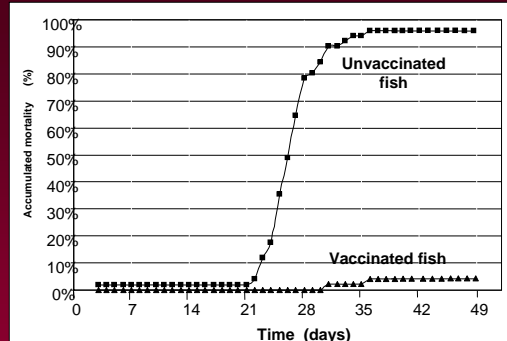
## IMMUNE RESPONSE TO HSP60, HSP70 AND FlgG OF FISH VACCINATED WITH V1 (ELISA)



## CHALLENGE OF VACCINATED AND CONTROL FISH WITH 8 x LD50 OF *Piscirickettsia salmonis*



## AQUACULTURE



### Economic Value

Salmon sales	~ 1,500,000,000 dollars / year
Losses by SRS	~ 150,000,000 dollars / year
Vaccine (Market)	~ 25,000,000 dollars / year
Research costs	~ 1,000,000 dollars (one time)

## VACCINE FOR *P. SALMONIS* (SRS)

### Salmon Farming Industry

Salmon sales	~ 1,500,000,000 dollars / year
Losses by SRS	> 150,000,000 dollars / year
Research costs (one time)	~ 2,000,000 dollars

The technology has been licenced to Novartis Animal Vaccine Inc. who is introducing the vaccine to the Chilean market this year