aquaculture innovation centre

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Exporting Live Seafood

Technically Achievable

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Advantage of Aquaculture Over Capture Fisheries

- Ability to have more control over the harvest process
- A key advantage is possibility of marketing live fish
  - Live fish not associated with spoilage or quality deterioration
  - Commend higher prices
    - Live = value addition

Shipment of Live Seafood

- Practical, profitable and challenging endeavor
- Extremely dependent on transit environment to maintain
  - Optimum selling conditions
  - Avoid mortality
- Special packaging systems to mitigate
  - Temperature abuse
  - Rough handling
- Changing government regulations
  - Best to work with experienced importer or freight forwarder

General Pre-Shipping Conditions for Live Shrimps

Cooled to a temperature that achieves pseudo-hibernation

- Avoid drastic temperature change
  - Rapid chilling $\rightarrow$ loss of legs/claws
  - Temperature too low $\rightarrow$ mortality
- Avoid dilution of salinity if using ice

Pseudo-hibernation temperature is dependent upon

- Species
  - Black tiger prawn (*Penaeus monodon*) & fresh water prawns (*Macrobrachium rosenbergii*)
- Harvest area
- Season

Packed shrimps not compressed or able to move

High humidity & oxygen environment

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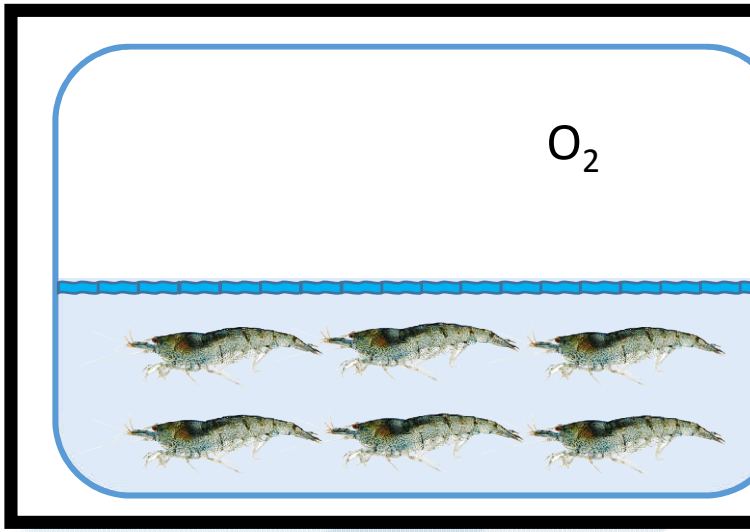
General Shipping Conditions for Live Shrimps

- Packed shrimps not compressed or able to move
- High humidity to avoid dehydration
- High oxygen environment
- Avoid building up ammonia
- Maintaining cool temperature
- Best results
  - Packed in a water and pure oxygen system



Pre-Shipping Conditions for Live Shrimp Trials

- Species: *L. vannamei*
- Healthy animals were used
- Pre-conditioned at 5 ppt salinity over night
- Cooled down from 30°C to 15°C over 2 hrs using cooler
- Packed 33 shrimps (30 g size) per box

In collaboration with:
Marine Products Exports Development Authority (MPEDA), Andhra Pradesh Fisheries Department, Singapore-India Partnership Office (SIPO) & farms in AP.

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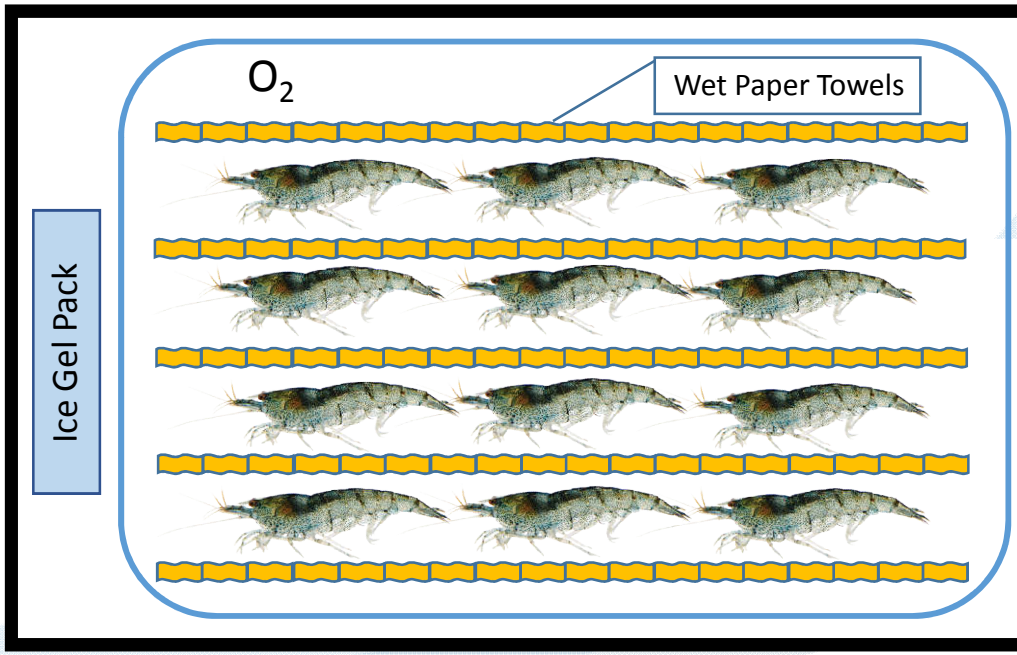
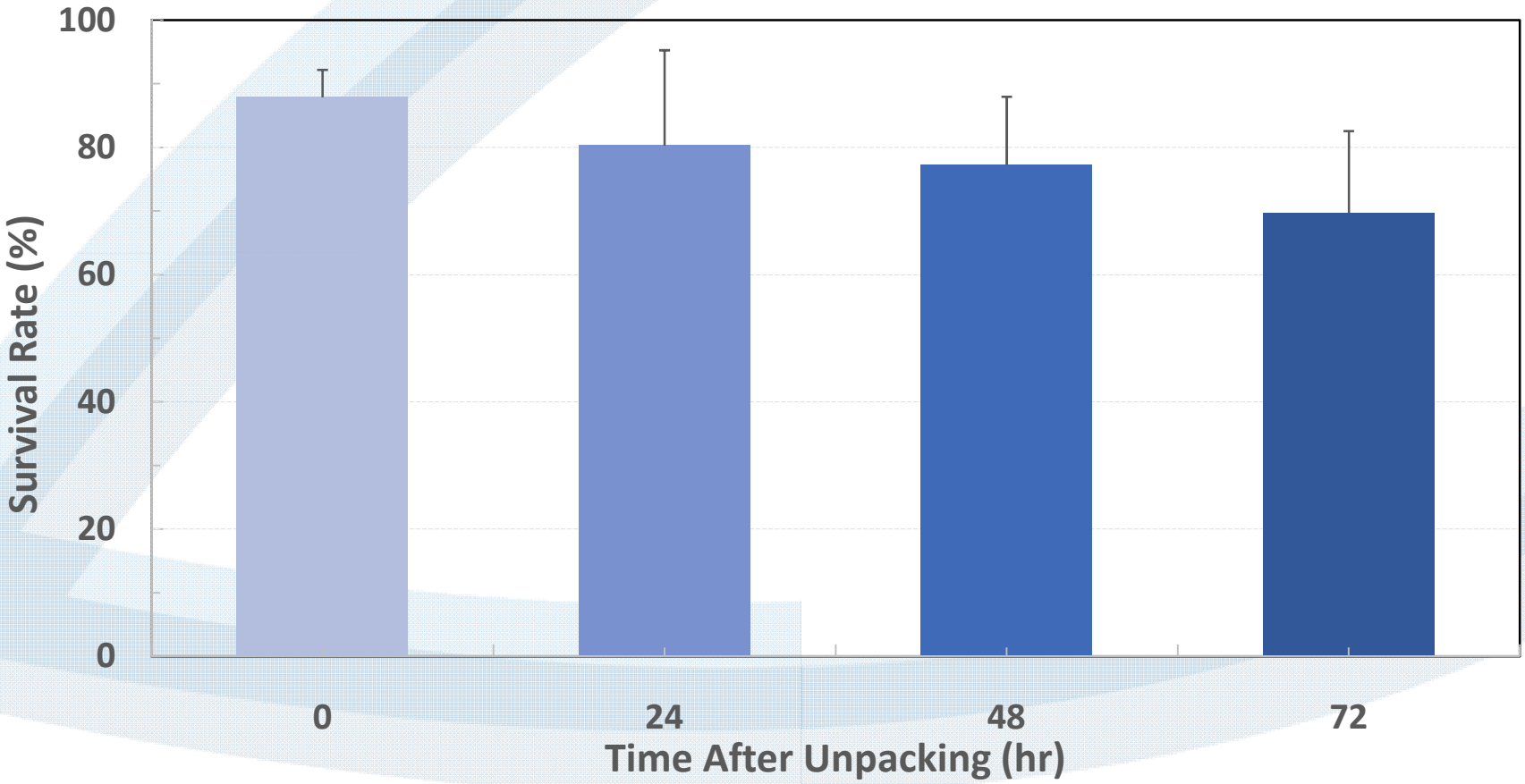
Shipping Conditions for Live Shrimp Trials

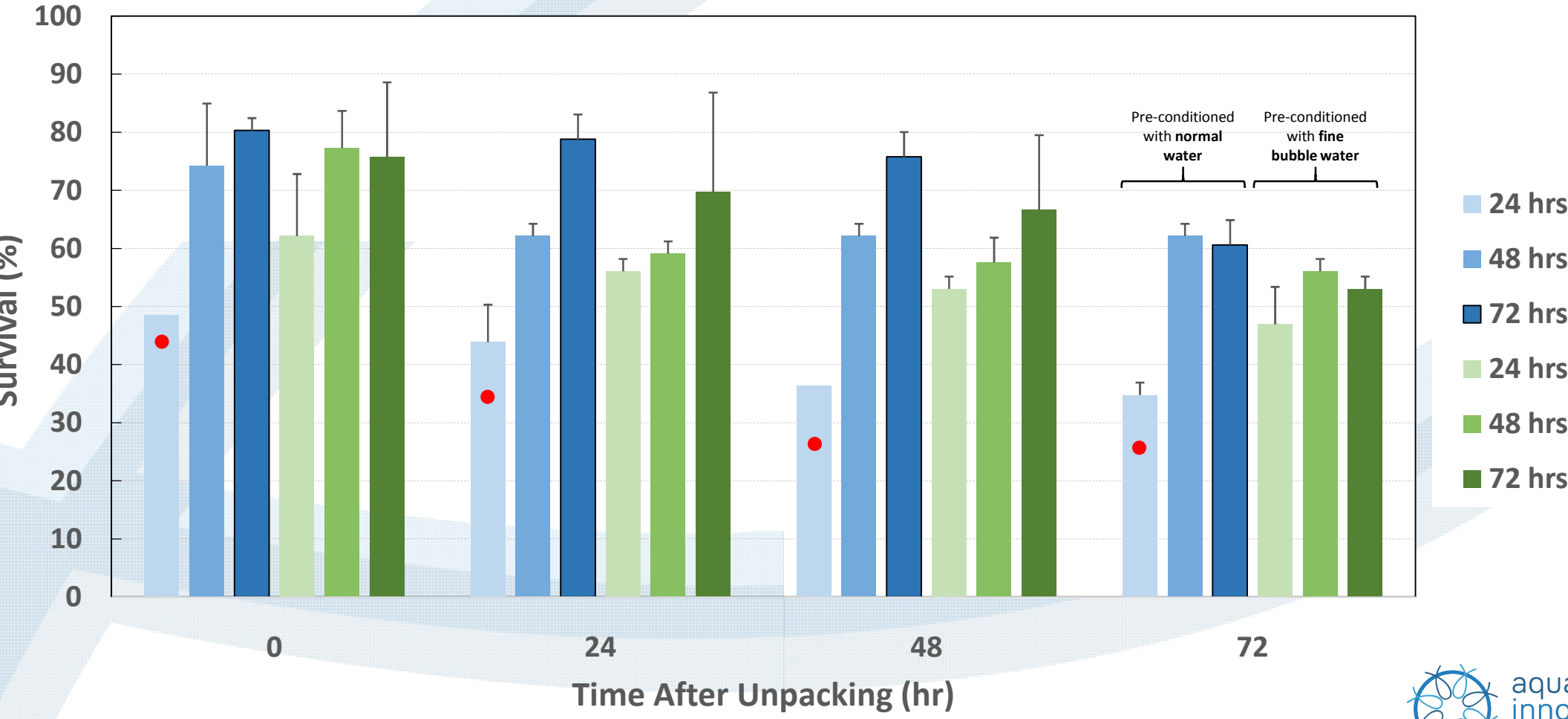
- Waterless condition
- Layered shrimps in styrofoam box
- Moist towels to provide high humidity
- Gas with oxygen
- Maintaining cool temperature
  - From 16.5°C to 19.5°C over **12 hrs** (logistic simulation)



Shrimps Can Survive Without Water for >12 Hrs With Proper Conditioning



Stressed Animals Recovered Quickly in Water with Fine Bubble (d<50 μm)



Search for Draught Resistant Species:

e.g. Kuruma Prawn (Marsupenaeus Japonicus)

Courtesy of Dr Farshad Shishehchian, Blue Aqua International

Methodology

ntrol (freshwater aerated overnight)

Fish: 10 Mollies
Water: 500 ml
Size: 0.6-1 g each
Replicates: 3

FB water (aged overnight)

Water sampling at 6-, 24- and 48-hr

Assays on: (1) Water quality parameters: pH, nitrogenous wastes, turbidity and dissolved oxyge
(2) Survival of fish in the bags at room temperature for 2 days
(3) Water bacterial load

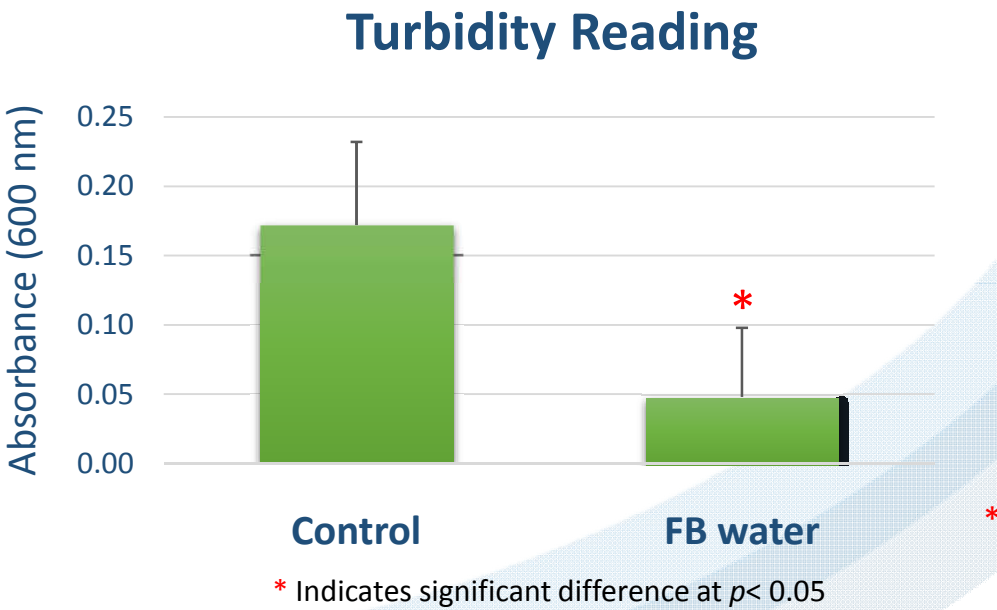
Water Quality During Transport of Live Mollies

rameters	Control 0 hr	FB water 0 hr	Control 6 hrs	FB water 6 hrs	Control 24 hrs	FB water 24 hrs	Control 48 hrs	FB w 48 h
pH	7.60 ± 0.01	7.50 ± 0.01	6.40 ± 0.17	6.40 ± 0.10	6.73 ± 0.32	6.50 ± 0.01	6.53 ± 0.12	6.40 ±
mmonia-N (ppm)	ND	ND	0.37 ± 0.06	0.33 ± 0.06	4.00 ± 0.29	1.83 ± 0.29	6.67 ± 0.58	4.33 ±
te-N (ppm)	ND	ND	ND	0.10 ± 0.01	0.07 ± 0.05	0.08 ± 0.03	0.07 ± 0.05	0.15 ±
te-N (ppm)	ND	ND	4.00 ± 0.01	4.00 ± 0.01	4.70 ± 0.58	4.70 ± 0.58	4.67 ± 2.89	4.33 ±
solved O_2 (ppm)	7.10 ± 0.01	9.10 ± 0.01	4.30 ± 1.31	5.17 ± 1.08	0.73 ± 0.31	4.57 ± 0.38	0.50 ± 0.26	2.23 ±

Values in Red indicate significant difference from the control at the particular time point at $p<0.5$

Water Turbidity During Transport of Live Mollies

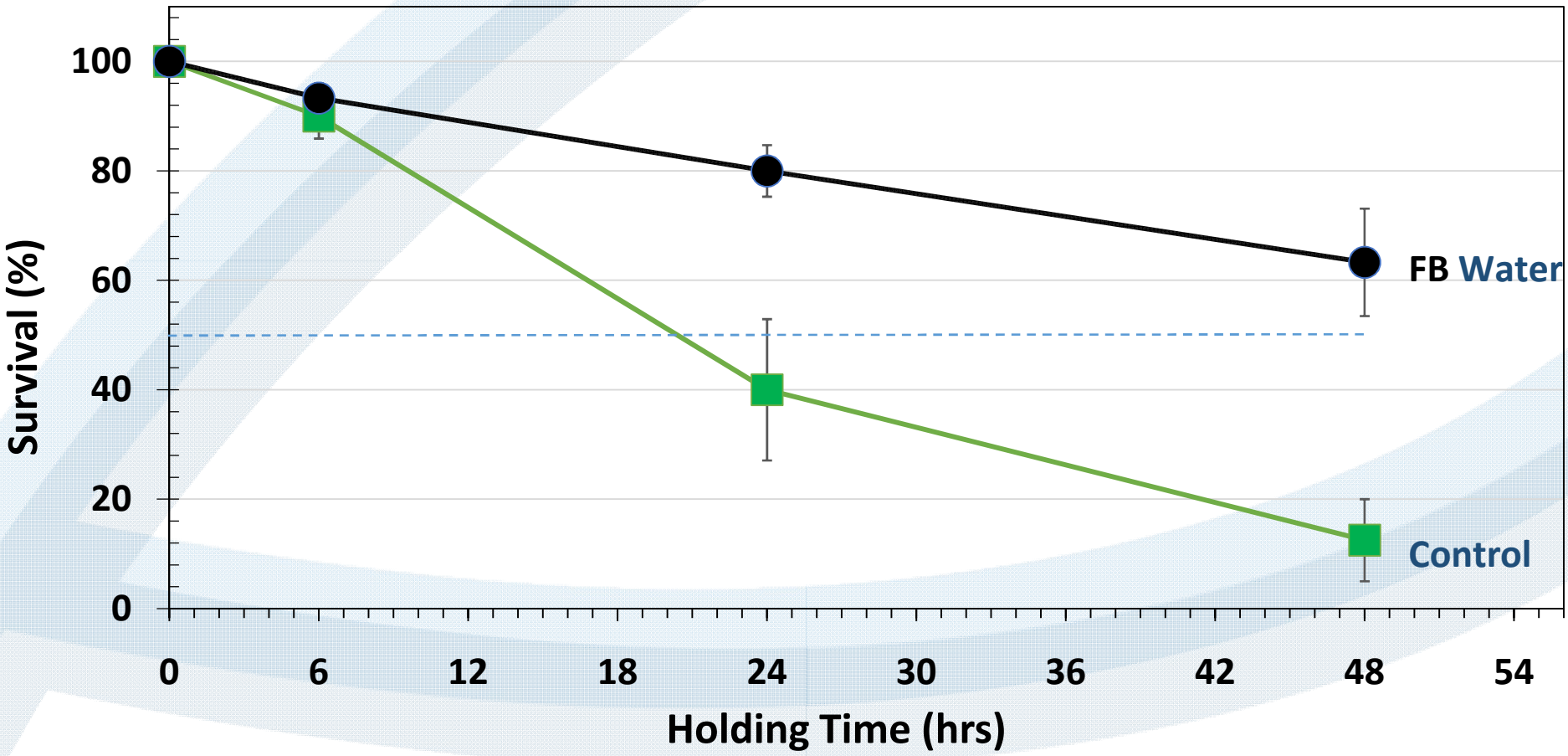
Control FB water



* Indicates significant difference at $p < 0.05$

- Water in the control bags was more turbid than the FB water during the 48-hr of transport
- Spectrophotometric reading of turbidity indicated significantly lower value in the FB water during the 48-hr of transport

Survival of Ornamental Fish in Aged Aerated Water & Fine Bubble Water



In Summary

- Using healthy animals
- Minimising stress
- Minimising injuries
- Maintaining moist & oxygenated (pre & post) conditions
- Reducing metabolism
- Redesigning packaging materials

Thank You