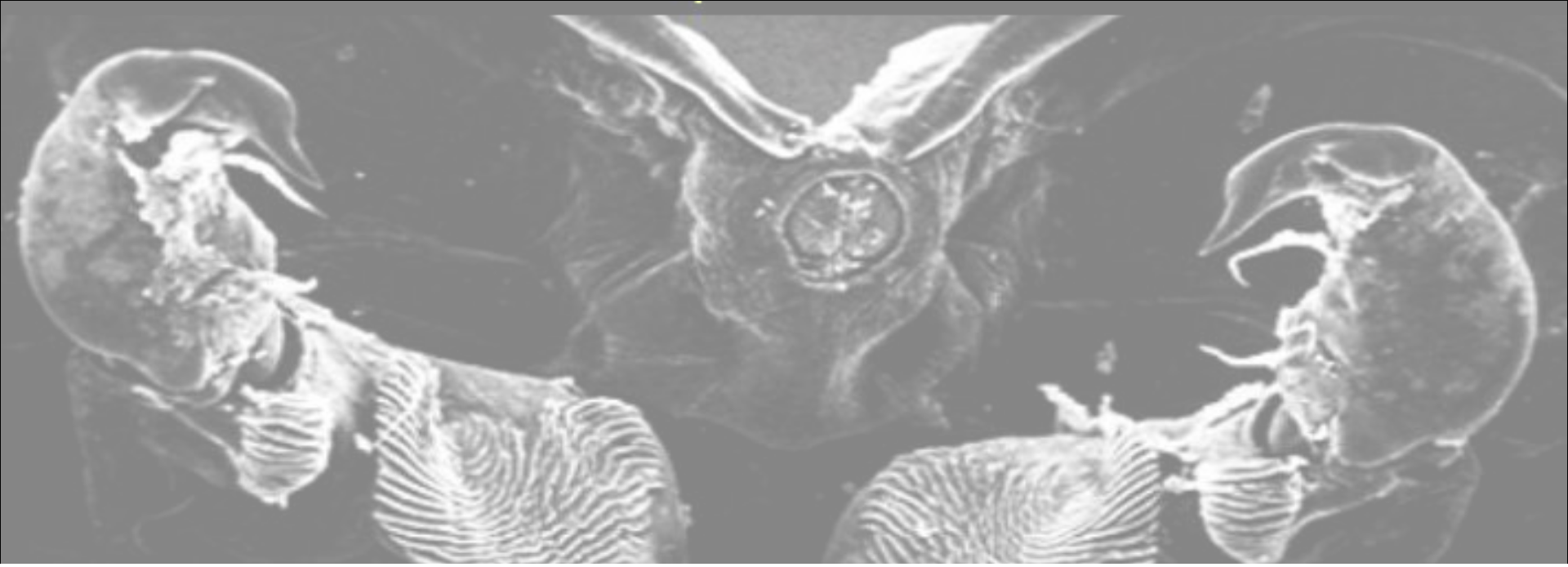
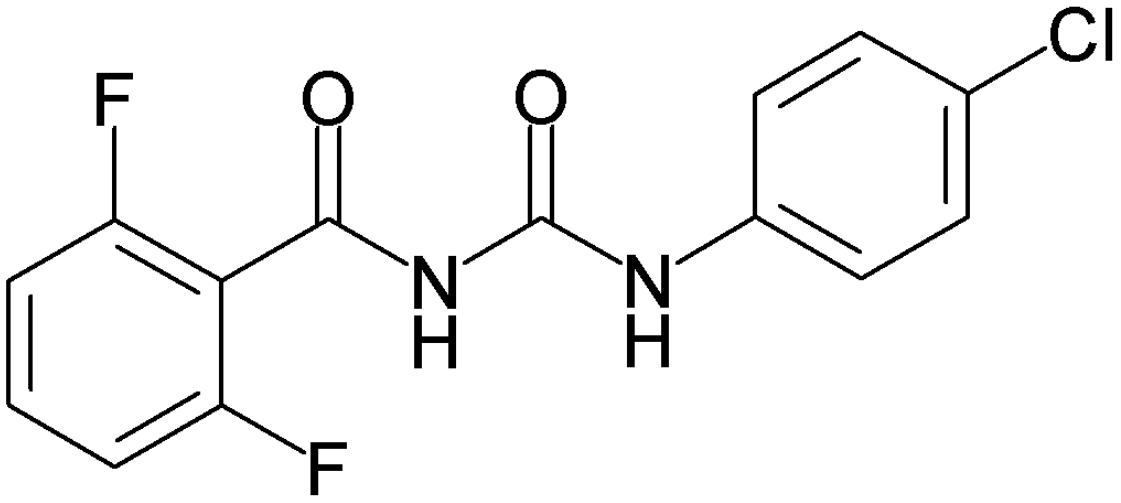


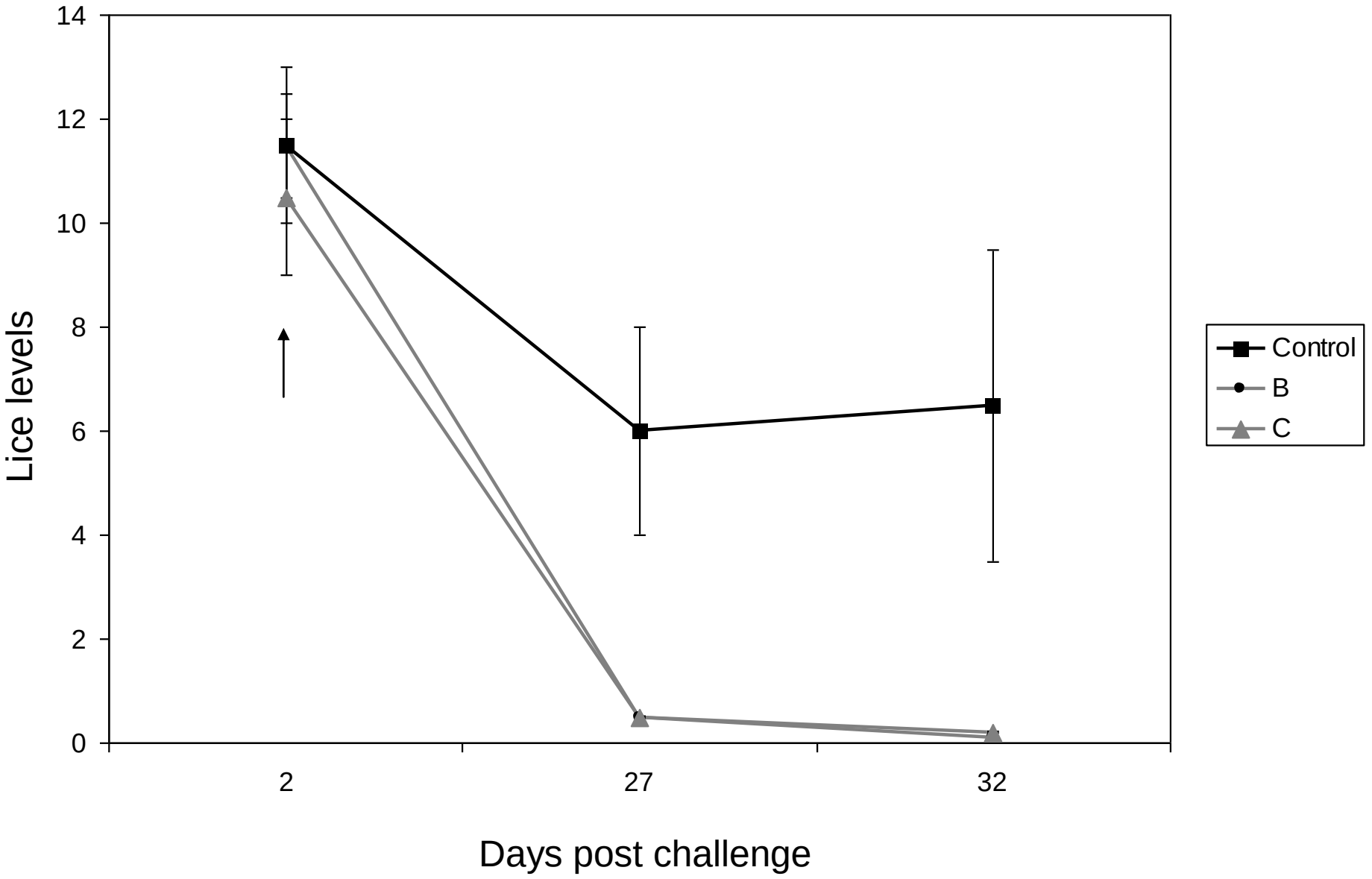
# *EWOS sea lice management*

## Diflubenzuron Releeze®



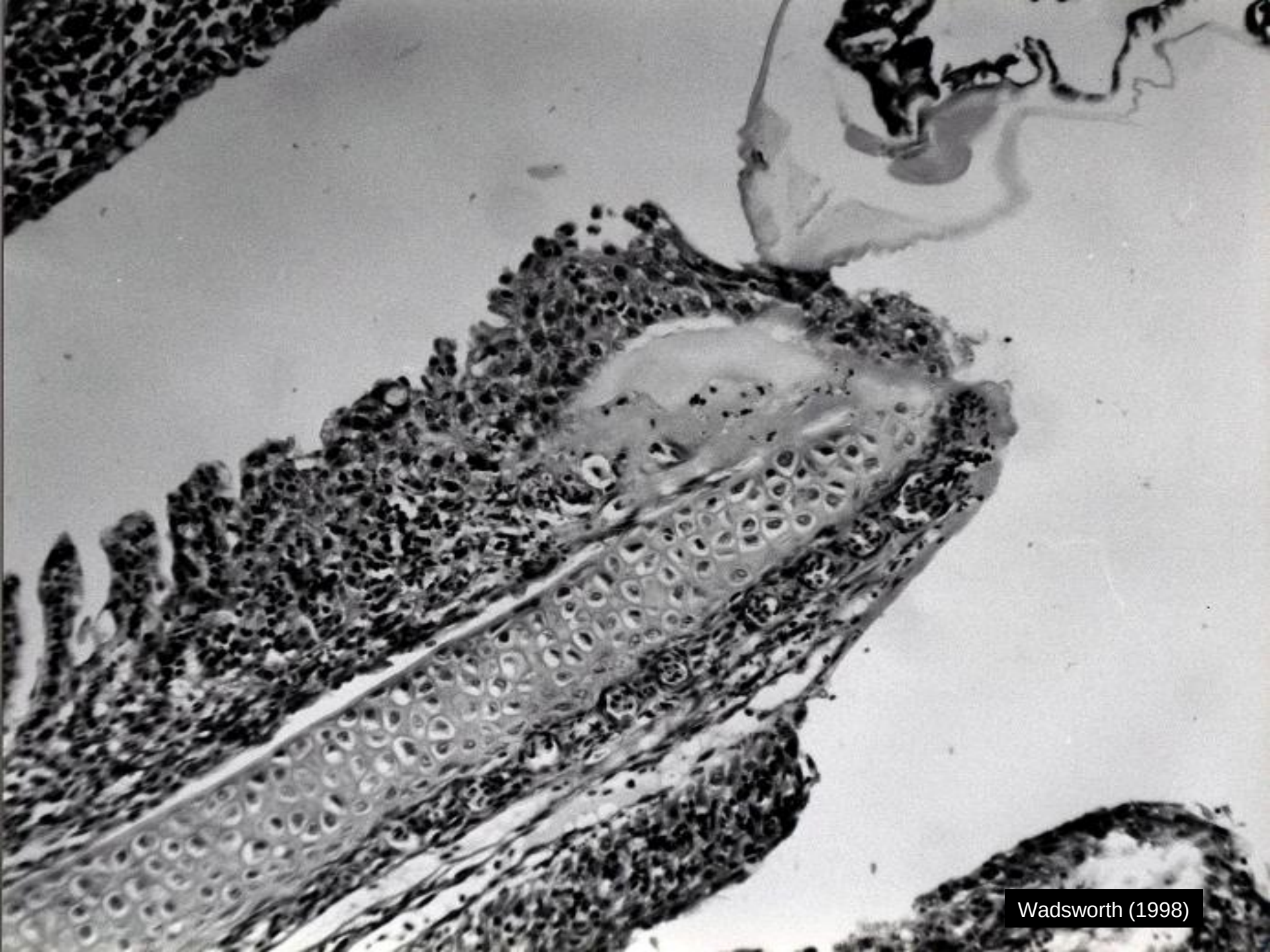

- Mode of action is to inhibit deposition of chitin
- Effective against all moulting stages
- MRL and withdrawal period established
- Commercial use Chile and Norway
- Assessing requirements in UK and Canada
- Resistance monitoring and management a key focus
- EWOS Norway – product manager Hege Hovland (tomorrow)

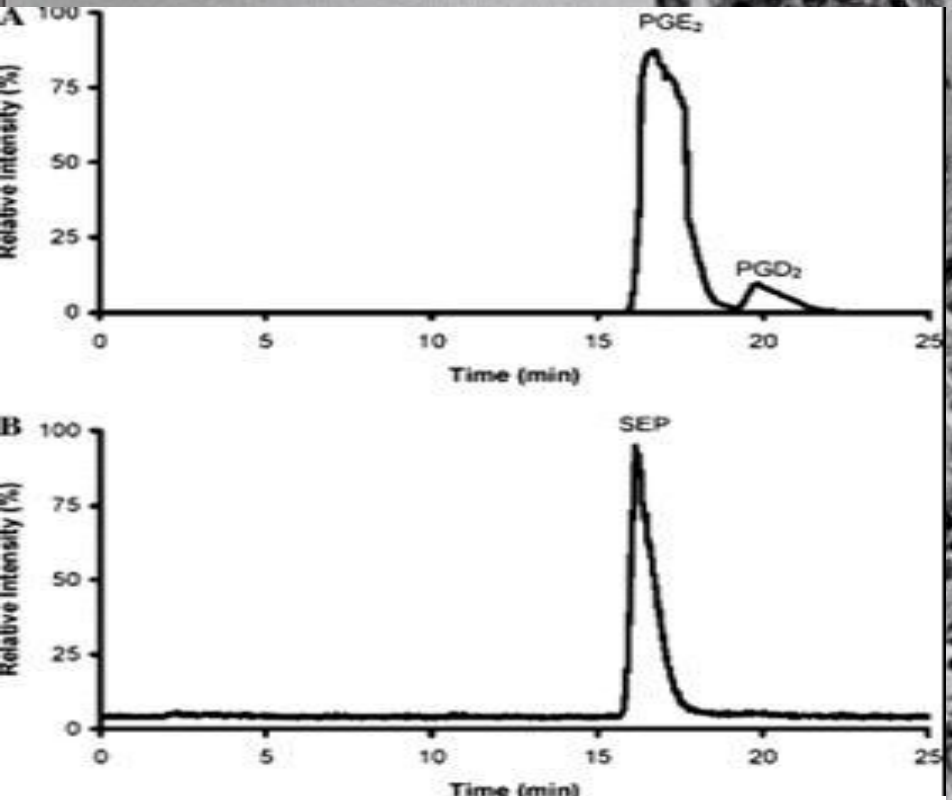
# EWOS Releeze®



# EWOS Releeze®

- Resistance monitoring – $LD_{50}$ test (VESO)
- Cold temperature efficacy
- Egg string / viability of infective stages
- Rotation of compounds (remove adults)
- Development of integrated pest management
- Additional tools to remove lice surviving treatments


Wadsworth (1998)




Fast M., Ross N., Craft C., Locke S., MacKinnon S., Johnson S. (2004)

Wadsworth (1998)

# Immune suppressants released

- Prostaglandin $PGE_2$
- Range of proteases
- Phosphatases
- Macrophage inhibitors

Effect on a range of factors

- Reduced respiratory burst
- Lower macrophage activity
- Increased cell death
- Decreased numbers of mucosal cells
- Down-regulation of immune genes (interleukin IL-1ß and MHC-1)
- **Local and systemic immune suppression**

# Growing understanding of suppression


- **Firth K.J., Johnson S.C., Ross N.W. (2000).** Characterization of proteases in the skin mucus of Atlantic salmon (*Salmo salar*) infected with the salmon louse (*Lepeophtheirus salmonis*) and in the whole-body louse homogenate. Journal of Parasitology. **86.** 1199–1205.

- **Nolan D., Raune N., Van Der Heijden M., Quabis E.S, Costelloe J., Wendellar S.E. (2000).** Juvenile *Lepeophtheirus salmonis* (Kroyer) affect the skin and gills of rainbow trout O*ncorhynchus mykiss* (Walbaum) and the host response to a handling procedure. Aquaculture Research. **31.** 823–833.

- **Kvamme, B.O., Kongshaug, H. & Nilsen, F. (2005).** Organisation of trypsin genes in the salmon louse (*Lepeophtheirus salmonis*, Crustacea, Copepoda) genome. *Gene* **352**, 63-74.

- **Fast M.D., Ross N.W., Muise D.M., Johnson S.C. (2006).** Differential gene expression in Atlantic salmon, *Salmo salar*, infected with *Lepeophtheirus salmonis* (Copepoda: Caligidae). Journal of Aquatic Health. **18**. 116–127.

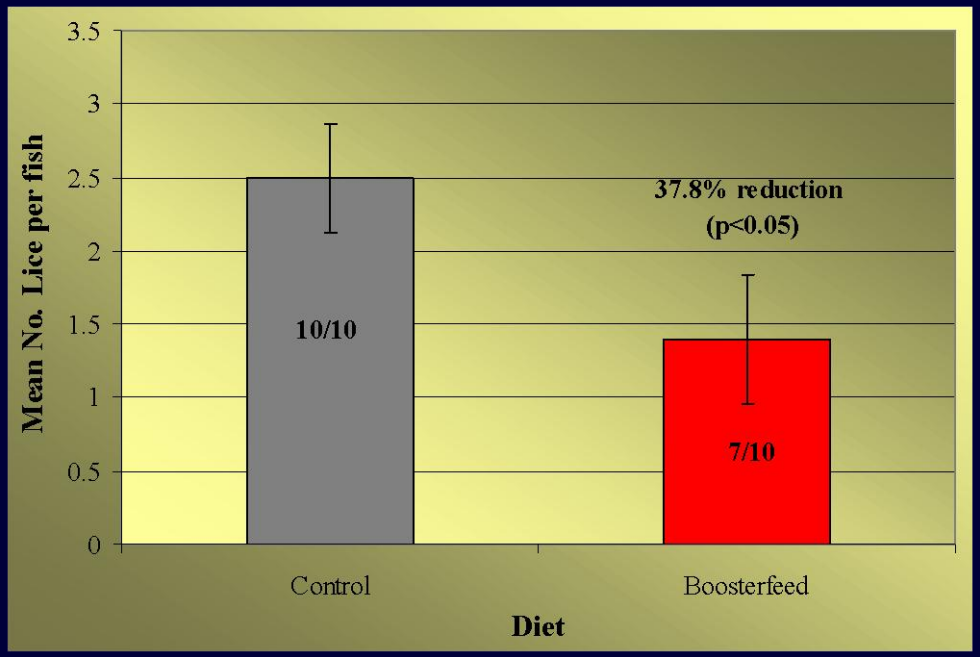
- **Fast M.D., Johnson S., Eddy T., Pinto D., Ross N. (2007).** *Lepeophtheirus salmonis* secretory / excretory products and their effects on Atlantic salmon immune gene regulation. Parasite Immunology. **29.** 179–189

- **Fast, M.D., Johnson S., Eddy T., Pinto D., Ross N. (2008).** Cortisol response and immune-related effects of Atlantic salmon (*Salmo salar* Linnaeus) subjected to short- and long term stress. Fish & Shellfish Immunology. **24**. 194–204

- **Wagner G., Fast M., Johnson S.C. (2008)**. Physiology and immunology of *Lepeophtheirus salmonis* infections of salmonids. Trends in Parasitology. 24. 176-183.

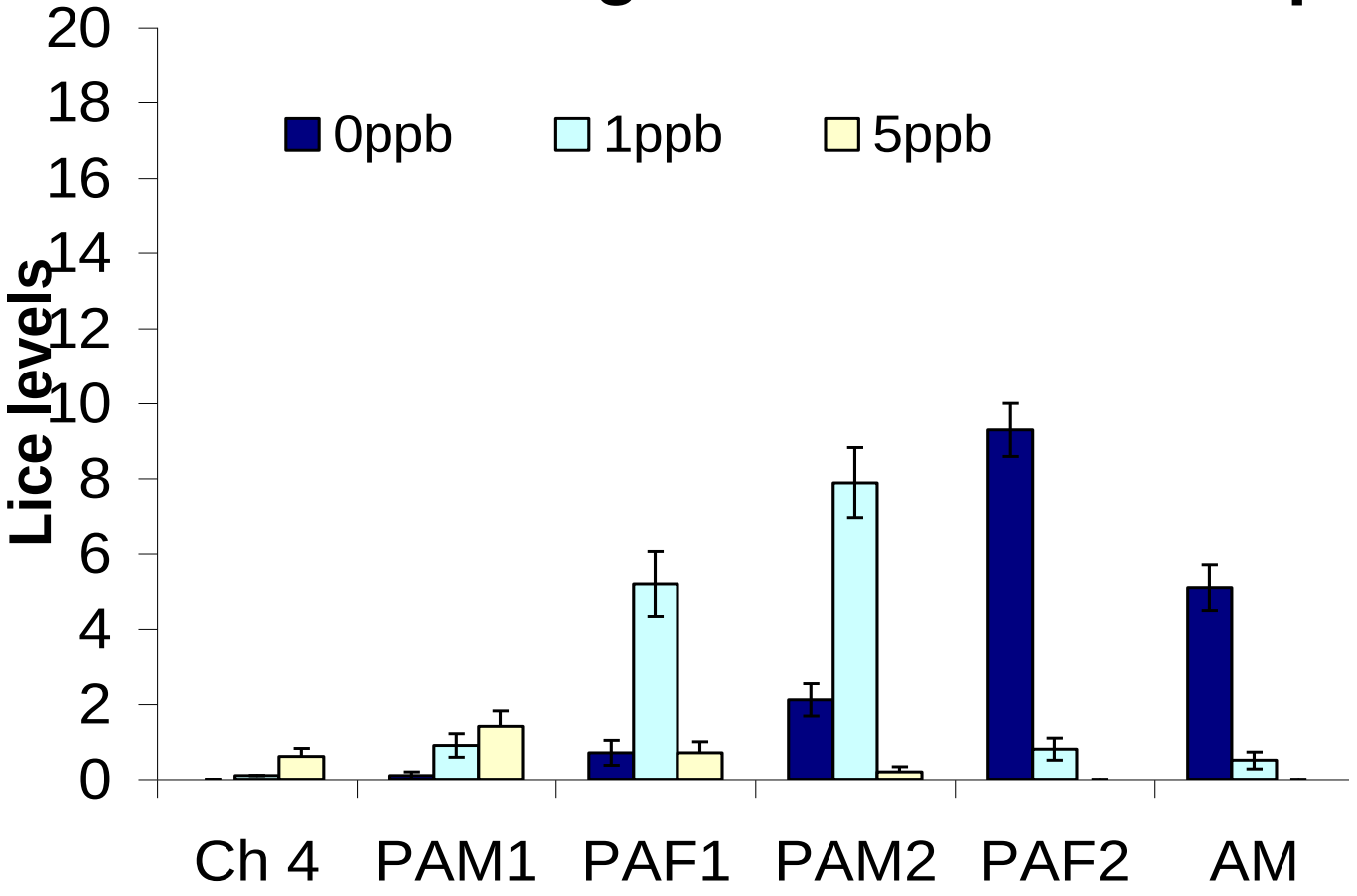
# Boost Control

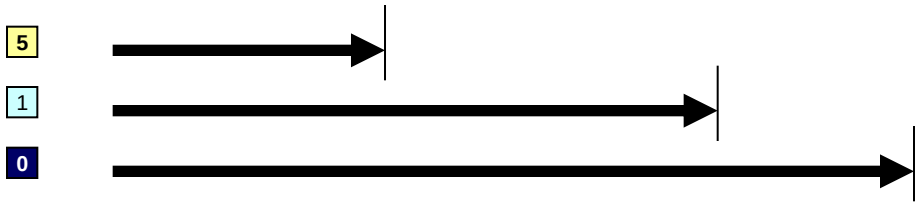
- Can reduce sea lice attachment (38%)
- Improved when combined with medicines




Burrells et al., 2000

# Surviving lice – slow development



# Other Control Mechanisms

- Some lice survive treatment
- Less robust against immune response
- Boosted fish remove >50%
- **Removing resistant population**