AMINO ACIDS AS SIGNAL MOLECULES AFFECTING FEEDING BY MICROZOOPLANKTON

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OVERVIEW

In previous research, we have shown that dissolved DMSP reduces feeding in many protist grazers:

- We wished to understand WHY and HOW protists respond to this chemical signal
- Feeding responses to algal chemical signals could ARISE FROM and AFFECT protist grazers as signal molecules

EXPERIMENTAL APPROACH

- Protist grazers were starved before feeding trials (except feeding state experiment)
- Dissolved chemicals (20 µM unless indicated) were added to protists in quadruplicate
- Protist grazers were starved before feeding trials (except feeding state experiment)

AMINO ACID EFFECT IS CONCENTRATION-DEPENDENT

RESULTS

- Favella feeding rate decreased at >20 nM proline
- Total dissolved free amino acid concentrations in seawater typically range from 2 to 20 nM
- Favella may be adapted to respond to amino acid ‘signals’: pulses 10-100x stronger than persistent background levels

FUZZY LINE:

- By affecting feeding and swimming behavior (see Wolfe poster TS24 79), common algal-derived compounds may act as potent deterrent signals with substantial ecological effects

RESULTS

- Feeding inhibition by 20 µM serine was weakened but still detectable 12 hr after chemical addition
- Favella growth rates were similar in all treatments:
  - CONTROL: 0.009 d⁻¹
  - ARGinine: 0.007 d⁻¹
  - SERINE: 0.009 d⁻¹

REMARKS

- *Data courtesy of K. Fredrickson
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AMINO ACID EFFECTS ON PROTIST GRAZING RATE

RESULTS

- Ciliate Favella decreased feeding in response to numerous amino acids at 20 µM
- Feeding inhibition was roughly proportional to amino acid side chain length, suggesting a common cell-surface receptor that optimally responds to molecules with small side chains
- Heterotrophic dinoflagellate G. dominans showed no response or slight stimulation of feeding in response to 20 µM amino acids

NO DEPENDENCE ON FEEDING STATE

RESULTS

- Ciliate Favella was preconditioned (22 hr) with three treatments:
  - FED: H. triquetra cells at 620 cells ml⁻¹
  - STARVED: no food
  - STARVED/FILTRATE: no food, filtrate from H. triquetra culture equivalent to 620 cells ml⁻¹

- Rate of uptake of fluorescently labeled H. triquetra (at 15% of total algal conc.) was used to measure feeding rate in all treatments

BOTTOM LINE:

- Ciliate Favella showed large, long-lasting feeding reductions in the presence of small side-chain amino acids
- By affecting feeding and swimming behavior (see Wolfe poster TS24 79), common algal-derived compounds may act as potent deterrent signals with substantial ecological effects