LIPÍDEOS NO SANGUE DE PEIXES ANTÁRTICOS E DE ÁGUAS TEMPERADAS

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J. Membrane Biol. (2009)

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2019

Introdução

- Peixes antárticos
  - Temperatura baixa (inferior a -2 ℃)
  - Hemoglobina ausente ou em baixas quantidades
  - Altas concentrações de oxigênio
  - Baixa demanda metabólica
  - Altas concentrações de AG insaturados
- Peixes de águas temperadas
  - Temperatura média (15-20 ℃)
  - Hemoglobina presente
  - Baixas concentrações de oxigênio
  - Alta demanda metabólica
  - Altas concentrações de AG saturados

Introdução

- Lipídeos são importantes para a determinação das propriedades da membrana celular

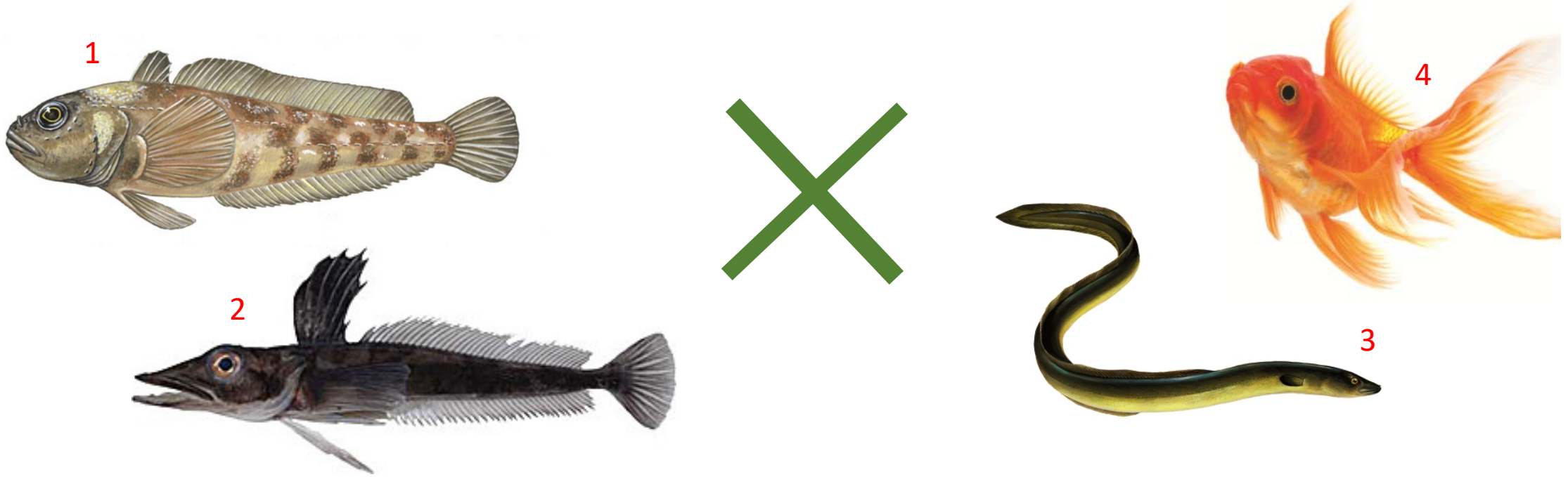
- Peixes de águas frias possuem alta quantidade de AG insaturados presentes nas membranas celulares e depósitos lipídicos do organismo.

Objetivo

Estudar a composição lipídica da membrana celular e do plasma de peixes antárticos comparados a peixes de zonas temperadas.

Material e métodos

- Antárticos: *Chionodraco hamatus*[1] e *Trematomus bernacchii*[2]
- Zonas temperadas: *Anguilla anguilla*[3] e *Carassius auratus*[4]



Material e métodos

- Sangue (centrifugação para coleta de plasma e membrana dos eritrócitos '*ghost-like cells*')
- Extração de lipídeos
- Metilação de AG
- Análise de fosfolipídeos (fosfatidilcolina, fosfatidiletanolamina, fosfatidilserina, fosfatidilinositol, esfingomielina, cardiolipina e ácido fosfatídico)
- Colesterol
- Fósforo Lipídeo total

Resultados e discussão

Table 1 Total lipid phosphorus and cholesterol in erythrocyte ghost-like membranes of four species of fish: nmol mg^{-1} protein ± SE

	C. hamatus	*T. bernacchii*	*C. auratus*	*A. anguilla*
Total lipid phosphorus	420 ± 23 (a)	225 ± 12 (b)	78 ± 5 (c)	145 ± 8 (d)
Cholesterol	253 ± 11 (a)	64 ± 2 (b)	24 ± 1 (c)	118 ± 64 (d)

Note: Differences among species for each parameter were calculated by one-way ANOVA followed by Scheffé post hoc test at $P = 0.05$ level. Values belonging to the same subset are followed by the same letter in parentheses

Resultados e discussão

Table 3 Phospholipid classes in erythrocyte ghost-like membrane lipids in four species of fish: percentage of total lipid phosphorus in each lipid class (mean of four determinations) ± SE

	C. hamatus	*T. bernacchii*	*C. auratus*	*A. anguilla*
Lysophosphatidylcholine	6 ± 1.4 (a)	4 ± 0.3 (b)	9 ± 0.5 (c)	6 ± 0.6 (a)
Phosphtidylcholine	45 ± 5.0 (a)	48 ± 2.9 (a)	29 ± 1.5 (b)	45 ± 5.6 (a)
Phosphatidylethanolamine	26 ± 4.3 (a)	28 ± 2.2 (a)	10 ± 1.4 (b)	8 ± 1.2 (b)
Sphingomyelin	4 ± 1.1 (a)	3 ± 0.5 (a)	27 ± 3.4 (b)	27 ± 5.0 (b)
Phosphatidylserine	10 ± 1.1 (a)	9 ± 0.4 (a)	13 ± 1.4 (a)	11 ± 2.4 (a)
Phosphatidylinositol	6 ± 0.7 (a)	5 ± 0.3 (a)	7 ± 1.0 (a)	6 ± 0.4 (a)

Note: Differences among species for each parameter were calculated by one-way ANOVA followed by Scheffé post hoc test at $P = 0.05$ level. Values belonging to the same subset are followed by the same letter in parentheses

Resultados e discussão

Table 4 Phospholipid classes in blood plasma in four species of fish: percentage of total lipid phosphorus in each lipid class (mean of four determinations) ± SE

	C. hamatus	*T. bernacchii*	*C. auratus*	*A. anguilla*
Lysophosphatidylcholine	6 ± 1.0 (a,b)	4 ± 1.1 (a)	3 ± 0.6 (a)	7 ± 1.8 (b)
Phosphatidylcholine	53 ± 6.3 (a)	50 ± 3.7 (a)	86 ± 5.6 (b)	64 ± 9.3 (a)
Phosphatidylethanolamine	12 ± 1.5 (a)	8 ± 1.3 (a)	4 ± 0.9 (b)	5 ± 0.2 (b)
Sphingomyelin	23 ± 3.7 (a,b)	28 ± 4.0 (b)	2 ± 0.4 (c)	17 ± 2.3 (a)
Phosphatidylserine	1 ± 0.1 (a,b)	5 ± 0.9 (c)	2 ± 0.1 (b)	0.3 ± 0.1 (a)
Phosphatidylinositol	0.2 ± 0.1 (a)	2 ± 0.3 (b)	0.1 ± 0.1 (a)	0.1 ± 0.1 (a)

Note: Differences among species for each parameter were calculated by one-way ANOVA followed by Scheffé post hoc test at $P = 0.05$ level. Values belonging to the same subset are followed by the same letter in parentheses

Resultados e discussão

Table 5 Fatty acid distribution in the ghost phospholipids of four species of fish: percentage of each fatty acid (mean of four determinations) ± SE

	C. hamatus	*T. bernacchii*	*C. auratus*	*A. anguilla*
14:0	6.5 ± 0.5 (a)	11.9 ± 0.7 (b)	9.0 ± 1.0 (a,b)	13.7 ± 0.7 (b)
14:1, ω-3	16.0 ± 1.1 (a)	–	4.6 ± 0.8 (a,b)	13.8 ± 3.8 (a)
16:0	8.6 ± 0.6 (a)	32.1 ± 0.5 (b)	67.5 ± 3.5 (c)	56.3 ± 0.7 (d)
16:1, ω-7	4.2 ± 0.8 (a)	24.6 ± 1.1 (b)	10.5 ± 3.5 (a)	4.6 ± 0.6 (a)
16:2, ω-3	–	10.3 ± 1.4 (a)	–	1.1 ± 0.1 (b)
18:0	4.1 ± 0.1 (a)	14.2 ± 1.7 (b)	1.7 ± 0.2 (a)	4.5 ± 0.8 (a)
18:1, ω-9	6.6 ± 0.8 (a,b)	8.2 ± 1.1 (b)	1.5 ± 0.5 (b,c)	2.5 ± 0.5 (b)
18:2, ω-6	–	–	6.3 ± 2.1	–
18:3, ω-6	–	–	1.1 ± 0.2	–
20:1, ω-9	13.9 ± 1.1 (a)	–	0.8 ± 0.3 (b)	–
20:5, ω-3	11.3 ± 0.7	–	–	–
22:1, ω-11	9.6 ± 0.3	–	–	–
22:6, ω-3	20.5 ± 1.5	–	–	–
Average double-bonds per fatty acyl chain[a]	2.30	0.53	0.32	0.23

Note: Differences among species for each parameter were calculated by one-way ANOVA followed by Scheffé post hoc test at $P = 0.05$ level. Values belonging to the same subset are followed by the same letter in parentheses

[a] The sum of the percentage of each unsaturated fatty acid × number of double bonds/100

Resultados e discussão

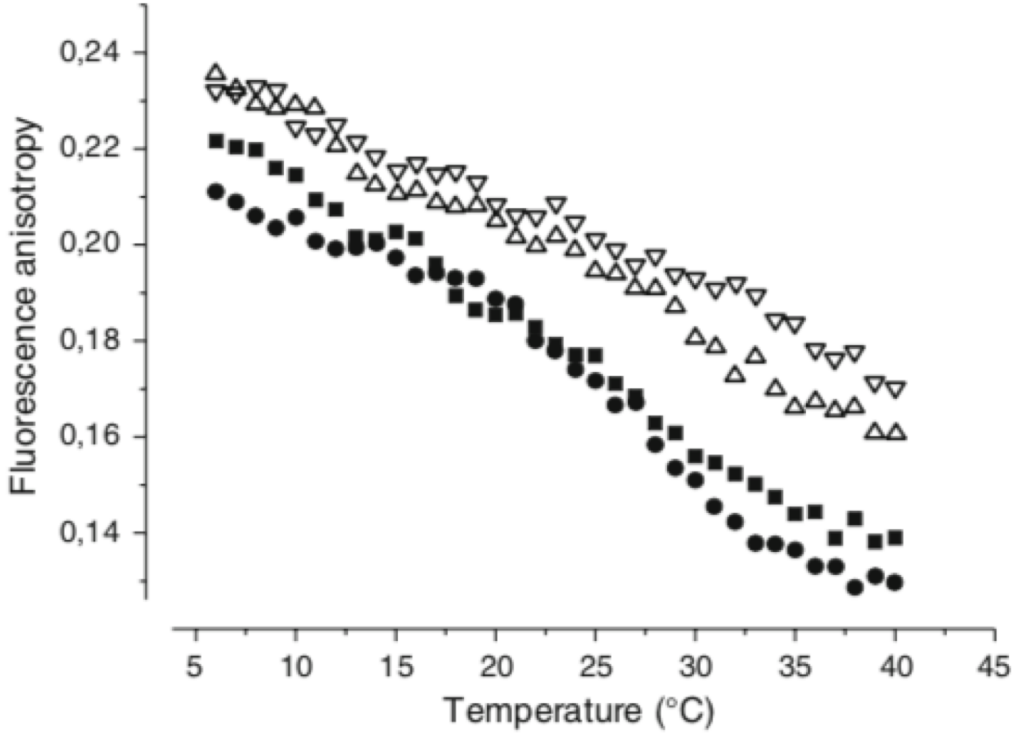


Fig. 1 Fluorescence anisotropy (fa) of diphenylhexatriene scan from 5°C to 40°C. ●-●, *T. bernacchii*; ■-■, *C. hamatus*; △-△, *C. auratus*; △-△, *A. Anguilla*. We calculated the parameters of the straight-line (two samples for each fish) best-fitting experimental data and obtained the following correlation equations (T = temperature): *C. hamatus*, fa = 0.239 − 0.003T; *T. bernachii*, fa = 0.235 − 0.003T; *C. auratus*, fa = 0.249 − 0.002T; and *A. anguilla*, fa = 0.245 − 0.002T

Conclusão

A viscosidade da membrana é semelhante nas duas espécies antárticas, no entanto essa similaridade é obtida por meio de diferentes estratégias.

Obrigada!

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