

## テラピアとグラミーの消化管内における偏性嫌気性菌の分布

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## Short Paper

## Distribution of Obligate Anaerobes in the Alimentary Tract of Tilapia and Gourami

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Microflora in the alimentary tract of fish has been investigated from the aspects of microbial ecology, fish nutrition, fish disease and public health. In general, the intestinal tracts of fish are known to harbor indigenous facultative anaerobes as the predominant bacteria. However, it has been found that obligate anaerobic bacteria are distributed in the intestinal tract of various freshwater fish including grass carp,<sup>1)</sup> goldfish, carp, ayu, tilapia<sup>2,3)</sup> and sturgeon.<sup>4)</sup>

In this study, the authors attempted to isolate aerobic and anaerobic bacteria from the alimentary tract of tropical freshwater fish such as tilapia and gourami by use of various selective media.

Tilapia *Oreochromis niloticus*, giant gourami *Ospromemus goramy*, carp *Cyprinus carpio* and ayu *Plecoglossus altivelis* were obtained from aquaculture ponds in Kagoshima Prefecture, and kissing gourami *Helostoma temminckii*, silver gourami *Trichogaster microlepis*, golden and marble gourami *Trichogaster trichopterus*, angelfish *Pterophyllum scalare* and goldfish *Carassius auratus* were purchased from an ornamental fish shop. The contents of the alimentary tract of fish (3 samples) were homogenized in a mortar and then diluted with dilution solution under exposure to N<sub>2</sub> gas. Aliquots (0.05–0.1 ml) of dilution solutions from appropriate dilution tubes were spread on different kinds of agar media including Z-AII, KS, EG, NBGT-1/3S (abbreviated as NBS in this paper), NBO/AS and NBC/BS. Z-AII and KS plates were incubated at 25° under aerobic condition, while EG, NBS, NBO/AS and NBC/BS plates were incubated at 25°C under anaerobic condition (anaerobic jar with N<sub>2</sub> gas) as described in previous papers.<sup>2,5)</sup>

Table 1 shows viable counts on Z-AII (total aerobes) and NBS (total obligate anaerobes), and taxonomic compositions of microflora isolated on EG plates (facultative and obligate anaerobes) from the alimentary tract of freshwater fish. In the alimentary tract of tro-

pical fish examined, numbers of obligate anaerobes exceeded those of facultative anaerobes. On the other hand, the reverse was true for Japanese cultured fish such as carp, goldfish and ayu. Especially giant gourami has a well-developed alimentary tract crammed with contents and obligate anaerobes outnumbered facultative anaerobes even in the stomach as well as the intestine. *Bacteroides* ATS was predominant in the intestines of tilapia and gourami except giant gourami, whereas various kinds of obligate anaerobes including *Bacteroides* ATS and BTS, *Bacteroidaceae*, *Clostridium* and spiral bacteria were isolated from the alimentary tract of giant gourami. As concerns aerobic and facultative microflora, *Aeromonas* was predominant in Japanese cultured fish, while *Plesiomonas shigelloides* and *Enterobacteriaceae* besides *Aeromonas* were isolated as significant ingredients from the alimentary tract of tropical fish.

Tropical fish examined in this study inhabit originally sluggish inland waters including lake, pond and river, and feed on the abundant planktonic algae and sedimental materials derived from planktonic algae and higher plants. It is speculated that much higher populations of obligately anaerobic bacteria can develop in the digestive tracts of the tropical fish compared with the Japanese cultured fish such as carp, goldfish and ayu because of their feeding habits and the structures of digestive tracts. Further work is required to determine the distribution and ecological significance of these anaerobic bacteria.

## References

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Table 1. Viable counts and taxonomic compositions of anaerobic microflora in the alimentary tract of tropical freshwater fish

Fish samples	B.W.* <sup>3</sup> (g)	Organ* <sup>1</sup>	Viable count (log No./g)		Taxonomic composition (%)* <sup>2</sup> on EG agar					
			Z-AII	NBS	B. ATS	B. BTS	Bact.	Clost.	Spir.	Fac.* <sup>4</sup>
Tilapia	750	P. I.	8.1	8.4	65	20	3	0	0	13
Giant G.* <sup>5</sup>	680	S.	5.2	6.9	35	3	8	53	0	0
		A. I.	6.7	8.6	33	15	43	8	3	0
		P. I.	7.0	9.2	20	50	13	10	8	0
Kissing G.	2.3	I.	6.5	7.4	45	0	48	0	3	5
Silver G.	1.7	I.	7.3	7.7	58	13	8	5	0	18
Golden G.	3.9	I.	6.9	7.5	68	8	0	0	0	25
Marble G.	1.9	I.	7.0	7.6	63	28	3	0	0	8
Angelfish	2.8	I.	8.4	8.8	10	0	70	3	0	18
Goldfish	8.7	I.	9.4	8.6	10	3	3	0	0	85
Carp	91	I.	8.3	7.9	10	0	0	0	0	90
Ayu	115	I.	7.5	6.3	10	0	0	0	0	90

\*<sup>1</sup> P. I.; posterior intestine, S.; stomach, A. I.; anterior intestine, I.; whole intestine.

\*<sup>2</sup> percentage expressed as the nearest integral number.

\*<sup>3</sup> Body weight (average of 3 samples).

\*<sup>4</sup> B. ATS; *Bacteroides* ATS, B. BTS; *Bacteroides* BTS, Bact.; *Bacteroidaceae*, Clost.; *Clostridium*, Spir.; spiral shape bacteria, Fac.;

facultative anaerobes.

\*<sup>5</sup> G.; gourami.

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