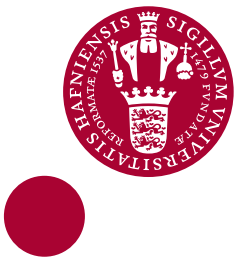

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Tainting of Rainbow Trout By Taste and Odor Compounds in Freshwater Aquaculture Systems in Denmark

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Abstract

Breeding of rainbow trout in Denmark is gradually shifting from traditional flow-through pond systems to larger raceway systems with up to 95% water recirculation. The intensive systems are constructed to meet environmental legislation, aimed at reducing water consumption from streams and rivers, and to establish more efficient and economically attractive breeding practices in aquaculture.

An unexpected and negative consequence of the water recirculation has been increasing problems with spoiled fish products caused by taste and odor compounds (TOC) such as geosmin and methylisoborneol (MIB). As compared to traditional flow-through pond systems, concentrations of TOCs are 5- to 10-fold higher in the recirculating systems. The dominant source of TOCs appears to be cyanobacteria growing on surfaces of walls and canals, but streptomycete bacteria in biofilters in water treatment basins may also contribute to TOC.

In a recent study of 200 trout from Danish raceway systems, about 90% of the fish had a geosmin level above the human threshold for detection (0.1 µg kg^{-1}), and sensory panels characterized the taste and smell of several fish as "muddy". When concentrations of geosmin in the water were plotted against concentrations in the fish, an almost linear relationship was found. The graph suggested that geosmin concentrations above 10 ng l^{-1} in the water might cause off-taste in the fish.

In an attempt to reduce levels of TOCs in the fish, the trout are transferred to depuration basins with clean water about a week before slaughtering. Drawbacks of this procedure are that large volumes of water are needed, it is difficult to keep the water free of TOCs, and the fish cannot be fed in the basins.

Episodes of high TOC concentrations in recirculating aquaculture may be forecast if growth of specific, TOC-producing organisms can be predicted. Application of sensitive, molecular methods for detection of cyanobacteria, streptomycete bacteria and other TOC-producing microorganisms will be discussed.