Reducing the effect of pre-slaughter fasting on the stress response of rainbow trout (Oncorhynchus mykiss)

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Abstract

Fasting is commonly used in aquaculture to empty the gut before slaughter, but little is known about how feeding frequency before fasting affects the stress response of trout. To find out more, 240 rainbow trout (Oncorhynchus mykiss) were separated into three groups with different feeding schedules during the final month of fattening, from 26 September to 28 October 2013 (daily, every two days or every four days) and two durations of pre-slaughter fasting (two days of fasting: 24.3 degree days, to nine days of fasting; 102 degree days). After slaughter, a number of stress-related parameters were measured, such as liver glycogen, skin/gill colour and haematological parameters (cortisol, glucose, lactate, triglycerides, lactate dehydrogenase and creatine phosphokinase). Trout given food every two days on the farm had lower levels of cortisol and higher levels of triglycerides and liver glycogen than the other treatments after two days of fasting; indicating that habituating trout to feed once every two days in the final month of fattening lowered their stress response to two days of fasting before slaughter.

Keywords: animal welfare, cortisol, fasting, glycogen, rainbow trout, stress response

Introduction

In aquaculture, the fasting of fish prior to slaughter is commonly practiced to evacuate the gut and reduce oxygen demand and waste production (Lines & Spence 2012). In recent years concerns regarding the maximum permissible duration of the fasting have been raised for different continental (Barcellos et al 2010) and marine fish (Morkore et al 2008). In trout, the Farm Animal Welfare Council recommends a 48-h limit on fasting (FAWC 1996), arguing that the welfare of farmed fish that have been fed regularly will be affected negatively by a sudden cessation of feeding. However, it is also important to consider the effect of feeding frequency before fasting. Rainbow trout (Oncorhynchus mykiss) in the wild, as most carnivorous fish, live a life of feast and famine, where prey is distributed heterogeneously in space and time (Armstrong & Schindler 2011). Fish can store energy when abundant and mobilise it during fasting, although both processes have limitations dependent upon species, life stage, environmental conditions and habituation.

Many recent publications have considered the effect of feeding frequency on fish growth and welfare (eg Cañon Jones et al 2012) but fewer have considered the effect of intermittent access to feed and its effect on the reaction to short-term pre-slaughter fasting. In the wild, most carnivorous fish have one meal every two days (Armstrong & Schindler 2011), suggesting that trout could adapt to a skip a day system, commonly used in poultry (Oyedeji & Atteh 2005) and tested on other fish, such as nile tilapia (Oreochromis niloticus) (Villarroel et al 2011). Although fish may present motivational mechanisms for feeding when nutritional reserves are low (eg Metcalfe & Thorpe 1992), farmed rainbow trout can fast for weeks (Ashley 2007) with no apparent negative effect on stress physiology or behaviour (Pottinger et al 2003; Jentoft et al 2005). More recently, a number of authors have analysed the effect of short-term fasting (up to three days) on plasma stress indicators in rainbow trout (Hoseini et al 2013), including the effect of water temperature (López-Luna et al 2013) and its effect on flesh quality (López-Luna et al 2014) but few studies have considered the effect of different feeding schedules in the final month of fattening on pre-slaughter fasting stress or compared extremes of fasting in terms of degree days (for example 20ºC days vs values over 65ºC days).