

## New Zealand Society of Animal Production online archive

This paper is from the New Zealand Society for Animal Production online archive. NZSAP holds a regular annual conference in June or July each year for the presentation of technical and applied topics in animal production. NZSAP plays an important role as a forum fostering research in all areas of animal production including production systems, nutrition, meat science, animal welfare, wool science, animal breeding and genetics.

An invitation is extended to all those involved in the field of animal production to apply for membership of the New Zealand Society of Animal Production at our website [www.nzsap.org.nz](http://www.nzsap.org.nz)

[View All Proceedings](#)

[Next Conference](#)

[Join NZSAP](#)

The New Zealand Society of Animal Production in publishing the conference proceedings is engaged in disseminating information, not rendering professional advice or services. The views expressed herein do not necessarily represent the views of the New Zealand Society of Animal Production and the New Zealand Society of Animal Production expressly disclaims any form of liability with respect to anything done or omitted to be done in reliance upon the contents of these proceedings.

This work is licensed under a [Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License](http://creativecommons.org/licenses/by-nc-nd/4.0/).



You are free to:

**Share**— copy and redistribute the material in any medium or format

Under the following terms:

**Attribution** — You must give [appropriate credit](#), provide a link to the license, and [indicate if changes were made](#). You may do so in any reasonable manner, but not in any way that suggests the licensor endorses you or your use.

**NonCommercial** — You may not use the material for [commercial purposes](#).

**NoDerivatives** — If you [remix, transform, or build upon](#) the material, you may not distribute the modified material.

<http://creativecommons.org.nz/licences/licences-explained/>

## BRIEF COMMUNICATION

## Growth responses of fat and muscle in the lamb to intra-arterial infusions of bovine insulin

J.E. WOLFF AND D.R. PETRIE

Ruakura Agricultural Centre, MAF Technology, Hamilton

**Keywords** Insulin; fat; muscle; lambs.

Over the past five years we have developed a whole animal preparation to examine the direct effects of insulin on the growth of fat and muscle in the lamb. This was done by infusing the hormone intra-arterially to raise its concentration in the blood perfusing tissues of one leg compared to the contralateral leg which has acted as a control. The approach has reduced the amount of insulin infused and has prevented effects of hyperinsulinaemia, such as hypoglycaemia or the release of counter-regulatory hormones, from completely opposing the anabolic actions of insulin.

Twenty-one Romney or Coopworth crossbred lambs of 12-15 weeks of age were surgically prepared with small catheters placed in the external iliac arteries and veins of each hind leg as previously described (Wolff *et al.* (1989). Sterile saline (9 g.l<sup>-1</sup>) was pumped at a rate of 0.1 ml.min<sup>-1</sup> through all catheters. Two to three weeks later, lambs with functional catheters were randomly assigned to different dose rates of bovine insulin, ranging from 0 to 0.46 mU.min<sup>-1</sup>.kg liveweight<sup>-1</sup>. For each lamb the insulin was added to the saline infused into the left or right arterial catheter (decided randomly) for 30 d. Following slaughter of the lambs, hindquarters were separated from the carcass. Major muscles, fat depots and bones were dissected (Wolff *et al.*, 1989) with the weight of tissues from the treated side being expressed as a ratio of those from the control side. Responses of both muscle (M) and fat (F) were

both linearly related to the infusion rate of insulin (I, mU.min<sup>-1</sup>.kg<sup>-1</sup>).

$$M = 1.192(+0.028) * I (R^2 = 0.68).$$

$$F = 1.432(+0.070) * I (R^2 = 0.64)$$

Bone weights were not significantly altered by insulin.

These data show that insulin was anabolic for both muscle and fat in the weaned lamb and that the incremental response of fat to insulin (fractional part of the coefficient) was more than twice as great as the muscle response. The result provides an explanation for the propensity of weaned lambs to deposit excessive amounts of fat in the carcass when they are fed high energy diets that would raise systemic insulin concentrations. We also found (Wolff *et al.*, 1989) that the muscle response diminished as lambs got older or heavier, so it is possible that the sensitivity of muscle growth to insulin may be one of the co-ordinated mechanisms that define the mature body size of an animal.

## REFERENCE

- Wolff J.E.; Dobbie P.M.; Petrie D.R. 1989. Anabolic effects of insulin in growing lambs. *Quarterly Journal of Experimental Physiology* 74: 451-463.