

Effect of stress on reproduction in pigs

V. Ramesh, Thanga Thamil Vanan and A. Varadharajan*

Assistant Professors,
Department of Livestock Production and Management,
Madras Veterinary College, Chennai - 600 007.

Effects of stress on animals and on its products, is a notoriously difficult concept to evaluate. It is well established that stress has a profound effect on the biology of pigs and the outcome of high stress systems is reduced productive efficiency. Reproductive processes are particularly affected by stress and some of the manifestations are reduced litter size, failure to show oestrus, poor conception rates and sporadic puberty attainment.

The principal effects of acute or chronic stress are on the endocrine system, the immune system and on the central nervous system (CNS), and these are associated with profound changes in the animal's behaviour. All these adaptations are components of the overall attempt by the animal to maintain homeostasis in a rapidly changing environment.

Mechanism

In stressed animals, endocrine changes are probably driven by the release of corticotrophin releasing factor (CRF) from the hypothalamus and the subsequent release of adrenocorticotrophin hormone (ACTH) from the anterior pituitary gland and corticosteroids from the adrenal cortex. Concurrently, there is production and release of B-endorphin from the hypophysis.

These hormonal changes in a young growing animal assist its ability to cope with stress, but in a reproducing female there is a cascade of other hormonal events, which stem from the original disturbance. These secondary events lead to either complete infertility or at the very least result in reduced reproductive efficiency.

Stressors

Stressors, which are factors causing stress in sows and gilts come in a variety of guises such as relocation, mixing into new social groups and environmental temperatures. One of the more important stressors may be associated with the man-animal interactions existing on individual farms.

In breeding females, the specific events of reproductive life such as weaning, mating and parturition also represent major stressors as evidenced by the rise in corticosteroid concentrations during these activities.

Nutritional stress is another factor which may be extremely important. Under nutrition can be judged against published nutrient requirements but pregnant sows, which are on maintenance energy intake in pregnancy and which are

accommodated in sow stalls exhibit stereotypic behaviour symptomatic of chronic stress. Pregnant sows should be offered high-fibre diets with the same energy supply, and should be fed more than once a day in order to circumvent this problem.

Anoestrus and infertility

Ovarian function depends on a finely balanced hormonal control of the hypophyseal-ovarian axis. The timing of endocrine surges and feedback control is crucial to the recruitment of follicles, their ultimate maturation and the production of viable ova. Any disruption of the sequence of events will inevitably result in endocrine chaos.

It is well established that elevated peripheral concentrations of cortisol in the immediate hours or days up to ovulation lead to asynchrony in the principal physiological events, and the reduced LH levels seen are responsible for inadequate luteinization of the mature follicles.

Cystic follicles are then formed and the ovaries may be rendered completely quiescent for an indefinite period in terms of ova production. Overtly, the breeding female will either be in constant oestrus (nympomania) or will be anoestrus for a considerable period.

In herds where intractable infertility is seen associated with chronic stress, usually a high level of stereotypic or displacement activity would also be observed. These behaviour patterns in pigs are characterized clearly in the phenomenon of 'bar-biting' and as vices such as 'tail-biting' in young pigs. In older animals, it could also be exhibited as hyperaggressive behaviour or poor maternal instinct.

Stereotypic behaviour provides a means whereby animals can cope with adverse environments and stressful situations whilst still maintaining homeostasis. Animals release endogenous opioid peptides such as B-endorphin during episodes of stereotypic activity and this alleviates the acute psychological pressure imposed by the stress. B-endorphin is in itself a hormone, which has inhibitory effects on the reproductive system and in fact is part of the normal mechanism causing anovulatory and anoestrus states in sows during lactation.

Social stress and stocking density

Social stressors are more difficult to define and understand, but situations

involving overcrowding in large groups are best avoided in a commercial environment. Individual animals probably react differently to the various stressors which they experience.

Stocking density and group size in group of cycling gilts can significantly affect their propensity to show a normal oestrus, successful mating and conception.

Reducing the space allowance by increasing group size increases the age at puberty. Housing enrichments in the form of wallowing, sprinkling and free access to range area, aid the gilts to reach puberty earlier.

Mating and service management

The successful throughput of breeding females in a modern pig unit depends largely on the success in mating females at regular intervals. In practice, the supply of mated females is often highly unpredictable. When a sow is weaned she must be under considerable stress as evidenced by behaviour patterns after weaning and the elevation of

corticosteroid hormones. Within 4 to 7 days of weaning, sows are subjected to the large stock boar and hopefully mating takes place. This must also represent a considerable stress to the animals.

In some circumstances, it is believed that stress can have positive effects in terms of reproductive performance. This represents something of a dilemma. We are well aware of the negative influences of stress on reproduction but there is a situation where stress has a beneficial effect. It is usually thought that between the extremes of minimal stress and acute stress is an optimum level of stress which is beneficial to the animal's reproduction.

Social isolation from a very early age (10 kg live weight) can have dramatic effects on both libido in boars and the mating behaviour of sows and gilts. Social deprivation in early life expressed libido significantly and reduces the expression of oestrus behaviour because of the ethological consequences of a poor social environment in early life.

Embryo Loss

The handling and husbandry of sows and gilts in early pregnancy is critical to the achievement of high prolificacy. At the time of implantation when delicate hormonal changes occur, stress can have severe deleterious effects on the prospects of embryo survival.

In the first 3 weeks of pregnancy, the fertilized eggs are delicately attached to the lining of the uterus. Any disturbances to the dam at this stage will cause hormonal upsets and increase the number of eggs rejected by the uterine lining.

It is now generally accepted that females should not be moved from the service area until 4 weeks after service.

This allows for a check on any animal returning to service at about 3 weeks after the initial mating and also helps to minimize the amount of stress that sows and gilts are exposed to at this time. Leaving the sows in the same accommodation for 4 weeks after service allows the maximum development of viable eggs for all sows.

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STRESS IS A REALITY



CAUSING HEAVY LOSSES IN LIVESTOCK FARMING

Introducing

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- Poor quantity/quality of semen
- Poor fertility
- Off feed and related disorders
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