BREEDING & CALVES

In-vitro fertilisation (IVF) treatment to speed up genetic advancement in cattle is a relatively new technique, but it is predicted to become a mainstream breeding tool over the next five to 10 years. **Wendy Short** reports.

Increasing productivity through IVF techniques

Cattle in-vitro fertilisation (IVF) programmes were just getting underway in this country when the foot-and-mouth epidemic started, says vet David Black, of the Cumbria-based advanced breeding technology consortium, Activf-ET.

The disease halted progress and led to the UK falling behind other countries, such as the USA, South America and Canada.

However, Mr Black believes IVF will soon overtake multiple ovulation embryo transfer (MOET) as a breeding technique, due to the greater benefits it offers.

He says: "IVF is standard practice in humans, where it is often perceived as a last resort for couples whose fertility might be compromised.

"Unsurprisingly, the same process used on cattle is sometimes viewed in a similar light.

"Bovine IVF gives producers the chance to breed from a virgin heifer, a pregnant cow, or an animal with high genetic merit which cannot get in-calf.

"A cow can have a low grade uterine infection which is not linked to her breeding history in any way, for example.

"Her embryos can be harvested, fertilised and placed in a surrogate.

"The practice is not intended to be used only on animals which are inherently infertile; it is very effective in cows of normal fertility, and this is where the future lies."

The overriding aim of MOET and IVF procedures is the same; to produce high numbers of viable embryos from animals of high genetic merit or with particular desirable traits, says Mr Black.

However, IVF offers the potential to harvest a higher number of progeny from a single animal, as the collection of eggs can be carried out within a shorter time frame and with greater flexibility.

The IVF technique uses unfertilised eggs, which are collected from the donor at a centre and transferred to a laboratory.

> **"It is very effective in cows of normal fertility, and this is where the future lies**
> DAVID BLACK

Faster

IVF cycles can be managed on a fortnightly, or even weekly basis. By contrast, a typical MOET donor collection procedure operates on a 60-day cycle.

Embryos produced from either technique can be stored indefinitely in liquid nitrogen.

With IVF still a relatively new concept in the UK, Activf-ET is currently the only organisation offering the service.

It has three ovum pick-up (OPU) teams, situated in Cumbria, Cheshire and Yorkshire, and cows travel to the centres for egg collection.

At present, a charge for the procedure only applies if a successful pregnancy follows. The service, which is non-surgical and fairly straightforward, is in direct competition with ET. Mr Black predicts prices will come down as it is taken up more widely and the technique is refined further.

He says: "IVF can also be viewed as a genetic 'insurance policy'. If it had been adopted before the foot-and-mouth outbreak, our national herd might look very different.

"Because we can collect eggs so frequently with IVF, there is the opportunity to use a different bull every week, if required. This means we can select from a wider pool of genetics and make faster genetic progress."

The advances in cattle embryo production are likely to have a close affiliation to the rapidly developing use of genomics in the UK, says Mr Black.

"In Canada, techniques are being developed to assess the genomic make-up of an embryo, to provide information on the traits it is likely to exhibit," he says.

"It is only a matter of time before this country follows suit. Using genomic predictions in conjunction with IVF means in future, a producer could order an embryo with known genomics to be transferred to his recipient cow on a particular day of his choosing.

"Access to embryo genomics, which includes the option to select the gender of the animal, could mean a producer will request a female embryo which has high health and fertility traits, good production traits, high immune status and even a level of TB resistance, for example.

"The use of IVF in cattle is not genetic manipulation; it is actually not unlike other breeding techniques – the main difference is that it is faster.

During ovum pick-up, the donor is given an epidural. An ultrasound vaginal probe carries the guided needle used for egg removal.