

Farm Animal Industrial Platform (FAIP)

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The importance of cloning in bovine selection

Research in animal cloning has brought forward an abundance of extremely useful knowledge in the area of reproduction and embryology. This wealth on information is in glaring contrast with the very low number of practical applications that can be foreseen in cattle in the medium term. Effectively, the very uncertain and low results of the technology ranging from 2-3 %, make the revenues too prohibitive for application at a large scale. Moreover, there are a lot of phenotypical abnormalities, especially in the perinatal phase.

For this reason the utilization together with transgenesis is often evoked. In this respect, our opinion meets the opinion of INRA: as long as we are not very sure of whatsoever transmitted by the “blind” transgenesis, application is not a feasible option and we need to master the “homologue recombination” before envisaging such application.

The following points need to be addressed before applications can take place:

- society needs to give the green light for application of cloning in the area of animal food production is possible. It is worth noticing that the products in question – milk and meat – are identical to the products of the ‘traditional’ animals. This point is crucial because the breeding industry is working for the society and it’s work has to be fully acceptable.
- it is necessary to prove that the genetic distances between clones and their donors are very small so that it is trustworthy to say that the genetic value of the donor is sufficiently equal to the genetic value of the clone. This may be insufficient, because it would be disastrous to learn that a cloned elite bull would be the carrier of a defect while its donor is not!
- an official authorization of Public Affairs Offices will be necessary, at least in France, before applications can be developed.

Therefore, practical applications may be possible if the technical problems are solved.

The cloning of female animals is interesting in selection schemes as a way to strengthen the reproduction potential of female elite animals and for improving the reliability of genetic evaluations on the female side. Embryonic cloning can be integrated well into selection programmes, assisted by markers providing sufficient DNA to the candidate embryos.

In terms of creating genetic progress cloning offers very little interest if compared to the classical selection system which is based on selection on the male side mainly.

The most obvious interest is certainly the dissemination of genetic progress, even if already ‘old fashioned’ genetics are disseminated:

- it is no longer necessary to loose bulls by accident or disease if we are able to make a stock of fibroblasts and, if such a case arises, to ‘reconstruct’ the animal by means of cloning;
- the reproductive life of bulls of certain breeds with very little genetic progress can be prolonged (typical example bulls of beef breeds used in out-crossing to produce beef animals from dairy cows).. The extension of the reproductive life of very famous dairy bulls will enable to receive commercial profit but not to improve genetic progress from these bulls;
- genetic dissemination by means of natural service bulls would be possible for male clones of a donor evaluated very good, should this operation be technically and economically viable.

With the current state of the techniques there is little risk with regard to genetic variability, as the size of the clones is obligatory small. The real risk is always the low number of males disseminated in the populations.

It should be mentioned that cloning may enable the rescue of certain rare lines or breeds that would be lost with classical methods because with the classical methods the effectiveness of the breeding programme is extremely reduced below a certain number of animals. By means of anecdote: INRA has managed to realize the rescue of the last cow of the 'Bleue du Bazougé' race!

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Notes at seminar UNCEIA-INRA, January 2003.