

THE
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The Cloning of Tamarillo

We have recently arranged to clone our Part Bred Arab gelding eventer Tamarillo and this article is an attempt to explain why we did this and to describe some issues to do with the biology of cloning and with the reactions of some people to the idea of doing it. The reason why we sought to clone our event horse was that we wish to preserve his genetic make-up, just as one would want to breed from any champion.

Words by Finn Guinness

Photographs from Biddesden archives unless stated

Unfortunately Tamarillo was gelded long before his abilities were proven so that the magic of his genetic make-up would be consigned to oblivion when he dies, just like that of all champion geldings in the past. Cloning provides us with the opportunity to overcome this situation and to salvage his genes for future generations. There will be the usual uncertainties with breeding from any animal – the great performers are not always great sires, but at least cloning gives us a chance.

The reason why Tamarillo seemed worthy of cloning was, and is, his special abilities. Eventers can sometimes succeed by being just fairly good at all the disciplines. Tamarillo was outstandingly able in some directions and this makes him especially interesting for breeding. He was a big mover with an exciting cadence and freedom of trot. He was also extremely agile – people who followed his career may remember two occasions seen on television when he got out of trouble competing at Badminton, once when he tripped in Huntsman's Close and another time getting out of the last element of the Quarry when close to home. He demonstrated superb stamina at Badminton and at Burghley when winning there in the rain and he seemed to find the big fences easy.

Cloning is performed as follows: a sample of skin cells is taken from the neck and put into culture. The nucleus of one of these cells is then substituted for the nucleus in an equine egg and the resulting 'fertilised' egg is given a tiny electric shock which activates development. The embryo is allowed to develop in culture for a few days and then placed in the



Tamarillo at the top of his eventing career with William Fox-Pitt

...of a recipient mare at the right
...to assume a pregnancy.

...in the case of Tomatillo, as our clone is
...named, Kathleen McNulty of Replica
...Farms took the skin cells from Tamarillo
...in suitable culture medium on the plane
...in North America where there is a centre
...of expertise for equine cloning – from
...micro-injectors in their laboratories to
...recipient mares at pasture awaiting the
...call. Cloning of amphibians, notably the
...American clawed toad *Xenopus laevis*, has been



Tomatillo

practised for fifty years but the cloning
of mammals presented special problems;
particularly the much smaller size of the
eggs and a further fundamental problem
which is the epigenetic programming
of the pronuclei. This last point was
demonstrated by the experimental
substitution of a mammalian egg nucleus
with two sperm nuclei and the parallel
treatment of another egg which was given
two egg nuclei. The two 'fertilised' eggs
developed very differently, the egg with
two sperm nuclei just making placental
tissue and the one with two egg nuclei
making embryo tissue but no placenta.
For some time this special feature of
mammalian embryogenesis was thought
to make the cloning of mammals
impossible but when the birth of Dolly
the sheep was announced it was realised
that the genes can be re-programmed
in time to make a proper embryo and
pregnancy. This does not occur every
time that cloning is attempted but faulty
development usually involves the early
stages. People have looked closely for
abnormalities in clones and some were
found in the early days of cloning. Larger
than normal lambs was one peculiarity
– this was prevented by improved culture
technique – and premature ageing was
thought to be another, though this does
not seem to be the norm. The shortened

gives rise to a clone are somehow
regenerated in the egg. We think that foals
begot by clones (i.e. the next generation),
will be normal and the evidence so far is
in favour of this.

We have had a variety of comments and
questions about our cloning project,
bringing up all sorts of aspects and
angles. The first and most unexpected
question we had was "Will it be a colt
or a filly?" This question shows that the
questioner has not thought about cloning
very much (which is often the case).
Actually, it might be possible to clone an
alligator and have both male and female
results. Apparently the temperature of
the incubation can determine the sex
of baby alligators. With mammals the
sex is chromosomally determined and
all members of a clone will have the
same sex. Second question: "Won't you
have to clone the rider too?" This could
very well be the case, i.e. to get the same
performance you might need to have the
same rider. In our case we want Tomatillo
for a different purpose – breeding – so the
riding side of things will be ancillary to the
project, though it may be interesting and

revealing. Third question: "He won't be
the same, will he?" Identical twin horses
often have different white markings
and this seems to be because the cells
concerned with generating white socks
and other markings are highly mobile
during development. Other features in
twins and clones are generally remarkably
similar. Morphogenesis, the development
of shape and form, seems to be
determined to a highly accurate degree.
An example with which we are all familiar
is our own arms – they benefit from the
same nutrition and similar environmental
treatment but nevertheless the similarity
of most people's arms is remarkable. We
do not know how the body achieves this
parallel precision but we can observe its
prevalence.

Our approach to cloning is that it is an
extension to the principle of selective
breeding to which we all aspire. We want
to preserve and disseminate excellence
and the bloodlines where it is found. It is
not more complicated than that. We hope
to raise Tomatillo and then stand him at
stud at Biddesden for the benefit of our
own breeding programme and for anyone
else seeking stamina, agility, boldness
across country and big movement. ~

The Chairman of the Stud Book & Registration Committee, when asked about the subject of cloning by the Editors, confirmed that the Committee has received a request to register a Part Bred Arab clone which is currently under consideration.