

# Germans chip in cutting edge technology

Kan Yaw Chong

**S**ABAH took home one sobering realization from The Sumatran Rhino Crisis Summit in Singapore.

That awakening is that we must now put the best science into a very small remnant of rhinos of maybe 10 or less which have arrived at the gate of hell!

That's emergency!

Which requires the immediate scientific might of both Cincinnati Zoo and Berlin's Leipzig Institute for Zoo and Wildlife Research (IZW) combined to avert extinction.

Cincinnati Zoo has what I would call a "leading edge" in natural breeding in captivity, after siring three calves between 2001 and 2008 before helping Indonesia to breed a fourth in 2012.

Berlin on the other hand, has what Dr John Payne called "cutting edge" in advanced reproductive technology with other large mammals, and proved they could produce baby elephants from frozen semen harvested in the wild, and looks poised to use the same techniques to produce successful pregnancies in breeding programs, plus an experimental success in producing a test tube embryo in the Black rhino, noted Professor Thomas B Hildebrandt of IZW.

But even Dr Terri of Cincinnati Zoo says she has figured it out how to produce calves with the Indian rhino with frozen sperms.

But since cryopreservation is still lagging behind when it comes to the Sumatran rhino, artificial insemination and embryo transfer is not yet an option but stepped up research and collaboration is.

Anyway, the desperate crisis and emergency had convinced all the experts it's not who is best but what is best for the species.

Certainly, the German boys in Berlin have spent many years in Sabah and they are figuring out something with the Sumatran rhino, known to be an entirely different from other rhinos.

**Professor: Complex stuff but focus turns things around**

Can they do it?

"Complex" stuff, not easy, not something we can do in one week, it may take a year or two years but if we don't start with that I think we lose a lot of options and the long term outcomes for the Sumatran rhino is much insecure," said Prof Hildebrandt.

There is a quickie surprise there.

I had expected him to say 20 years but he thinks one or two years can see some results.

Focus makes a lot of difference, he says.

"I think if we really focus on the Sumatran rhino as in a crisis, we will have enough resources and support from the political side, NGOs and the scientific community," Prof Hildebrandt noted.

So natural breeding in captivity and advanced reproductive technology will move in parallel with neither the 'leading edge' nor the 'cutting edge' working at crossed purposes.

They all seem to recognize the need to distinguish between immediate, short, medium and long term goals to highlight the urgent from not so urgent.

**Prof: We'll use every method, every tool box in the game to push up reproductive success**

Hildebrandt says his immediate goal is to prevent and reverse extinction of the species.

"Our final goal is to establish a healthy population in a natural environment when maybe in 20 years, our children can see a lot of Sumatran rhinos on Sabah grounds that could be possible but if we fail..."

With that high dream and vision set in his heart, Hildebrandt said Berlin will leave no stones unturned to achieve a breakthrough, like Cincinnati.

"We will try to use every method and every tool box available and that means advanced reproductive technology has to be implemented," he promised.

"But it's quite complex, one team alone can't do it," Hildebrandt admitted

"It will take team work, so international collaboration is very important," he said.

"For example, we must use the knowledge already developed for reproductive medicine and also the livestock industry. We will use the techniques developed in these two branches and apply it to the Sumatran rhino but we have to modify and optimize these techniques," he said.

"If we make it, I think we can push up the breeding success much more than we can do with natural breeding right now," Prof Hildebrandt speculated.

**Part of the agenda: Use of surrogate mothers One problem with natural breeding is speed.**

The fact that the female takes three years to produce an offspring sets a natural limit, he noted.

"If advanced reproductive technology succeeds, we could implement surrogate mothers, that is, we can breed the Sumatran rhino with the help of other rhinos and multiply the number of individuals much faster," Hildebrandt shared his potential possibilities of breeding as many rhino babies and as fast as possible.

Everyone of the rhino experts are acutely aware that the long term survival of the species hangs on their genetic diversity.

So, it's not just about siring more babies, its about siring genetic integrity as well.

That's why Terri is keen to get Tam sent over to Cincinnati to mate with a totally unrelated Suci to pump in the genetic fortress.

It is really a radical and costly measure but it is crisis driven.

It just has to be done and you'll find in this report Prof. Hildebrandt agrees since he has already collected sperms from Tam.

**Widespread pathology part of the crisis**

A root cause of the crisis is widespread reproductive pathology which threatens the collapse of easy natural breeding.

But this is where people like Prof Hildebrandt and Dr Roobert Hermes had stepped in with their advanced reproductive technology to capture and freeze the genes of the animals which are actually reproductively dead.

"If we use these techniques, then we can incorporate much more genetic diversity because we can still utilize infertile individuals for the breeding program," he said.

"I think that's the big picture we are looking at, quite challenging but we are quite optimistic that we can achieve that," Prof Hildebrandt asserted.

So, hopefully, some happy breaking news will come from Berlin as well.

**Cutting edge advanced reproductive technology - what is it?**

What then is this cutting edge 'advanced reproductive technology'?

"For example, the most simple technique would be artificial insemination, then sperm cryopreservation so that they can exchange gametes," Prof Hildebrandt said.

"Actually, just a couple of days before the Crisis Summit, we did an ovum pickup in Tabin, Sabah. That means we harvested follicles from Puntung and look for assays, we can freeze these assays, we can mature these assays, we can use the assays in vitro fertilization systems," Prof Hildebrandt said.

"That means we bring the assays together with the sperms, produce an early embryo and then we can re-transplant the embryo into a Sumatran rhino but also into a surrogate mother, like a White rhino or a black rhino," he said.

**Reason Sabah needs high science to preserve species**

Datuk Dr John Payne talked a lot about the urgent need for Berlin's cutting edge technology to face Sabah's crisis of just a low 10 individuals, especially if all these low 10 that are eventually caught may disappoint every body like the euphoria over Puntung turned sour when they found just too many cysts in the uterus to produce any baby.

Hildebrandt confessed he did feel depressed about it at one point.

"At the moment, every single rhino we have in captivity in Sabah, has reproductive problems," Prof Hildebrandt said.

"For Tam, we can't really say if he is viable for natural breeding or not but we already started to bank his semen for the future so he is most likely capable to natural sire babies but Puntung - she has some issues in the uterus so that means she cannot conceive natural wise because there are too many cysts inside. So natural mating is not possible. In the end she will never be able to produce offsprings in this situation but with advanced technology we can harvest her assays, produce embryo out of her assays and then transplant these embryos into a surrogate mother. So I think advanced reproductive technology is a very good option to produce offsprings from Puntung what she by herself alone can't manage," Prof Hildebrandt explained how high science can squeeze babies out of reproductively dead female rhino to send vibes of hope in a grim situation.

"It is a little bit like what we apply to a woman or sue in the human field, if we have an infertile woman, she can still get pregnant with the help of reproductive technology."

**Gut feeling - can change the direction**

What is his gut feeling about the future of the Sumatran rhino?

"I think I was a little bit depressed how bad the situation is but this meeting here brings together brings together a lot of experts and a lot of people who are willing to dedicate a lot of resources, a lot of passion to save the rhino. So I think this is a very important meeting and that we'll have to secure hopefully the future of the animal."

So, it's not over the hill yet?

"No, we can't give up the hope, we are still at a situation where we can change the direction of this process. Maybe in 20 years, our children can see a lot of Sumatran rhino on the ground in Sabah."

American conservationists went all out to save nondescript animals but here is such a spectacular species in Sabah and Indonesia left languishing at the brink of extinction.

**Prof: Surprise how little support Sumatra rhino gets from politics and public**

What's his personal view of the Sumatran rhino?

"We really talked about that too in our last group session and it's quite surprising that the Sumatran rhino has so less support from the public and from the political side," Prof Hildebrandt wondered aloud.

"For us, it's a very charismatic animal yet tension for this crisis is very minimal. What happens is the orangutan is getting much more focus on the public and that's really a pity because the orangutan population is doing much better than the Sumatran rhino population but no body cares really. I think this meeting here has to open the eyes of a lot of officials and to raise more awareness about this crisis. We are experts, we do our part to support this process of saving the rhino."

So, what does he like about the Sumatran rhino?

"I think it's a very challenging animal because when we started we didn't understand the reproductive biology but all these examinations, all these tests we did in Sabah gave us a good knowledge on how the Sumatran rhino function and I think the Sabah rhino is the smallest rhino in the world, it's very trustful, it can easily be trained to be kept in captivity without any stress," Prof Hildebrandt said.

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Most mammals can't wait to have sex.

But getting Sumatran rhinos to do it turned out to be the biggest headache because they are extreme loners in nature, very aggressive and hostile even between female and female, except during a very brief spell when the female is estrous (the periodic sexual excitement in a female mammal, excluding human, that precedes ovulation).

The great challenge prompted the International Rhino Foundation to provide a grant to Dr Terri to investigate when the female ovulates when they become receptive to male advances.

She finally cracked the secret code that turned repeated failures to spectacular success.

"This one thing that has been very interesting which took us a year to figure out in Cincinnati is Sumatran rhinos are induced ovulators!" Dr Terri pointed out.

The big breakthrough discovery is Sumatran rhino ovulates only after mating when the ovary releases one or more eggs available for fertilisation, in response to hormonal change that occurs within the reproductive tract - a reproductive feature which makes this rhino very special and separates it from other rhinos!

"And what that means is that the female will not ovulate every 21 days, no matter what, she will only ovulate if she mated with the male or had some kind of physical interaction with the male" Dr Terri said.

"And if she doesn't ovulate, then her cycle length is variable and so you can't say every 28 days there is going to be an estrus (the periodic sexual excitement in a female mammal excluding human that precedes ovulation) if she is not ovulating. So, this is one fact that makes the Sumatran rhino more complex than other rhino species, where you know it's a 35-day cycle or a 45-day cycle," Dr Terri shared her insight.

"This means in natural breeding of the Sumatran rhino in captivity, you have to look at those ovaries and you have to see what's going on the ovaries," she stressed.

**Dr Terri explains the cyst epidemic**

**Daily Express:** The Sumatran rhino female seems to be very cyst-prone which damages fertility and fails breeding .What's the problem here?

**Dr Terri:** You know we see that reproductive pathology occurs in a lot of animals. We have noticed now in zoos that are not breeding on a regular basis. So the female, we think it's the continual exposure to the cyclic hormones and they need to undergo a pregnancy because that's the period, that's the time when they are not cycling consistently and it gives them a break and if they don't go through a pregnancy they seem to eventually develop this pathology

So we know it happens for that purpose, it's possible there are other factors involved. If the animals in Sabah are separated and are so fragmented that the females are not meeting males, then they are not getting pregnant and so the condition actually mimics other captive animals that are introduced to a male and so they develop a pathology in the wild simply because they are not finding a male and they are not conceiving.

**Estrogen stimulates cysts and tumor**

Dr Nan Schaefer, a Sumatran rhino reproduction physiologist and former chairman of SOS Rhino, who is no stranger to Sabah, highlighted the specifics.

"In the un-splintered wild, female Sumatran rhinos are pregnant most of the time so they are always under progesterone, a hormone secreted by the female reproductive system that functions to regulate the condition of the inner lining of the uterus. If they are not in the wild or live in a fragmented forest or in captivity,

and they are not pregnant, they are under estrogen and estrogen is one of the stimuli or triggers to the tumors. So, if they are not pregnant, there is so much estrogen to stimulate these tumors," Dr Schaefer said.

**Daily Express:** What sparked your interest to do this in the first place. I heard in the beginning, the zoo was keen to get some rhinos from Sabah to do this but they made an error of judgement and rejected the export? Did you first approach Sabah?

**Dr Terri:** I wasn't involved



Tam in Tabin - Despite low sperm count, Dr Terri thinks he may be able to sire babies with Suci.

in those parts in the 1980s, but I have seen all the paper work about it, yeah, apparently initially, Sabah agreed to work with the US with the rhinos but then there was an outcry, there was a protest about it and so they backed out.

**Daily Express:** So we missed the boat, now they have great regrets.

**Dr Terri:** You did, you did and some of those who have been involved in peninsula Malaysia they know that too.

**Daily Express:** So you were the Chief scientist behind the whole captive program?

**Dr Terri:** In Cincinnati, I was in charge of it, yes.

**A diet of over 200 species of wild plants**

**Daily Express:** We heard that this rhino needs to eat 200 species of plants, how did you to feed them in your zoo?

**Dr Terri:** We may not get 200 species of plants in our zoo. No, it's very difficult challenge because we are not in a real southern climate, it's not as warm as it is here year round, so during the growing period we can get some local browse but primarily we rely on first browse being flown in from California and from Florida. And they can grow it year round so we do get different varieties that the rhino seem to eat well and once we figured that out we have been able to keep them very healthy but it's not the diversity that they get in Indonesia. It's not 200 different varieties but it's about 20."

**The way forward for the world**

**Daily Express:** What's the way forward after all these discussions here over the last few days?

**Dr Terri:** (Laughs) You know, captive breeding was controversial when it started for good reason, but you know what was so concerned about and why this whole summit was called because despite some great protection, the wild population is declining at such a rapid rate that where once it just seemed like we had the option of either just protecting wild rhinos or doing both. I don't think we are going to have that option any more. It's too critical. We haven't stopped the decline in the wild population, more so now than when I got involved, I believe the captive breeding component is important and a strategy to save the species. And since we have gone through such a steep learning curve, granted there were problems in the past but now we have learnt and if we are smart we just continue to pass on to the next generation we should be able to succeed at a much higher rate than we did in the past. If you look at the last decade, I mean we stopped losing rhinos due to dietary problems, and we started producing offsprings and those were the two biggest challenges we had when the program started so I think we have

overcome some big hurdles."

Proven success - don't put rhinos in one basket

**Daily Express:** You have the proven success, the only proven success in the world in 124 years and as you said, not looking at hypothetical propositions?

**Dr Terri:** You know, and if you think about it, it's as much back and forth that goes on about rhinos being in zoos or not, you don't want all your rhinos in one place, you need to have them in several different locations because no body can predict when a disease out-

will in Malaysia and Sabah, did you need political will to do what you have been doing or were you self sufficient in terms of funds in the US?

**Dr Terri:** Yes, a lot of money is needed for this collaboration. Well, Cincinnati Zoo pays for itself, so everything I have done in Cincinnati, I raised my own funds, I kept the program going, I come over here and work, I pay for it myself. In addition, the International Rhino Foundation has been a huge, huge part of this programme. They provided all the funding for the Sumatran Rhino Sanctuary and has supported a lot of efforts in keeping that programme running and any kind of special services they need.

**Daily Express:** So, you have private solutions there in terms of money

**Dr Terri:** Yes, but it's very hard to get money, we struggle every year and part of the reason is there has only been 2 to 4 Sumatran rhinos in the US so there aren't a lot of zoos and people interested in supporting it.

**Daily Express:** How do you feel yourself, you go down in history as the first person in history as the first person having succeeded in captive breeding of Sumatran rhino? We are sure you are very happy.

**Dr Terri:** Very, very happy. You know, what I tend to do is I don't sit back and enjoy the successes, I always look forward to what more there is to do and we still have a long way to go, so I think more about what we haven't done yet and what we need to do and I don't sit back and think, wow, this is great what we have done! Its just part of the personality I guess.

**Daily Express:** So, the big question: Do you think we can succeed - to prevent the extinction of the species?

**Dr Terri:** We can, we still have time and we are at a much better place than we were in the 1980s. So the challenge is keeping our wildlife population alive as well. We need to keep that, no matter how small it gets we need to keep that wild population alive as well. We are not ready to give up on that. Terri agrees with Sabah's Cabinet decision to capture all rhinos for captive breeding

**Daily Express:** But Sabah has made a Cabinet decision trying to capture everything in Danum Valley for captive breeding, do you think it is a good move?

**Dr Terri:** It might be the only chance at this point. I can't argue against it that's for sure.

When the species gets too fragmented and we have seen it over and over again, when the numbers get too low, and the individuals are fragmented, if we capture them all up and put them in a captive breeding centre, we have been able to turn them around and produce enough animals we can release them again and repopulate, so it can work.

**Daily Express:** How important is this Sumatran Rhino Crisis Summit in Singapore?

**Dr Terri:** I think the answer to that is going to be a few years from now, because a lot of things get said at meetings and it's going to depend on the actions that follow.

**Daily Express:** Karen Dixon said the Sumatran rhino has reached a tipping point. Do you agree?

**Dr Terri:** Yes, I certainly think the term crisis is appropriate. We just want to convince people to do the right thing it is a national treasure and it's (Sabah, Indonesia) is the last place.

**Daily Express:** Can we save it?

**Dr Terri:** That's why it seems if we get the topic more on the world stage, there is a little bit more incentive because if the world is watching and the world says: You know, why don't you save your rhino, then may be little more pressure and on the flip side, what a positive thing it is to say: they have actually saved the rhino, they did the right thing, they actually turned it around so it's opportunity to get some good world recognition as well. - Kan Yaw Chong