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## BPLC - Biomécanique et pathologie locomotrice du cheval

Rapport Hcéres

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agence d'évaluation de la recherche  
et de l'enseignement supérieur

Section des Unités de recherche

# Evaluation Report

Research unit:

Biomécanique et Pathologie Locomotrice du Cheval  
(BPLC)

Ecole Nationale Vétérinaire d'Alfort

Mars 2009



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et de l'enseignement supérieur

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# Evaluation Report

Research unit:

Biomécanique et Pathologie Locomotrice du Cheval  
(BPLC)

Ecole Nationale Vétérinaire d'Alfort

Le Président  
de l'AERES

Jean-François Dhainaut

Section des unités  
de recherche

Le Directeur

Pierre Glorieux

Mars 2009



# Evaluation Report



## The research unit :

Name of the research unit : Biomécanique et Pathologie Locomotrice du Cheval (BPLC)

Requested label : Unité propre DGER

N° in case of renewal :

Head of the research unit : Mme Nathalie CREVIER-DENOIX

## University or school :

Ecole Nationale Vétérinaire d'ALFORT (ENVA)

## Other institutions and research organization:

Institut national de la recherche agronomique (INRA)

## Date(s) of the visit :

December 17, 2008



# Members of the evaluation committee

## Chairman of the committee :

M. Laurent VIEL, Faculté Vétérinaire de Guelph, Canada

## Other committee members :

M. François Xavier Lepoutre, Université de Valenciennes

M. Jimmy Saunders, Faculté Vétérinaire de Gand, Belgique

M. Serge Poiraudreau, Hôpital Cochin, Paris

M. Mickaël Weishaupt, Faculté Vétérinaire de Zurich, Suisse

CNU, CoNRS, CSS INSERM, CSS INRA, INRIA, IRD.... representatives :

# Observers

## AERES scientific representative:

M. Marc LALANDE

## University or school representative:

M. Henri-Jean BOULOUIS, délégué à la recherche, ENVA

## Research organization representative (s) :

M. Gilles AUMONT, Chef du département Santé Animale del'INRA



# Evaluation Report

## 1 • Short presentation of the research unit

- *Numbers of lab members including researchers with teaching duties, full time researchers, ingeneers, PhD, students, technicians and administrative assistants* : 2 professors and 4 assistant-professors ; 5 engineers (3 contract supports) ; 2 PhD students ; 2 technicians (1 contract support) ; 2 administrative assistants (1,1 equivalent time).
- *Numbers of HDR and of HDR who are PhD students advisors* : 3 HDR ; 2 HDR who are students advisors.
- *Numbers of PhD students who have obtained their PhD and average lenght of a PhD during the past 4 years ; Numbers of PhD students currently present in the research unit ; Numbers of PhD students with fellowships* : 3 students have obtained their PhD from 2005 to 2008 (evaluated years) with an average length of 4 years, all with fellowships ; 2 PhD students currently present in the research unit.
- *Numbers of lab members who have been granted a PEDR* : 1.
- *Numbers of “publishing” lab members* : all teaching-researchers are publishing (6/6) ; moreover the 5 ingeneers are also publishing.

BPLC is a national equine research entity or research unit within the structural organization of Ecole Nationale Vétérinaire d'Alfort (ENVA) and receives personal support from both ENVA and Institut National de la Recherche Agronomique (INRA). The main pillar of the equine research program was developed to respond to a demand of the national equine sectors (racing and sport horses) and to engage research compliant with the industry priorities. Further, the latter is a foreseeable natural evolution of the two principal research leaders since the early 1990's. In the broad objective mandate, the research unit has targeted its efforts in the advancement and understanding of limb biomechanics and osteo-articular pathologies responsible for the largest percentage of performance related problems. Ultimately, through the application of state of the art diagnostic equipment and the development of novel devices, the team expectation is to provide the industry with attainable curative and preventative measures. Although the research unit is administratively composed of two distinct teams largely based on their goals and objectives, otherwise the two research groups share a great deal of commonality in their administrative and infrastructure needs. Hence their investigative domain is definitely complementary with a natural and mutual synergy.

The following assessment and commentary pertains to both research groups as most of the research activities or programs are really one entity, similar in its core research and facilities.

## 2 • Preparation and execution of the visit

Documentation provided prior to the site visit although voluminous was comprehensive, clearly presented and served its purpose as a complete and informative reference document. The oral presentations by the principal investigators as well as their associated colleagues from each team were of the highest scientific quality as well as entertaining. Exchange during the question period was frank, sincere and professional. Despite the intensity and expectations of such program evaluation, the flow of the events that took place was seamless and collegial.



### 3 • Overall appreciation of the activity of the research unit, of its links with local, national and international partners

Since its early instigation to the present, the general objective of this research unit has focused on improving the understanding of the normal functioning and pathologies associated with the locomotor system (tendons and osteo-articular surfaces) of the horse. The two research teams have brought to term multi-year research programs and when necessary, re-aligned their objectives not only to satisfy the recommendations of funding agencies but also to better focus their energy, available personnel and research programs to better define and fulfill their mandate. The research activities have been enriched by the collaborative work entered with other laboratories locally, regionally and internationally. The latter is clearly supported by the respectable list of collaborators in peer-review publications, workshops, conferences and special awards.

### 4 • Specific appreciation team by team and/or project by project

#### Team « Biomécanique articulaire et tendineuse (BAT) »

The main goal of this group is to improve the health and safety of horses during strenuous competition. Although in the last 4 years, the Sequisol project became the priority theme, the research group has largely continued to perform fundamental and basic research pertaining to physiologic, patho-physiologic and biomechanic activities of the forelimb tendon apparatus. Along with these research projects, highly specialized and sophisticated analytical techniques were developed and some of them considered of substantive value to entertain patentability

- Team position locally, nationally and internationally:

This research group was very productive in terms of publications with a commendable 2.5 average publications per year in internationally recognized peer-review journals and 6 average per year presentation of abstracts and posters at scientific meetings since 2004. It should also be mentioned that the researchers were also actively recruited to write book chapters and invited to present at multiple national and international scientific and continuing education conferences with most of them requiring conference proceeding publication materials. The latter publication record is a concrete assertion of this research group's productivity and highest quality standards for scientific research. Not only does their publication in peer-review journals attest to their scientific position internationally but the number of abstract and poster presentations highlights their progressive research work momentum and achievement.

In its research core program, this team has been very consistent and in instances adaptable, without losing the broad and specific character of the original theme. Since its first review in 2004, the BAT program has moved along a rational and coordinated path providing a very fertile and predictable environment for the 2010-2013 periods.

In terms of communication to the industry i.e. the users, the research group does seem to communicate the results of their findings in a very efficient and timely manner to the local and regional equine audiences such as equine practitioners, breeders, and the sport and racing industries, despite the daily demanding research schedule



Note de l'équipe	Qualité scientifique et production	Rayonnement et attractivité, intégration dans l'environnement	Stratégie, gouvernance et vie du laboratoire	Appréciation du projet
<b>A</b>	<b>A</b>	<b>A</b>	<b>A</b>	<b>A</b>

Team « Imagerie et pathologie ostéo-articulaire (IPOA) »

Under the applied clinical research theme, the team located at a centre (CIRALE) is largely supported by the local equine industry, has a primary mandate to provide a specialized clinical performance referral service. The centre by means of its specialized clinicians and state of the art imaging equipment, evaluate a significant 1000 cases on an annual basis. Referred cases are admitted for reasons ranging from obvious lameness to subtle locomotion abnormalities affecting athletic performance. In addition to providing a clinical service, the team is also engaged in several applied and fundamental research projects. Most of the applied research is focused on treatment modalities for tendonitis and osteo-arthritis. Taking advantage of the accessibility to imaging resources, such as scintigraphy and MRI, studies on ultra-structural changes of the tendon and osteo-articular surface of normal and lame horses have been undertaken. Further in the applied research component, since 2001 the team has carried out a longitudinal prospective study of the role and importance of osteo-articular lesions affecting the young foal up to one 1 ½ year olds. Although time consuming, these types of epidemiological studies are pivotal to establish valid preventative measures and inheritance patterns.

- Team position locally, nationally and internationally:

Because the team has a program centered around the applied research science domain, their peer-review publications are in most cases immediately relevant to the practicing veterinarian. Similar to the BAT team, the group has an outstanding publication record in peer-review journals (7 per year), proceeding (20 per year), abstracts and posters (3.5 per year) and book chapters (3 per year). There is no question that the Principal investigation (PI) of this team is a sought after investigator and clinician at the international, regional and local level. The latter is definitely noteworthy as the PI and other members of the team have recorded on average a spectacular twenty presentations per year and the majority as invited guest speakers. Thus the popularity of their work directly reflects their close relationship with the industry and their ability to respond positively to their immediate and long term needs. Certainly, this is concrete evidence of the quality, originality and commitment of this group as well their capability to deliver. Similar to the BAT team, this team has articulated very well their general and specific plans for the next 4 years with the emphasis in perfecting diagnostic imaging tools and to advance therapeutic modalities beyond the usual drug intervention by investigating more biologically compatible approaches (stem cells).

Note de l'équipe	Qualité scientifique et production	Rayonnement et attractivité, intégration dans l'environnement	Stratégie, gouvernance et vie du laboratoire	Appréciation du projet
<b>A</b>	<b>A</b>	<b>A</b>	<b>A</b>	<b>A</b>





## 5 • Appreciation of resources and of the life of the research unit

One of the greatest assets of this research group is the productive and spirited harmony by which the personnel of each team has created and nurtured in their working environment. It is the committees' opinion that it is convincing evidence demonstrating program leadership, discipline and collegial workmanship environment.

- Specialized and Non-specialized technical support:

Considering the scope of the research program from both teams, the teaching and clinical service load assumed by the two PI, the technical staff support appeared to be minimal. The committee has to assume that senior veterinary students and interns provided a large proportion if not most of the technical work. In the BAT team, the committee was utterly impressed with the high quality and performance of the engineering technical staff. Their expertise in some of the BAT research was undoubtedly critical in the success of the project activities and their skills will also be as crucial in masterminding the field study. It is very unfortunate that the position of the engineering staff may be lost, jeopardizing the continuity of this pivotal project. Therefore it is essential that these engineering and technical support staff positions, being specialized in the field of biomechanics are preserved.

- Graduate students:

The research team has engaged one or two graduate students in its program over the last 4 years. They have been actively involved not only in their research projects but also participated as first and second author publications. Undoubtedly the team could greatly benefit in having a few more graduate students at the doctorate and master degree level but it is recognized that the PI has adopted a prudent approach in this endeavour due to the important teaching and administrative responsibilities utilizing a large percentage of the daily schedule.

## 6 • Recommendations and advice

– Strong points :

The unit developed an integrated research program focused on the equine locomotion system with a special emphasis on the understanding of the biomechanical function (Theme1) and characterization and treatment of the lesion sites (Theme 2). With the strong interrelationship between the two themes, the unit has embarked on well-designed multi-year projects, which are inherently complementary to each other. The scientific publication productivity of the unit is highly commendable and of excellent quality. It must be recognized and noted that the work developed in the biomechanics laboratory with the assistance and support of the engineering personnel is a remarkable achievement and a groundbreaking accomplishment (many similar studies worldwide have failed and/or were unable to apply it under field conditions).

The physical location of the IPOA team i.e. in the core sport related equine industry provides an unlimited access to not only a variety of clinical cases but also more importantly a rich source of case material in fulfillment of the present and the next 4 years. The team members of this research group have made this equine centre the envy of many other veterinary schools world-wide and more importantly the expertise either clinical or research related have developed to become one of the most respected and prestigious equine locomotion facility internationally. The number of invited guest speaking engagements is a proof of this centre uniqueness.

Another important success of such a specialized unit has been the ability of the teams to translate their basic science findings to a more formal, ready to use product by the industry. The latter is an asset deserving special attention as in many other veterinary research program in North America and elsewhere, the greatest failure of



such a program as the one above, is to communicate and concretely formulate a practical and applicable end product. Additionally, the unit has built a strong program in response to the short and long term needs and priorities of the equine industry.

It is apparent that the faculty in both teams continues to maintain a substantial undergraduate teaching responsibility as well as advising graduate students. Their participation in the graduate program is a precious benefit to the veterinary school and in the training of young scientists.

– Weak points :

The committee has recognized that two graduate students have been recently accepted into the BAT program. However, within the two units, considering the number of on-going intense and challenging research projects there is a definite need to develop a plan of action for the next 4 years which should include an increase in the number of graduate students, technical support and engineering staff. The teams should draw upon the expertise and support of associate faculty in the management, training and education of future graduate students.

The facilities available at the ENVA require some infrastructure improvement in order to meet the needs and to continue its excellent research progress. One possible solution to the increasing requirements for laboratory standards would be to regroup the team to the facility of the IPOA team. This would improve the cohesiveness of the units and maximize the available technical support facilitating on-going research. The undergraduate teaching responsibilities of the BAT team would need to be modified to accomplish this move.

There was unanimous consensus among the evaluation committee members that both principal investigators had a dedication and passion for the research unit, which are second to none. However, the Principal Investigators have an enormous teaching, research, clinical and speaking responsibility. There is the concern that there is a lack of a sustainable recruitment policy in place which is essential to maintain the level of research quality and proficiency that has been established in the unit. Recruiting and maintaining new research talent is imperative to the future success of the unit.

In their report, the team leaders recognized similar areas in need of improvement and believe they are taking measure within the scope of their mandate to address the most pressing issues.

– Recommendations :

It is unquestionable that the Equine Locomotion Unit at the ENVA is a unique organization and has achieved incredible accomplishments. The research program and associated activities are very ambitious and perhaps overwhelming at times not only with respect to the research aspects but also the expectation from the personal with regards to teaching, clinical services and research along with associated publications and translational conferences. To that effect, the committee does recommend a critical assessment of the locomotion unit in collaboration with the ENVA higher administration in terms of logistics in regards to how the staff (especially the director of the unit), can realistically distribute their time and effort in a sustainable environment while maintaining the highest standards in teaching, research, clinical services and administrative responsibilities.

The IPOA research team has the potential to attract and entertain partnership research projects that could provide appreciable multi-year funding for the research program. Although the committee realizes that such a contract will put further constraints on an already busy staff, if any additional permanent faculty are contemplated this could be an avenue which could provide funding to long term graduate student in either the PhD program or post-doctorate position.

Note de l'unité	Qualité scientifique et production	Rayonnement et attractivité, intégration dans l'environnement	Stratégie, gouvernance et vie du laboratoire	Appréciation du projet
A	A	A	A	A



# Ecole Nationale Vétérinaire d'Alfort

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A l'attention de Monsieur le  
Directeur de la section des unités  
AERES

Alfort le 30 mars 2009

Monsieur le Directeur,

Je vous prie de trouver ci-joint la réponse que la Directrice de l'UMR Biomécanique et Pathologie locomotrice du Cheval INRA-ENVA a souhaité vous transmettre. Cette réponse est organisée selon vos indications en deux fichiers attachés distincts, RepGenBPLC AERES et RepFactBPLC AERES.

Je vous prie d'agréer, Monsieur le Directeur, l'expression de ma sincère considération.

Directeur Délégué à la Recherche  
ENVA



# Ecole Nationale Vétérinaire d'Alfort

☒ Professeur N. Crevier-Denoix  
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Maisons-Alfort, le 30 mars 2009

## Réponse au Rapport d'évaluation AERES de l'UMR INRA-ENVA 957 de Biomécanique et Pathologie Locomotrice du Cheval (BPLC)

### *Observations de portée générale* *General observations*

First of all, the members of the BPLC research unit wish to thank the AERES for having invited experts in equine sciences from foreign countries to participate in the evaluation committee, in addition to French experts from the human field, taking in account that there is no other research group than BPLC in equine biomechanics and locomotor pathology in France. The unit has highly appreciated that its research program could be thus directly assessed in the light of the international (including North America) competition context in equine sciences.

The unit also wishes to thank all the members of the evaluation committee for their constructive remarks and stimulating questions. We are grateful to the committee, and first of all to its chairman, to have expressed with such accuracy and subtlety, though synthetically, the objectives of the research program of each team and its academic and applied achievements, and to have recognized the impact of the latter for the equine industry.


The recommendations of the committee include the increase in the number of graduate students in the unit. As the BAT team comprises so far only 1 HDR faculty, it appears to us that 2 PhD students (+ 2 Masters and 2 Theses of Veterinary doctorate) is already a reasonable load. However, the two assistant-professors (Maîtres de conférences) of this team should obtain their HDR within the next 4 years, which will allow increasing the number of graduate students in a near future.

Given the clinical duties of the IPOA team members, additional permanent faculty are needed for training an increased number of graduate students. This is under way through the 2009-2010 recruitment perspectives (faculty positions intended for the CIRALE).

Infrastructure improvement is also mentioned in the recommendations. The grouping together of the two teams of the unit on the CIRALE site is presently under study. It goes along with new investments on the site by the State and the Basse-Normandy area; a final decision on this issue should be taken in 2009. As mentioned in the report, this project would imply some changes in the undergraduate teaching activities of the BAT faculty members.

We are grateful to the evaluation committee to have acknowledged the enormous personal investment that the scientific and administrative management of the BPLC unit requires, especially since additional heavy, teaching and/or clinical, services are also provided. We fully agree that some service modulation is required for a sustainable development of the unit.

We are also convinced of the absolute necessity to maintain the permanent positions of full time research engineers and technical support staff in the BAT team to keep on developing technological innovation (including new measurement devices and methods), which has contributed to the international acknowledgement of this team in equine biomechanics, as well as the development of strong links with the human biomedical field.

A handwritten signature in black ink, consisting of several fluid, overlapping strokes that form a stylized representation of the name 'N. Crevier-Denoix'.

Pr N. Crevier-Denoix  
Directrice de l'UMR BPLC