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"Europe must make progress on animal genomic editing." Interview with J.P. Jégou, President of the French Veterinarian Academy"

By European Scientist - 23.04.2021

English

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"Europe must make progress on animal genomic editing." Interview with J.P. Jégou, President of the French Veterinarian Academy"

- Research -

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European Scientist was able to interview Jean-Pierre Jégou, President of the Académie Vétérinaire de France since the beginning of 2021, after five years as Secretary General, of this prestigious Academy founded on January 12, 1928. Current knowledge on ***Covid in domestic animals*** *and* ***European legislation on New Genomic Techniques (NGT)****,* ***Crispr-Cas9****, here are the major topics that we were able to address during this interview.*

The European Scientist: Two recently published reports found the first evidence that dogs and cats can be infected with B.1.1.7 , a variant of Covid-19. Animals also seem to be affected by the pandemic, can you give us some details?

Jean-Pierre Jégou: Many domestic animal species have long been affected by coronavirosis (birds, cattle, pigs, dogs, cats, etc). The first isolated Coronavirus was isolated by a veterinarian in birds (avian infectious bronchitis) in 1937. Some species escape, however, such as arthropods or else fish and we must note the absence of specific Coronaviruses in small ruminants and primates (S. Le Poder et al., 2020).

The fact that pets in particular may be infected with SARS-CoV-2 was expected and has been reported since the beginning of the pandemic in a publication by Éric Leroy, one of the members of our academy (Transmission of Covid-19 to pets: a risk not to be overlooked.)

The spicule S protein of SARS-CoV-2 has an affinity for the dog's ACE2 receptor which may be contaminated with some specific low pathogenic Coronavirus. The dog is susceptible to SARS-CoV-2, along with other animal species such as cats, ferrets or mink. Very early in the pandemic, these species were recognized as susceptible to natural SARS-CoV-2 contamination in live animals in contact with Covid-19 infected owners in different countries (Belgium, China, USA, France, Netherlands). Wild felids (tigers, lions and puma) have also been infected.

For the recent cases you mentioned, these are sick dogs and cats infected with the British variant. They have suffered from myocarditis-like heart conditions with various symptoms of rhythm disturbance or heart failure. They therefore expressed a more severe form than with the original strain. Most of them survived medical treatment without contaminating other animals or people around them. The fact that these animals suffering from myocarditis are so by the British variant as the image of what happens in human beings did not fail to question.

This situation prompts us to ensure reservoirs for SARS-CoV-2 variants cannot build up without being identified. This implies taking charge very cautiously of an epidemiological surveillance.

Please note that on November 25, 2020, a joint Opinion Paper of both French Academies "National Academy of Medicine"(ANM) and "Veterinarian Academy of France"(AVF), on "SARS-CoV-2: sensitivity of animal species and public health risks" was published. My colleagues J Brugère-Picoux, Y Buisson and J-L Angot, carried out an exhaustive analysis of cases of contamination of domestic animals and wildlife by SARS-CoV-2 under natural and experimental conditions. The recommendation was to monitor for any new SARS-CoV-2 mutation in S protein, whether linked to mink or not. It was about being able to adapt vaccines to these mutations as has occurred in veterinary medicine for Avian Infectious Bronchitis for decades.

Finally to come back to the contamination of dogs, let us be vigilant because genetic recombinations between variants of SARS-CoV-2 and dog Coronaviruses could be accompanied by an adaptation of the virus to the dog with increased replication of these recombinants and possible contamination of both canine and humans. As also underlined by the Joint Opinion of the ANM and the AVF, one can evidently see the value of working in a "One Health" context in order to develop effective strategies to fight the Covid-19 pandemic. This is also confirmed by a very recent, larger-scale study in the south of France.

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This serological study is a confirmation of the susceptibility of the Dog to infection with SARS-CoV2 but the hypothesis that variants with multiple mutations in the Spike protein with adaptation of the virus to the dog has not been demonstrated.

T E S: You recently wrote to Ursula Von Der Leyen to draw her attention of the President of the EU Commission to the strategic importance of Genomic Editing research to combat panzootic infectious diseases in production animals. Can you summarize the highlights of this letter for us?

J-P J : This letter sent to Mrs Von der Leyen was above all intended to denounce the obsolete nature of Directive 2001/18 / EC of the European Parliament and of the Council of March 12, 2001 on the deliberate release of genetically modified organisms into the environment with regard to the development of new Genomic Editing technologies such as those involving the use of programmable endonucleases (CRISPR-cas9 for example). It urges the Commission to change this regulation by taking animal production into account in order to facilitate research in the European Union on the Genomic Editing of production animals (mammals) which is utmost and critical importance. The aim is to get European research out of its current dead end in this area.

Such research can help improve animal health – and public health in the case of zoonoses – by improving the resilience of these animals to infectious diseases with significant global economic impact. The CRISPR-Cas9 method (2012) is a technological revolution facilitating Genome Editing in animal or human medicine and in agronomy.

The French Veterinary Academy is convinced that some of the applications will be able to help meet urgent global challenges such as the combat against zoonotic and non-zoonotic panzootics. This involves modifying the sensitivity of certain animal species to infectious diseases by creating whole herds resistant to certain infectious diseases, some of which can be transmitted to humans. Several countries in North America, the People's Republic of China and the United Kingdom have already produced genome edited animals and in particular pigs insensitive to the PRRSV (Porcine Reproductive &Respiratory & Reproductive Syndrome virus) in 2017, whose annual global losses are estimated at 2.5 billions of dollars. In addition, Chinese researchers produced pigs insensitive to Classical Swine Fever Virus in 2018. Genome Editing will be a major factor of prophylaxis of significant panzootic or enzootic infectious diseases in production animals in the 21st century, as claimed by our colleague Michel Thibier.

In these times when we see every day the close and disastrous relationship between populations and pathogens: the COVID 19 virus in humans, that of African Swine Fever in pigs, Avian Influenza in birds (chickens and ducks), that of Rhinopneumonia in the equine, **it is time for politicians to stop hampering research on these issues.**

I want to make it clear that this Genome Editing Technique in question is not the introduction of a piece of foreign genome but the equivalent of natural gene variants. Additionally, these are techniques carried out in confinement on animals monitored and identified individually with the possibility of interrupting the technique immediately if necessary. At this stage, it is therefore a question of safeguarding European and French research, particularly in terms of Genomic Editing. The European contribution to this field of research has now become very small (10% of the world publications) globally and this intolerable situation calls into question the competitiveness and the agri-food and health independence of the Union. This would be a way to make the EU economy sustainable, to invest in environmentally friendly technologies and to support innovation. *Genome Editing has the potential to be a major factor of prophylaxis of significant panzootic or enzootic infectious diseases in production animals in the 21st century, as claimed by our colleague Michel Thibier.*

T E S : This initiative follows a report in 2020 on targeted modification of the genome of domestic animals, can you give us a brief summary of that?

J-P J. : The 2020 AVF Position Paper is indeed accompanied by a report on New Genomic Techniques (NGT) for inducing targeted modifications in the genome of domestic animals and their potential applications. The tools are presented there. The position taken by the French National Academy of Medicine, the follow-up of this file by the French Academy of Sciences, the openings desired by the French Academy of Agriculture and the French Academy of Technologies with regard to these NGT are recalled. Finally, the position of the French Parliamentary Office for the Assessment of Scientific and Technological risks (OPECST) in favor of this research, a real technological breakthrough, must be recalled and supported.

The Position Paper of the French Veterinary Academy is very clearly in favor of the development of research projects making use of modern genome engineering technologies. It is a matter of being encouraged at all levels and adequately funded, otherwise they will further increase the behind position prejudicial to Europe as already mentioned.

The AVF recommends that the E U legislation adapted to the case of genetically edited domestic animals see the light in order to establish a regulatory framework which depends on the type of genetic modification and takes into account the rapid development of N G T's in this field. so as to foster innovation. This new legislation would have to take into account the fact that most research worldwide but in the EU aimed at producing animals whose genome has been the object of targeted modifications are only of interest to the extent that they actually confer a particular health or welfare or even economic benefit.

The French Veterinary Academy recommends that projects relating to the production or import of domestic animals whose genome has been edited by rewriting certain DNA segments be examined on a case-by-case basis by the competent authorities and that they are the subject of a scientifically based opinion, also taking into account an analysis of the degree of acceptability by the civil society.

T E S: **You denounce Directive 2001/18 / EC. In your opinion, it has "become inadequate and prevents any development of a research project". What are your expectations ? Should it be repealed?**

J-P J. : Our expectation is to call into question any approach, such as that of the Court of Justice of the European Union which consists in making an amalgam between Genetically Modified Organisms by the introduction of new genetic material and Organisms whose genome has been re-edited in safe conditions with invaluable benefits, particularly in terms of animal and public health in relation to the major panzootics of transmissible and sometimes zoonotic infectious diseases. We therefore recommend that the Commission of the European Union revise this 20-year-old Directive and finally allow in the E U the possibility for national research organizations in particular to actively invest.

T E S. : How do you explain that the laws remain so rigid when genomics has made such progress? The barrier of the sanctification of species which was an obstacle for some should no longer pose a problem with the use of Crispr-Cas9?

J-P J. : Any new technique must take into account with extreme respect the current state of genomes resulting from millions of years of evolution with mutations preserved or not according to the laws of natural selection. This involves authorizing a few supervised trials of targeted genome editing, protecting certain species against pathogens for which no protective solution, notably vaccine, has been proposed.

T E S: Did Emmanuel Charpentier's obtaining the Nobel Prize have no effect on politicians ?

J-P.J. : The attribution of the 2020 Nobel Prize in chemistry to Emmanuelle Charpentier and Jennifer Doudna is certainly the official guarantee – which could not be stronger – given to this N G T developed from Crispr-Cas9. It is probably the potential of this discovery in terms of medical applications that has been rewarded. One can expect that politicians will seize this scientific recognition to finally allow Science to express itself also in this field in the European Union in a global policy of innovation as advocated by the E U Commission.

T E S : Recently in France Minister Julien Denormandie declared NBTs are not GMOs. Could he not support the point of view of your letter to Brussels?

J-P.J. : Yes, this open attitude of Julien Denormandie, the French Minister of Agriculture and Food vis-à-vis the New Genomic Techniques (N G T's) was well noticed by us on November 5, 2020 when he spoke at the General Assembly of the French Cereal Union. On January 7, he confirmed to Agri-Presse his wish to see the European legal framework for these N G T's evolve and be amended, because to him, the present Directive is unsuitable for the necessary new scientific framework, even if it means seeing the anti-GMO lobby appear, which has happened as a matter of fact. His speeches, however, his own position, only refers onto plants and the problem of Genome Editing in animals seemed to be ignored or obscured. Therefore, it was indeed important to make known to the European Commission the position of the Veterinary Academy of France.

The 2020 Position Paper of our academy was sent to several members of the Cabinet of the Minister of Agriculture and Food at the time, Mr. Didier Guillaume. They had expressed a reservation more linked to a doubt about societal acceptance than to a genuine scientific reluctance. The time for clarification and taking responsibility to allow enlightened science to distill its benefits for our societies finally seems to have come.

ABOUT THE FRENCH VETERINARY ACADEMY:

The Veterinary Academy of France was established by decree of January 12, 1928. It arose from two independent Parisian associations founded in 1844, then from their merger in 1848 under the name of Central Association of Veterinary Medicine, recognized as being of public utility by Decree of April 16, 1878. Made up of around 180 members, the Minister of Agriculture and Food is Honorary President. Jean-Pierre Jegou took over the presidency at the start of 2021.

The Veterinary Academy of France studies all subjects relating to the scientific, technical, legal, historical and ethical fields where the skills of the veterinarian are exercised, in particular those relating to animals, their diseases, their relations with humans. and the environment, animal production and Veterinary Public Health. It contributes to the dissemination of scientific progress and to the improvement of techniques relating to veterinary activities. By drafting Reports, and Position Papers, the French Veterinary Academy advises public authorities and enlightens public opinion in areas of expertise that concern our fellow citizens a little more each year: Animal welfare, Scientific research, pandemics and zoonoses, One Health, Biodiversity, safety of the food chain, training of veterinarians....

This is how it delivered its Position Paper on Genome Editing in domestic animals as of June 20, 2019. The Academy is developing technical and scientific, national or international relations between veterinarians and other stakeholders in Life and health sciences. It is a member of the European Federation of Academies of Medicine (FEAM) as well as it works closely with other French medical and scientific academies. In France, The French Veterinary Academy is a member of the so-called Federation BioGée (a word invented by Michel Serres in reference to Bio, Life and Gée, the Earth). This is a group of scientific societies, academies, business associations and teaching societies which wished to initiate a collective movement about the sciences and technologies of life, health, Earth. and the environment and to defend the contributions of these disciplines in the crises facing the French society.

Mutagenèse : la CJUE aurait-elle des idées arrêtées sur le concept de Nature ?

Alors que l'Europe entière s'est mise en pause estivale, la Cour de justice de l'Union européenne, elle, n'a pas chômé. En effet, dans un communiqué du 25 juillet 2018, elle a rendu un arrêt préjudiciel dans lequel elle affirme que les « organismes obtenus par le biais de la mutagenèse étaient des OGM et qu'en tant que ... Lire la suite de

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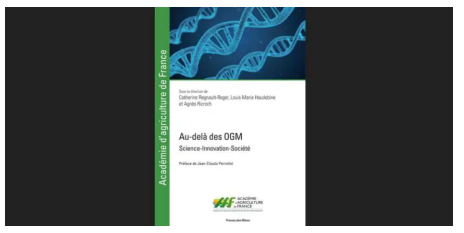

Au-delà des OGM : un ouvrage collectif pour dépasser les a priori

L'ouvrage Au-delà des OGM vient de paraitre aux éditions Presses des Mines. Il regroupe des textes signés Catherine Regnault-Roger, Louis-Marie Houdebine, Agnès Ricroch (Dir.), Jean-Claude Pernollet (préface), Claudine Franche, Marcel Kuntz, Brigitte Laquièze, Jean-Yves Le Déaut, Catherine Procaccia et Virginie Tournay. European Scientist a interviewé cinq des auteurs. Un ouvrage qui se situe en plein ... Lire la suite de

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Biotechnologies d'édition du génome : l'UEAA demande une modification de la réglementation européenne

Le prix Nobel de Chimie a été attribué en cette année 2020 à Emmanuelle Charpentier et Jennifer Doudna pour la découverte d'un nouvel outil d'édition du génome, la technique CRISPR-Cas, une révolution technologique plus connue sous le nom « les ciseaux génétiques ». Cette invention est récente. Elle a été publiée par le journal Science en 2012 et ... Lire la suite de

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«L'édition de gènes a été une formidable avancée», déclare Michel Thibier, ancien président de l'UEAA (Interview)

Auparavant, nous avons publié un article sur l'Union Européenne des Académies d'Agriculture appelant à une révision de la réglementation européenne sur les organismes génétiquement modifiés. Michel Thibier, ancien président de l'UEAA (Union Européenne des Académies d'Agriculture), membre de l'Académie d'Agriculture de France, de l'Académie Vétérinaire de France et de plusieurs Académies étrangères répond à nos … Lire la suite de

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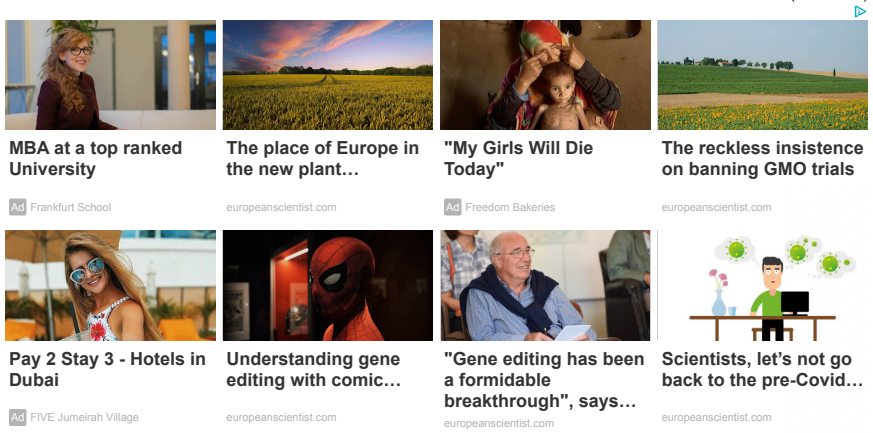

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