



# **Ebola and Immune System**

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## **Summary**

Ebola hemorrhagic fever is a formidable disease whose surges always result in a high number of victims in sub-Saharan Africa. There is no official treatment against the virus, which makes the task of containment extremely delicate. However, the existence of survivors to the virus demonstrates curable nature of the disease and suggests the existence of favorable factors of immunity. The author examines these factors and their challenges and perspectives in the cure of the disease.

## **Keywords:**

Hemorrhagic fever, Ebola virus, outbreaks, disease containment, immune system, treatment.

## **Introduction**

Ebola hemorrhagic fever is experiencing in recent months a disturbing rise in West Africa. First identified in 1976 on the banks of the Ebola River in the Democratic Republic of Congo (former Zaire), the Ebola virus causes in its victims quite dramatic pathological symptoms: sudden fever, diarrhea, vomiting, bleeding resulting in rapid dehydration and, to a huge proportion of cases, inexorable death and at very short notice. The particularly challenging nature of this condition is further enhanced by the transmission mode (blood and other bodily fluids) by simply and unwise physical contact. Furthermore, the abrupt, incisive and deadly outbreaks of the disease in Africa give it complete, probably more than AIDS, a pandemic status coupled with a highly and darkly apocalyptic character that threatens the very existence of the humanity.

Opposite, medicine seems to be more overwhelmed. We still do not know the official treatment against the virus. The care of the sick, which consists in strict quarantine, the draconian safety measures and the palliative treatment of symptoms of the condition (hydration, rest ...) clearly are not enough to curb the epidemic: 5843 case registered in 6 months, including more than 2,700 deaths in West Africa alone<sup>1</sup>. The particular virulence is measured in this outbreak from previous.

More than 2,700 deaths are indeed a massacre. However, in our desire to contribute effectively to the mobilization against this pathology, a fact

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<sup>1</sup> Statistics from the World Health Organization (WHO) on 22 September 2014. However, the figures are still evolving. See address: <http://www.who.int/csr/disease/ebola/ebola-6-months/introduction/fr/>

brought to our attention: if Ebola is *potentially deadly* for all its victims, it is not *actually fatal* to all. As proof, it leaves death in its path, but it also leaves survivors that exist among its victims. The figures are as clear in terms of death and in terms of survival. Not to mention the interesting parallel that could be done with healthy subjects in terms of occurrence, the most striking finding in our eyes is the evidence of a possible recovery from an illness a priori as lethal and *without treatment background*.

Naturally, we have been led to ask us for the cause. Also, in our desire to help solve this very real biopolitical threat<sup>2</sup>, we intend to dig this aspect, to explore the other side of the Ebola hemorrhagic fever.

In fact, the search for causes of the increase of patients with fever Ebola, yet deemed mortal, was conducted by several specialists. It is part of a broader understanding of the etiology of the disease.

For us, anxious to contribute to the improvement of knowledge on survival to Ebola, we proceeded as follows: the search for the general and scientific literature about the disease, which we limited to only a few documents in the desire to have basic knowledge; the tracking, targeting and examination, also reduced to a few documents, of scientific work addressing the question of the survival of Ebola and its causes; the presentation and analysis of all these cross data, accompanied by reflections in perspective.

For our study, certainly methodical but seen from a primarily pragmatic angle<sup>3</sup>, given the urgency of the matter, we favored the selection of documentary data easy to read, immediately available, open access, and reduced in number. That, at risk of leaving aside other data of equal importance but not consulted. Nevertheless, we have ensured the reliability and completeness of the sources consulted.

We do not claim to exhaust the question, much less issue is an absolute opinion. Our biological and medical knowledge still modest does not allow us. We do not pretend, in our reasoning, to be infallible in every respect. Our approach is motivated exclusively by the citizen desire to help the public to suggest avenues of research and thus bring our contribution to the resolution of an important issue affecting the human city.

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<sup>2</sup> Biopolitics is an approach to political science that focuses on biological issues of life in human society and in the conduct of policy. In this case, the Ebola virus threatens, directly or indirectly, the existence of States.

<sup>3</sup> This also explains its brevity.

## GENERAL INFORMATION ON EBOLA HEMORRHAGIC FEVER

Ebola hemorrhagic fever is a disease caused by a microbe, a virus of the *filoviridae* family<sup>4</sup>. The virus is usually present in nature in bats and other animals by contamination. It is transmitted from animals to man and from man to man. Clinical signs of the disease are usually fever, headache, fatigue and muscle aches. The incubation period lasts on average 5 to 12 days<sup>5</sup>. Therein, the virus particles invade the immune system, causing high fever and, in the end stage renal disease and bleeding leading to death.

The Ebola virus was first identified in 1976 by Dr. Peter Piot. We know him 5 species or strains<sup>6</sup>. Its extreme virulence, high lethality, its apparent invincibility and its apocalyptic symptoms can only mark the collective consciousness<sup>7</sup>. The Ebola virus is classified as Level 4 in terms of biological danger. Treatment consists in the isolation of patients and palliative care of clinical manifestations (hydration, rest ...). However, the insidious and accelerated virus spread quickly extends beyond the medical services of the States concerned, which increases the number of deaths. Outbreaks are still severe. The non-governmental organization *Doctors Without Borders* has said "out of control" the epidemic in West Africa, that epidemic is particularly intense in Guinea, Sierra Leone and Liberia. This State considers its very existence "threatened." WHO is concerned about the epidemiological situation. International mobilization starts. In the wake of enterprising NGOs already on the ground, the governments of affected or indirectly affected countries are engaged in cooperation with the international community to fight against the virus<sup>8</sup>.

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<sup>4</sup> The *filoviridae's* family (Filoviridae or Filovirus) includes the Ebola and Marburg viruses.

<sup>5</sup> With the range of 2 to 21 days, according to experts.

<sup>6</sup> This is *Ebolavirus Zaire* (EBOV) *Ebolavirus Sudan* (SUDV) *Ebolavirus Reston* (RESTV) *Ebolavirus Tai Forest* (TAFV) *Ebolavirus Bundibugyo* (BDBV).

<sup>7</sup> The virus has inspired many disaster films and novels that show virus destroying populations on a large scale.

<sup>8</sup> Development of experimental treatments, financial and logistical mobilization are on the agenda. See Marcelline Gneproust, "La maladie à virus Ébola: la nouvelle équation de la communauté scientifique" in *Fraternité Matin*, cahiers Santé, Thursday, 25 September 2014.

## **EVIDENCE OF THE POSSIBILITY OF SURVIVAL TO EBOLA**

The first identified case of Ebola dates back to 1976, the year of discovery of the virus. That year, the pathogen would infect 318 people to kill 280, a fatality rate of 88.05%. Despite a better understanding of the disease and the health provisions to apply, this rate remains relatively high, at 70% approximately<sup>9</sup>.

This also means that 30% of sufferers survive the infection. In any case, no strain is known to be lethal to 100%. In the absence of a powerful treatment for this disease, one is happy to see that people are getting off rather lightly. But then pops into our mind the following questions: how and why, without apparent treatment, their body does resist so triumphantly? This leads us to focus the immune system of these patients in particular and mankind in general.

### **THE IMMUNE SYSTEM AS REMPART?**

To do this, it is wise to remember that the Ebola virus is present in nature, mainly in the bodies of bats from the family of *African Pteropodidae*. Bats are, in the present state of knowledge, healthy carriers. The pathological nature of the virus appearing only in other animals, including primates, and humans, contamination by various channels (contact and consumption of infected animals especially). At pathological stage, one can contain the growth of the pathogen at least in the environment of the infection by the use of certain chemical solutions: sodium hypochlorite (bleach), Triton X-100 to 0, 25% methanol, etc.<sup>10</sup> Ultraviolet (UV) radiation from the Sun is also expected to be effective against Ebola virus<sup>11</sup>, which would explain his happy rarity in densely sunny regions of the planet.

It follows that our dear viral alien, tyrannical for it vis-à-vis human, is not invincible in the environment. That, in addition, some human organisms take him head is more than promising. But then, what parallel drawn between environmental disinfection Ebola and healing of survivors? Do

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<sup>9</sup> This figure is an average of all viral strains fatality rate of Ebola confused. Each, however, has its degree of virulence, the *Ebolavirus Zaire* and *Sudan Ebolavirus* currently being the most deadly strains (up to 90% for the first).

<sup>10</sup> Ebola virus disease - Wikipedia.

<sup>11</sup> *Ibid.*

they drink the bleach? Of course not! Are they exposed to the radius of the Sun? No. So what unexpected mechanisms allow these miracle men and women to effectively counter the infection?

For it is likely, if not obvious, that not yet precisely identified mechanisms (ecological, biological, etc.) may play for some patients and not for others, and especially in a same infectious environment. In other words, an immune system with certain characteristics can guarantee protection against Ebola virus.

This hypothesis concerns the researchers. According to an interesting article of doctors Virender Sodhi and Anup Mulakaluri, studies have revealed differences between the immune system of the survivors and that of non-survivors to outbreaks of Ebola in Sudan and Gabon in 1996. The survivors possess, in fact, a greater concentration of IgG and IgM antibodies and support a stronger antiviral response. All these features were sadly deficient in non-survivors. In this dramatic race against time, their immune system was much slower to respond to the invasion, resulting in massive loss of immune cells and mercilessly fatal outcome for the organism (Baize et al., 1999)<sup>12</sup>. The action of immune cells in the resistance to Ebola was confirmed by another study on survivors and non-survivors in the 2000-2001 epidemic in Gulu, Uganda. There, the survivors have not only developed a strong immune response against the virus, but the organism continues to generate antibodies long after the onset of infection (Sobarzo et al., 2013)<sup>13</sup>.

Another fact even more significant is highlighted by the research of the IRD and CIRMF in Gabon<sup>14</sup>: During a vast serological survey conducted nationwide by a multidisciplinary team<sup>15</sup>, 4000 blood samples were analyzed for the presence of antibodies against Ebola. Result: 15.3% of carriers. Curiously, these healthy carriers never have, according to them, suffered from the disease or developed clinical features of infection and live for some outside areas at risk. However, high immunity rates show the reality of a contact of population with the virus. No risk factor could be identified. But the presence of bats, believed to be the natural reservoir of

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<sup>12</sup> Virender Sodhi and Anup Mulakaluri "Ebola Epidemic: Strategies for Prevention", 15 August 2014. URL: <http://ayurvedicscience.com/newsletters/the-ebola-epidemic-strategies-for-prevention/>

<sup>13</sup> Virender Sodhi and Anup Mulakaluri, *op. cit.*

<sup>14</sup> Pierre Bécquart et al, "High Prevalence of Both Humoral and Cellular Immunity to *Zaire ebolavirus* Among Rural Population in Gabon", 2010, *PLoS ONE* 5 (2): 9126. IRD Research Institute for Development; CIRMF: International Centre for Medical Research in Franceville (Gabon).

<sup>15</sup> Gaëlle Courcoux, "Une immunité naturelle contre Ebola ?" in *Actualité scientifique*, record no. 337, IRD, January 2010. The work, which lasted three years, mobilized doctors, epidemiologists, virologists, veterinarians and laboratory technicians.

the virus, suggests an indirect contamination of men by the fruits consumed of both sides. Then the assumption is that the bats contaminate fruits<sup>16</sup>, people touch or eat contaminated fruits, are infected, do not make symptoms or disease<sup>17</sup> and develop antibodies against the virus. This fact proves once more the importance of innate immunity in protection and survival to Ebola.

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<sup>16</sup> Via saliva or other bodily secretions.

<sup>17</sup> Researchers have hypothesized a mild form of the disease or a form "without symptoms."

## Conclusion

That said, the Ebola hemorrhagic fever remains a formidable disease. But the knowledge, up on its occurrence and biology of the virus offers promising prospects. We saw a particularly boosted immune system is proving to be an effective bulwark against the virus.

Many points remain to be elucidated about natural immunity to a virus as expeditious as lethal. Meanwhile, we know the central role of orthobiological factors<sup>18</sup> in natural immunity and therefore in the protection against diseases. The information from the studies cited does not clearly identify the proportion of these factors in the occurrence and survival to disease. But beyond urgent solutions to counter and curb the epidemic, it is the understanding of the factors of natural immunity, with all its practical consequences, which must be thorough, as suggested by Dr. Alexis Carrel<sup>19</sup>. Such issues are not confined to the Ebola virus, but are eminently scientific, sociopolitical and futurological.

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<sup>18</sup> Literally, "right living", so on the lifestyle through diet and a life which "gives life", which is "biogenic", "biodynamic".

<sup>19</sup> "This is to research the factors of natural immunity that medical science should soon move today." In Christian Belnez, *Les aliments vivants : source de santé, de bien-être et de longue vie*, Éditions Dangles, 2007.