

# Bioerror or Bioterror?

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## The scenario:



2018, all intelligence and safety services on alert. An unidentified killer bacterium is spreading panic. Multi-antibiotic resistant and highly virulent, it attacks with a particular ferocity children of a certain blood group, immunodepressed persons and human's domestic animals. Incubation time is ultrafast (few hours). Its transmission occurs through all the food and sanitary chain: water, meats, vegetables, cereals and fermented products. So high is its transmissibility that its spread seems unstoppable.

Two weeks after its appearance in May 2018, the killer bacteria has already caused the death of 350 people among which about 200 children in 15 different countries, with multiple outbreak sources simultaneously observed in Europe, in Asia and in North America. The slaughter caused to pets and breeding animals adds to the sanitary crisis a food crisis and a large-scale economic crisis.

The third week, several biology laboratories succeed in identifying the pathogenic agent, a strain of *E. coli* never identified previously. Real hybrid, it has characteristics of ubiquity and resistance akin to those of *Listeria* while combined with the capacities of adaptation proper to *Escherichia coli*. For these reasons, the scientists dub it "Escherichia coli multi-toxinogenic ally Listeria", but people retained its scary little name: ECMUTAL. Most important, the scientists of the multiple laboratories having sequenced its genome are unanimous: ECMUTAL is of synthetic origin, because it contains XNA meta-sequences of XNA that are used to make interoperable the DNA sequences of some *E. coli* strains with some of *Listeria*, which would not interact otherwise. Yet nature does not make XNA by itself.

Accident or attack? As the media put it, "bioerror" or "bioterror"? The first debates focused on on that question.

Some—the most "conspiracy theorists"—suspect an attack of Bio-Quaïda or of the mysterious sect known as "the Children of Xenom". But contrary to its habit, Bio-Quaïda never claimed the attack. As for the Children of Xenom, they are quickly exonerated: the searches showed that they possess only rudimentary amateur biological equipment. Yet synthesizing XNA requires state-of-the-art genomic techniques which can be found only in professional laboratories. And when the sect began defending the thesis of an extraterrestrial attack, most agreed that they were too fanciful to be seriously suspected. Besides, several of their members were seriously infected. People have thus concluded that if it's about bioterror, then it is the feat of a laboratory, or at least of some members of it.

The most skeptics—among which a number of scientists—lean towards the thesis of bio-error: several xenobiological species (i.e. containing XNA) could have escaped from the labs and exchanged genes to form the ECMUTAL species. Even if the probability is low, this is actually possible because the principle of semantic containment is roughly the same (replacing one of the four bases ATGC by a base X). Paradoxically, the new species would be both synthetic (based on an artificial genome) and natural (not intentionally created by man). Of course, no laboratory recognizes any liability. They all have observed strict safety standards and confinement rules, in compliance with established laws and protocols. How to assume responsibility for something one could not anticipate? It was also very doubtful

that someone had developed a weapon so poorly focused and hardly controllable. Such a weapon would threaten its creators as well. This is not credible, except if one imagines that the terrorists have used biosynthesis to develop a form of immunity... which would be a première, since synthetic biology focused hitherto on “inferior” organisms, not on humans!

As to the more pragmatic, for them bioerror or bioterror return to the same. The best way to be prepared against potential bioterrorist attacks tomorrow is to do everything to fight pandemics today (and vice versa). When you can't foresee, what matters is “*preparedness*”: do everything to get ready to answer. Anyway, because it strikes blindly and without discrimination, is it not nature the “terrorist No. 1”?

Soon, the idea makes its way from science labs to health policies: a group of synthetic biologists proposes a new confinement technique called semantic ZNA; instead of replacing one of four bases with a new one (X), one would add a base pair (Z and Z'). This technique would create an immunization against ECMUTAL and the gradual destruction of the latter by those immunized. Even if it works in mice, this modification is risky, with unknown effects on humans. The risk of mortality and biological aberration cannot be ruled out.

What decision(s) to take? To save most of the humanity of tomorrow, the only existing way would be this drastic change in our genetic makeup. What price are we ready to pay to save human lives? What is the future of this generation if it belongs to another species? Will we have to modify likewise the genetic makeup of the various animal and plant species from which Man feeds itself? What relationship the new species will have with the world, and with other non-ZNA species?

### **How to play:**

The chronology of events creates discussion and the final position of the group.

Some suggested characters:

- 1) Politics: some of them new from the outset but had to prevent spreading the news. Their roles: taking decisions and communicating them (or not) “carefully” to the public.
- 2) Communication experts: they advise the politics on their communication strategies.
- 3) Scientists: they study the killer bacterium, try to find immunization strategies against it, and to provide advice and expertise for health policies. However, their motivations are not always clear: saving humanity? Getting funds? Suggesting the best “scientific” solution whatever the consequences?
- 4) Investigators: they look for the “patient zero” and try to solve the mystery of the origin of ECMUTAL (accidental or intentional).
- 5) Psychologists: they are in charge to inform and advise the parents of “immunizable” children.
- 6) Children: can they decide by themselves?
- 7) Ethicists, theologians: Discuss moral issues. What role should they play in the decision?
- 8) Opponents: found it senseless to address the failures of semantic containment by new measures of semantic containment. This would be opening the door to a headlong rush towards the limitless genetic modification of the human race!

Your turn! How will you make the scenario evolve? What decisions will you make?

