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Prevention, Surveillance and Bio-Containment Response to Communicable Diseases in Migratory Flows Control Operations: The Interoperability Concept and the Role of the Italian Red Cross Volunteer Military Corps

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ABSTRACT

In the age of globalization, the evolution of epidemiological scene, the system of the communication routes and international travels, the humanitarian crises, the new challenges represented by the climate changes, underdevelopment, mass migration, with Complex Political Emergencies (EPC) (rebellions and insurrections, wars of liberation, separatist/anti-separatist wars, coups d'état, wars for ethnic and religious dominance, "delegated" wars, wars of marginalized groups) and international (bio) terrorism, are elements which influence the genesis of outbreaks of emerging/re-emerging infectious diseases. In the system of prevention and control of public health emergencies at national and international level, the adequate surveillance and response systems with mechanisms of collaboration among State and Non-state Actors, are crucial requirements, particularly in order to face the biological risk related to migratory flows. In the Eu early warning and response system for infectious diseases, Italian Red Cross Volunteer Military Corps (ItRC VMC), auxiliary of Italian Armed Forces under the humanitarian organization Italian Red Cross National Society, is a crucial national actor, thanks to the "interoperability" of all resources in terms of personnel, materials and procedures. In fact, with its "interoperability" capabilities, ItRC VMC contributes to the efficiency of bio-risk prevention and response national system, related to migratory flows, setting up biocontainment assets, under Ministry of Health directives and according to the International Health Regulations.

Keywords: Military corps, Italian Red Cross, Infectious diseases, Epidemiological scene

INTRODUCTION

In the evolution of the global epidemiological framework, the communications system and international tourism, it is observed that emerging diseases (diseases considered as new and whose 75% is related to the process of zoonoses) and/or re-emerging diseases (diseases believed to be eradicated or at least under control) are also related to Complex Political Emergencies (CPE) and, as a direct consequence, strictly connected to emigration flows, food insecurity, diseases, sexual abuses, collapse of health systems and social and environmental degradation. In fact, globalization, urbanization, mass emigration, climate change, new technologies, the economic gap between developed and third-world countries, the social or armed conflicts and (bio)international terrorism, represent the challenges not only to international stability, but also to the emergence and re-emergence of infectious diseases causing serious consequences to humans (Communicable Disease (CD) and Infectious Disease of High Consequence (IDHC)). In particular, IDHC has epidemic or pandemic potential and spread rapidly through a population within a short time, that may occur infrequently (low probability) but are associated with high rates of death (high consequences for public health concern in industrialized and developing countries) [1-4]. The EU Directive n. 2000/54/EC relating to protection against risks deriving from exposure to biological agents in the workplace, classifies microorganisms into four groups, based on the risk of causing an infection **(Table 1)** [5]. European Parliament and Council Decision N. 1082/2013/EU of the October 22nd, 2013 on "serious cross-border threats to health and repealing Decision No 2119/98/" describes in Annex, criteria for selection of serious communicable diseases and related special health issues to

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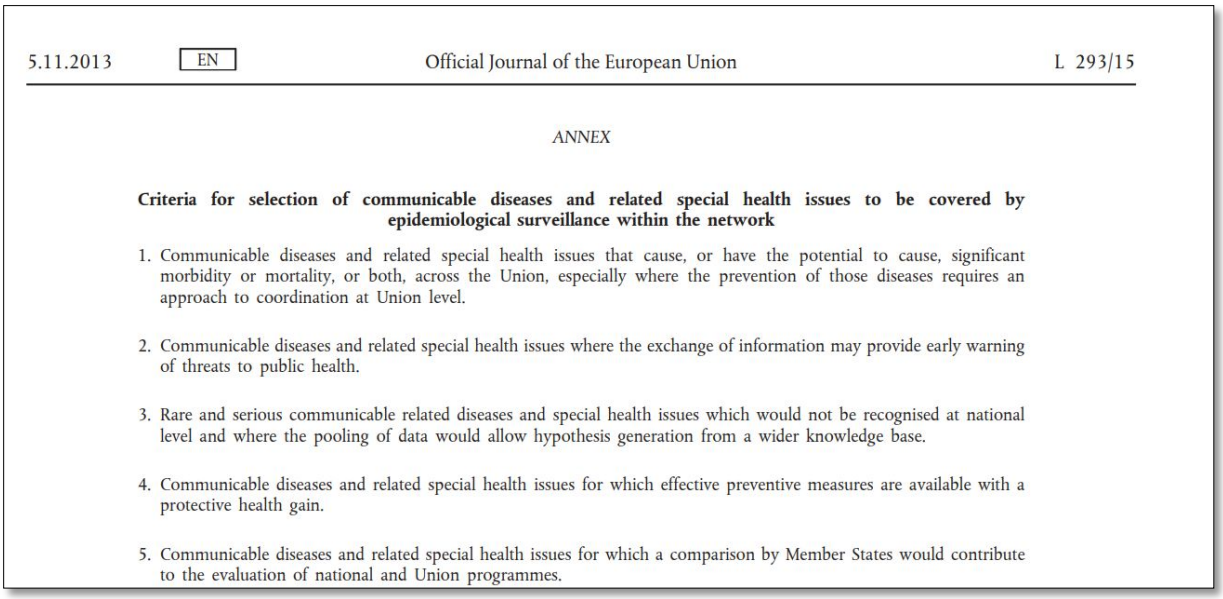
be covered by epidemiological surveillance within the network **(Figure 1)** [6].

Table 1. Bio-agents classification into four groups based on the risk level (D.lgs n. 81/08 – art. 268) [22,23].

Groups	Risk Level	Features
I	Negligible	Bio-Agent that is Unlikely to Cause Human Disease
II	Slight	Bio-Agent that can cause human disease and represents a hazard to workers; It is unlikely that spreads in the community; Effective prophylaxis and treatment measures. E.g. *Legionella pneumophila*, Flu Virus, Cytomegalovirus
III	Medium	Bio-agent that can cause severe human disease and it is a serious hazard to workers; It may present a high risk of spread in the community but there is usually effective prophylaxis or treatment available. E.g. *Mycobacterium tuberculosis*, Hepatitis B, C, D, Human Immunodeficiency Virus – HIV
IV	High	Bio-agent that can cause severe human disease and it is a serious hazard to workers; It may present a high risk of spread in the community but there is no effective prophylaxis or medical treatment. E.g. EBOLA, Marburg, Congo Hemorrhagic Fever



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ANNEX

Criteria for selection of communicable diseases and related special health issues to be covered by epidemiological surveillance within the network

1. Communicable diseases and related special health issues that cause, or have the potential to cause, significant morbidity or mortality, or both, across the Union, especially where the prevention of those diseases requires an approach to coordination at Union level.

2. Communicable diseases and related special health issues where the exchange of information may provide early warning of threats to public health.

3. Rare and serious communicable related diseases and special health issues which would not be recognised at national level and where the pooling of data would allow hypothesis generation from a wider knowledge base.

4. Communicable diseases and related special health issues for which effective preventive measures are available with a protective health gain.

5. Communicable diseases and related special health issues for which a comparison by Member States would contribute to the evaluation of national and Union programmes.

Figure 1. Annex – part of the Decision No 1082/2013/EU of the European Parliament and of the Council of 22nd October 2013 on serious cross-border threats to health and repealing Decision No 2119/98/EC.

In the hypothesis of impossibility to reach the "zero" risk for the population, the previous considerations, along with the definition of a system of early detection and more effective forms of surveillance and control of epidemics, are the basis of the International Health Regulations, adopted by the World Health Assembly on May 23rd, 2005. The Regulation provides for the designation of National IHR Focal Points identifiable in complex structures, such as General Management, Departments or Agencies, with the mission of identifying points of specific contacts, reachable at any time for communications. In August 2007, the Italian Minister of Health informed the General Manager of the appointment of the General Management of Health Prevention (DGPS) as National IHR Focal Points. Within the DGPS, we find in particular, the Office III for the Technical Coordination of Maritime, Air and Border Health Offices - Health Care Services for Air and Sea Personnel in Italy (USMAF-SASN) and the Office V for the Prevention of Communicable

Diseases and International Prophylaxis, which currently is studying measures to face biological threats and bioterrorism. National information flows and international infectious diseases and diseases of interest to IHR, "from" and "to" the DGPS Offices III and V are interchanged with the EU, the Italian Ministry of Foreign Affairs, the Italian Defence, the Italian Ministry of Infrastructure and Transport, the Italian Red Cross, and other Administrations. Looking at National and International Partners of the Early Warning and Response System infectious and emergencies Diseases, on the one hand, the DGPS therefore enters in contact with the international networks of the WHO (warning messages on the Event Information Site (EIS) platform for IHR National Focal Points), ECDC (Early Warning and Response System EWRS and the IT platform TESSy), of Global Outbreak Alert and Response Network (GOARN) of Global Public Health Intelligence (GPHIN), Global Health Security Initiative (GHSI) - EU Commission, etc.; on the other hand, the DGPS enters in contact with the national networks such as the National Health Service (NHS), the regions, USMAF, INAIL, the Experimental Zooprophylactic Institutes, Carabinieri, Italian Civil Protection National Service, Military Health Service; the High Institute of Public Health-CNESPS; the National Reference Centers for Infectious Diseases. The General Direction gives support to activities for National Center for Diseases' Prevention and Control (CCM), a coordinating Agency among the Ministry of Health and the Regions, for surveillance, prevention and timely response to health emergencies, established by the law of May 26th, 2004, n. 138 [7-9].

In case of transportation and management in high bio-containment of patients affected by high infectious diseases, such as, in particular, 4th biological agents risk group (highest pathogenic characteristics risk group in a biosafety point of view, according to D.lgs. 81/2008, art. 268) or Category A (high morbidity and mortality, according to CDC classification, in a biosecurity point of view) such as Viral Hemorrhagic Fevers), the Ministry of Health established a central management protocol for Suspected/Probable/Confirmed (S/P/C) cases. Preparedness and response organization protocols and plans, provide S/P/C case management at Central Level, with the involvement of Regions and, where necessary, of other government Departments and/or Private Bodies, and possible relocation at one of the National Reference Centres for the clinical management of high contagious patients (INMI) "Lazzaro Spallanzani" in Rome and "Azienda Ospedaliera L. Sacco" in Milan, in ways that will be evaluated from time to time, under the Ministry of Health coordination. In case of ships sailing to Italian territorial waters or flights within the National airspace with suspected cases of infectious diseases on board, it will be activated the normal international prophylaxis procedures by the USMAF, that start contextually the central Protocol [10-12].

BIO-RISK IN MIGRATORY FLOWS CONTROL ACTIVITIES AND ItRC VMC BIOCONTAINMENT MANAGEMENT

Since 2014, when 165,000 migrants arrived from the North African coasts by sea, ItRC VMC has been operating in bio-risk management activities inside Migratory Flows Control Operations according to previous national law. At the request of the General Staff of the Italian Navy, with "Mare Nostrum" Operation (OMS) – Migratory Flows Control Operations Environment, the ItRC Military Corps ensured doctors and nurses, managing biocontainment units and enforcing the health facilities of the Italian naval units deployed to monitor illegal migration flows, and contributing to the efficiency of health prevention and safety national system, in collaboration with the Italian Ministry of Health, taking part to the EU surveillance and response mechanism into the Italian Red Cross National Actor [13]. In particular, the ItRC Military Corps activities carried out were health care in favor of Italian Navy crews and in favor of migrants, with syndromic surveillance carried out by military doctors and nurses on board, through the observation, monitoring and reporting of main syndromes. When OMS ended on 31st October 2014, with the start of the following operations in Migratory Flows Control context, such as "Triton" and subsequently "Sophia" (end of mandate: September 2019), implemented by Frontex (European Agency for the Management of Operational Cooperation at the External Borders of EU) and the Italian Government ("Mare Sicuro" Operations - 1st January 2015), the Italian Red Cross operated health care activities through the employment of ItRC military doctors and ItRC Volunteer Nurses. The ItRC VMC assets involved in such operations, include deployment of biocontainment units, both on board and at naval bases, implemented in four different phases, from June 2014 to September 2015. In particular, CBRN decontamination and Biocontainment units located at Italian Navy Helicopter Base MARISTAELI, Catania (Sicily, Italy) are composed of biocontainment and decontamination functional compartments disposed in a sheltered modular structure. This facility is managed by the Aero-Medical Evacuation team with capacity of biocontainment: AMET-Bio with Staging Unit-Bio functions **(Figure 2)**, composed of one Military doctor (Team Manager), one Military nurse with four biocontainment/decontamination operators (responsible for the management of the stretcher isolator, the "ISOARK" biocontainment tent **(Figure 3)** and the decontamination system) [3].

Figure 2. AMET-Bio UNIT and Staging Unit-Bio: CBRN Decontamination and Bio-Containment Units, called AMET-BIO (Aero-Medical Evacuation team with capacity of biocontainment) at Italian Navy Helicopter Base MARISTAELI, Catania (Sicily, Italy) [3].

Figure 3. IsoArk N36-4 Isolation stretcher with HEPA filtration system and a Spinal board (yellow board) as support, upon ECO/NATO stretcher, in front of the Isolation Chamber Isoark equipped with Oblo' and CBRN filtration system [3].

Through the implementation of bio-containment and decontamination assets at Italian Naval Base – Maristaeli (Catania) with the set-up of AMET-Bio, ItRC Volunteer Military Corps contributed to the completion of Aeromedical Staging Unit-Bio function: the aeromedical unit operating "transient patient" Suspected ("S" case) to be affected by high contagious diseases, using specifically STI (Stretcher Transit Isolator), ready to use in a few minutes, and equipped with a retaining accessory for various kinds of fluids and transportable on aircraft and helicopters. As to the measures considered in presence of a confirmed case, we must refer to the Guidelines/Rules/Regulations of the Ministry of Health about Biosafety and High Bio-Risk Patients Transportation. In particular, it is worth mentioning the instructions presented in the Ministry of Health document n. 24349 issued on 16th October 2006 – "Viral Hemorrhagic Fevers: recommendations and directions on the transport", which indicates, for the clinical management of cases, the possibility of admission both at INMI [14-17]. When it is not possible to transport in a short time suspicious high disease cases to the Referral hospitals, the patient is temporarily transferred to an insulation tent, continuing health care (AMET-Bio Unit) until the time of transportation to specialized medical facilities [18]. In case of long-duration transport from MARISTAELI, Catania to the Specialist Hospitals of Rome and Milan, a technical stop is required at the Biocontainment Unit at the Naval Base of Taranto - MARISTANAV, following the same transport

process used on the outward journey. As far as it is possible, the patient's transfer activities should be kept to a minimum.

CASE PRESENTATION: BIO-EMERGENCY ON BOARD THE "BOURBON ARGOS" VESSEL – STRICT OF SICILY, 2015

The **Figure 4** shows the four phases of a rescue mission operating by AMET-Bio, carried out for patient recovering from the "Médecins sans frontiers" (MSF) vessel called "Bourbon Argos", in case of Suspected infection by 3rd risk group biological agents, indicating the Entities involved and the means of transport used for each phase [18,19].

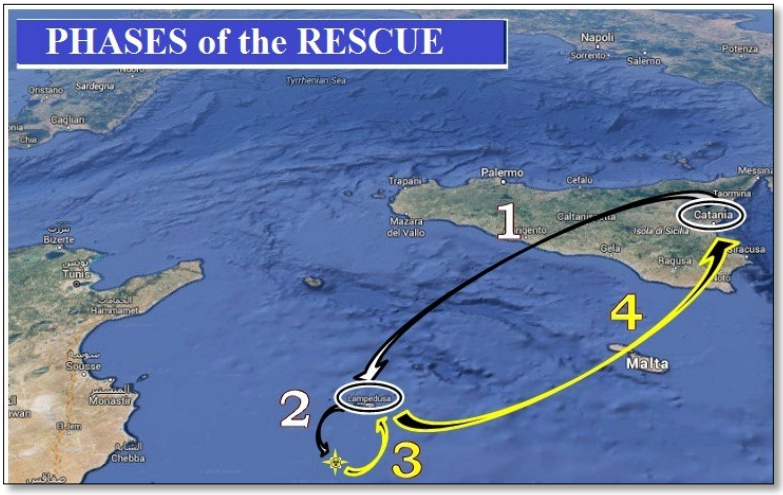

Figure 4. Phases of a rescue mission operating by AMET-Bio IRC MC unit [20].

As a case report, the following pictures show the photographic documentation related to the operating phases of AMET-bio intervention on Eritrean patient on board the MSF "Bourbon Argos" vessel, located about 40 miles off the coast of the Lampedusa Island. The operation took place in conjunction with the Italian Navy and the Italian Coast Guard biocontainment units, demonstrating the "interoperability" of biocontainment capabilities, a concept which will be specified in the following paragraph.

08:10 a.m. – Bio-Alarm! Operation Room (S.O.M.M.) of the Italian Navy MARISTAELI Helicopters Station alerts ItRC VMC Team AMET-Bio;

10:05 a.m. – AMET-Bio Team is projected by Italian Navy helicopter (EH-101 helicopter) with destination: helicopter base in Lampedusa Island;

11:30 a.m. – AMET-Bio Team arrives in Lampedusa Heliport and reaches the Lampedusa port facility by ambulance service (Palermo Territorial Health Service Company – ASP-6). Biocontainment Team embarked on a Coast Guard boat (CP-322) **(Figure 5)**;

Figure 5. Stretcher isolator transshipment by ItRC VMC AMET-Bio operators from Lampedusa port facility to Coast Guard CP322 patrol boat; Ambulance stretcher (on the left side) deployed by Palermo Territorial Health Service Company Operators; preparation of stretcher isolator loading on patrol boat (on the right side) [18,20].

04:05 p.m. – AMET-Bio Team reaches the MSF naval unit that gave the alarm by sea **(Figure 6)** and takes the patient providing appropriate sedation, using specifically STI **(Figures 7 and 8)**; the patient "potentially" affected by an high infectious disease, who can be transported, is always treated as life threatening and transported in adherence to International Health Regulations.

Figure 6. Approach phase of the ItRC VMC biocontainment team (personnel wearing green suits) on board the Coast Guard CP322 patrol boat, sailing to the "Bourbon Argos" vessel [20].

Figure 7. CP322 patrol boat reached the "Bourbon Argos" vessel, which embarks IRC VMC biocontainment team for the beginning of the patient' bio containment transportation with stretcher isolator [20].

Figure 8. The stretcher isolator transshipment phases by ItRC VMC bio containment operators from "Bourbon Argos" vessel to the Coast Guard CP322 patrol boat [18,20].

05:10 p.m. – AMET-Bio Team leave the MSF vessel, providing biocontainment transportation in human stretcher isolator to the Lampedusa port facility, by CP-322 **(Figure 9)**.

Figure 9. Stretcher isolator transshipment by ItRC VMC AMET-Bio operators from patrol boat to Lampedusa port facility [18,20].

06:30 p.m. – following the same transport process used on the outward journey, AMET-Bio Team leaves Lampedusa Heliport to Catania, to transport the patient to the insulator camera ISOARK located at MARISTAELI.

08.00 p.m. – the Team reaches AMET-BIO facility by EH-101 helicopter, providing reception, administration, processing, ground transportation, feeding and "limited" medical care for patients entering and leaving the aeromedical evacuation system to referral institute [18,20].

Like in this case of transfer in the national territory, the Italian Health Ministry response system provides obligations relating to the notification of suspected or confirmed cases, and requires patient transportation in high biocontainment by helicopter or boat, with a human stretcher isolator and an insulation tent set up on board of a naval unit in the port area or at MARISTAELI biocontainment and decontamination unit. The regulation provides bio-safety obligations: the ItRC VMC team must be protected with appropriate personal protective equipment (PPE) during transportation by helicopter or boat, to the naval unit which hosts the potential patient in high biological risk [18,20].

DISCUSSION

The case report shows the "Interoperability Concept" of ItRC VMC, auxiliary of Italian Armed Forces, whose capabilities to participate to the Ministry of Health and Italian Navy Biosafety activities and High Bio-Risk patients transportation in Migratory Flows Control Operations, contribute to the completion of Aeromedical Staging Unit-Bio function thanks to preparedness in biocontainment and decontamination activities and response system, according to Italian legislation. ItRC VMC personnel working in the transport unit in high-bio containment must possess appropriate certification proving their training in an "Interoperability" framework. In particular, after having passed basic training course for CBRN Defense (one week, full time), the second level of training is the "Enabling Course for CBRN Decontamination and Bio containment Units Operator" (duration: 2 weeks, full time/recipient personnel: lower Officers, NCOs and enlisted military personnel) which prepares attendees for specialists tasks related to the Bio containment Standard Operative Procedures (SOP) about treatment of CBRN contaminated people; setting up and management of decontamination unit, ISOARK insulation tent, materials and equipment; treatment of a hazard wastes, following NATO regulation and the Italian Ministry of Health decrees. Under the Interoperability Concept, AMET-Bio Team operates in different transport services (maritime, ambulance and aeromedical services). In fact, the safe patient transportation in high biocontainment is conducted in different transportation ways on the various maritime, aircraft and land segments, thanks to the "interoperability" in terms of personnel, materials and procedures (in particular Extra-hospital management procedures). More in detail, the main aspect of the interoperability concept regards High biocontainment transportation equipments and operational procedures, which can be regarded during: the stretcher isolator transshipment by ItRC VMC AMET-Bio operators (all qualified in biocontainment and CBRN decontamination) from patrol boat to Lampedusa port facility; the preparation of stretcher isolator loading activities on Ambulance stretcher set up by Palermo Territorial Health Service Company Operators. ItRC Military Corps has also implemented the concept of interoperability in the operational coordination of response structures during healthcare/biocontainment operations management and the rational and efficient and effective set up of all resources [3,21].

CONCLUSION

In this context, ItRC VMC represents a crucial actor in the mechanism of international surveillance, control and response system to biological risk in Migratory Flows Control operations, and in any events that could be a risk for the public health, and with a potential cross-border spread, working along with other military and civil agencies, in an interoperability framework. According to the National regulation, ItRC VMC personnel working in the transport unit in high-biocontainment must possess appropriate certifications, attending special training. All courses, plans and operating procedures aim to standardize and define the operative use of bio-containment/decontamination facilities based on the following sources of law, enacted by both the A.J.P. and A.T.P NATO regulation and the Italian Ministry of Health decrees, procedures and guidelines, implementing the "interoperability" concept in constant relationship with national and NATO Forces, also in a civil environment. ItRC VMC, thanks to its capabilities in the prevention, surveillance and response system, consistent with WHO/EU/Italian regulation, has implemented the concept of interoperability in bio-risk response capabilities, particularly in coordination with healthcare and surveillance operations management in Migratory Flows Control operations, with effective and efficient use of all resources.

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