Emerging Health Risk Notification, 20 Dec 2015. El Niño and Rift Valley fever (RVF) risk, east Africa. This Notification is a pilot effort of an interagency working group that integrates Federal expertise to synthesize risk information and response options for biological threats to US citizens and interests. The Notification is provided to USG operational biosurveillance centers for analysis and dissemination. *The views expressed do not necessarily represent those of all departments and agencies that participate in the Pandemic Prediction and Forecasting Science and Technology Working Group.*

Summary: *The risk of El Niño-driven RVF outbreaks is high in east Africa. Intensified efforts within the next 30 days are needed to mitigate the threat. Countries at risk likely require additional assistance with animal vaccination and mosquito control, key measures to minimize RVF activity.*

El Niño status and possible global health impacts. NOAA's El Niño advisory [1] predicts the current El Niño will likely peak during the Northern Hemisphere winter 2015-16, then abate during late spring or early summer. NOAA assesses it could rank among the top 3 strongest El Niño episodes since 1950. Predicted rainfall anomalies through March 2016 are broadly consistent with previous El Niño patterns (Fig 1).
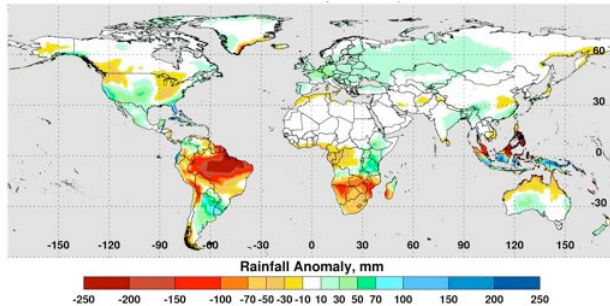

Fig 1. Predicted rainfall anomalies, Jan-Mar 2016. Anomalies are departures from the long-term, region-specific average. *US Air Force 14th Weather Squadron, NASA/GSFC.*

Previous El Niño events have caused health impacts [2], including increased transmission of infectious diseases [3]. The USG, WHO and others are assisting countries in preparing for health impacts [4], but additional assistance likely is needed to minimize RVF impacts in east Africa.

RVF significance. RVF, a mosquito-borne viral disease that causes mortality and morbidity in humans and economically-important domestic animals, often follows El Niño-driven rain in east Africa. Flooding of mosquito habitats initiates outbreaks in animals; humans are infected by mosquito bite or exposure to animal meat, milk, or blood.

Major east Africa outbreaks coincided with strong El Niño events in 1997-8 and 2006-7. The current potential for RVF outbreaks is of US importance for at least 2 reasons:

Regional health and economic impacts: The 2006-7 outbreaks in Kenya, Somalia, Tanzania, Sudan, and Madagascar are estimated to have caused > 200,000 human infections with > 500 deaths [5], and cost Kenya alone $32 million from livestock losses and international export bans [6]. The US is resettling refugees from centers in the region that may experience El Niño effects, including RVF.

US global health engagement: Kenya, Ethiopia, and Tanzania are Phase 1 countries in the Global Health Security Agenda (GHSA) [7]. The potential for RVF is an opportunity to strengthen GHSA partnerships for preventing, detecting, and controlling biological threats.

Forecasting RVF outbreaks. NASA, USDA, and DoD developed a RVF outbreak forecasting model that uses satellite-derived data, drawing on the tight coupling between RVF activity and El Niño-driven flooding [8]. USG alerts based on the model during the 2006-2007 El Niño enabled east Africa countries to enhance surveillance, communicate risk, and begin other preparations 2-4 months before human infections. Detailed mapping of case locations subsequently validated model predictions [9]. The RVF Monitor program has operationalized the model and provides monthly updates online [10]. Recently it identified areas at risk for RVF activity because of substantially elevated rainfall in Sudan, South Sudan, Ethiopia, Somalia, Kenya, and Tanzania (Fig 2).
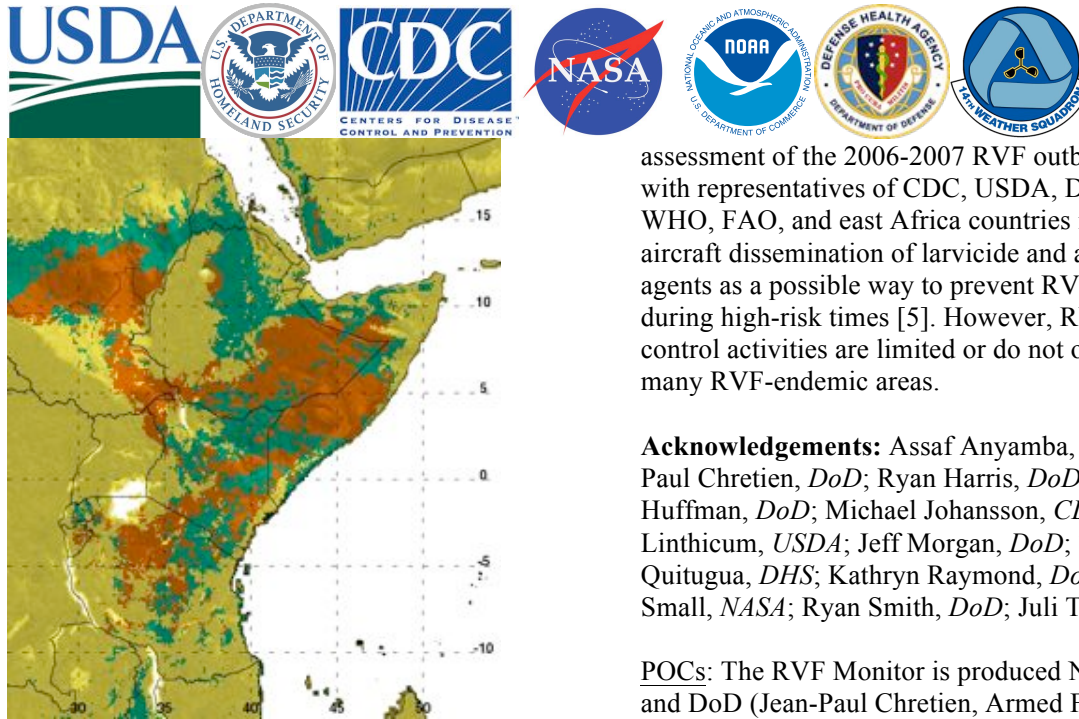
Fig 2. Rainfall RVF hotspots in east Africa, 1 Oct-16 Dec 2015. Dark green: Potential epizootic areas (areas with previous known or predicted presence of RVF virus). Dark red: Potential epizootic areas with recent heavy rainfall. These are current RVF risk areas. *NASA/GSFC/GIMMS, USDA/ARS/CMAVE.*

Recommendations for RVF preparation. USG agencies are assisting countries at risk for RVF with El Niño forecasts (from the NOAA Climate Prediction Center) and widely-agreed preparedness measures, such as animal and human surveillance and health education. Early initiation of such activities may accelerate RVF detection and control, as RVF forecasting enabled in 2006. Additionally, the early warning of RVF activity provides an opportunity to mitigate significantly or even prevent RVF activity. *Two key components of this approach must be initiated soon to achieve this goal, and likely require external assistance:*

Animal vaccination: WHO advises that a sustained animal vaccination program can prevent animal RVF outbreaks, which precede human outbreaks [11]. WHO warns that vaccination must precede RVF activity, since vaccinators may inadvertently spread the virus among animals. Because of cost and logistics, countries in the region likely require external assistance to implement pre-outbreak vaccination.

Vector control: WHO also recommends larviciding measures at mosquito breeding sites (which are predicted in the RVF Monitor) as an effective form of vector control, if applied before breeding sites become widespread with flooding [11]. In an after-action assessment of the 2006-2007 RVF outbreaks, a team with representatives of CDC, USDA, DoD, NASA, WHO, FAO, and east Africa countries identified aircraft dissemination of larvicide and adulticide agents as a possible way to prevent RVF outbreaks during high-risk times [5]. However, RVF vector control activities are limited or do not occur across many RVF-endemic areas.

POCs: The RVF Monitor is produced NASA, USDA, and DoD (Jean-Paul Chretien, Armed Forces Health Surveillance Branch, jean.chretien.mil@mail.mil). NOAA provided El Niño weather and climate forecasts (Susan Buchanan, Susan.Buchanan@noaa.gov).

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