Brazil Health and Air Quality

Utilizing NASA EOS To Enhance Capabilities to Monitor and Identify Transmission Risk Areas of Leishmaniasis in Bahia, Brazil

By:
NASA DEVELOP: Mobile County Health Department

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Scene 1: Countdown 5 to 1 along with beep sound

Scene 2: Introduction slide begins with music playing: La Vema Onda- Various Artists.
(NASA DEVELOP
Brazil Health and Air Quality Summer 2012)

(Song obtained from:http://www.amazon.com/Atra%C3%A7%C3%A3o-Presents-Music-From-Brazil/dp/B002KQ0XSG)

Scene 3: Globe with Project title: *Utilizing NASA EOS to Enhance Capabilities to Monitor and Identify Transmission Areas of Leishmaniasis in Bahia, Brazil* with zoom in transition

Scene 4: Study area map created in ArcMap with study periods: 2001, 2006, and 2011

Scene 5: Music continues with video clips of daily life in Bahia, Brazil.
(Video recorded by project member's brother in Bahia, Brazil)

Scene 7: Slides with pictures of life cycle of leishmania and affected people and animals
(Pictures acquired from: http://portal.saude.gov.br/portal/arquivos/pdf/manual_lta_2ed.pdf
http://portal.saude.gov.br/portal/arquivos/pdf/manual_leish_visceral2006.pdf
CDC/Frank Collins: Sand fly Picture (P.papatasi)

(Back ground music for all speakers starts here and continues to the end)
(Music acquired from public domain sample music on P.C.)

Moara Martins (voice over):
Leishmaniasis is a disease caused by a parasite that is transmitted to humans and animals by the bite of a sandfly. This disease takes two forms in Brazil, visceral and cutaneous. The visceral causes the victims spleen to distend. If left untreated, visceral leishmaniasis nearly always results in death. The cutaneous leishmaniasis is the more common of the two forms. It causes the victim to form large skin lesions at the bite site. Due to the occurrence of leishmaniasis in impoverished regions, open sores may lead to other infections.

Scene 8: Slides with pictures of team, partners, and workplace begin.

Marine Karapetyan (voice over):

NASA DEVELOP students at the Mobile County Health Department partnered with the Federal University of Bahia and Bahia State Secretary of Health and Surveillance to use remote sensing applications to identify environmental conditions in which the vectors thrive and ultimately transmit the leishmania

parasite. For the purpose of this study, we explored precipitation, vegetation, elevation, and moisture as potential conditions which affect sandfly presence.

Scene 9: Case point data on map of Bahia, Brazil is shown, followed by videos of data.

Margaret Gordon (voice over):

The health data for this study was provided by the Secretary of Health and Surveillance in Brazil in the form of a spreadsheet. The data was extensive and included individual patient information. For the purpose of this study, we tailored the spreadsheet to serve the needs of this project. The precipitation data was acquired using the Tropical Rainfall Measuring Mission, or TRMM. The TRMM platform has five sensors on board. These sensors are used to produce 15 products, four of which are a result of a combination of sensors including the precipitation products. As for the elevation data, we used the Shuttle Radar Topography Mission, or SRTM, digital elevation model. Over the course of the mission, which lasted ten days, radar scanned the earth's surface to create a near-global database of the earth's topography.

Scene 10: Video clip of Terra satellite begins, followed by images of vegetation indices.
(Video acquired from nasa.gov)

Hunter Winstanley (voice over):

We used MODIS imagery to evaluate three different indices. First, Normalized Difference Vegetation Index, or NDVI, uses the near infrared band two and the visible red band one to determine changes in greenness on Earth's surface based on the density of green chlorophyll in vegetation. Next, the Normalized Difference Moisture Index, or NDMI, is an index that measures the amount of moisture by sensing characteristic differences between the very reflective near infrared band two and the water absorbed short-wave infrared band six. This index highlights areas of healthy green vegetation with high moisture content and disturbed areas of vegetation with low moisture content.

Scene 11: Images of NDWI appear, followed by example images of other data sets.

Nathan Owen (voice over):

Using the near-infrared band two and the short-wave infrared band five of MODIS imagery, the Normalized Difference Water index, or NDWI, measures vegetative liquid water in the canopy. The

precipitation, elevation, and each of the three index model outputs were in raster form. To obtain the needed values for data analysis, we extracted values to points for each of the conditions per leishmaniasis case.

Scene 12: Correlation graphs are shown, followed by resulting risk maps. Images of NASA EOS and case numbers appear later, followed by example image of Landsat data and a NDVI image using Landsat.

Claire Shipman (voice over):

We analyzed the data using statistical methods including regression, ANOVA, and pearson's correlation. Results indicate that transmission of the disease tends to occur in areas of low elevation with increased precipitation. Also, cutaneous leishmaniasis is more likely to occur in areas with increased moisture, vegetation, and liquid water content based on the normalized difference models. Based on these results, there are several definitive risk areas for both forms of the disease. The use of NASA Earth Observing Systems to study leishmaniasis has proven to be an effective tool to understand the environmental features that can influence the disease's occurrence. Also, the presence of either form of disease, cutaneous or visceral, is dependent on different environmental features spatially and temporally. The results of this study can be refined by utilizing Landsat imagery to identify the environmental factors on a smaller scale, for example, cities. Also, the methodology applied can be extended to the study of other parasitic diseases.

Scene 13: *(Scroll down of credits and acknowledgements)*

Marine Karapetyan (voice over):

We would like to thank our advisors and partners, as well as our mentor, Dr. Bernard Eichold II. For more information about the DEVELOP National Program, or to see more videos like this one, visit our website at develop.larc.nasa.gov

(*Link to site*: http://develop.larc.nasa.gov/)