

A database on ticks and tick-borne zoonoses in the (sub-)tropics: an example of intersectoral and institutional collaboration at international level

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Abstract

Tick-borne zoonoses (TBZ) are a serious public health threat in both Southern and Northern hemispheres. Over the last decades, TBZ have caused serious illnesses and deaths in humans and have been increasing worldwide due to ecological and human factors. Within the activities of ICTTD-3, an EU funded project a geographical database on TBZ in the (sub-)tropics has been developed. The final goal is to produce updated TBZ distribution maps, constructing ecological niches models for vectors/zoonoses and drawing TBZ risk maps. A list of TBZ pathogens relevant for the (sub-)tropics has been compiled. The database includes data on TBZ within the tropical and sub-tropical belt (35°S-35°N). An extensive bibliographic search of scientific papers, reports, conference proceedings and other publications on TBZ is being collected by a multidisciplinary team belonging to various institutions and projects/networks worldwide, including

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researchers/lecturers from the SAPUVETNET III project. SAPUVETNET is an international network on Veterinary Public Health composed by 10 Latin-American and 5 European Veterinary Faculties, financed under the EU ALFA III Programme. As spatial information is the core component of the database, each record is geo-referenced: geographical coordinates, when not provided by the authors, were extracted from web gazetteers. From a total of 524 relevant publications reviewed and entered in the database, 705 geo-referenced TBZ records (out of 1,446) have been extracted. About 347 records are geo-referenced at village level and 43 have coordinates provided by the authors.

Keywords

Ticks, tick-borne zoonoses, (sub-)tropics, public health

UMA BASE DE DADOS SOBRE CARRAPATOS E ZOOSEOS TRANSMITIDAS POR CARRAPATOS NOS SUB TRÓPICOS: UM EXEMPLO DE COLABORAÇÃO INTERSECTORIAL E INSTITUCIONAL A NÍVEL INTERNACIONAL

Resumo

As zoonoses transmitidas por carrapatos (ZTC) constituem uma séria ameaça à saúde pública em ambos os hemisférios Norte e Sul. Nas últimas décadas, as ZTC têm produzido doenças graves e morte em seres humanos e têm vindo a aumentar em todo o mundo devido a factores ecológicos e humanos. Dentro das actividades de ICTTD-3, um projecto financiado pela UE, foi desenvolvido um banco de dados geográficos sobre ZTC nos (sub) trópicos. O objetivo final é produzir mapas de distribuição actualizados de ZTC, construir modelos ecológicos de nichos de vectores / zoonoses e desenhar mapas de risco de ZTC. Uma lista de patógenos relevantes de ZTC para os (sub) trópicos foi compilada. A base de dados inclui dados sobre as ZTC dentro do cinturão tropical e sub-tropical (35° S-35° N). Uma extensa pesquisa bibliográfica de artigos científicos, relatórios de trabalhos, conferências e outras publicações sobre as ZTC está a ser realizada por uma equipa multidisciplinar que pertence a várias instituições e projectos / redes mundiais, incluindo os investigadores / professores do projecto SAPUVETNET III. O Sapuvetnet é uma rede internacional de Saúde Pública Veterinária, composta por 10 Faculdades de Veterinária de países latinoamericanos e 5 de países europeus, financiados no âmbito do Programa ALFA III da União Europeia. Como a informação espacial é o principal componente do banco de dados, cada registo é uma coordenada geográfica. De um total de 524 revistas e publicações relevantes no banco de dados, foram extraídos 705 registos geo-referenciados de ZTC (de um total de 1446). Cerca de 347 registos são geo-referenciados ao nível de aldeia e 43 têm coordenadas fornecidas pelos autores.

Palavras chaves

Carrapatos, zoonoses transmitidas por carrapatos, (sub) trópicos, saúde pública

UNA BASE DE DATOS DE GARRAPATAS Y ZONOSIS TRANSMITIDAS POR GARRAPATAS EN LOS SUBTRÓPICOS: UN EJEMPLO DE COLABORACIÓN INTERSECTORIAL E INSTITUCIONAL A NIVEL INTERNACIONAL

Resumen

Las zoonosis transmitidas por las garrapatas (ZTG) son una amenaza grave para la salud pública, tanto en el hemisferio sur como en el norte. Las ZTG pueden transmitir enfermedades graves y producir muertes en seres humanos y han estado aumentando en todo el mundo debido a factores ecológicos y humanos. Entre las actividades de ICTTD-3, un proyecto financiado por la UE, se ha desarrollado una base de datos geográfica de TBZ en el subtrópico. El objetivo final es producir mapas actualizados de distribución de ZTG, construcción de modelos de nichos ecológicos para vectores/zoonosis y la elaboración de mapas de riesgo de ZTG.

Una lista de patógenos relevantes para el subtrópico ha sido compilada. La base de datos incluye datos sobre ZTG en el cinturón tropical y subtropical (35° S-35° N). Una amplia búsqueda bibliográfica de artículos científicos, informes, actas de congresos y otras publicaciones sobre ZTG se está haciendo por un equipo multidisciplinar perteneciente a diferentes instituciones, proyectos y redes en todo el mundo, incluyendo los investigadores-profesores del proyecto Sapuvetnet III. Sapuvetnet es una red internacional de salud pública veterinaria compuesta por diez países de América Latina y cinco facultades veterinarias europeas, financiadas en el marco del Programa ALFA III UE.

Como la información espacial es el componente principal de la base de datos, cada registro es una coordenada geográfica. De un total de 524 publicaciones, revisados y consignados en la base de datos, 705 registros de ZTG georreferenciadas (de 1446) se extrajeron. Cerca de 347 registros son una referencia geográfica a nivel de aldea y 43 tienen las coordenadas proporcionadas por los autores.

Palabras clave

Garrapatas, zoonosis transmitidas por garrapatas, sub-trópico, salud pública

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Introduction

Ticks and tick-borne diseases (TBD) affecting humans and animals are a worldwide serious economic and health matter. Ticks can transmit a great number of pathogens common to animals and humans (tick-borne zoonoses/TBZ). Rickettsiosis, borreliosis, ehrlichiosis and haemorrhagic fevers have an increasing impact on public health in the tropical and sub-tropical countries (Jongejan and Uilenberg, 2004).

In recent years the diffusion of digital climatic and ecological layers, the development of GIS technologies, the increased computing power available, along with the advances in ecological niche modelling made possible to produce risk maps for vectors and transmitted diseases. Such maps are an useful tool for effective responses to the diseases (Kitron, 2000; Randolph, 2000). TBZs distribution is strongly related to environmental factors limiting the vector habitat, so that collecting geographical information is a key issue.

The development of an integrated database on ticks and TBZ is the first step towards the production of distribution maps, ecological modelling and TBZ risk maps.

A geographical database on TBZ in the (sub-)tropics has been developed within the ICTTD-3 project (Integrated Consortium on Ticks & Tick-borne Diseases). The project is financed by the European Union (EU-INCO), and it is aimed to support a research program on tick-borne diseases jointly executed by a consortium of 43 institutions in 29 countries (<http://www.ictttd.nl/>). ICTTD-3 envisages to enhance international collaboration in training, research and control of tick-borne diseases to promote inter-sectoral cooperation (amongst biologists, veterinarians and medical doctors) and to exchange information/data amongst different institutions, networks and projects worldwide (e.g. SAPUVETNET III, PANVET, RED-SPVet, EDEN, etc.) In particular, the collaboration with SAPUVETNET III project has been particularly active. SAPUVETNET III is an international network on Veterinary Public Health composed by 10 Latin-American and 5 European Veterinary Faculties, financed under the EU ALFA III Programme (www.sapuvetnet.org/).

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Germany and at the III Congreso Nacional de Saúde Pública Veterinária, I Encontro Internacional de Saúde Pública Veterinária, 25-28 Outubro 2009, Bonito-Brasil.

Materials and methods

The database was developed using MS Access® throughout Visual Basic for Applications (VBA) programming. TBZ records occurring in the (sub-) tropical regions of Latin America, Africa and Asia (countries / areas in the belt between 35°N and 35°S are included).

As regards the database structure, it includes 3 forms: (1) operator form, (2) source publication, (3) pathogen/disease records. Publication/bibliographic data are structured according to BibTeX standard (<http://www.bibtex.org>).

Data on diseases/pathogens are being collected according to the following categories:

- I. vector: tick names (genus and species) from the World list of valid tick names: Horak I.G. *et al.* (2002);
- II. disease/pathogen: names/abbreviations taken from ICTVdB-Universal Virus Database ver.4; List of Prokaryotic Names with Standing in Nomenclature;
- III. detection method: isolation, PCR, microscopy, serology, clinical cases (incl. data on prevalence/incidence, according to type of study: epidemiological survey, clinical case reporting);
- IV. report refers to: human, animal, tick (larva/ nymph/adult; on-host, free-living stage);
- V. report date (month/year),
- VI. report location: country, town, village, etc.;
- VII. imported cases: location/country where tick and/or TBZ was contracted (e.g. tourists, travellers, workers);
- VIII. geographical coordinates: datum WGS84 from atlas maps, web gazetteers.

A list of relevant pathogens/TBZ has been compiled referring to the available scientific literature and with the contribution of experts from the ICTTD network. An extensive bibliographic search of scientific papers, reports, conference proceedings and other publications on TBZ in the (sub-)tropics was carried out (and it is still in progress). A search for unpublished (“hidden”) material and

contacts with relevant people in countries/regions of interest was also carried out. The database was distributed/circulated and info/data were exchanged amongst different institutions, projects and networks worldwide (e.g. SAPUVETNETIII, PANVET, RED-SPVet, EDEN, etc.).

Single records have been geo-referenced by using coordinates provided by author(s) or coordinates retrieved from web gazetteers (i.e. GNS GeoNet Names Server; <https://www1.nga.mil/ProductsServices/GeographicNames/Pages/default.aspx/html/index.html>) at different accuracy level (village, province/district, country). As geographic position accuracy require an estimation, the coordinates provided by authors were compared considering the error generated by geo-referencing the same locations by a gazetteer.

Data analysis were carried out with open source software (GRASS GIS, Quantum GIS, R data analysis language), integrating data on human population livestock / density, climate, vegetation, etc., available from the web.

Results

From 524 relevant publications so far reviewed and entered in the database, 705 out of 1,446 TBZ records have been extracted, and geo-referenced. In particular 347 records are geo-referenced at village level by using a gazetteer and 43 records have coordinates provided by authors.

A quantitative estimate of the mean error of village-level coordinates from gazetteer was carried out by comparing some hundred records coordinates provided by the authors to those of the same locations obtained from gazetteer, thus resulting that 95% of records is geo-referenced within 10 km radius from the true position. Some preliminary distribution maps were produced.

Ecological niche characterization of best described pathogens and vectors (i.e. Spotted Fever Group rickettsiosis and *Amblyomma cajennense* and *A. triste* in Latin America) and production of predictive maps for geographical distribution of ticks and TBZ in the (sub)tropics (in progress).

Discussion

According to the literature review/analysis carried out, pathogens causing severe public health problems seem to be better described (e.g. CCHF in South Africa and Turkey).

It appears that some areas are actively sampled for diseases, i.e. near research/health institutions and in the countries with more developed health services (e.g. SFG Rickettiosis in Brasil).

Finally, it should be noted that precision accuracy of geographic coordinates is a limiting factor to take in account for the geographical scale of analysis.

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Note: due to the large number of bibliographic references, it is not be possible to include all bibliography searched and analysed for our study. The complete list of articles/bibliographic sources is available at <http://www.personalweb.unito.it/315381.dottorato/>

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