A database for use in risk analysis and surveillance of exotic aquatic diseases – introducing a new electronic journal

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Abstract

PANDA (Permanent Advisory Network for Diseases in Aquaculture) was set up in 2004 with funding from the European Union (http://www.europanda.net/). One of its objectives was to establish a readily available data source that could be used to support risk assessment, surveillance and contingency plans for exotic and emerging aquatic diseases in Europe. A small international task force was charged with developing a database to fulfil this need. The particular focus of the group was to develop an easily accessible structure that included epidemiologically useful data. The process of development, pre-testing, the final database structure and the resource implications of developing and sustaining such a database will be described and discussed. The database will be launched as a free-access peer-reviewed electronic journal (AQUATIC DISEASE RISK REVIEW) which will be published at the PANDA website twice every year.

Introduction

PANDA (Permanent Advisory Network for Diseases in Aquaculture) was set up in 2004 with funding from the European Union Framework Programme 6, under the theme of scientific advice in support of policy. PANDA aims to establish a network of experts in the areas of fish health, preventive medicine, diagnostics, epidemiology, aquaculture and risk analysis. The purpose of the PANDA network is to provide scientific support to the European Commission, for policy making and legislation in the areas of prevention and control of infectious diseases in aquaculture species in the EU. The network has specific objectives, allocated into 5 Work Packages (WP). However, it is the intention of its members that the network will serve as a forum for the exchange of information and ideas even after these stated objectives have been achieved. In this form, it can be an extensive network of experts who will be able to form new Work Packages and provide scientific advise on future questions that the European Commission may pose to the network. PANDA has created a web-site (http://www.europanda.net/) in which fish health experts are encouraged to register in an online database and participate in relevant discussions through the respective forums.

PANDA WP 2 is charged with describing and evaluating the risks of introduction of exotic, emerging and re-emerging disease hazards and their potential impact on European aquaculture and aquatic wildlife. Epidemiologic information on which to base these assessments of risks will be provided by WP 3. The "Epidemiology Work Package", WP 3, was given the task of designing a database of the current epidemiologic knowledge on infectious diseases that impact (or can play a role in the future of) EU aquaculture and aquatic wildlife. The database is intended to include information on the epidemiology of each pathogen and the respective infections, in such detail that it can be used as the scientific basis for activities such as risk analysis, surveillance, surveys to assess freedom from disease as well as design and implementation of disease prevention and control schemes. It is also anticipated that the database will be very useful in supporting actions in emergency situations.

Methods

Members of the WP 3 (authors of the present work) discussed and decided on the structure of the database during an initial 2-day meeting, in April of 2004. This meeting consisted of 3 sessions of 3-4 hours each. The requirements of the database were specified as:
  - a focus on epidemiologic information.
  - Easily accessible information.
  - Current up to date with a facility to enter new information in a timely fashion
  - High quality, reliable information.

During the initial meeting it was decided that the database would be relational and built using Microsoft® Access (Microsoft Corporation, Redmond, WA, USA). The main information needs were identified and lists of database fields were compiled. After the end of the initial meeting, one of the authors (dB.I.) created the database and made it available to the other members of the group for comments and suggestions. The group met 4 more times, in order to refine the database and coordinate the work with members of WP2. Between meetings the work was advanced through electronic communication (e-mail). After the database was in an operational form, it was tested by inputting information on specific pathogens. By doing this, we could evaluate the ease of use, the need for addition of new fields or changes in the description of existing ones or even the need for changes in the grouping of information presented. We expect to have a final and polished version of the database by September of 2006. The database is currently available on-line (http://www.revistaaquatic.com/panda/) and open for suggestions for improvement.

Results

The design of the database was guided by its main purpose: to provide the basis for risk analysis and epidemiologic surveys. Presentation of the basic information is in tabular form, however, a particular strength of the database is the provision of hyperlinks that lead to pages, which provide more detailed information. This ability is very important when presenting epidemiologic information. A lot of the studies, which have produced information on the epidemiology of specific diseases, are observational. Therefore, it is not only important to list their findings but also the conditions under which the studies were conducted, any alternative explanations of the findings or any reservations about the applicability of the results that the authors of the studies might have presented in the original papers. Such information is preserved in our database through the use of hyperlinks.

 The listing of information is organized by pathological agent. A very important distinction made in the database is that between infection and disease. It is understood that disease causation is multifactorial and a pathogen is just one of the component causes of each disease. Based on this principle, information is listed separately for each agent and for the clinical disease(s) in which it is implicated as a causal agent. For each agent, the database lists some basic information (e.g. physical properties, strains, geographical distribution, OIE status etc.). Information on the diseases in which this agent is implicated is given in a different section of the database. This section lists information on clinical signs, case definitions, existence of carrier states, etc. Information is also given about possible preventive or control measures for the specific disease, along with more detailed information on studies that describe application of such measures, using hyper-linked information. Another section of the database lists information on host susceptibility (separately for infection susceptibility and disease susceptibility) and on genetic resistance.

Separate sections in the database detail available information on diagnosis of presence of the agent directly or indirectly. Information on existence of gold standards, as well as sensitivity and specificity of each test are included in this section. Through the use of hyperlinks, additional information can be given about studies that were done for evaluation of diagnostic tests under different conditions. This information is very important in judging the applicability of the published

sensitivity and specificity values in specific field situations. All available descriptive epidemiologic information (time, space and animal) is included, as well as any recommendations for studies to produce such information, where it is lacking. Information on transmission of the pathologic agent is included in a separate part of the database, detailing known methods of transmission and presenting epidemiologic information on available descriptions of field observations of occurrences of transmission. Additionally, a separate part of the database includes information on observed outbreaks of the disease (under field or experimental conditions). More detailed information on the conditions and course of the outbreaks can be given by opening new screens through the use of hyperlinks.

Description of risk factors is given prominence, differentiating between risk factors for acquiring the infectious agent and risk factors for development of clinical disease in infected animals. More detailed descriptions of observational studies that produced risk-factor information are given using hyperlinks. Finally, information on sanitary measures and relevant legislation is also included in a separate section of the database, as is information on international experts for each pathogen.

Discussion

This is the first database of aquatic pathogens that focuses on information on the epidemiology of the resulting infections. It is expected that it will be a valuable tool for people working in risk analysis, prevention and control of fish diseases. The database was designed and implemented as a tool to support epidemiology of aquatic animal diseases in the EU, however, it could be easily expanded to include diseases that are of particular interest in other parts of the world. Disease control efforts in the present day of worldwide trade of fish, molluscs and related products should consider the disease situation globally and cannot just focus on specific geographical areas. It is expected that as this database evolves it will become a tool that will compile all the available epidemiologic information for aquatic animal diseases from different areas of the world.

The database will be kept complete and up-to-date by inviting submission of database entries from experts in the form of pathogen reviews. After the database has reached its final operational form it will be launched as a free-access, peer-reviewed electronic journal (AQUATIC DISEASE RISK REVIEW). The journal will be published twice per year (March 1st and September 1st) on the PANDA website. The aim will be to provide a comprehensive database of epidemiological information about all the major aquatic diseases. The intended audience will be epidemiologists, risk analysts, fish disease specialists, diagnosticians, mathematical and statistical modellers and policy makers. Authors will be encouraged to review all available information (including unpublished observations and "gray" literature) and offer personal opinion and critical evaluation of published epidemiologic information. The peer-review process will guarantee the quality of the information in the database. In general, reviews will only be updated every 2 years, in the first instance, unless a submitting author can make a good case for new information, which necessitates a more rapid update. Minor supplementary information may be added to each review during this 2-year period if it is correctly cited and approved by the editor.

We believe that this journal will be embraced by the international community of workers in aquatic animal disease. PANDA has provided the technical infrastructure for the project, but filling the database with all the important information is outside of the scope of PANDA, at least for the moment. With the contribution of experts in the field, it can become a very useful tool for everybody working with aquatic animal disease. Not only it will provide a complete account of available epidemiologic knowledge, but it will also help identify knowledge gaps and future needs for research. Furthermore, it will help PANDA widen and maintain its network of experts in aquatic animal disease, which can only benefit this area of research and respective policy making.