The FP7 EU Project "The Disease Control Tools" (DISCONTOOLS, http://www.discontools.eu): the contribution of an Expert Group on *E. coli*

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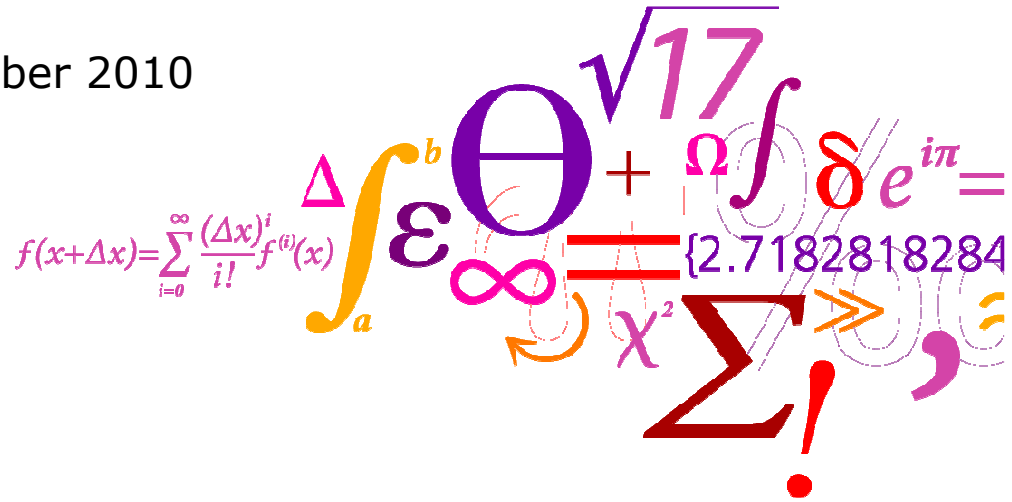

DTU Food
National Food Institute

What is DISCONTOOLS?

(Disease Control tools)

A little about the *E. coli* input

Project launched by Animal Health Industry (International Federation for Animal Health - Europe (IFAH-Europe))

Part of 7. framework programme (FP7) funded by DG research

4 Year Project commenced in March, 2008

DISCONTOOLS is a stakeholder driven project

All European & Global Stakeholders welcome to join

Objectives of DISCONTOOLS

- Develop tools focusing & prioritizing research
- Stimulate delivery of new and improved diagnostics, vaccines & pharmaceuticals
  - Develop database on 50 diseases
  - Develop prioritisation model
  - Develop Gap Analysis model
- Ensure the deployment of new technologies in the animal health research area as rapidly as possible

Organisation

- 5 Work Packages
  - Project Management –WP1
  - Disease Prioritisation – WP2
  - Gap Analysis – WP3
  - Technology Evaluation – WP4
  - Communication – WP5
- Project Management & Communication is managed by Project Management Board
- Stakeholder Forum & Advisory Council

WP2 – Disease Prioritisation

- Develop the Disease database (standardized format for data collection)
- One Expert group per disease to edit data
- Prioritisation Model – on web
  - Criteria – Knowledge, Impact, Tools
  - Scoring & Weighting
  - Decide on final prioritisation
- Interactive website open to the public
  - Receive and respond to input
  - Dynamic - information updated continuously

WP3 – Gap Analysis

- Gap Analysis methodology
  - Gaps in knowledge
  - Gaps in diagnostics, Vaccines, Pharmaceuticals (Tools)
  - Prioritise Gaps
- Important that Expert Groups focus on the tools
- Need broad input including Academia, CVO's & Industry
- Summarise Gaps and research required

WP4 – Technology Evaluation

- Evaluate current methodology
  - What do other industries do?
  - Aerospace, Biotechnology, Machinery, Nanotechnology, Others?
- Communicate methodology to the research community
- New technologies should be deployed at the earliest possible opportunity

WP5 – Communication and dissemination

- Ensure effective communication with and between stakeholders
- Foster interactions between EU and third countries organisations including international bodies
- Disseminate the results
- Publish information and methodologies
- Communication strategy based on a flexible website

Models for Prioritisation and Gap Analysis

- **Simple** & **flexible** models agreed for Prioritisation and Gap Analysis
- 5 documents (SOPs)

- "**Disease & Products analysis**" – to gather information on the diseases
- "**Scoring Model**" – for prioritisation
- "**Scoring Model Interpretation Guide**" – to help experts scoring
- "**Gap Analysis scoring sheet**" – to score gaps in tools
- "**Gap Analysis Interpretation Guide**" – to help experts scoring

- Guides for scoring were agreed to keep the exercise as objective as possible
- Tools were developed to help the Expert Groups
- Testing of the models on 8 diverse diseases is ongoing
- Models will be refined as necessary (scoring scheme, coefficients…)

Disease and Product analysis

Disease

Revised 19 September 2010

Product Analysis	Current knowledge	Gap(s) in availability of products/knowledge
Part 1 Control Tools		
1 Diagnostics availability		
1.1 Commercial Diagnostic kits available worldwide		
Host/Pathogen		
1.2. Commercial Diagnostic kits available in Europe		
Host/Pathogen		
1.3. Diagnostic kits validated by International Standards (OIE) or European Standards (EU) or National Standards		
1.4 Diagnostic method(s) described by International standards (OIE) or European Standards (EU) or National Standards		
1.5. Commercial potential for diagnostic kits in Europe		
1.6. DIVA tests required and / or available		
Intended for eradication of disease or economic control of disease/ need and nature of the desired DIVA test		
1.7 Opportunities for new developments		

DISCONTOOLS SCORING MODEL
DISEASE _____

Revised 12-07-2010

Criteria	Scores					Coef	Total (score*coef)
Disease knowledge	1	2	3	4	5		/100
1. Speed of spread						2	
2. Number of livestock species involved						2	
3. Persistence of infectious agent In the environment						2	
4. Risk of spread to susceptible populations						2	
5. Potential for silent spread						2	
6. Wildlife reservoir and potential spread						2	
7.Vector reservoir and potential spread						2	
8. Variability of the agent						2	
9. Understanding of fondamental immunology						2	
10 Host pathogen interaction						2	
Impact on wider society	1	2	3	4	5		/100
1. Disease impact on production						5	
2. Economic direct impact (including cumulative cost (e.g. Enzootic vs. epizootic)						5	
3. Economic indirect impact (social, trade)						5	
4. Agriterrorism potential						5	
Impact on public health	1	2	3	4	5		/100
1. Impact of occurrence on human Health						3.33	
2. Likelihood of occurrence						3.33	
3. Impact of occurrence on Food Safety						3.33	
4. Transmissibility (spread from animals to humans)						3.33	
5. Spread in humans						3.33	
6. Bioterrorism potential						3.33	
Impact on trade	1	2	3	4	5		/100
1. Impact on international Trade due to existing regulations						5	
2. Impact on EC Trade due to existing regulations						5	
3. Potential for zoning						5	
4. Impact on Security of Food supply						5	
Animal welfare	1	2	3	4	5		/100
1. Duration of animal welfare impact						10	
2. Proportion of animals affected suffering pain/injury/distress as a result of the disease						10	
Control Tools	2	1	0	-1	-2		/100
1 Appropriate diagnostics						16.66	
2 Appropriate vaccines						16.66	
3. Appropriate pharmaceuticals						16.66	
Total score							

Disease Scoring Model – Interpretation guide

Final 19 May

	Criteria	Scores					Coef	Total
Source	**Disease knowledge**	**1**	**2**	**3**	**4**	**5**	**2**	**/100**
Defra AP	1. Speed of spread	None Non transmissible	Very slow Low level of transmission within holdings and unlikely between holdings.	Slow Slow transmission between holdings with or without animal movements	Medium Rapid transmissions between holdings with or without animal movements	High Rapid transmission between holdings without animal movements		
CVO AP	2. Number of livestock species involved	one	ND Expected to be limited	Limited 2 species	Medium 3 species	High 4 species and over		
CVO AP	3. Persistence of infectious agent In the environment	No never found	Rare occasionally found	ND if unknown	Constant animal reservoir or vector	Not removable from the environment		
CVO AP	4. Risk of spread to susceptible populations	No Not contagious	Low Transmissible direct contact	ND if unknown medium	Medium Indirect contact, contagion	High airborne infection		
WG Defra	5. Potential for silent spread	none	Negligible Signs of infection easily recognised and likely to occur in animals under supervision	Low Signs of infection easily recognised but depends on the level of supervision	Moderate Specific diagnosis may be difficult in one or more species	High Disease/infection not likely to be detected for some time		
WG Defra	6. Wildlife reservoir and potential spread	None no known wildlife reservoir	Minor Prevalence in remote wildlife	Moderate. Wildlife reservoir: no direct contact with humans or domestic animals	Significant Wildlife reservoir	Serious. Wildlife reservoir in close contact with humans and/or domestic animals		
CVO AP	7.Vectors reservoir and potential spread	None No known vector or reservoir	Low Competent vector(s) thought to exist in the country but not considered capable of surviving and transmitting infection	Medium Competent vector(s) exist in the country but not considered capable of surviving and transmitting infection	High Competent vector(s) exist in the country but not considered capable of surviving but could transmit infection	Very high Competent vector(s) exist in the country and is capable of surviving and transmitting infection		
CVO AP	8. Variability of the agent	Negligible One type, stable host/vector	Low few types, not mutating, stable host/vector	Moderate Few types, not mutating, low host specificity, stable vector if any	High Numerous types or mutating, low host or vector specificity	Very high Numerous types and mutating, low host or vector specificity		

DISCONTOOLS PRODUCT GAP ANALYSIS
DISEASE _____

Criteria	Scores					Coef	Total
Diagnostic tools	2	1	0	-1	-2		/100
1. Availability						4.17	
2. Prevention and control - Differentiation of infected from vaccinated (DIVA)						4.17	
3. Strategic reserve						4.17	
4. Capacity of production						4.17	
5. Market potential						4.17	
6. Affordable						4.17	
7. Quality/stability/ durability						4.17	
8. Sensitivity						4.17	
9. Specificity						4.17	
10. Reproducibility						4.17	
11. Simplicity/ease of use						4.17	
12. Speed						4.17	

Criteria	Scores					Coef	Total
Vaccination tools	2	1	0	-1	-2		/100
1. Commercial availability						4.55	
2. Monitoring for infection in a vaccinated population						4.55	
3. Strategic reserve						4.55	
4. Capacity of production						4.55	
5. Market potential						4.55	
6 Affordable						4.55	
7. Quality/stability						4.55	
8. Safety of vaccines						4.55	
9. Efficacy						4.55	
10.Immunity						4.55	
11. Convenience of use						4.55	

Criteria	Scores					Coef	Total
Pharmaceutical tools	2	1	0	-1	-2		/100
1. Availability						4.55	
2. Prevention and control						4.55	
3. Strategic reserve						4.55	
4. Capacity of production						4.55	

Product Gap Analysis – Interpretation Guide

Vaccination tools	2	1	0	-1	-2	Coefficient 5.00	Score /100
1. Commercial availability	Not available	In development	Available elsewhere outside EU, Us, Australia	Available in the US or Australia	Fully available and authorised in Europe		
2. Monitoring for infection in a vaccinated population	Tool(s) not available	Tool(s) In development	Tool(s) available but not tested under field conditions	Commercially available authorised tool(s)in Europe but only partially effective	Commercially available authorised tool(s) in Europe and fully effective		
3. Strategic reserve	None	Very low Poor level of reserves for any emergency with poor storage characteristics	Low Adequate level of reserves for any emergency with good storage characteristics for short periods	Medium good level of reserves for any emergency with good storage characteristics for intermediate periods	Fully acceptable Very good level of reserves for any emergency with good storage characteristics		
4. Capacity of production	Very restricted.	Restricted and requires notification of demand well in advance	Limited but requires early notification of demand	Limited but meets specific demands	Unlimited meet any market demands		
5. Market potential	Very low	limited	intermediate	high	Very high		
6 Affordable	Too expensive to be used	Expensive but affordable for developed countries only in some circumstances but not for developing countries	Affordable for developed countries but expensive for developing countries	Fully affordable for developed countries But expensive for developing countries	Fully affordable for developing and developed countries		

DISCONTOOLS Expert Groups

Diseases in focus:

Production diseases: Para TB, Liver Fluke, Coccidiosis, Nematodes, S. aureus mastitis, Environmental mastitis, Small Ruminant mastitis, PRRS, PCV II, SI, Swine A. pleuropneumonia, Swine mycoplasma, BVDV, BRSV, BHV-I, Mycoplasma bovis, Theileria

Epizootic: AHS, ASF, AI, BTV, CBPP, CSF, FMD, PPR, RVF, Sheep & Goat Pox, Ruminant Zoonotic Pox, SVD, WNV

Zoonotic: Rabies, Nipah, Anthrax, Brucellosis, Bovine TB, Q Fever, Trypanosomiasis, Leishmaniasis, Leptospirosis, Clamydiosis, Cysticercosis, Echinococcosis, Salmonellosis, **E. coli**, Campylobacterosis, Hepatitis E, BSE, Cryptosporidiosis, CCHF

Verocytotoxin/Shiga toxin-producing *Escherichia coli* (VTEC/STEC) Expert Group

Coordinator: Alfredo Caprioli, Istituto Superiore di Sanità, Community Reference Laboratory for *E. coli*, Rome, Italy

	Field	Expert
1	Laboratory diagnostics, animals	**John M. Fairbrother**, OIE Reference Laboratory for *Escherichia coli,* Faculté de médecine vétérinaire, Université de Montréal, Saint-Hyacinthe, Canada
2	Laboratory, pathogenesis, animal colonization	**Roberto M. La Ragione**, Veterinary Laboratories Agency (Weybridge), UK, Med-Vet-Net Deputy Coordinator
3	Laboratory, pathogenesis, animal colonization	**Lothar H. Wieler**, Veterinary Faculty, Freie University Berlin, Germany
4	Laboratory, animal colonization, farm ecology	**Jeffrey T. LeJeune**, Ohio Agricultural Research and Development Center, US
5	Food Microbiology	**Jeppe Boel**, National Food Institute , Technical University of Denmark, Copenhagen, Denmark
6	Epidemiology, burden of human disease (HUS) estimation, risk factors	**Gaia Scavia**, Dept. Veterinary Public Health, Istituto Superiore di Sanità, Rome, Italy

Deliverables by *E. coli* expert group

- Input to “Disease and Product Analysis”
- Input to “Product Gap Analysis”
- Input to “Disease scoring model”

Main gaps – human infections (1)

- ***Identification of the minimal set of VTEC virulence genes/factors ("virulome") required for causing severe disease in humans.***
- ***Better diagnostic methods for the identification of human VTEC infections.***
- ***Better surveillance systems, with inclusion of VTEC non-O157 and definition of the serotypes/clones associated with severe diseases (HUS and bloody diarrhea).***
- ***Estimation of the burden of VTEC infections, including costs, in the population; at present, it is available only for a few countries.***

Main gaps – human infections (2)

- ***Estimation of the possible role of humans as a reservoir for sorbitol fermenting VTEC O157 and some VTEC non-O157 (eg, O26 VT2+ve) pathogenic clones***
- ***Research on VT genetic variation and expression and on the diseases potential of the different toxin variants; mechanisms of VT blood transportation during HUS.***

Main gaps Animal infections (1)

- ***In general, to extend the knowledge gained on VTEC O157 to the main pathogenic VTEC non-O157 serogroups.***
- ***Improve the understanding of colonization and persistence of VTEC O157 and non-O157 in ruminants.***
- ***Improve the understanding of the biology of the "super shedder" phenomenon and of the role of these subjects in the infection cycles.***
- ***Improve the understanding of the immune response in animals, particularly to bacterial structures that could represent vaccine components.***

Main gaps Animal infections (2)

- ***Research on inter- and intra-farm spread of VTEC: how is the organism spread between farms and how are animals exposed within a single farm. Improve the understanding of the environmental survival.***
- ***Research on the use of probiotics and phage therapy to prevent colonization.***
- ***Modeling the cost/benefit of control measures in term of reduction of the burden of VTEC infections in humans.***

Main gaps: Food control

- *Easy and rapid tests targeting the main VTEC non-O157 pathogenic serogroups are required. VTEC that are presumably poorly virulent to humans are abundant in animals and food, so the methods should be targeted to the serogroups/clones most associated with human disease.*

- *Role of vegetables: Studies on the interaction between bacteria and plant organisms and models for crop contamination via manure and/or irrigation.*

Status of work

E. coli input delivered

Input on other diseases have been or are in the process of being produced

The "prioritising" process is in progress

The results of the will be published on the website:
http://www.discontools.eu

Currently the *E. coli* input only available on "members area" of the web site

For more and updated information:

http://www.discontools.eu

Thank you