Vaccine vs *Campylobacter jejuni*

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BACKGROUND

Campylobacter spp is the most common bacterial cause of human gastroenteritis on the world. It commonly founds as a commensal of the gastrointestinal tract of cattle, sheep, pigs, goats, dogs, cats, rodents, wild birds and poultry. Many cases of human enteritis have been linked to contact with animals, contaminated water or contaminated food of animal origin[1].

Infection with *Campylobacter* spp causes diarrhoea, fever, abdominal pain, nausea, headache and muscle aches. Most infections are self-limiting but an acute infection can have serious consequences, such as Guillain Barré Syndrome, Miller Fisher Syndrome, peripheral neuropathies and functional bowel diseases, such as irritable bowel syndrome[2].

Campylobacter jejuni is a spiral-shaped Gram-negative pathogen belonging to the group of epsilon-proteobacteria. It presents one or two polar flagella at its ends allowing its characteristic mobility like corkscrew. It is a microaerophilic microorganism, thermophilic (optimum growth temperature at 42°C) and neutrophil (pH optimum of 6.5 to 6.9)[3].

Figure 1. SCAN SEM X5000 of *C. Jejuni* [4].

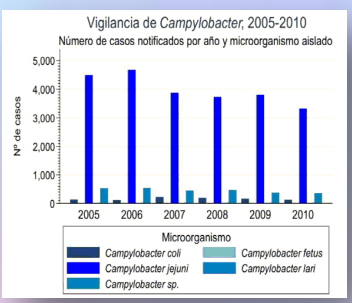

Figure 2. Incidence of campylobacteriosis in Spain [5].

Table 1. Mechanisms of pathogenicity[6, 7].

Infectious process	Molecules involved
Capsule	Repeating oligosaccharide units attached to a dipalmitoyl-glycerophosphate lipid anchor
Adherence	*CapA, flaC, cadF, docC, racR, jlpA, FspA2, peb1, dnaJ*, flagella, OMP called CBF.
Colonization	
Invasion	*virB11, CIAB, iamA, pldA* and fucosylated oligosaccharides
Toxin production	-CJT: heat-labile enterotoxin -CDT: distension cytotoxin
PVir plasmid	Encodes a type IV secretion system (SSTIV).

Campylobacter jejuni produces a heat-labile enterotoxin (CJT) that shares some common properties with enterotoxins of *Vibrio cholerae* (CT) and *Escherichia coli* (LT). CJT comprises two subunits: the larger A subunit which has enzymatic activity, and the smaller B subunit, which is immunodominant[8].

The CJT increases cAMP levels, causes changes in CHO cells and induces accumulation of Na^+ and Cl^- in the loop fluid[8, 9].

The optimum production is achieved at 42°C in 24h, and the produced amount increases with polymyxin[8, 9].

INITIAL HYPOTHESIS AND OBJECTIVES

The main objective is to develop an efficient vaccine against *Campylobacter jejuni* cost-effective and accessible to the entire world population. The return would be based on savings in social costs applied to diseases arising from this organism and saving costs in the process of research and development; later in labour, equipment and material required to manufacture.

My initial hypothesis is that toxins could be a key point in the development of vaccines, so I will produce a toxoid vaccine.

MATERIALS AND METHODS

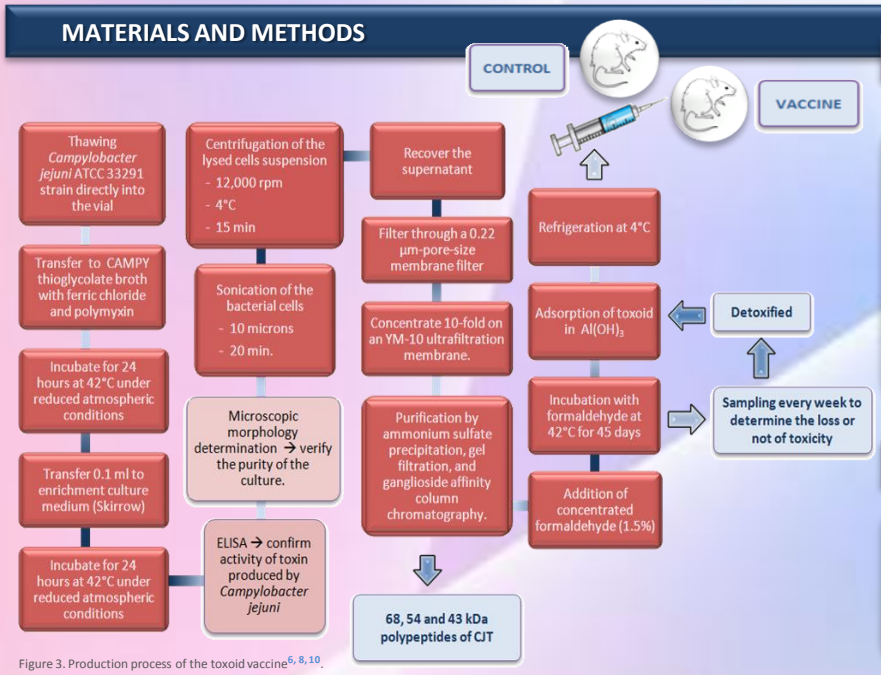

Figure 3. Production process of the toxoid vaccine[6, 8, 10].

EXPECTED RESULTS

- Maintain high vaccination coverage with two doses of CJT.
- It is expected to get good toxin concentrations in the vaccine.
- The results should show high levels of anti-CJT antibodies and all immunization groups should induce a long immune response with similar levels of Ig titers[10].
- It is expected an effectiveness between 80% and 100%.
- The antigenicity of the vaccine will not be significantly compromised after prolonged heating (under 50-55ºC).
- After large-scale production, prices will be low and affordable.
- The vaccine should be safe, with few or even no side effects.
- The vaccine may be administered to immunosuppressed individuals and pregnant.

BENEFITS

Vaccination is the most effective way to prevent campylobacteriosis and can help protect people at risk measure. Also thanks to vaccination decreases the number of hospitalizations and therefore also reduce medical costs against campylobacteriosis , helps break the transmission or reduce the chances of a susceptible person comes into contact with an infected person.

PLAN OF DIFFUSION

Dissemination of research:

Previous agreements with companies or public and private entities for the diffusion and dissemination of results / Publication in scientific journals / Contributions to scientific meetings / Participation in forums or professional conferences / Participation in national and international trade fairs / Press releases and project brochures / Posting on network using new technologies

Dissemination of production: laboratories

Contact with public and private companies

Dissemination of marketing: last customer

To promote vaccination campaigns raising awareness of the importance of vaccination:

Posters in health centres / Posting on network using new technologies (facebook, twitter, mobile applications ...)

Meetings with ONGs for implementation in developing countries

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