

Investigating the potential contribution of the food pathway to CDI incidence in an Irish hospital scenario specifically regarding pork meat with the additional risk of antibiotic usage.

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INTRODUCTION

Clostridioides difficile is a gram-positive, spore-forming anaerobe which causes infection (CDI) to human gastrointestinal health (Kouhsari et al., 2018). CDI is formerly regarded as a traditional nosocomial disease associated with intestinal dysbiosis due to antibiotic administration (Lagier, 2016). In recent years, the epidemiology of *C. difficile* has greatly changed resulting in an increased incidence of community-associated CDI, an identified potential for zoonotic and foodborne transmission to humans, and the emergence of hypervirulent strains (Gould and Limbago, 2010; Cartman et al., 2010; Hensgens et al., 2012; Fu et al., 2021). Clinically relevant *C. difficile* strains have often been isolated from a variety of retail food products across several continents over the past few decades as evidenced in a meta-analysis report accounting for studies between 1981-2019 (Rodriguez-Palacios, 2020).

The aim of this study is to investigate the potential association between CDI colonisation and disease in an Irish hospital with exposure to *C. difficile* through consumption of retail pork meat.

METHODOLOGY

The incidence of *C. difficile* in an Irish hospital scenario through food and pork meat consumption was modelled with an agent based modelling simulation method using a previously published model (Kwon et al., 2016). The model was modified to simulate the scenario of the Irish hospital environment: 13 560 hospital beds at 90.7 % occupancy with an average length of stay at 6.1 days as reported by the OECD, (2018); Prescription of antibiotics for an acute hospital in Ireland was assumed at 76.5 dose/day/100 bed days, ranging between 26.3-104.8 (HPSC, 2020). The probability of finding spores in raw pork meat was characterised by a mean of 0.02, and a range of [0.00.03] (Rodriguez et al., 2014) with a concentration of 20 spores/g (Weese et al., 2020). The average person in Europe consumes 10kg of pork per annum (European Commission, 2013) this was applied to estimate the average number of pork meals consumed by an Irish person per annum (133-

200 pork meals) against the standard size of a portion of meat as reported by the HSE serving guide (50-75g) (HSE healthy food for life, 2016). The model output was then plotted using R (R Core Team, 2020).

RESULTS

The outcomes of the stochastic simulations for the general food pathway colonisation and infection demonstrated that the median colonisation was 1.7 per 10 000 patient-day stay with 5 % and 95 % percentiles of [0.52, 2.89] whereas the estimated disease rate had a median of 0.05 with a percentile interval [0.014 0.096].

The outcomes of the potential pork meat pathway colonisation and infection demonstrated that the median colonisation was 3.1 per 10 000 BDU with 5 % and 95 % percentiles of [2.07, 4.39] whereas the estimated disease rate had a median of 0.09 with a percentile interval [0.052 0.144].

DISCUSSION

This study provides insight to the potential contribution of the food pathway to CDI incidence specifically regarding pork meat with the additional risk concerning antibiotic usage. The HPSC (www.hpsc.ie) reported, 2053 cases of CDI for the year of 2018, with 1 218 cases associated with hospitals. This showed an increase from 2017, when 1766 cases of CDI were reported, with 1,117 associated with healthcare facilities. The per annum increased incidence of patients seeking treatment for CDI in Ireland will likely result in significant impacts on the Irish public healthcare system.

The outcomes of the food pathway to colonisation and infection presents some preliminary evidence that food in general and pork meat specifically may not represent a contribution to CDI. The estimated incidence rates of the food pathway (n=21) and worse case pork meat (n=39) are in agreement with Kwon et al. (2015) and when compared with the Irish CDI hospital prevalence would signify less than 4 % of the total prevalence.

Future work to assess the effect of antibiotic treatment and seasonality may provide further insight on the significance of the food pathway in hospital and community acquired CDI.