Development of a vaccine against Helicobacter pylori infection: An update

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Abstract

Helicobacter pylori (H. pylori) is a bacteria present in the stomach of an important percentage of the population worldwide. Its infection can be asymptomatic but it is linked to gastric inflammation, that may evolve to ulcers and gastric cancer. Here I will focus new data (most of the data is referred to murine models, due to the lack of human studies) regarding advances towards a reliable vaccine against H. pylori that can be used as a prevention for healthy organisms to be infected by the bacteria and/or as a treatment for host organisms already infected. I will focus on articles published in the last year and I will refer to more extensive reviews for more detailed information.

Introduction

Helicobacter pylori (H. pylori) is a bacteria that is present in the stomach of a high percentage of humans and, although its infection can be asymptomatic for the host, it can also promote the appearance of inflammation, peptic ulcers and gastric cancer (Graham 2021; FitzGerald and Smith 2021). It has been traditionally treated with antibiotics, but antibody resistant strains have arisen and are an important public health problem (Tshibangu-Kabamba and Yamaoka 2021). In addition to therapeutic options, there have been attempts to eradicate the H. pylori infection, in order to decrease the prevalence of gastric cancer, but it has not been eradicated yet (Moghadam et al. 2020). Furthermore, basic research has been perform aiming to better understand the infection mechanism and murine models have been generated (Dey et al. 2021) A vaccine against Helicobacter pylori infection A vaccine has been proposed as a good solution to eradicate H. pylori infection and, as a consequence, eliminate an important causative factor of gastric cancer. The topic has been reviewed with more detail elsewhere (Dos Santos Viana et al. 2021; Robinson and Lehours 2020). Here I will refer to the latest advances towards the development of a vaccine.

Some predictive in silico studies has proposed a number of epitopes to generate a vaccine against them (Taş et al. 2020; Banga Ndzouboukou et al. 2021), and also a number of compounds that are putative candidates for vaccination, based on one (Wang et al. 2020) or many epitopes (Jafari and Mahmoodi 2021; P et al. 2021; Ma et al. 2021; Rahman et al. 2020). A parenterally administrated vaccine (by intranasal or subcutaneous route), together with the adjuvant cyclic guanosine monophosphate-adenosine monophosphate (cGAMP), activated host immunity in an effective way to reduce the gastric mucosal colonization by H. pylori (Chen et al. 2020).

Oral vaccination has also been tested in murine models. Xie et al. administrated an oral vaccine to mice before (prevention) and after (treatment) being infected with H. pylori and observed a decrease in H. pylori infection rate and gastric inflammation, compared to non-treated group (Xie et al. 2021). Similarly, Zhong et al. tested another preventive oral vaccine in murine models of H. pylori infection, concluding that it diminished bacterial colonization via activation of host immunity, such as Th17 response (Zhong et al. 2020). A Saccharomyces cerevisiae-based vaccine, orally administrated to mice prior to infection, was also capable to reduce H. pylori loads in the stomach after infection (Q et al. 2021).

Conclusions and further directions

As I showed in this review, many vaccines are currently being designed and tested in animal models. Despite of that, many of them are used for prevention and, more importantly, human studies are missing. The development of a vaccine that could be used in the clinics will allow massive vaccination campaigns, especially in populations that present high incidence of H. pylori infection (Molaoa2021).

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