Letter to Editor: Challenges in the Development of Hepatitis C Vaccine

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Letter to Editor

Globally elimination of HCV is a major challenge to reduce the burden of this deadly virus. Chronic Hepatitis C can increase the risk for certain types of cancers [1]. To minimize the burden of HCV World Health Organization (WHO) set a goal in May 2016 for the elimination of HCV by the end of 2030. The principle aim of this project is to minimize the 80% per annual new infection and 65% turn down the mortality ratio [2]. For the treatment of HCV the development of all the interferon based drugs like direct-acting antivirals (DAAs) is particularly available with low prices in the developed countries. It’s true that DAAs are major contributor to control the global burden but many limitations of medication make the expansion of a prophylactic vaccine requisite to attain the goal. Before the progression of liver infection mostly HCV infection is asymptomatic, and the HCV screening is not efficient in all the countries that are the reasons a number of individuals are not detected with HCV infection [3]. DAAs increased the rate of treatment but the reinfection of HCV is one of the major challenges to gain the goal. After the efficacious treatment the immunity of individual slows down which cannot compete with reinfection of HCV although individuals are under the risk of other infections, includes homosexuality, health workers with continuous exposure of blood and blood products and drug users [4]. Meanwhile, the evolution of greatly effectual direct acting antivirals (DAAs) has transformed the medications of HCV but this treatment is still much expensive to many underprivileged medical departments and may also correlate with the evolution of viral resistant strains which also pass on to other individuals [5]. Mostly HCV infected individuals are asymptomatic and not diagnosed until the liver infection is advanced [6]. To cope all these obstacles a prophylactic vaccine is very important to prevent from chronic infection but still it remains a goal to achieve this advent. If it is possible to achieve a prophylactic vaccine, then it will be a great opportunity for the individuals who are at the risk of HCV to eliminate the infection of deadly virus. However, there are some limitations in the development of a prophylactic vaccine. One of the challenges is the viability of traditional methods for the HCV vaccine configuration. Production of inactivated and live attenuated entire virus vaccine is effectual in case of other viruses, but this method is not reliable for the production of HCV vaccine. The incompetence and proceeding limitations to culture HCV has produced different challenges in the production of inactivated and live attenuated entire virus vaccine [7].

The marvelous genetic diversity of HCV is the fundamental challenge for the development of a prophylactic vaccine. The genetic diversity of hepatitis C virus surpasses the human immunodeficiency virus-1 with known 7 genotypes and more than 80 subtypes. HCV strains vary on an average of about 30% of their amino acid’s ratio from different genotypes, while different subtypes vary on an average of about 15% of their amino acids ratio within each genotype [8]. Immune alternative and the error-prone polymerase of the virus produces different quasispecies of correlated but genetically different viral variants inside the infected person in summation to heterogeneity within genotypes and subtypes, which provides many chances for choosing the viral variants with resistance to antibodies and T-cell feedback [9]. Antibody resistance
can emerge from mutations either inside or far from antibody obligatory epitopes providing the virus with supplementary contraption of immune diversion illustrated by different studies. Vaccine introduction rapidly activates the immune responses or the production of immune responses which target heterogenetically conserved regions of the viral genomic sequence that may be essential for the immunity against HCV infection for the viral heterogeneity inside and between infected people [10]. A limited number of cross-reactive immune responses against the different HCV strains are a prime challenge to develop a prophylactic vaccine.

Another challenge in the production of effective HCV vaccine is the insufficiency of in vitro approach and immunocompetent small animal models which provide the current ongoing vaccination method that induces defensive immunity [11]. The generation of rat Hepacivirus which is similar to HCV will introduce a new small animal model for the assessment of vaccine. It’s structurally associated with HCV but limited sequence homogeneity with HCV is the demerit of this model [12]. The well-formed rational design of immunogens will be beneficial in order to develop a prophylactic HCV vaccine. Improvements in the scanning of antibody repository are acknowledging greater perception into the category of nAbs which are correlated with SVC, there is potential to use this statistic to generate immunogens which approbate the development of such kinds of antibodies [13].

A mega investment proceeded by pharmaceutical companies on DAAs with a huge financial bonus of approximately £15 billion in 2015 according to Gilead Sciences which deflected the surveillance of HCV vaccine production. To develop the vaccine there is negligible private sponsored speculation in spite the dire need of a permitted vaccine being recommended by researchers. For publically sponsored medical care system, an accessible vaccine provides a reasonable substitute to prohibit costly DAAs which may engage sponsorship from governments and foundations [13]. In the absence of a prophylactic vaccine the elimination of any such pathogens is difficult and impossible so there is urgent need for funding investment to develop a successful HCV vaccine.

In conclusion, efficacy of DAAs for the elimination of HCV is not enough unlikely the development of a prophylactic vaccine. The appropriate animal model should be studied for the exact correlation of the protective immune response. The major improvements in the in vitro mechanism will provide a better tool for rational design vaccine.

References

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