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An evaluation of doctors and medical students' attitudes and beliefs of pediatric vaccinations in Pakistan

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Aims: As doctors and medical students now have decreased exposure to vaccine preventable diseases and as the media's portrayal of vaccines may cause misconceptions; this survey aims to explore their attitudes towards pediatric vaccinations.

Methods: Vaccination attitudes and beliefs of doctors and medical students from four institutions in Pakistan were assessed by an anonymous, self-administered, internet-based survey from 14 April 2015 to 14 July 2015. Questions related to the importance of vaccination, effects of multiple vaccines, reasons for parental refusal and perceived barriers to vaccination in both developed and developing countries. Data were analyzed qualitatively for themes and sub-themes. Ethical approval was obtained from King's College London.

Results: 103 doctors and 29 students participated and the majority of doctors (83/102 (81.4%)) and students (25/29 (86.2%)) agree/strongly agree that parental refusal to vaccinate their child is a form of neglect. 63/102 (61.8%) of doctors and 11/29 (37.9%) students disagree/strongly disagree that unvaccinated children should be excluded from school. 89/102 (87.3%) of doctors and 14/29 (48.3%) of students disagree/strongly disagree that multiple vaccines weaken a child's immune system. 51/52 (98%). 90/102 (88.2%) of doctors and 13/29 (44.8%) of students disagree/strongly disagree that natural immunity is better than vaccines.

Conclusion: The findings of this study form a platform to develop interventions promoting positive attitudes towards children's vaccines. Further research would be invaluable to enhance understanding including the media's role in propagating these attitudes as well as the impact of cultural factors. Attitudes of other professionals working with should be assessed to determine a holistic perspective of the attitudes and beliefs.

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Prokaryotic expression of influenza conserved domain chimer protein (HA2-NP) as a universal vaccine candidate

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Influenza, a respiratory pathogen, causes high degree of mortality and morbidity during seasonal epidemics and sporadic pandemics. By selecting conserved antigenic proteins, e.g. hemagglutinin small subunit (HA2) and nucleoprotein (NP), we would be able to develop a vaccine based on a fusion protein causing both cellular and humoral response which are the most challenging aspects in designing a universal vaccine. For this purpose, primers for the antigenic part of NP were designed using bioinformatic tools. The desired product was multiplied *via* polymerase chain reaction (PCR) method using the designed primers which was then penetrated into T vector, followed by insertion into pET28a vector in order to construct pET28a/NP. Both pET28a/NP and pET28a/HA2, the latter was previously generated in our lab, were digested with the same restriction enzymes HindIII/XhoI and therefore NP was inserted to downstream region of HA2 in pET28a/HA2 construct. The generated pET28a/HA2-NP was transformed into *E. coli* (BL21(DE3)) using chemical competent (CaCl₂) method. The expression was induced by isopropyl-beta-D-thiogalactopyranoside (IPTG) in concentration of 1mM in 37°C and optimized in 28°C. The results were confirmed by sodium dodecyl sulphate-polyacrylamide gel electrophoresis (SDS-PAGE) followed by western blotting. The results showed that the antigenic segment of NP was successfully cloned into pET28a/HA2. The 36KD protein band of HA2-NP was observed on SDS-PAGE and western blotting. Unlike current available vaccines in which some allergic reactions are observed, our chimer protein is continual and safe, stimulating both cellular and humoral immunity systems. Our construct could potentially provide a basis for a universal vaccine candidate.

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