Vaccine design against *Toxoplasma gondii* in ovines using surface antigen-1 (SAG1) and dense granule protein-6 (GRA6) antigens through immunoinformatic approach

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NRF National Research Foundation

NICIS NATIONAL INTEGRATED CYBERINFRASTRUCTURE SYSTEM

CHPC

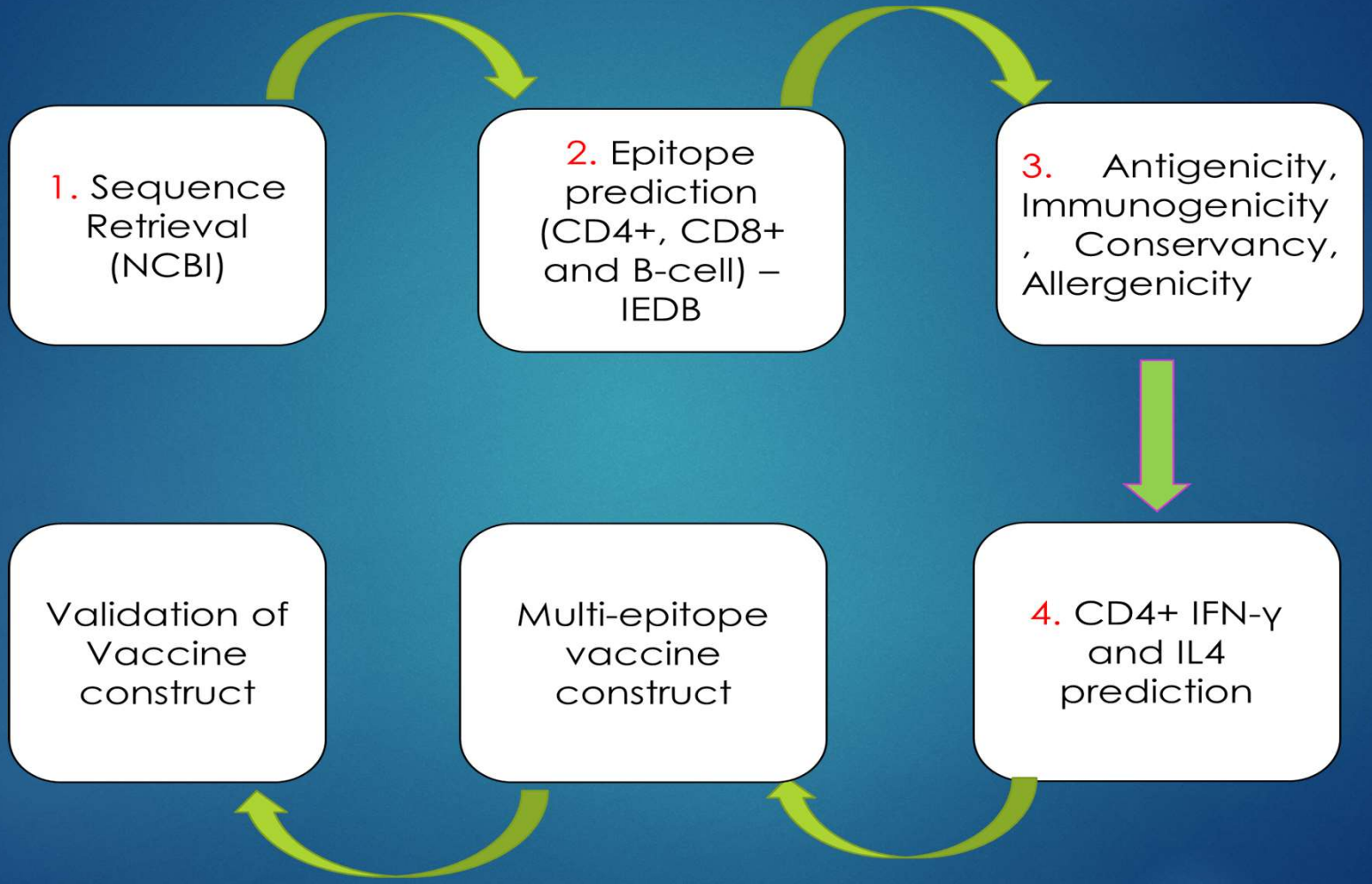
Introduction

- Toxoplasmosis: Zoonotic disease known to infect almost all warm-blooded animals (including humans).
- Caused by Toxoplasma gondii resulting in congenital infections and abortion in humans and livestock.
- Primary carrier/host: Cats (Felidae)
- Intermediate hosts: Humans and livestock
- Threatens public health due to increased zoonotic risk of transmission of infections to humans
- Mode of transmission: Consumption of contaminated food, water and dust.
- In humans: Poorly cooked meat containing *T. gondii* tissue cysts or accidental ingestion of contaminated water or vegetables with infected cat faeces

Aim

- Identify antigenic T-cell and B-cell epitopes
- Design a potentially cost-efficient peptide-based vaccine by exploring the *T. gondii* antigens through immunoinformatics techniques.

MATERIAL & METHODS



RESULTS AND DISCUSSION

- IDENTIFIED:
  - 1 CD8+ and 1 CD4+ T cell epitopes
  - 10 B cell epitopes
- Multiepitope vaccine construct design via attachment of linkers(GPGPG, and KK) and Adjuvant (Cholera toxin B subunit)-3Dpro

- VALIDATION
- ProSa: Z score = -2.93

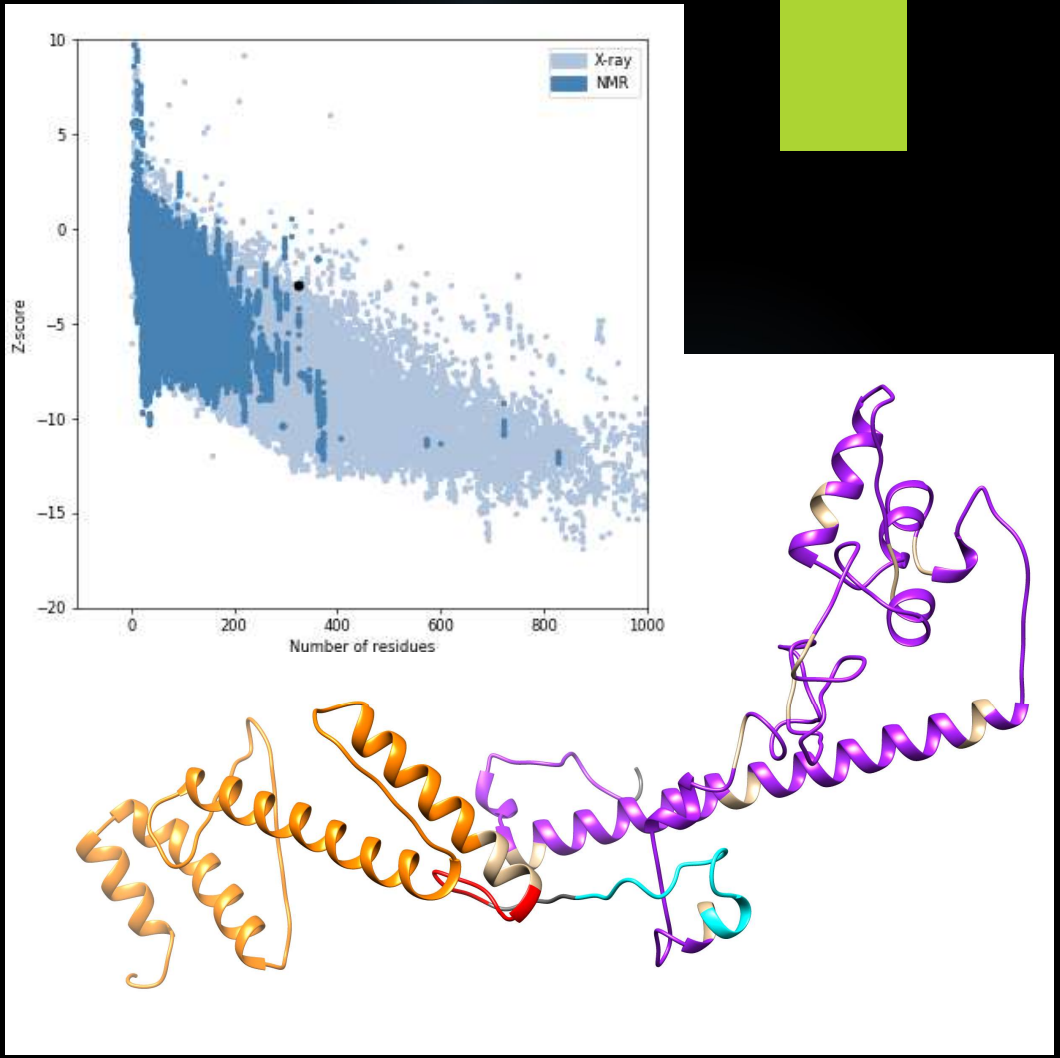
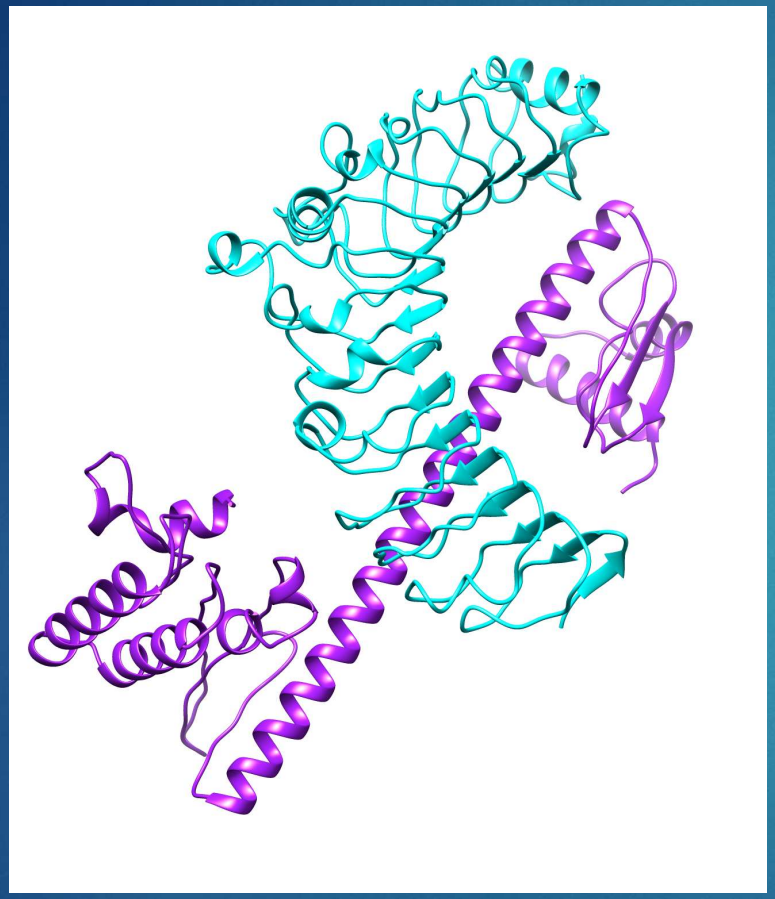


Fig. 1: Tertiary structure of final refine multiepitope designed vaccine and validation ProSA plot



- DOCKING: Toll-like receptor-4
  - ✓ Binding affinity: -151.645 kcal/mol
- Physicochemical properties of vaccine construct
  - ✓ Antigenicity: 0.9135
  - ✓ Solubility: 0.9485
  - ✓ pI: 9.81
  - ✓ Molecular weight: 34.08 kDa
  - ✓ Instalibity Index: 29.36
  - ✓ Aliphatic Index: 75.62
  - ✓ GRAVY: -0.425

Fig. 2 Tertiary structure of designed vaccine docked against Toll like receptor 4 (TLR2)

CONCLUSION

- Current study designed a promising multiepitope vaccine from a cocktail of T. gondii antigens.
- Designed vaccine was highly antigenic and non-allergenic, appropriate for production.
- Great promise in conferring complete host protection as it effectively elicited host immune response
- Valuable for future studies focusing on vaccine development against T. gondii.