

## A Serological Study in Response to People at Occupational Risk of Rabies Virus Exposure in Nepal

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### Abstract

A serological study to know the antibody titer against rabies virus in human beings, who are at occupational risk, was conducted in Nepal in 2014. A total 44 serum samples were collected out of which 21 samples were collected from medical professionals (working at Sukraraj Tropical Hospital) and 23 were collected from veterinary professionals (working at Central Veterinary Hospital, Central Veterinary Laboratory and Rabies Vaccine Production Laboratory) in Kathmandu. Among the 44 samples, 4 were collected from unvaccinated persons. The other 40 people sampled were vaccinated with inactivated rabies vaccine. All samples were subjected to the Rabies Fluorescent Focus Inhibition Test (RFFIT) test at Centre for Disease Control and Prevention, Atlanta, USA. The antibody level of 7 persons was found to be less than the WHO recommended titer of 0.5 IU/ml. Six medical professionals and one veterinary professional had a low rabies virus neutralizing antibody titer. The 4 samples collected from unvaccinated persons, and 3 collected from vaccinated persons had a titer below 0.5 IU/ml. This study shows that medical and veterinary professionals who are responsible to nurse or handle rabies patients, rabid animals or rabies virus are still at high risk. This underscores the importance of recommendations for regular serological testing of occupationally exposed individuals and vaccinating booster dose when necessary.

### Introduction

Rabies is endemic and priority zoonotic disease in Nepal. The death of 200 [1], human being and 300 animals [2], per year has been reported in this country. The disease has been confirmed in cattle, buffaloes, goats, alpaca, dogs and mongoose [3]. Rabies occurs throughout the year and dog is the principle vector for the transmission of disease. Rabies Vaccine Laboratory in Kathmandu produces 50,000 doses of cell culture vaccine for animal use whereas vaccine for human use is imported from other countries [3]. Health authority purchased 300,000 doses expending 1 million USD every year to purchase inactivated cell culture rabies vaccine for human use (personal contact with EDCC). In 2012, 334,737 doses of cell culture rabies vaccine were purchased by Epidemiology and Disease Control Division, the Department of Health Service. Vaccine is not available to all victims at risk in country side therefore the case fatality is higher [4]. More than 45,000 people receive post exposure vaccination annually in Nepal. Number of dog bitten cases per month coming to Sukraraj Tropical Hospital (STH) for post exposure treatment is 1520 and in average 50 cases receives post exposure rabies vaccine daily in this hospital (Personal contact with STH Hospital).

Human or animal health workers, in contact with rabid animal or patient or rabies virus are at high risk of rabies infection. Therefore pre exposure rabies vaccine has been recommended by World Health Organization (WHO) for medical peoples, veterinarian and laboratory personals. The immunization protocol includes three injections, e.g. at days 0, 7, and 28. The serological evaluation of immunization is made 1-3 weeks after the last injection, and checked every 6 months in the

case of laboratory workers or every 2 years for other diagnosticians. Booster vaccination must be given when the titer falls below 0.5 International Units (IU) per ml. In the absence of serological monitoring, the vaccination regimen should consist of a booster vaccination at 1 year and thereafter every 1-3 years [5,6]. Therefore the antibodies titer in response of rabies vaccine in vaccinated people or animal should be tested periodically by performing Rabies Fluorescent Focus Inhibition Test (RFFIT) after vaccination to avoid unnecessary vaccination and to reduce the risk of rabies infection. In this study we have measured antibody titer against rabies vaccine in professional people who have high risk hazard of Rabies.

### Methodology

Blood samples were collected from 44 persons (13 female and 31 male) after getting oral consent in 2014. Sampled persons were 21 medical professional and 23 veterinary professional having occupational risk of rabies. Among medical professional 4 were doctors and 17 were technicians (paramedical) working at Sukraraj Tropical Hospital, Kathmandu. Among veterinary professional 9 working at Central Veterinary Hospital, 7 working at Central Veterinary Laboratory and 7 working at Rabies Vaccine Production Laboratory in Kathmandu. All 44 samples person were 28-58 years old. Among 44 collected samples, 4 were from unvaccinated persons and rest was from vaccinated persons in different time. Serum was separated labeled accordingly and stored at -20°C in refrigerator. The description of samples was presented in table 1. Samples were packed and transferred to Centre of Disease and Prevention Rabies

Laboratory, Atlanta USA according to IATA instruction. The serum samples were subjected to RFFIT according to protocol described by World Health Organization (1996).

## Results and Discussion

The test revealed that 15.9% of tested samples had antibody titer 0.043 IU/ml below than WHO recommendation 0.5 IU/ml serum and 84.1% of tested samples had adequate titer ranging from 1.1 to 3316 IU/ml. Out of 40 sample collected from vaccinated person 7.5% had low antibody titer. The result of RFFIT has been presented in table 1. The variation of antibody titer was directly related to the number or frequency of dose, type of vaccine and duration between vaccination time and time of sample collection. Six medical professional and one veterinary professional had low level of titer. The low level of titer in 4 unvaccinated medical professional was normal and expected in control samples. Sample No. 1 revealed low titer because sampled person had taken nerve tissue post exposure vaccine 15 years ago. Low antibody titer of sample No. 8 (medical professional) and sample No. 29 (veterinary professional) might be due to lack of booster dose both of them had taken pre-exposure vaccination 1-3 years ago. However other factor such as host ability to immune response, quality of vaccine and health status may influence the production of antibody titer in host [7]. Sample No. 7 had highest titer 3396 IU/ml because

Sampled person had taken pre exposure cell culture inactivated vaccine and again booster dose 3 month ago. All 40 vaccinated people had taken inactivated cell culture vaccine except sample No. 1 and all sampled person with adequate antibody titer had taken booster in addition to pre or post exposure vaccine. This study showed that 15.9% of sampled professional were working at risk at Sukraraj Tropical Hospital and Central Veterinary Hospital were rabid patient were examined and treated. Among 7, 5 were female and 2 were male by sex. Therefore pre exposure vaccination and periodic sero-monitoring of antibody titer and administration of booster for person working at risk is urgent which is lacking in Nepal. WHO and World Organization for Animal Health has also recommended such preventive measures to be adopted by people at risk of rabies who work in medical and veterinary hospital or laboratories [4,8].

Sample No.	Sex	Titer	IU/ml	Recommendations
1	Male	< 5	< 0.043	Recommendation boost
2	Female	6000	52	Adequate
3	Male	2200	19	Adequate
4	Female	45	0.39	Consider boost
5	Male	1200	10	Adequate
6	Male	1100	9.6	Adequate
7	Female	> 390625	>3396	Adequate
8	Female	21	0.18	Recommended boost
9	Female	< 5	< 0.043	Recommended boost
10	Male	15625	>136	Adequate
11	Female	< 5	< 0.043	Recommended boost
12	Male	1900	16	Adequate

13	Male	145	1.3	Adequate
14	Male	230	2	Adequate
15	Male	1100	9.6	Adequate
16	Female	1100	9.6	Adequate
17	Male	5100	44	Adequate
18	Female	< 5	< 0.043	Recommended boost
19	Male	1500	13	Adequate
20	Male	1300	11	Adequate
21	Female	280	2.4	Adequate
22	Male	1300	11	Adequate
23	Male	3125	50	Adequate
24	Male	250	8.6	Adequate
25	Female	270	4.3	Adequate
26	Male	3600	58	Adequate
27	Male	1300	21	Adequate
28	Female	70	1.1	Adequate
29	Male	7	0.11	Recommended boost
30	Male	1800	29	Adequate
31	Male	4200	67	Adequate
32	Male	4600	74	Adequate
33	Male	4200	67	Adequate
34	Female	270	4.3	Adequate
35	Male	2700	43	Adequate
36	Male	1900	30	Adequate
37	Male	110	1.8	Adequate
38	Male	1100	18	Adequate
39	Female	450	8.6	Adequate
40	Male	12000	192	Adequate
41	Male	1300	21	Adequate
42	Male	5100	82	Adequate
43	Male	210	3.4	Adequate
44	Male	1900	30	Adequate

Table 1: Result of RFFIT of human serum samples collected from Nepal in 2014.

## Conclusion

All medical or veterinary professional who are at risk of rabies infection are recommended to take pre-exposure inactivated cell culture rabies vaccine. Antibody titer in vaccinated persons should be

tested periodically to ensure the antibody level of protection and to inject booster dose of vaccine accordingly.

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