



# An Experimental Investigation on Resistance/Susceptibility to H5N1 Virus in Indigenous and High Yielding Chickens Of India



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## SUMMARY

Comparative evaluation of genetic resistance/susceptibility among Indian chickens viz. Aseel (Peela), Kadaknath and high yielding Synthetic dam line (SDL-IC) broiler strain (50 birds/genetic group) to induced intra-nasal infection (1000 EID50) with highly pathogenic avian influenza virus strain A/chicken/Navapur/India/7972/06 (H5N1) was undertaken. Overall mortality percentages were 100%, 98% and 92% with Mean Death Time as 3.12, 5.92 and 6.96 days for Kadaknath, Aseel and SDL-IC broiler respectively within 10 days experimental period. Significant differences in severity of clinical signs, gross lesions and time for onset of symptoms were observed. The virus re-isolation from tissues revealed a different pattern of organ invasiveness among the three genetic groups, however, lung was found to be the most affected organ followed by brain both during early and late phase of H5N1 infection in the three genetic groups.

**Key words:** avian influenza, H5N1, indigenous & synthetic chickens, genetic resistance.

## INTRODUCTION

The genetic resistance capabilities of indigenous birds against H5N1 infection need to be evaluated for developing better and humane measures of avian flu management (1). Hence an experiment was designed for a comparative evaluation of genetic resistance among indigenous chicken breeds and indigenously developed high yielding synthetic broiler stock against highly pathogenic avian influenza virus (HPAIV).

## MATERIALS & METHODS

**Experimental Birds:** Aseel (Peela), Kadaknath and Synthetic broiler dam line (SDL-IC) procured from Desi Fowl Unit and Experimental Broiler Farm of Central Avian Research Institute (CARI), Izatnagar.

**Virus:** A/chicken/Navapur/India/7972/06 from High Security Animal Disease Laboratory (HSADL), IVRI, Bhopal.

**Animal Experiment:** For each genetic group eight week old birds were divided into two groups viz.

- Control (uninfected) group (10 birds/genetic group)
  - Treatment group (50 birds/genetic group): infected intra nasally with a dose of 1000 EID50 @ 0.1ml/bird
- The birds were observed and recorded for clinical signs, mortality and gross lesions on daily basis for a period of 10 days.



## RESULTS & DISCUSSION

### Post challenge mortality pattern and Mean Death Time (MDT) (2 & 3)

Genetic Group	Cumulative mortality%	MDT (dpi)
Kadaknath	100%	3.12±0.13 <sup>c</sup>
Aseel	98% (1 Out of 50 survived)	5.92±0.19 <sup>b</sup>
SDL-IC Broiler	92% (4 Out of 50 survived)	6.96±0.14 <sup>a</sup>

No mortality in the control (uninfected) birds.

- Clinical Signs:** The day wise scoring and percentage of birds showing clinical signs in each genetic group post challenge with HPAI is depicted in the Table below.
- Gross Lesions:** Overall severity of gross lesions was less in Kadaknath followed by Aseel and broiler which might be due to less MDT in Kadaknath as compared to other genetic groups (3).

Genetic group	Organ invasion in descending order of Mean HA titres (log2)
Kadaknath	Early(2-3 dpi) Lung & bursa> others
	Late (4-6 dpi) Spleen>lung>liver>cecal tonsils>others
Aseel	Early(3-5 dpi) Pancreas>brain>liver>cecal tonsils>others
	Late (6-8 dpi) Brain>lung & cecal tonsils> proventriculus>others
Broiler	Early(4-5 dpi) Lung & kidney>brain>bursa>proventriculus>cecal tonsils>others
	Late (6-8 dpi) Brain>trachea & lung>cecal tonsils>kidney & spleen>others

Clinical Signs	Genetic groups	Days of post infection (dpi)									
		1	2	3	4	5	6	7	8	9 & 10*	
Depression	K	-	+ (12%)	++ (50%)	+++ (65%)	+++ (90%)	+++ (100%)				
	A	-	-	+ (16.6%)	+ (19%)	++ (59.4%)	+++ (80%)	+++ (90%)	+++ (98%)	+	(100%)
	B	-	-	-	± (2%)	+ (2%)	++ (52%)	++ (60%)	++ (60%)		-
Discolouration of shank & legs	K	-	+ (20%)	++ (42%)	++ (60%)	++ (90%)	+++ (100%)				
	A	-	-	+ (16.6%)	+ (19%)	++ (59.4%)	+++ (80%)	+++ (90%)	+++ (98%)	+	(100%)
	B	-	-	-	± (2%)	+ (2%)	++ (32%)	+++ (51.4%)	+++ (60%)		-
Torticollis & head twitching	K	-	± (20%)	+ (31%)	+ (43%)	++ (90%)	++ (90%)				
	A	-	-	± (4.2%)	+ (12%)	++ (90.6%)	++ (90%)	+++ (90%)	+++ (98%)		-
	B	-	-	-	-	-	-	± (5%)	± (5%)		-
Swollen head, eyes & hock	K	-	-	-	-	-	-				
	A	-	-	± (4.2%)	+ (12%)	++ (90.6%)	++ (90%)	+++ (90%)	+++ (98%)		-
	B	-	-	-	-	-	++ (32%)	++ (51.4%)	+++ (60%)		-
Cyanotic comb & wattle	K	-	-	-	-	-	-				
	A	-	-	-	-	+ (59.4%)	+ (80%)	++ (90%)	++ (98%)		-
	B	-	-	-	-	-	++ (32%)	++ (51.4%)	+++ (60%)		-
Nasal bleeding	K	-	-	-	-	-	-				
	A	-	-	-	-	++ (90.6%)	++ (90%)	++ (90%)	++ (90%)		-
	B	-	-	-	-	-	++ (54%)	++ (60%)	+++ (60%)		-
Greenish diarrhoea/pasty vent	K	-	+ (20%)	+ (42%)	+ (60%)	++ (90%)	++ (100%)				
	A	-	-	-	-	-	++ (50%)	++ (60%)	++ (60%)		-
	B	-	-	-	-	+ (12%)	+ (27%)	+ (40%)	+ (40%)		-

- = No Lesions; ± = Minimal; + = Mild; ++ = Moderate; +++ = Severe; Values in the parenthesis represent the percentage of live birds showing the clinical signs for that particular dpi.  
 K – Kadaknath; A – Aseel; B – SDL-IC Broiler; \* 4 Survivors of broiler and 1 Aseel were recorded for clinical signs on 9 and 10 dpi.



Kadaknath bird showing severe torticollis on 3 dpi



Aseel birds died on H5N1 infection on 4 dpi



SDL broiler showing swollen eyelids & nasal bleeding on 7 dpi



Aseel showing sub-cutaneous hemorrhage in the shank on 5 dpi



Aseel showing sub-cutaneous edema of head on 6 dpi



Aseel showing congestion of brain on 6 dpi



SDL broiler showing anemic musculature on 8 dpi



SDL broiler showing congestion of liver on 8 dpi

## CONCLUSIONS

- Overall, SDL Broiler strain exhibited lowest mortality, highest mean death time, less severe clinical signs with delayed onset, followed by Aseel; Kadaknath were the highest susceptible among the three genetic groups. These differences may be assigned to the genetic attribute of these stocks.
- In all the three genetic groups lung was found to be common organ to be affected most followed by brain both during early and late phase of H5N1 infection.
- The present results further strengthen the need of enhancement of immunocompetence status of host by genetic selection or other alternative method, without compromising the production. Further, these stocks may be characterized for MHC genes and other genes related to H5N1 resistance like MX1 gene in future studies.

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## ACKNOWLEDGEMENT

The authors would like to thank the Directors, of Indian Veterinary Research Institute (IVRI) & Central Avian Research Institute (CARI), Izatnagar, UP and Joint Director, High Security Animal Disease Laboratory (HSADL), IVRI, Bhopal, India for providing necessary facilities and funding in the form of fellowship during the course of this study.