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H5N1 Avian Influenza in Kuttanad — India's Duck-Farming Belt and the Zoonotic Disease Challenge

9 January 2026

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WHY IN NEWS

An H5N1 Avian Influenza outbreak in Kerala's Kuttanad region in January 2026 triggered the culling of approximately 55,000 birds — primarily ducks of the indigenous Chara and Chembally breeds — raising concerns about the impact on small farmers and the zoonotic transmission risk to poultry workers.

H5N1 AVIAN INFLUENZA — THE PATHOGEN

Avian Influenza (Bird Flu) is caused by **Influenza Type A viruses** that primarily infect birds. It is classified into:

Subtypes: Named using two surface proteins:

- **Hemagglutinin (H):** 18 known subtypes (H1–H18)
- **Neuraminidase (N):** 11 known subtypes (N1–N11)
- **H5N1** = Hemagglutinin type 5 + Neuraminidase type 1

Pathogenicity classification:

- **LPAI (Low Pathogenic Avian Influenza):** Causes mild illness in birds; low mortality; most strains
- **HPAI (Highly Pathogenic Avian Influenza):** Causes severe disease and high mortality in poultry; H5N1 is a HPAI strain

Zoonotic potential: H5N1 is one of the most concerning avian influenza strains because it can infect humans — primarily through:

- Direct contact with infected birds or their droppings
- Contaminated environments (poultry farms, live bird markets)
- Processing or slaughtering infected birds without PPE

Global H5N1 timeline:

- **1996:** First isolated from a goose in **Guangdong province, China**
- **1997:** First documented **human deaths** in Hong Kong (18 cases, 6 deaths; H5N1)

2003–2008: Major outbreaks across Southeast Asia, Middle East, Africa — 860+ human cases, ~60% case fatality rate in humans (if untreated)

2021–2023: Massive global spread to North America and Europe in wild birds and domestic poultry — billions of birds affected

India 2006: First H5N1 detection in domestic poultry (Maharashtra); subsequent outbreaks in various states

Kerala: Recurrent outbreaks since 2015 — Kuttanad is a hotspot due to high duck density

KUTTANAD — INDIA'S SUB-SEA-LEVEL DUCK FARMING BELT

Kuttanad (primarily **Alappuzha district, Kerala**) is unique in India for several reasons:

Geography:

Known as **"the rice bowl of Kerala"** and the **"Venice of the East"** (Nehru called it this)

Parts of Kuttanad lie **below sea level** (–1 to –2.5 m) — one of the few agricultural regions globally cultivated below mean sea level

Surrounded by **Vembanad Lake** — Kerala's largest lake and a Ramsar Wetland (designated 2002)

Water management: Polders (bunds) and pumping stations keep farmlands from flooding

Duck farming: Kuttanad has a centuries-old tradition of migratory duck farming — large flocks (200–5,000 birds) walked across paddy fields to feed on post-harvest grain residue, snails, frogs, and insects. This was the original **free-range, integrated paddy-duck farming system**.

Indigenous breeds at risk:

Chara (Champai): Medium-sized, good egg layer, adapted to backwater conditions; named for its tendency to swim like fish ("Chara")

Chembally: Smaller, hardy breed; excellent forager; reddish-brown plumage; endemic to Kerala backwaters

Both breeds are registered under the **National Bureau of Animal Genetic Resources (NBAGR)** as indigenous genetic resources of India.

January 2026 outbreak:

Confirmed: HPAI H5N1 in multiple duck flocks, Alappuzha district

Culling: ~55,000 birds within a 1 km radius of confirmed cases (standard containment protocol)

Compensation: Farmers paid under the **National Livestock Disease Control Programme (NLDCP)** guidelines

GOVERNMENT RESPONSE PROTOCOL

National Action Plan for H5N1:

India's response to avian influenza outbreaks follows the **National Action Plan for Highly Pathogenic Avian Influenza** (Ministry of Fisheries, Animal Husbandry and Dairying):

Containment zones:

Infected zone: Within 1 km of outbreak — all birds culled

Surveillance zone: 1–10 km — monitoring, movement restrictions, no live bird markets

Alert zone: 10–50 km — heightened surveillance, voluntary reporting

Response teams:

DART (Disaster Advance Response Teams): Rapid deployment teams for culling and biosafety enforcement

Rapid Response Teams (RRT): Veterinary and epidemiological experts

Compensation under NLDCP:

Poultry owners compensated at **75% of market value** for culled birds

Central Government funds 50% of compensation; State funds 50%

Centre for Cellular and Molecular Biology (CCMB), Hyderabad — pathogen diagnosis and genomic sequencing for avian flu outbreaks

Human health interface:

ICMR (Indian Council of Medical Research) monitors zoonotic transmission risk

National Centre for Disease Control (NCDC), Delhi — epidemiological surveillance

PPE protocols for culling teams; no human H5N1 cases in the January 2026 Kuttanad outbreak

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THE ONE HEALTH FRAMEWORK

H5N1 is a classic "One Health" issue — where animal, human, and environmental health are interconnected.

One Health approach:

Coined by the **FAO–OIE–WHO Tripartite Alliance** (now Quadripartite with UNEP)

Recognizes that 75% of emerging infectious diseases are zoonotic (animal-origin)

India adopted One Health principles in the **National Action Plan for AMR (2017–2021)** and various zoonotic disease guidelines

Kuttanad's ecological vulnerability:

- Dense migratory bird populations using Vembanad Lake as a staging area bring wild H5N1 carriers (migratory waterfowl are natural reservoirs)
- Mixed farming systems (ducks + cattle + humans in close proximity) increase spillover risk
- Climate change increasing flooding events forces wild birds and domestic flocks into closer contact

UPSC RELEVANCE

Prelims: H5N1 (HPAI — Highly Pathogenic Avian Influenza; zoonotic; first isolated 1996 Guangdong China; first human death 1997 Hong Kong); Kuttanad (Alappuzha dist, Kerala; below sea level; Vembanad Lake; rice bowl of Kerala); Chara and Chembally breeds (indigenous Kerala duck breeds; NBAGR registered); NLDCP (National Livestock Disease Control Programme; MoFAH&D); DART (Disaster Advance Response Teams); CCMB (Centre for Cellular and Molecular Biology; Hyderabad; CSIR lab).

Mains GS-3: One Health approach — linking animal, human, environmental health | Zoonotic disease management in India — governance framework | Indigenous animal genetic resources and their conservation | Disaster management in animal husbandry: compensation, containment, communication | Vembanad Lake — conservation, livelihoods, and ecological threats | Climate change and emerging infectious disease risk.

📌 FACTS CORNER — KNOWLEDGEPEDIA

H5N1 AVIAN INFLUENZA:

Type: HPAI — Highly Pathogenic Avian Influenza

Subtypes: H = Hemagglutinin (18 types); N = Neuraminidase (11 types)

H5N1 first isolated: 1996, Guangdong province, China (goose)

First human deaths: 1997, Hong Kong; 18 cases; 6 deaths

Case fatality rate (humans, historically): ~60% if untreated

India first detection (domestic poultry): 2006 (Maharashtra)

Kerala outbreaks: recurrent since 2015; 2026 = Kuttanad, Alappuzha dist

Culling 2026: ~55,000 birds; breeds: Chara + Chembally (indigenous Kerala ducks)

KUTTANAD — GEOGRAPHIC DATA:

Location: Alappuzha district, Kerala

Elevation: –1 to –2.5 m below mean sea level (one of world's lowest farmlands)

Called "Venice of the East" (attributed to Jawaharlal Nehru)

Also: "rice bowl of Kerala"; paddy-duck integrated farming tradition

Adjacent: Vembanad Lake (Kerala's largest lake; Ramsar WoII 2002; ~2,033 sq km)

INDIGENOUS DUCK BREEDS:

Chara (Champai): medium-size; good egg layer; adapted to backwater conditions

Chembally: small; hardy forager; reddish-brown; endemic to Kerala backwaters

Both registered with: NBAGR (National Bureau of Animal Genetic Resources), Karnal, Haryana

RESPONSE FRAMEWORK:

Infected zone: within 1 km — compulsory culling

Surveillance zone: 1–10 km — movement restrictions

Alert zone: 10–50 km — heightened monitoring

Compensation: 75% market value; Central 50% + State 50% (under NLDCP)

NLDCP: National Livestock Disease Control Programme; MoFAH&D

INSTITUTIONAL FRAMEWORK:

DART: Disaster Advance Response Teams (rapid deployment for culling)

CCMB: Centre for Cellular and Molecular Biology; Hyderabad; CSIR lab; does pathogen sequencing

ICMR: monitors zoonotic human transmission risk

NCDC: National Centre for Disease Control; Delhi; epidemiological surveillance

ONE HEALTH:

Framework: FAO–OIE–WHO–UNEP Quadripartite Alliance

Principle: animal, human, environmental health interconnected

Statistic: 75% of emerging infectious diseases are zoonotic

OTHER RELEVANT FACTS:

NBAGR (National Bureau of Animal Genetic Resources): Karnal, Haryana; under ICAR; maintains gene bank for indigenous livestock breeds

> Vembanad-Kol Wetland: designated Ramsar site in 2002; covers parts of Alappuzha, Kottayam, Ernakulam districts
>
> India has 73+ indigenous cattle breeds registered (NBAGR) + numerous poultry, goat, sheep breeds

Sources: PIB, NCDC, WHO, Kerala Animal Husbandry Dept

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