



Polyphenolic-Based Feed Water Tested on Poultry as a Potential Respiratory Infection Countermeasure

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Abstract

An enhanced polyphenolic chemistry was put into local water¹ on 2 different commercial chicken farms in Tamil Nadu, India and given to 3 different flocks starting at 14 days of their lifecycle and until the end of their commercial growth period of 40 to 48 days (full-sized chickens). The expected mortality/morbidity from respiratory infections (viral, including avian flu, and bacterial) was approx. 50%². Using the feed water this dropped to zero, determined by the judgment of the farmers, there were also no indications of any incidences of respiratory infection. Some limited clinical *in vivo* test data supports the indication that the feed water provides distinct viral prophylaxis.

1. Introduction

IntraMont Technologies has developed an antiviral technology based on enhanced polyphenolic chemistry. The approach builds on the documented capacity of certain polyphenols to bind to proteins including those coating the nasal passages and virion particles, thereby reducing viral attachment and replication.

¹ In this report the product is referred to as EP (enhanced polyphenolic) water.

² It is presently difficult to obtain official, fully documented morbidity rates for poultry farm chickens. This value was provided to us by the farmer supervising this study based on his interactions with the farms in his region. Such difficulty is reported in the United States, as well [<https://undark.org/2025/09/16/avian-flu-farm-data-privacy/>].

A patented formulation (U.S. Patent 11,517,523 B2, issued 6 Dec 2022) was originally developed for a daily-use toothpaste. This product aims to establish a safe anti-viral residue in the oral cavity and oropharyngeal regions through routine brushing of the teeth, providing a prophylactic effect against the initiation of respiratory infections.

The core ingredients of the toothpaste are a select gallic tannin mixed with zinc gluconate. In 2021 Moscow State University, working with us, ran experiments on the ability of these two unique, principal ingredients by themselves and in combination to prevent the infection of embryonic kidney cells by a pseudovirus simulant of SARS-CoV-2. Embryonic kidney cells were compared treated vs. untreated with these ingredients. Figure 1 shows the comparison with green fluorescent protein imaging.

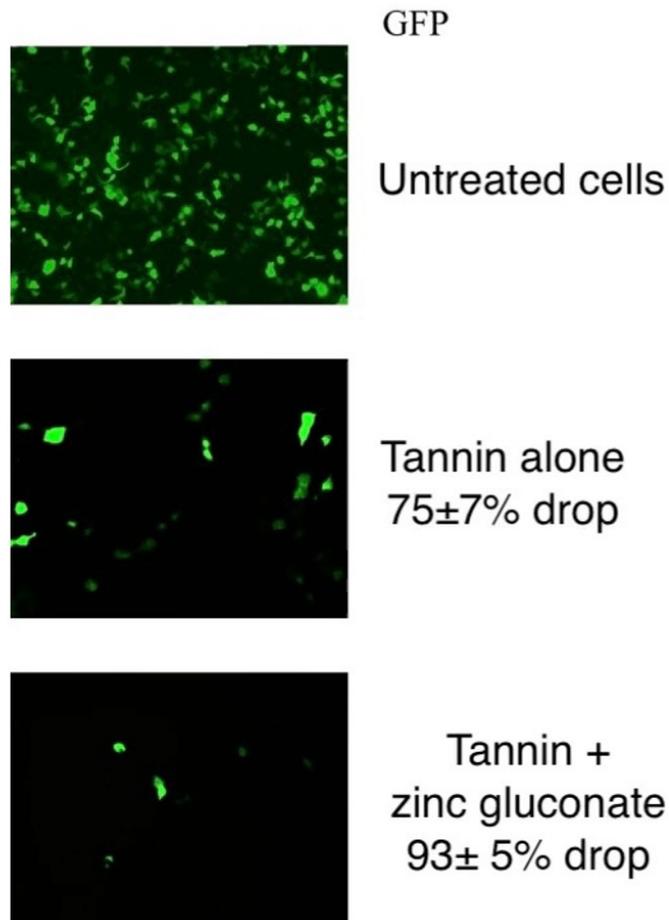


Figure 1. Representative images illustrating the protective action of tannin against S-protein pseudotyped lentiviruses infection of HEK-ACE2 cell line. Cells were pre-incubated 2 hours with either 0.9% NaCl (top), 20 µg/ml tannin (middle), or combination of 20 µg/ml tannin with 10 µg/ml Zn gluconate (bottom).

The zinc gluconate-alone image was not provided but was cited as looking identical to the top image. A full report is available.

2. Mechanistic Rationale

Polyphenolic compounds can bind viral surface proteins and/or block host cell receptors, potentially preventing viral entry. Tannins are polyphenols with at least (14) hydroxyl groups. The presence of these groups enhances the bioavailability of the compound. When administered via drinking water, these compounds may deposit along the avian respiratory tract, functioning as a persistent physical–chemical barrier against airborne pathogens.

This approach is analogous to polyphenolic nasal sprays developed by Cornell University, Columbia University, UC Berkeley, and Moscow State University, but delivered in a more scalable and less labor-intensive manner via farm water systems. Additional references in the open literature cite the ability of select tannins to inactivate a variety of viruses.

We offer three references to support this concept.

1. Inactivation of Pathogenic Viruses by Plant-Derived Tannins: Strong Effects of Extracts from Persimmon (*Diospyros kaki*) on a Broad Range of Viruses, Kyoko Ueda, Ryoko Kawabata, Takashi Irie, Yoshiaki Nakai, Yukinobu Tohya, and Takemasa Sakaguchi, *PLoS One*. 2013; 8(1): e55343. Published online 2013 Jan 25. doi:

10.1371/journal.pone.0055343, PMCID: PMC3555825, PMID: 23372851

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3555825/>

This reference cites strong antiviral activity of a persimmon tannin against (12) different viruses including both enveloped and non-enveloped ones.

2. Inhibition of SARS-CoV 3C-like Protease Activity by Theaflavin-3,3'-digallate (TF3), Chia-Nan Chen, Coney P. C. Lin, [...], and John T.-A. Hsu, Evid Based Complement Alternat Med. 2005 Jun; 2(2): 209–215. Published online 2005 Apr 7. doi:

10.1093/ecam/neh08, PMID:15937562
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1142193/>

This reference cites the ability of tannic acid to inhibit an earlier SARS virus.

3. Tannins as Antiviral Agents, Neli Vilhelmova-Ilieva, Angel S. Galabov and Milka Mileva, Intechopen, DOI: 10.5772/intechopen.86490, Published: August 21st 2019
<https://www.intechopen.com/books/tannins-structural-properties-biological-properties-and-current-knowledge/tannins-as-antiviral-agents>

Additional References

U.S. Patent 11,517,523 B2 (Issued Dec 6, 2022).

IntraMont Technologies, Inc. Oral-surface administered preparation for the prevention of illnesses acquired via the oral cavity and the pharynx. U.S. Patent No. 11,517,523.
<https://ppubs.uspto.gov/pubwebapp/external.html?db=USPAT&q=11517523.pn>.

(alt summary page: <https://www.patentbuddy.com/Patent/11517523>)

Moscow State University:

Analysis in late 2020 and early 2021 (Private communication).

Moscow State University publication on their nasal spray:

Tsvetkov V, Varizhuk A, Kozlovskaya L, Shtro A, Lebedeva O, Komissarov A, Vedekhina T, Manuvera V, Zubkova O, Ereemeev A, Shustova E, Pozmogova G, Lioznov D, Ishmukhametov A, Lazarev V, Lagarkova M. EGCG as an anti-SARS-CoV-2 agent: Preventive versus therapeutic potential against original and mutant virus. *Biochimie*. 2021 Dec;191:27-32.

Cornell:

<https://news.cornell.edu/stories/2022/03/promising-nose-spray-could-prevent-and-treat-covid-19#:~:text=A%20small%20molecule%20has%20been,mice%20led%20by%20Cornell%20researchers.>

Shapira, T., Monreal, I.A., Dion, S.P. *et al.* A TMPRSS2 inhibitor acts as a pan-SARS-CoV-2 prophylactic and therapeutic. *Nature* **605**, 340–348 (2022).

Columbia University:

<https://www.science.org/doi/10.1126/science.abf4896>

de Vries RD, Schmitz KS, Bovier FT, Predella C, Khao J, Noack D, Haagmans BL, Herfst S, Stearns KN, Drew-Bear J, Biswas S, Rockx B, McGill G, Dorrello NV, Gellman SH, Alabi CA, de Swart RL,

Moscona A, Porotto M. Intranasal fusion inhibitory lipopeptide prevents direct-contact SARS-CoV-2 transmission in ferrets. *Science*. 2021 Mar 26;371(6536):1379-1382.

UC Berkeley:

Zhu, C., Lee, J.Y., Woo, J.Z. *et al.* An intranasal ASO therapeutic targeting SARS-CoV-2. *Nat Commun* **13**, 4503 (2022).

The development of orally-administered antiviral products versus nasal sprays affords extreme user or animal compliance. It should also be noted that there is no option for adding zinc salt to nasal sprays as their presence directly in the nasal passages can cause olfactory epithelial nerve damage with resulting loss of sense of smell. This condition is termed “anosmia”.

Citation:

Alexander TH, Davidson TM. Intranasal zinc and anosmia: the zinc-induced anosmia syndrome. *Laryngoscope*. 2006 Feb;116(2):217-20. doi: 10.1097/01.mlg.0000191549.17796.13. PMID: 16467707.

Synergistic Rationale

We speculate that in the poultry feed water chemistry presented in this report the zinc ions dissociated from the gluconate molecule, block the ACE2 receptor site, through which respiratory infections can be initiated, and that the tannin we employed constrains the zinc ions from being absorbed and metabolized by the receptors so that the total daily absorption of the zinc is limited to a tolerable level.^{3 4}

³ Lee MC, Chen YK, Tsai-Wu JJ, Hsu YJ, Lin BR. Zinc supplementation augments the suppressive effects of repurposed NF-κB inhibitors on ACE2 expression in human lung cell lines. *Life Sci*. 2021 Sep

3. Field Trials in Poultry

Following these developments, IntraMont adapted the same chemistry for agricultural applications, specifically to reduce respiratory viral and bacterial diseases in poultry — a significant source of economic loss due to pathogens such as highly pathogenic avian influenza (H5N1). Working with a contract health products company, Solice International (Coimbatore, India) a feed water was prepared principally employing the select tannin and zinc gluconate.⁵

3.1 Methods

Three field trials were conducted on commercial poultry farms in Tamil Nadu, India. The intervention involved supplementing farm drinking water with the polyphenolic formulation dissolved in local farm water starting a few days after hatching and maintaining as needed by the chickens (ad libitum) throughout the grow-out period.

No concurrent antibacterial or antiviral feed additives were used during the trials. Mortality and morbidity from respiratory disease were recorded and compared with historical or concurrent farm controls.

1;280:119752. doi: 10.1016/j.lfs.2021.119752. Epub 2021 Jun 23. PMID: 34171382; PMCID: PMC8219909.

⁴ Di Jin, Xinran Wei, Yunyi He, Luying Zhong, Huijie Lu, Jiaxin Lan, Yuting Wei, Zheng Liu, Hongbo Liu, The nutritional roles of zinc for immune system and COVID-19 patients, *Frontiers in Nutrition*, 2024 Apr 19;11:1385591. doi: [10.3389/fnut.2024.1385591](https://doi.org/10.3389/fnut.2024.1385591)

⁵ Patent pending.

Newborn chicks carry effective maternal immunity against infections. The farmer supervising these trials set the start date for beginning the administration of the EP water at 14 days.⁶

Starting at day 14, the chickens were given 500 L of the enhanced polyphenolic water (EP water) until it was consumed, at which point they were switched back to untreated water. This was maintained until the end of each batch lifecycle. Therefore, the chickens were given approx 50 ml of the EP water per day, although the total water consumption (polyphenol water and untreated water) increased each day by approx. 15 ml/day until reaching 500 ml per day total by day 35 and maintained at that level until each batch lifecycle ended. As a result the EP water was used up in a 4 hr period each day when initially administered, dropping to 1.6 hrs by the end of the lifecycle.

3.2 Results

The first farm that tested this feed water was Duraiswamy Farm⁷ in Palladam, Tamil Nadu. This study started with 10,000 chicks at 4 days old, while suspending the administration of any other medication (no existing antibacterial or antiviral feed additives). Out of 10,000 chicks grown to full size (48 days), approx. 5000 were expected to die from respiratory disease. As a control, approx. 5000 died on a neighboring farm of the same size at the same time.

Result: Using the IntraMont water, no chicks/chickens died from respiratory disease. 400 died from excessive heat exposure.

⁶ Haems, K.; Strubbe, D.; Van Rysselberghe, N.; Rasschaert, G.; Martel, A.; Pasmans, F.; Garmyn, A., Role of Maternal Antibodies in the Protection of Broiler Chicks against Campylobacter Colonization in the First Weeks of Life., *Animals* 2024, 14, 1291.

⁷ We were advised by Duraiswamy Farm that the expected morbidity rate from respiratory infections (including the various strains of avian flu), that is number of total chickens in a batch that will die from such infections to be approximately 50% on their and neighboring poultry farms.

The second study was run on a nearby farm, Raghupati. Again, 10,000 chicks were given the feed water. The study was completed at 43 days. No deaths affiliated with respiratory infection, nor any cases of respiratory infection were observed.

The 3rd study was on the Duraiswamy Farm. Here 9,000 chicks were given the feed water. The study was terminated at 37 days as the chickens were regarded as fully grown and a buyer purchased the chickens from the farm. No respiratory infections were observed. The collected data were provided to us as approximate values. In future farm studies the collection of data can be improved, possibly under the supervision of a pathologist. This can include forensic analysis of chicken which did not survive to full growth.

The relevant metrics for each batch is presented in Table I.

Table I. . Field Trial Outcomes

Farm	Batch #	Start Date	# of Chickens at Start of Trial	#/Age (days) of Chickens at Date of Sale (Alive)	# Chicken Dead from "Other Causes"
Duraiswamy	1	March 26, 2025	10,000	3,800/39 4,000/43 1,800/46	400
Raghupati	2	May 20, 2025	10,000	4,500/40 3,000/42 2,150/43	350
Duraiswamy	3	June 18, 2025	9,000	3,500/34 4,700/37	800

Summary: Across three trials with a total of 29,000 treated birds, no mortality from respiratory disease was observed, compared with expected rates of ~50% in untreated flocks.

4. Controlled Challenge Study – ICAR Bhopal

4.1 Methods

The Indian Council of Agricultural Research (ICAR) conducted a formal H5N1 challenge study using specific-pathogen-free (SPF) layer⁸ chickens.⁹ Birds were divided into groups and administered feed water beginning either one or two days prior to viral challenge, with a third group as an untreated control.

Virus: HPAI H5N1 clade 2.3.4.4b, dose 10^6 EID₅₀ via intranasal route.

(7) isolated chickens per test group.

Challenge date: 10 May 2025 (following water administration start on 9 May 2025 for Day -1 group and 8 May for Day -2 group).

Test period: 14 days.

4.2 Initial High-Dose Findings

At 10^6 EID₅₀, all birds in all groups died within 48 hours post-challenge. We then had a conference call with the personnel at ICAR and Vipragen Biosciences Private Ltd., a private CRO we had contracted with for the general anti-viral testing of our products in India. At that point we had shared the initial farm study results and suggested that the challenge titer was possibly 2 to 3 orders of magnitude greater than the chickens on the farm were experiencing¹⁰¹¹ because the virus was not able to incubate in the farm chickens (ambient viral load vs. incubated viral load). The ICAR participants in the call agreed that this was possible. They suggested taking two additional groups of the SPF chickens and testing them at a viral load of 10^5 EID₅₀. One group would receive the feed water starting 1 day before the viral challenge, and the second group 2 days before. A third group would be no treatment control.

Results:

At 72 hrs after the challenge:

- Water started 2 days prior to challenge: 2 birds out of 7 died. Then no further mortality.

⁸ These are female chickens raised for egg production. The tested birds were at chick age.

⁹ A full report is available separately.

¹⁰ Master Question List for Highly Pathogenic Avian Influenza (HPAI),
DHS Science and Technology Directorate, August 08, 2024.

¹¹ Private communication with Vipragen Biosciences.

- Water started 1 day prior to challenge: 3 birds out of 7 died. Then no further mortality.
- Control: 4 birds out of 7 died. The next day 1 additional bird died. Then no further mortality.

Researchers noted that this dose may exceed natural exposure levels by 2–3 orders of magnitude.

4.3 Reduced-Dose Findings (10^5 EID₅₀)

Table III. Mortality in ICAR Challenge Study at 10^5 EID₅₀

Group	Treatment Start	Birds (n)	Mortality at 72 h	Final Mortality (Day 14)
1	2 days pre-challenge	7	2	2
2	1 day pre-challenge	7	3	3
3	None (control)	7	4	5

Summary: Pre-treatment with feed water reduced early mortality compared with controls, with greater benefit seen when water administration began two days before viral challenge.

5. Separate *In Vitro* Virucidal Assay

5.1 Methods

ASTM E1052-20 standard assay for assessing microbicidal activity against viruses in suspension was performed by Vipragen Biosciences Pvt. Ltd. (Mysore, India) on a standard toothpaste formulation diluted 1:20 in sterile water.

The diluted formulation was applied to canine liver cells, followed by exposure to H1N1 influenza A virus at 10^6 TCID₅₀/mL. Cytotoxicity was monitored.

5.2 Results

- Complete inactivation of virus within 30 seconds (earliest measured timepoint)
- No cytotoxicity observed after 3 minutes (longest measured exposure)

6. Conclusion and Next Steps

The enhanced polyphenolic formulation demonstrates strong antiviral potential in *in vitro*, *in vivo* and field settings, with promising indications from controlled challenge studies. We assume that the drinking of the feed water sets of and maintains an enhanced polyphenolic residue in the animal's respiratory tract that acts as a tissue barrier against topically-initiated infections.

Further research should focus on:

- Defining optimal dosing schedules and concentrations.
- Mechanistic confirmation via tissue residue analysis.
- Expanded trials across multiple poultry breeds and climates, with improved forensics.
- Exploration of cross-species applications, including swine and human prophylaxis.
- High magnification (e.g., cryo-em) imaging of virion interaction with the active prophylactic ingredients.