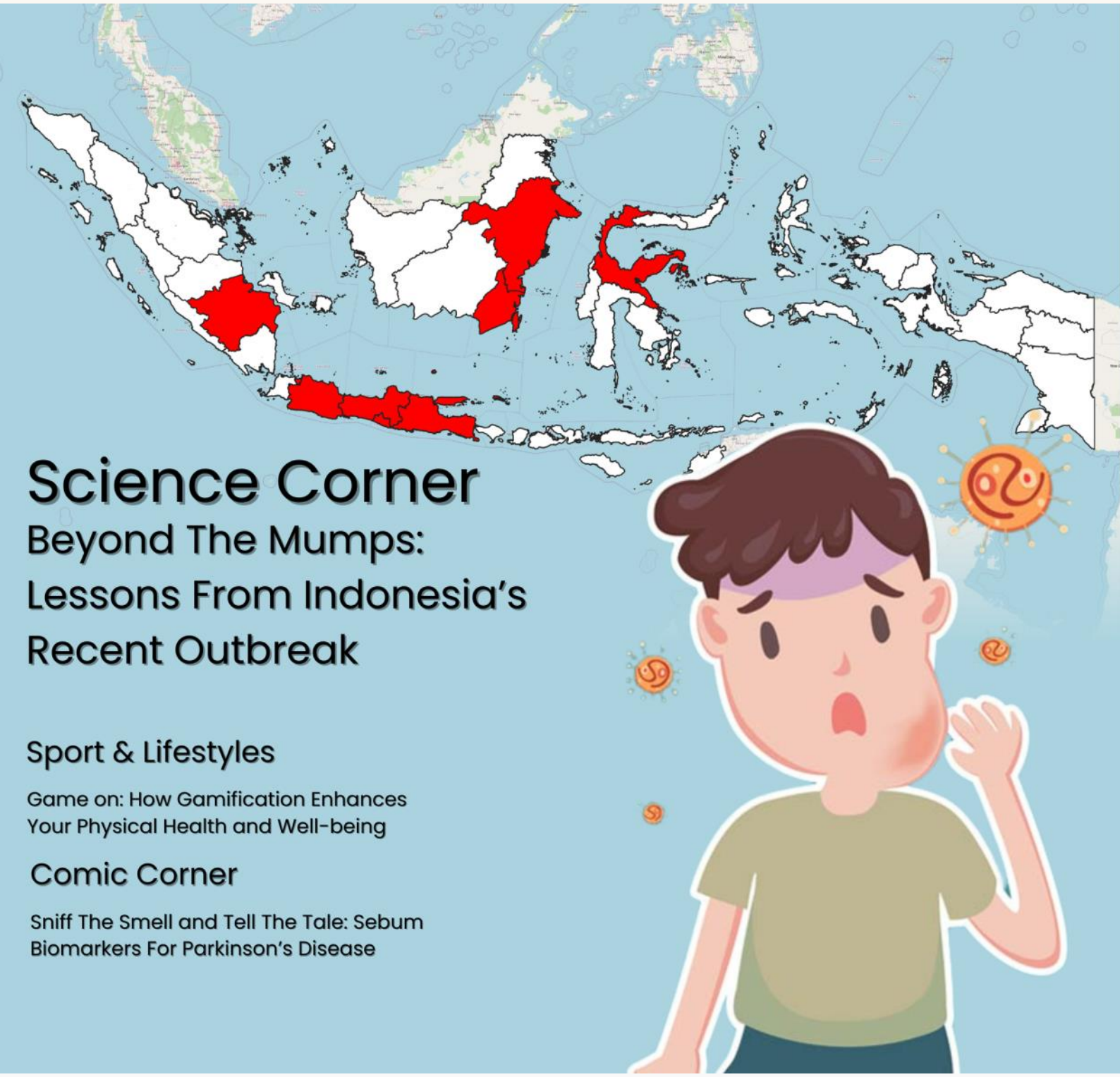
INA-RESPOND

INDONESIA RESEARCH PARTNERSHIP ON INFECTIOUS DISEASE

KEMENTERIAN KESEHATAN REPUBLIK INDONESIA

NEWSLETTER

February 2025



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HEALTH POLICY AGENCY
MINISTRY OF HEALTH REPUBLIC OF INDONESIA
2025

MASTHEAD

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FEATURES

STUDY UPDATES

InVITE & PROACTIVE

By: Eka Windari R., Nur Latifah Hanum, Restu Amalia Mukti

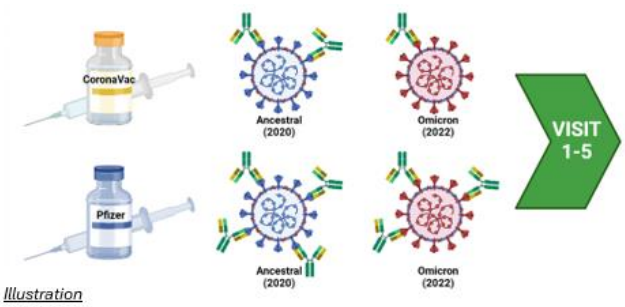
InVITE

The InVITE serum specimens from the main study visits 1, 2, and 3, as well as symptomatic visits, are currently undergoing analysis at the Central Laboratory, NIH, US. Additionally, RNA extracted from mid-turbinate swabs collected in UTM during symptomatic visits will be shipped alongside serum specimens from extension visits 4 and 5. This shipment is planned for June 2025, with the analysis of all specimens expected to be completed this year. To facilitate this process, the INA-RESPOND team is preparing to submit a draft of a new Material Transfer Agreement (MTA) to the MTA Committee via their website. Simultaneously, the team is also preparing for the Site Close-out Visit (SCV), scheduled for February 2025, after receiving SCV approval from the InVITE Global team.

The InVITE Publication Committee holds routine meetings to discuss ongoing manuscript development and review concept plans related to InVITE data and specimen usage. Recently, a new concept plan from the Kirby Institute, UNSW, was submitted to the committee, proposing an assessment of the neutralization capacity of sera from InVITE participants.

Given the evolution of SARS-CoV-2, with mutations in its Spike protein affecting transmissibility and immune evasion, different countries have experienced unique variant distributions due to varying immunity levels. Variants achieve dominance through transmission advantages and immune escape, while factors such as vaccine type, dosage, and time since vaccination influence population-level neutralization responses, which broaden over time.

The submitter highlighted that while global data on immune responses to variants exist, data from countries participating in the InVITE study remain limited. This sub-study aims to fill this gap, contributing to future pandemic preparedness and vaccine accessibility planning. Specifically, it will examine post-vaccination neutralization capacity, its duration of effectiveness, and how vaccine platforms and natural infection influence neutralization responses across different variants.



Illustration

The sub-study will utilize a highly sensitive live-cell serology assay to evaluate the breadth of neutralization across SARS-CoV-2 variants representing the global pandemic trajectory. Each pandemic year will be covered by one representative variant, including Ancestral (2020), Delta (2021), BA.5 (2022), XBB.1.5 (2023), and JN.1 (2024). This approach ensures a comprehensive assessment of neutralization capacity across key viral variants and different COVID-19 vaccines, providing critical insights into real-world immune responses over time.

While the InVITE Publication Committee will decide on the approval of the concept plan, this potential sub-study has already been communicated to INA-RESPOND via email. Key concerns raised include the requirement for Local Ethics Committee approval for a new sub-study and the shipment of sera specimens from Visits 1–5 to the Kirby Institute in Australia. The MTA procedure will be further discussed with the MTA Committee once all InVITE specimens have been sent to the Central Laboratory.

PROACTIVE

The Impact of the COVID-19 Pandemic on the INA-PROACTIVE Study

The INA-PROACTIVE (INA-104) study, which concluded in 2023, is now in the final stages of preparing its report for the Ethics Committee. As part of this final report, the team has documented a temporary suspension of the study due to the impact of the COVID-19 pandemic, particularly during its initial phase in 2020. This unforeseen disruption posed significant challenges but also provided valuable lessons for future research. The experience underscored the importance of adaptive study designs, contingency planning, and flexible research methodologies to ensure continuity in the face of global health crises.

Following the first reported COVID-19 cases in Indonesia on March 2, 2020, INA-RESPOND issued its first memorandum on March 16, 2020, announcing the temporary suspension of recruitment and follow-up activities. The memo outlined that, in response to the COVID-19 pandemic and in accordance with the Indonesian Minister of Health's Decree No. HK.01.07/Menkes/169/2020—which designated referral hospitals for managing emerging infectious diseases—all INA-RESPOND research sites were instructed to pause subject recruitment and follow-up visits from March 16 to March 28, 2020.

A second memo was issued on April 2, 2020, extending the suspension period from March 28 to April 11, 2020. As the pandemic worsened, a third memo was released on April 13, 2020, providing an updated notification that the suspension of subject recruitment and follow-up visits would remain in effect indefinitely until further notice. The decision was made to protect both the study team and participants while aligning with government policies to prevent transmission at a time when diagnostic tools and effective treatments were not yet available.

During the temporary suspension, Research Assistants (RAs) focused on completing pending tasks, such as updating research data, organizing the site

regulatory binder, and conducting refresher training on study procedures. As health protocols for staff and service processes were gradually implemented across hospital sites, INA-RESPOND decided to allow study visits to resume starting September 1, 2020. However, if any site encountered conditions that posed a risk to the safety of participants or the research team, they were allowed to pause follow-up activities as long as they informed the INA-RESPOND Secretariat in advance.

For subjects whose visit schedules were nearing the end of the window period during the temporary suspension, visits were still conducted when possible to minimize missed visits due to subject absences. This approach helped ensure strong subject retention throughout the study. Additionally, RAs maintained regular communication with participants through WhatsApp messages, phone calls, and tracking their involvement in HIV support groups when direct communication failed. These efforts maximized the continuity of participant engagement in the study.

One of the key challenges encountered was the unavailability of HIV-Viral Load (HIV-VL) cartridges, as suppliers reallocated production to meet the urgent demand for SARS-CoV-2 cartridges. As a result, the protocol team decided to allow subjects to continue their scheduled study visits while postponing VL testing. Specimens were still collected and stored to ensure testing could be completed once cartridges became available. This delay impacted data completeness, as VL results could not be documented immediately after follow-up visits, requiring additional time for testing. To maintain data integrity, sites completed and uploaded case report forms (CRFs) with available information, while VL results were updated later in the On-Site Data Clarification Forms (ODCFs) within the Electronic Data Management System (EDMS). RAs also documented this delay by submitting protocol deviation forms in Log 1300, using minor protocol code 39, as VL testing exceeded the required 24-hour timeline.

Additionally, RAs were instructed to document any participant diagnosed with COVID-19 in the Case Report Form (CRF; Log 200) and report it as an Important Medical Event (IME). During the study period, a total of 138 IMEs were reported. Notably, in the INA-PROACTIVE study, COVID-19 emerged as the leading contributor to non-AIDS-related mortality, accounting for 10 out of 62 non-AIDS-related deaths (16.1%) among adult participants. These findings provide crucial insights for researchers, clinicians, and policymakers, emphasizing the significant impact of COVID-19 on individuals living with HIV.

In summary, the impact of COVID-19 on the INA-PROACTIVE study was significant. Lockdowns and social distancing measures challenged in-person visits, resulting in lower enrolment and follow-up rates. The pandemic also raised concerns about study integrity, as interruptions in data collection and deviations from original protocols threatened the reliability of study outcomes. Reallocating healthcare and laboratory resources toward the COVID-19 response also created barriers to conducting the study as planned.

Despite these challenges, the INA-PROACTIVE study team successfully adapted its research procedures to ensure study continuity while maintaining data quality. This experience highlights the importance of proactive planning and flexibility in long-term observational studies, especially when faced with unforeseen global disruptions like the COVID-19 pandemic. Looking ahead, telemedicine and remote monitoring could serve as alternative solutions, allowing researchers to conduct virtual visits, collect data electronically, and reduce in-person interactions. Additionally, flexible study protocols, such as decentralized and adaptive designs, can help mitigate disruptions while ensuring patient safety.

FAREWELL

VIRTANIA AND LOIS

By: Dedy Hidayat, Eka Windari Rusman, I Wayan Adi Pranata, Mila Erastuti, Nur Latifah Hanum, Restu Amalia Mukti, Tiya Saraswati

Virtania Meirina Agusta — Former INA-RESPOND Clinical Research Associate (2020-2025)

January 10, 2025, is a day filled with mixed emotions for all of us at the INA-RESPOND Secretariat office. It is the day we say goodbye to our dear colleague and friend, Virtania Meirina Agusta, or as we warmly call her, Nia. We are happy because she is starting a new journey, but at the same time, we feel sad because we will miss her so much.

Nia joined INA-RESPOND as a Clinical Research Associate (CRA) in September 2020 and worked closely with Mila and Tiya. Her role as a CRA involved conducting Site Initiation Visits (SIV), Site Monitoring Visits (SMV), and Site Close-out Visits (SCV). She also reviewed Clinical Research Monitor SOPs and performed specimen inventory visits for HIV and COVID-19 studies. Her dedication and hard work have contributed greatly to the success of our research projects.

Nia is more than just a colleague. She is a bright and cheerful person who brings life to every room she enters. Her laughter, so full of joy, fills the office every day and makes even the busiest days feel lighter. She is always kind and friendly, making everyone feel welcome and appreciated. Whether she is sharing a funny story, giving advice, or impressing us with her amazing fashion sense, Nia always makes the office a happier place.

I (Tiya) remember the first time I met her. At first, I thought she might be hard to talk to because she looked so elegant and confident. But as we got to know each other, I found a wonderful friend. We talked about many things, from raising children to skincare and makeup. Nia could turn even a simple chat about lipstick into a fun and interesting conversation. She has a special way of making every moment meaningful with her warmth and positivity.

Beyond her professional skills, Nia is also someone who deeply cares about others. I will never forget how she helped me during one of the most challenging times of my motherhood journey. When I was struggling with breastfeeding, feeling exhausted, dealing with pain, and almost ready to give up, Nia stepped in without me even asking. She went out of her way to contact a breastfeeding counselor and even arranged for them to come to my house. Her incredible support and encouragement gave me the strength to continue direct breastfeeding when I was close to giving up. Her kindness, thoughtfulness, and unwavering support meant the world to me.

Nia is not only stylish and full of energy, but she is also a person of strong faith. Even in our busy office life, she reminds us to think about the bigger picture, not just work and deadlines, but also our

purpose and the importance of kindness. Her thoughtful words and sincere prayers will always stay in our hearts.

Another thing that makes Nia special is her love for an active and healthy lifestyle. She exercises regularly and knows how important it is to take care of her body. She always makes sure to eat well and stay healthy, inspiring many of us to do the same. Her dedication to fitness and well-being is something we truly admire.

One unforgettable moment that truly shows her love for nature and an active lifestyle was when Dedy, one of INA-RESPOND Secretariat staff, planned an open trekking trip. Initially, several INA -RESPOND colleagues planned to join, but at the last moment, many backed out because only a few INA-RESPOND members had signed up. The rest were participants from outside the Secretariat. Despite this, Nia and her husband still went on the trek with Dedy, proving her deep passion for outdoor activities and her commitment to an active lifestyle. She doesn't just have knowledge about health, she lives it every day!

Nia is also known for her confidence and courage. She was the first person to volunteer as a talent for INA-RESPOND's network content. Her enthusiasm for speaking and presenting was truly inspiring, encouraging her colleagues to step forward and participate as well. She embraced the opportunity with excitement and energy, showing that she was never afraid to be in the spotlight and always eager to share knowledge and engage with others. Her boldness and positivity made her a role model for many.

Leaving a job is never an easy choice, but we fully support Nia's decision to take this next step in her life. She has worked so hard and made a big impact on our team. We are sure that wherever she goes, she will continue to shine and do great things.

Nia, thank you for everything, for your hard work, your kindness, your wisdom, and most of all, your friendship. Thank you for making us laugh, for giving us advice, and for inspiring us every day. We will miss you so much, but we know that your future is full of success and happiness.

May your next journey bring you many blessings, joy, and wonderful opportunities. Keep being your bright, stylish, and inspiring self. Farewell, dear friend. This is not goodbye, but a "see you again" with love in our hearts. 💚

As we bid farewell to Nia and celebrate the incredible energy, passion, and warmth she brought to our team, we are also preparing to say goodbye to another remarkable colleague, Lois Eirene Bang. While Nia's departure marks the end of a bright and lively presence in our office, Lois's farewell signifies the closing of a chapter filled with dedication, perseverance, and excellence in clinical research. Both women have left a lasting impact on INA-RESPOND in their own unique ways, and though we will miss them dearly, we are proud to see them embark on new adventures. Now, let us take a moment to honor Lois and her invaluable contributions to our team.

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Every connection writes a chapter, and this is where ours pauses. Farewell our best friend, Lois Eirene Bang.

Lois Eirene Bang
—Former INA-RESPOND
Clinical Research Site Specialist
(2017-2025)

As a Clinical Research Site Specialist (CRSS), Lois' has made significant contributions over the past seven years at INA-RESPOND, and her experience and efforts have been highly regarded by the INA-RESPOND team, **especially to us – her CRSS colleagues**.

Lois's departure marks an exciting new journey as she steps beyond her comfort zone to embrace new opportunities in the global field of clinical research. Her promotion to an organization that is also well-known in clinical research is is a testament to her hard work and professional excellence, and we couldn't be prouder.

Contributions and Achievements

Lois demonstrates excellent communication and negotiation skills while collaborating with her team, supervisors, colleagues from NIAID and Kirby, as well as study teams at the sites collaborating with INA-RESPOND. The ideas and solutions she provides are consistently practical and beneficial. dr. Emon Winardi Danudirgo, Sp.PD, Principal Investigator (PI) from St. Carolus Hospital (Site 640) particularly values working with Lois, even expressed a strong need for her insights on certain aspects of the study before moving forward with implementation.

For seven years, Lois has been actively involved in COVID-19 and HIV studies, both observational and interventional. Her contributions in these studies have been highly significant. Her strong organizational skills in managing time, documents, and issues have enabled her to successfully complete these studies.

Lois has also participated in D2EFT Investigator Meetings, where she represents the operational team for the implementation of D2EFT in Indonesia. She often reminds us of tasks that still need to be completed by CRSS. On many occasions, Lois takes the initiative to organize meetings to expedite the completion of pending tasks.

Memorable Memories and Experiences

The drug importation process for the D2EFT study faced numerous challenges, leaving a significant impression on Lois and those around her. During this time, we numerous Lois's dedication in coordinating with various parties to facilitate a smooth import process and to ensure that the study subjects received their medication. The transition period at INA-RESPOND contributed to the challenges in the final drug importation process for the D2EFT study, with the medication being held up at customs for approximately two months. Despite these obstacles, Lois's commitment and effort

Picture 1. (top) D2EFT Investigator Meeting in Indonesia 18-19 June 2019.

Picture 2. (middle left) D2EFT Investigator Meeting in Cape Town 24-25 January 2020; and (middle right) D2EFT Investigator Meeting Bangkok November 2022.

Picture 3. (bottom left) Lois with D2EFT Investigational Product.

were evident. She played a pivotal role in successfully managing the drug importation process at INA-RESPOND. Lois was profoundly moved when the medication finally arrived in Indonesia and was able to be administered to the subjects on time.

Lois' dedication to her work is truly inspiring. She has consistently made the long journey from *Cisauk, Tangerang* to INA-RESPOND Secretariat in Central Jakarta, spending three hours on the road every day. We have enjoyed hearing her stories

about the ups and downs of this journey, including humorous incidents and the challenges she faced. Even during her pregnancy, Lois remained enthusiastic about commuting from her home to the office, facing various challenges along the way Her dedication is truly admirable.

Hope and Prayer

As Lois's move on to new opportunities, we wish her all the best in her future endeavours. May success and happiness always accompany her in every step of this new chapter of her journey, allowing her to enjoy more special moments and quality time with her family. Lois, your dedication and spirit will always be remembered!

Closing remarks

Dear Lois, You have been a wonderful colleague, and saying goodbye is not easy.

We would like to express our deepest gratitude for the friendship and cooperation we have shared throughout our time together. We truly appreciate the dedication and contributions you have made. Wishing you continued success in your new career journey.

Keep your spirits high and shine brightly in this new chapter of your life! Let's stay in touch and cherish the good memories we have created!

SCIENCE CORNER

BEYOND THE MUMPS: LESSONS FROM INDONESIA'S RECENT OUTBREAK

By: Erni, Adhella Menur

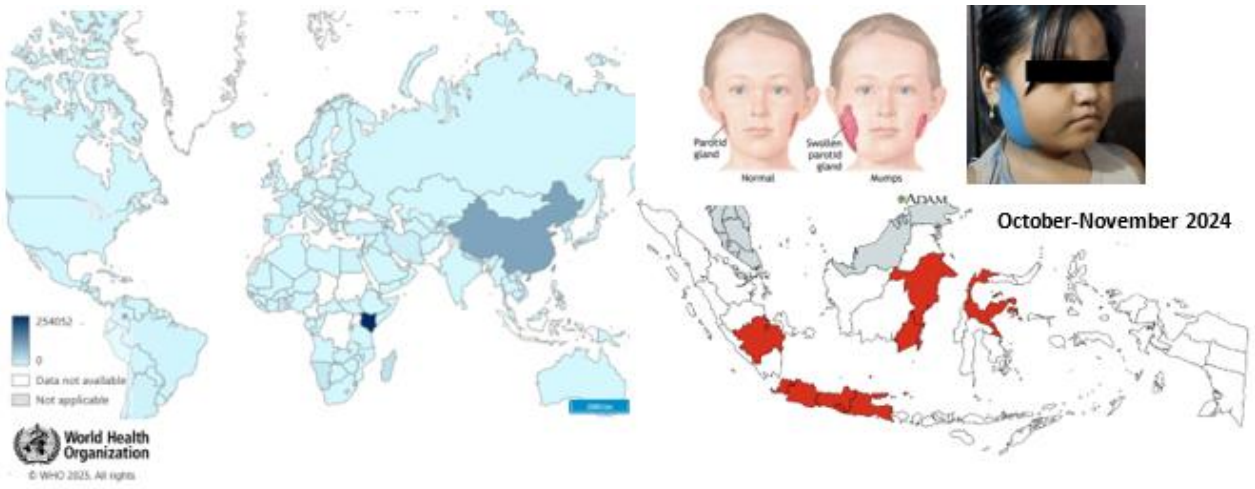

Figure 1. Global data on reported mumps cases show no available reports from Indonesia. However, during October and November 2024, the MoH event-based surveillance identified a mumps outbreak in several provinces (marked in red).

The mumps outbreak in Indonesia

The earliest description of mumps as a disease dates back to the 5th century BC by Hippocrates. One notable passage describes: "*Swellings appeared about the ears, in many on either side, and in the greatest number on both sides. They were of a lax, large, diffused character, without inflammation or pain, and they went away without any critical sign.*" Although mumps is generally a self-limiting disease, it is associated with rare but potentially serious complications, including deafness, orchitis, oophoritis, pancreatitis, and meningitis. The virus that caused the disease was first identified in 1934, and the first mumps vaccine, known as *Mumpsvax*, was developed in 1967 by Maurice Hilleman. The vaccine was created using a strain of the mumps virus that had infected his five-year-old daughter, Jeryl Lynn Hilleman. The combination vaccine containing live attenuated viruses for measles, mumps, and rubella (MMR) was introduced around 1971. Currently, 123 of the 194 (63.4%) WHO member countries have included the MMR vaccine in their national immunization programs. While the discovery of the mumps vaccine has significantly reduced the number of cases globally, mumps remains less well-controlled compared to measles and rubella. Between 1999 and 2019, approximately 500,000 mumps cases were reported annually to the WHO. Several mumps outbreaks occurred in many countries. Even in highly vaccinated populations, such as in the United States, outbreaks still occur. For example, a 2006 outbreak involved over 6,500 cases in the US, mostly among vaccinated university students aged 18–24, with 84% having received two doses. Similarly, a 2009–2010 outbreak saw over 3,500 cases in vaccinated adolescents aged 13–17, with 89% receiving two doses.

The rate of mumps incidence in Indonesia is challenging to estimate because mumps is not a notifiable disease and is not included in annual reports to the national or WHO database. The actual number of mumps cases in Indonesia is likely much higher, as mumps vaccination is not part of the routine immunization program. The MMR vaccine is available only in private healthcare facilities, costing approximately US$42 (IDR 700,000). The surge in mumps infections in Indonesia has been notably high, particularly in the past few months. In late 2024, several schools reported a significant increase in mumps cases, known as *gondongan* in Indonesian language, spreading rapidly among students. On October 30, 2024, the Directorate General of Disease Prevention and Control released a circular letter urging heightened precautions for mumps, emphasizing case reporting through event-based surveillance and proper case management.

By November 2024, suspect mumps cases nationwide had reached 6,593. The provinces with the highest reported cases included East Java, Central Java, West Java, *Banten, Jakarta, Yogyakarta*, East Borneo, South Sumatra, South Sulawesi, South Borneo, and Central Sulawesi. Specific regional data showed an estimated 2,001 cases in *Malang*, 1,596 cases in *Jombang*, 907 cases in *Banyuwangi*, 621 cases in *Rembang*, and 215 cases in *Kediri*. The Jakarta Health Office alone reported nearly 30,000 cumulative mumps cases from January to November 2024.

The mumps outbreak in Indonesia highlights significant gaps in immunization coverage and the challenges of high population density. Additionally, mumps has been largely neglected compared to other infectious diseases, as it often presents with mild symptoms. This underestimation allows the highly contagious disease to spread unchecked. Mumps can still lead to serious complications, potentially imposing a substantial burden on individuals and the healthcare system. Furthermore, the misuse of antibiotics to treat this viral infection raises an even more critical concern about the growing threat of antimicrobial resistance. In this edition, we will delve into this often-overlooked yet preventable viral infection.

The virus behind the outbreak

The mumps virus (MuV) is a non-segmented negative-strand RNA virus from a member of the Paramyxoviridae family. The structure of the virus consists of an enveloped core decorated by spike form glycoprotein called mumps hemagglutinin-neuraminidase (HN) and the fusion protein (F), V/phospho-/I proteins, matrix protein (M), large protein (L) and small hydrophobic proteins (SH). Currently, there are at least 12 genotypes composed by the sequence of the SH gene, where genotype G became the most frequently detected genotype in mumps outbreaks worldwide.

The mumps virus spreads through respiratory droplets when an infected person coughs, sneezes, or via direct contact with contaminated surfaces. Humans are the virus's only natural host, as it binds to sialic acid receptors in the epithelial cells of the respiratory tract. The virus replicates and spreads systemically for 12–25 days before symptoms appear (incubation period). Approximately one-third of infected individuals experience subclinical infections with no symptoms, yet they can transmit the virus. Affected individuals may experience prodromal symptoms such as fever, myalgias, anorexia, malaise, headache, and nonspecific upper respiratory symptoms. The hallmark of mumps is inflammation of the salivary glands, leading to swelling of one or both parotid glands, accompanied by pain and discomfort in the cheeks and jaw area.

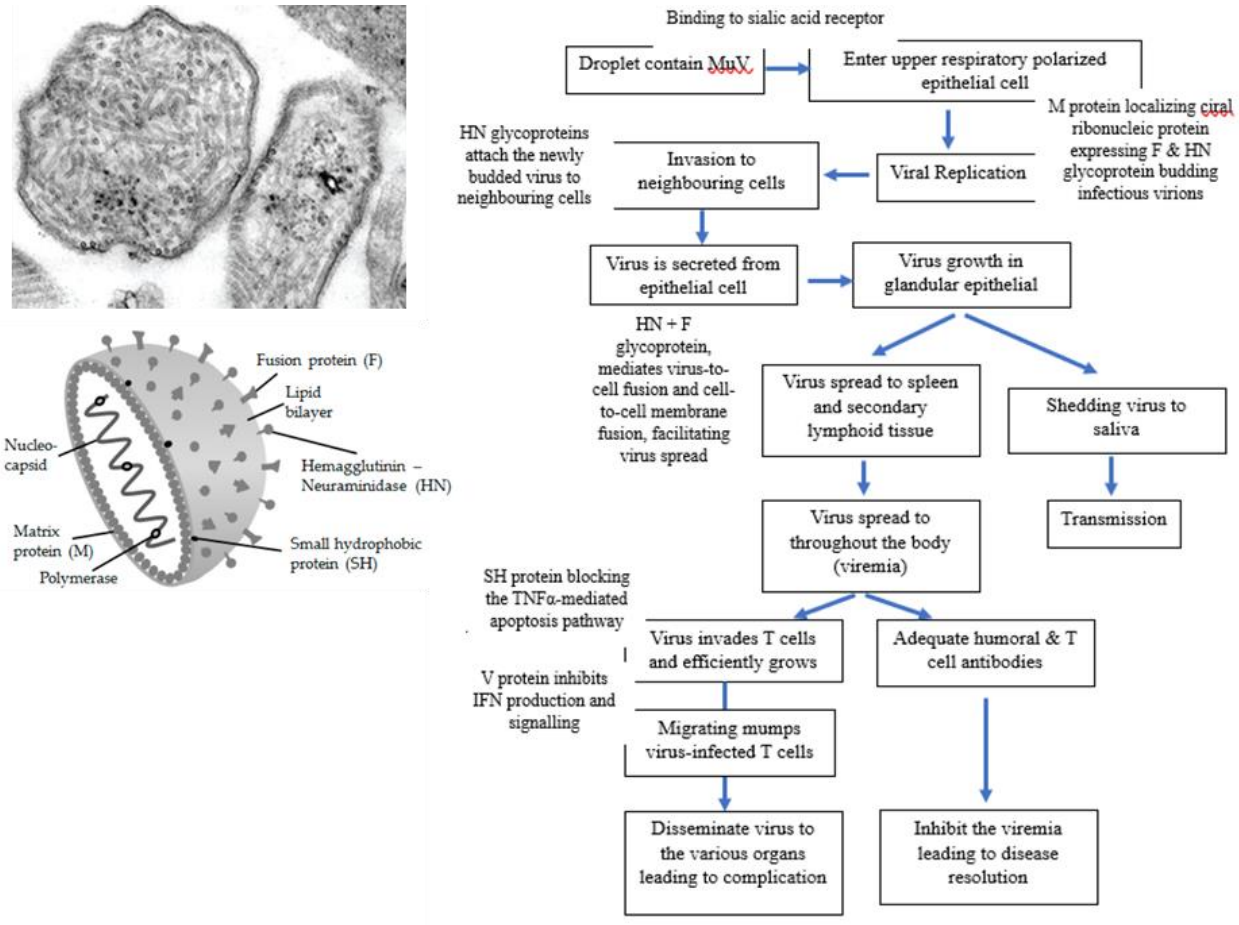

Figure 2. Mumps virus structure and pathogenesis. (Source: Rubin S, et. al., 2015, doi: 10.1002/path.4445; Beleni AI, et. al., 2018, doi: 10.3390/ijerph15081618; Su SB, et al., 2020, doi: 10.3390/ijerph17051686).

In complicated cases, mumps can result in meningitis, encephalitis, pancreatitis, hearing loss, oophoritis in females, or orchitis in males. The probability of developing orchitis is around 25% in post-pubertal males. Orchitis typically occurs 1–2 weeks after the onset of parotitis. Although mumps orchitis rarely results in sterility, it may contribute to subfertility. It can also lead to oligospermia, azoospermia, and asthenospermia (defects in sperm movement). Unilateral orchitis can significantly, though transiently, affect sperm count, motility, and morphology. Fertility impairment is estimated to occur in approximately 13% of patients with orchitis. However, 30%–87% of individuals with bilateral orchitis may experience infertility.

Clinical observation and laboratory testing are used to confirm a mumps infection. The preferred method of specimen collection is a buccal swab obtained within three days of parotitis onset, with laboratory confirmation achieved through rRT-PCR testing. Serology testing for IgM and IgG antibodies from paired serum samples may also aid diagnosis. However, the IgM response may not be detectable for up to five days after symptom onset in unvaccinated individuals and may be absent in vaccinated individuals. Mumps is typically a benign illness that resolves on its own within 10 days of symptom onset. Treatment primarily involves supportive care to alleviate symptoms. Patients with mumps should follow droplet precautions

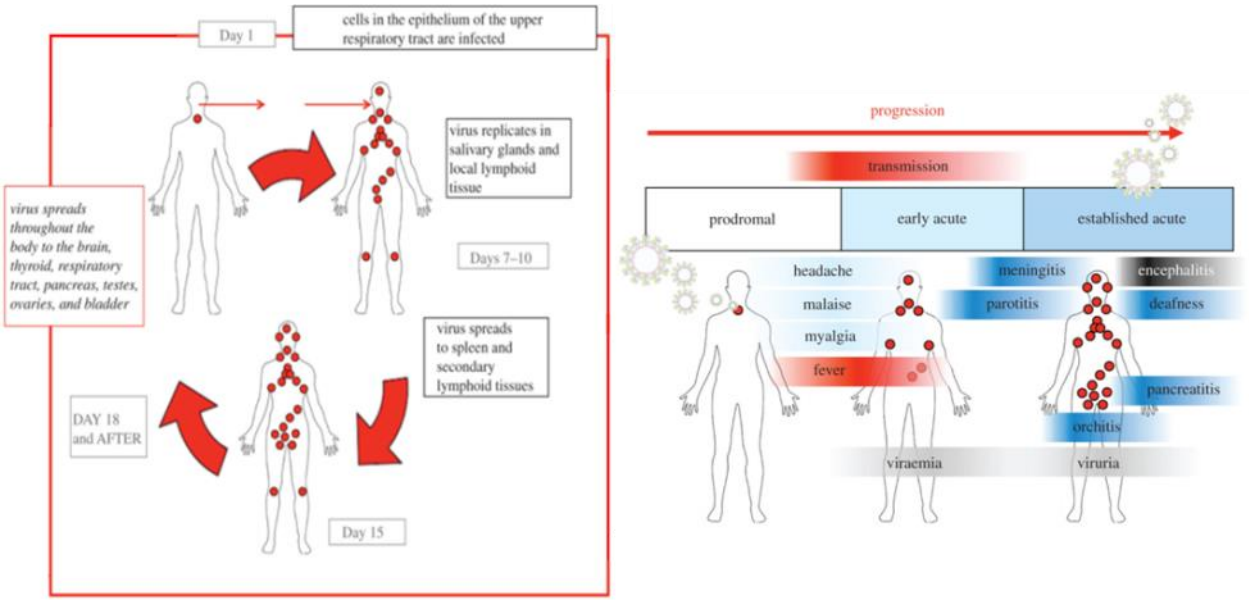

Figure 3. The nature of mumps. (Source: Rubin S, et. al., 2015, doi: 10.1002/path.4445).

and remain isolated for 5–9 days after the onset of parotid swelling to reduce the risk of transmission.

Why does mumps keep coming back?

Despite the availability of effective vaccines, mumps outbreaks continue to be reported in various countries, raising the question: why does mumps keep coming back? To understand this, we need to explore several factors that may have contributed to the return of mumps.

Vaccine hesitancy and low vaccination rates

Although two doses of the MMR vaccine are claimed to be 88% effective against mumps, some individuals remain reluctant to get vaccinated. False claims about the MMR vaccine—particularly he unproven association between the vaccine and autism—have fueled widespread fear and mistrust. Despite extensive scientific studies disproving these claims, misinformation continues to circulate, influencing many parents to skip vaccinations for their children. The situation is exacerbated by the rise of anti-vaccine groups that actively oppose immunization and spread negative rhetoric about vaccines.

In countries where mumps has been nearly eradicated, a false sense of security may develop, with people perceiving the disease as no longer a threat. This perception can lead to complacency and lower vaccination rates. Additionally, the COVID-19 pandemic has disrupted vaccination programs globally, creating gaps in immunization coverage and leaving populations vulnerable to outbreaks.

In low- and middle-income countries, where mumps vaccination is not included in routine national immunization programs, low vaccination rates persist due to barriers such as limited awareness and financial constraints. Although the Paediatrician Association recommends the MMR vaccine in Indonesia, its uptake remains low. The government's national immunization program only provides the MR (measles and rubella) vaccine for infants at nine months old, while the MMR vaccine must be sought privately. Many parents are reluctant to seek the MMR vaccine due to its cost and a lack of understanding about its importance. One mother interviewed stated that even if she could

afford the vaccine, she did not see its value because mumps is perceived as having low mortality.

Waning immunity and the need for booster doses

Over time, immunity to mumps can wane, leaving individuals who were previously infected or vaccinated at a young age more susceptible to the virus as they grow older. This is especially true for adolescents and young adults who received the vaccine in early childhood but did not receive a second dose. As these individuals enter their teenage and early adult years, they face a higher risk of contracting mumps and potentially spreading it to others. Research indicates that vaccine-derived immunity lasts an average of 27 years after the final dose is administered. This suggests that, in addition to the two doses typically given during childhood, a third dose at around age 18 may be necessary to maintain immunity into adulthood and reduce the risk of outbreaks.

Regarding concerns about certain mumps virus strains potentially escaping vaccine-induced immunity, a study was performed to address it. Sera from children collected six weeks after receiving the MMR vaccine were tested against selected group of genetically diverse mumps virus strains. While neutralizing antibody titers varied among strains, all were effectively neutralized, suggesting that immune escape is unlikely. Nonetheless, molecular surveillance and continued evaluation of vaccine efficacy remain crucial.

Population movement and crowded living conditions

With increasing global interconnectedness and easier travel access, the risk of mumps outbreaks is no longer confined to specific regions. Travelers with incomplete or no vaccination who visit endemic or outbreak areas may contract the virus and potentially bring it back to their home. Mumps cases also tend to rise rapidly in crowded populations, where close contact significantly enhances viral transmission. Another contributing factor in such conditions is a lack of awareness. When mumps is perceived as a benign disease, this underestimation hinders prevention, early detection, and effective disease control efforts.

Lesson learned and the way forward

The resurgence of mumps highlights critical gaps in immunity, public awareness, and surveillance systems. A single case of mumps can lead to an outbreak in a community with low MMR vaccine coverage rates or with close contact. This poses a significant challenge for Indonesia as a developing, densely populated, tropical country with many infectious disease priorities. Educating the public is the top action for addressing this overlooked yet important viral infection. People need to understand that mumps is highly contagious and should practice health measures such as maintaining good hygiene (e.g., regular handwashing, using a mask, and proper cough/sneeze etiquette) and avoiding crowded places. Individuals should also seek appropriate medical consultation, avoid antibiotic misuse, maintain proper nutrition, and isolate if infected to prevent further transmission. Awareness of complications like orchitis, meningitis, or hearing loss is critical to timely medical intervention.

While we hope the government will include the MMR vaccine in the national routine immunization program, individuals who can afford it should be encouraged to get vaccinated. Promoting vaccination through partnerships with local leaders and health workers can help dispel myths about vaccine safety and improve vaccine acceptance within communities. With over 17,000 islands, Indonesia's geography presents logistical challenges in delivering vaccines to remote areas. To address this, innovative solutions could include deploying mobile vaccination units and integrating vaccination

drives into existing health outreach programs. Lastly, improving surveillance, notification, record-keeping, and outbreak response systems is crucial for effectively controlling mumps. It's time to designate mumps as a notifiable disease.

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There is something unique about the management of mumps in Indonesia. A long-standing myth involves the use of **"Blau,"** a traditional blue powder used as an old-fashioned laundry bleach. It is believed that applying this powder to the swollen salivary glands can cure the disease. Some theories behind this myth suggest that the practice originated during colonial times as a way to mark individuals with mumps. Others believe that parents applied the powder intentionally to discourage children from touching the swollen area or to keep them embarrassed and confined at home. **The practice has absolutely no curative value for mumps** but may have been beneficial in isolating children and preventing the further spread of the virus 😄

SPORT & LIFESTYLE

GAME ON: HOW GAMIFICATION ENHANCES YOUR PHYSICAL HEALTH AND WELL-BEING

By: Marco Ariono

Lack of exercise is linked to over 5 million deaths each year worldwide and increases the risk of chronic diseases. According to the World Health Organization (WHO), more than 25% of adults globally are not physically active, with even higher rates in some regions. To help people stay active, making exercise enjoyable is essential for maintaining motivation.

One effective way to achieve this is through gamification—adding game-like features to mobile or wearable apps. These features make physical activity more fun and encourage participation through challenges and community engagement. Gamification works by using elements from games, such as points, leaderboards, and challenges, to keep users engaged and productive.

These features add a new layer of fun to fitness that wasn't there before. For example, earning points or setting high scores gives a sense of achievement, while leaderboards and friendly competition make the experience more exciting. Competing with friends makes staying active feel less like a chore and more like an enjoyable game.

The Role of Gamification in Physical Activity

Adolescence is a crucial time for forming habits that last a lifetime. Numerous advantages of physical activity during this phase include reduced stress, elevated mood, and enhanced sleep quality. Gamified apps like "Nike Training Club" and "Zombies, Run!" are made to make working out more fun and encourage consistent participation. These platforms improve intrinsic motivation and adherence to physical exercise routines by fusing entertainment with fitness objectives.

Research shows that gamification can dramatically lower negative emotions and raise adolescents'

sense of wellbeing. Interactive devices such as the Xbox Kinect and Nintendo Wii, for instance, offer a fun setting that encourages youth to engage in exercises like yoga, aerobics, and dancing while also encouraging self-control and social interaction.

Physical inactivity is a serious health issue for elderly people. Through the combination of virtual reality and physical activity, gamified interventions provide an effective solution. Using entertaining games like virtual golf, tennis, and bowling, users of devices like the Nintendo Wii and Xbox Kinect can enhance their balance, coordination, and general physical performance.

Some gamified platforms combine structured workout programs with traditional games. For instance, Wii Fit offers aerobic workouts, yoga classes, and balance activities, all of which are intended to focus on various aspects of fitness. In order to reach personal objectives, obtain badges, or unlock new challenges, users are encouraged to complete daily tasks. This promotes a feeling of achievement and continuous participation.

Significant gains in postural balance, flexibility, and muscle strength were shown in older women who participated in a study comparing the Xbox Kinect Sports and Nintendo Wii. These results highlight the potential of gamification to improve older populations' mental and physical health.

Psychological Benefits

One of the most important aspects of total well-being is mental wellness. Gamification's emphasis on producing entertaining and significant experiences is what makes it possible to boost mental health. Gamification improves self-esteem, creates a sense of accomplishment, and lessens the symptoms of anxiety and depression by transforming routine tasks into thrilling challenges.

For example, gamified fitness applications that use leaderboards and personalized goals promote social contact and friendly competition—two things that are crucial for emotional support. These motivating factors are beneficial to both adults and adolescents because they foster resilience and a good view on life.

Physical activity has been shown to be important in preventing mental health issues. Higher risks of anxiety and depression are associated with sedentary lifestyles, which are defined by extended periods of inactivity. Gamified therapies offer an entertaining means of staying active, which helps to reduce these hazards.

Video games that demand movement, or "exergames," have been shown to have a positive impact on mental health outcomes. These games improve emotional stability and cognitive abilities in addition to increasing physical activity. Furthermore, real-time tracking and feedback are ensured by the combination of wearable technology and smartphone apps, which helps users stick to their health objectives.

Creative missions or narratives, such saving a virtual environment or reaching plot points, are common in gamified activities. These components encourage consumers to participate emotionally and physically in the activity while offering a diversion from pressures.

Positive and Negative Effects of Gamification

Gamification is a very compelling way to keep active because it has been demonstrated to increase the efficacy, efficiency, and enjoyment of physical activity. It increases pleasure, encourages social connection, and helps fight loneliness—especially in older adults—by implementing captivating design elements. Through cooperative or competitive activities, gamification promotes appreciation and a sense of community. Additionally, it can increase the intensity of training, decrease inactive behavior, and promote sustained use of health apps. Furthermore, by assisting users in forming healthy habits, boosting intrinsic motivation, and making physical activity more pleasurable for staff members, gamified tactics improve practical knowledge and foster healthier and more effective work environments. Gamification in rehabilitation offers efficient alternatives for musculoskeletal healing by addressing issues with traditional approaches. For students and older adults alike, gamification drives physical activity and builds sustained interest, making fitness a more enjoyable and rewarding experience.

Gamification offers advantages, but it also has disadvantages. Reduced activity levels may result from some players viewing exergames as enjoyment rather than actual exercise. Long-term behavior change can be impeded by an over-reliance on extrinsic motivators because users may become preoccupied with short-term objectives or feel overpowered by competitive factors, both of which can have a detrimental effect on mental health. Additionally, some people may become demotivated by the emphasis on competition, which would lead to tension rather than engagement.

Conclusion

Gamification is a potentially effective way to encourage mental and physical wellness in a variety of age groups. This strategy makes use of games' motivational potential to promote active living while also improving cognitive and emotional health. The potential for gamification to transform education and health is becoming more and more clear as technology advances.

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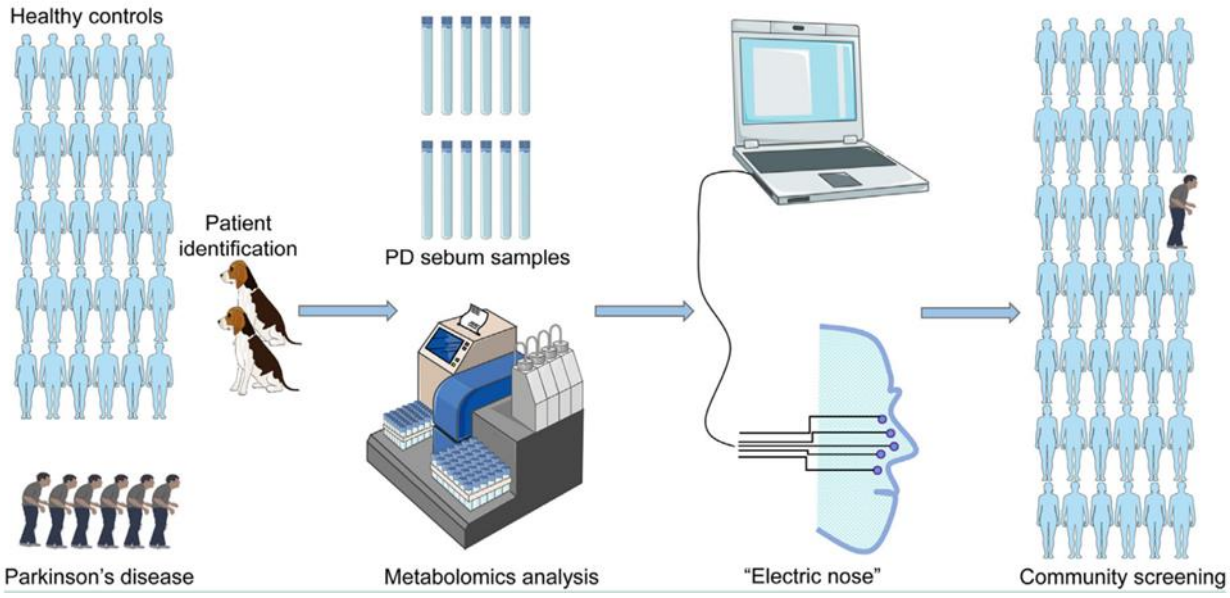
COMIC CORNER

SNIFF THE SMELL AND TELL THE TALE: SEBUM BIOMARKERS FOR PARKINSON'S DISEASE

By: Aly Diana



Parkinson's disease (PD) is a neurodegenerative disorder that often evades early diagnosis, as symptoms like tremors and rigidity typically appear only after significant neuronal loss. This groundbreaking journey began with the extraordinary observation of Joy Milne, a Scottish nurse who noticed a distinctive musky odor in her husband years before his PD diagnosis. This peculiar ability to detect Parkinson's by smell inspired a series of scientific investigations, leading to the discovery of sebum—a lipid-rich secretion of the skin—as a carrier of potential biomarkers for PD.

Sebum has emerged as a promising candidate for non-invasive biomarker discovery, thanks to its biochemical richness and accessibility. Researchers have applied cutting-edge techniques, such as gas chromatography-mass spectrometry (GC-MS) and liquid chromatography-mass spectrometry (LC-MS), to identify compounds associated with PD. Key findings include:

Volatile Organic Compounds (VOCs): Studies identified altered levels of VOCs, including perillic aldehyde, octadecanal, and eicosane, in sebum from PD patients. These compounds, linked to lipid peroxidation, highlight oxidative stress as a hallmark of PD. While initial results showed these VOCs could differentiate PD from controls, later analyses emphasized their structural similarity to lipid breakdown products.

Lipid Dysregulation: The study demonstrated significant disruptions in lipid metabolism pathways in PD patients, including the carnitine shuttle and sphingolipid metabolism. These findings suggest a

deeper connection between lipid dynamics and neurodegenerative processes.

High-Molecular-Weight Lipids: A study using paper spray ionization mass spectrometry (PS-MS) identified unique patterns of triacylglycerides and diglycerides in PD sebum. This rapid analysis method captured molecular features undetectable by traditional techniques, paving the way for faster diagnostics.

Gene Expression Profiles: Transcriptome analyses of RNA extracted from sebum revealed over 100 differentially expressed genes associated with PD. Machine learning models trained on these datasets demonstrated the potential for RNA-based biomarkers to diagnose PD with high accuracy.

Recent advancements focus on translating these findings into practical diagnostic tools. Techniques like PS-MS, combined with machine learning, enable rapid and accurate analysis of sebum samples collected non-invasively. Studies report up to 84% correct classification of PD cases based on VOC profiles, offering promising avenues for early detection.

An intriguing parallel line of research involves the use of trained dogs to identify PD through smell. Studies have shown that dogs achieve remarkable sensitivity and specificity rates, often exceeding 85%, in distinguishing PD samples from controls. These findings underscore the potential of olfactory-based diagnostics, whether via human ingenuity or canine capabilities.

From a serendipitous observation by a devoted couple to rigorous scientific breakthroughs, this journey exemplifies the power of curiosity and determination. I find the evolving narrative of PD biomarkers inspiring, as it bridges human intuition with cutting-edge science. It is my hope that these advancements will soon translate into accessible diagnostic tools, enabling earlier detection and better management of Parkinson's disease.

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