

## ● オフィンニ ユディル 特定助教

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**研究課題:** 人新世における脆弱な結びつき：インドネシアの自然界と人間社会の接点でのウイルスに関するワンヘルス研究

(Vulnerable nexus in the Anthropocene: A One Health study of viruses at Indonesia's desecrated nature-human interface)

**専門分野:** ウイルス学 (Virology)

**受入先部局:** 東南アジア地域研究研究所 (Center for Southeast Asian Studies)

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インドネシアで医師として勤務した後、神戸大学で博士号を取得しました。その後、米国のハーバード大学と大阪大学で5年間ポスドク研究員として研究を続け、神戸大学で助教として勤務しました。これまでウイルス学に関連する臨床研究および基礎研究に携わってきましたが、現在の研究は、インドネシアにおける自然生態系と人間社会の間に存在するウイルスに関連する脆弱性を探ることに焦点を当てています。これには、ウイルスの動態の全体像を包括的にマッピングし、生態学的に不安定な地域でその影響を受ける人間と、動物、植物、環境を含む「非人間的な存在」の関係を解明することが含まれます。そして、人為的行為の結果としてのウイルスのスピルオーバーを予測し、研究結果を実行可能な政策に変換することを目指しています。

私の学術的背景は医学とウイルス学に偏りがちですが、新型コロナウイルスのパンデミックは、解決すべき現実の問題が、生物、公衆衛生、生態だけでなく、文化、経済、政治的意思決定を含む広範な社会文化的要素と絡み合っていることを如実に示しました。白眉プロジェクトと東南アジア地域研究研究所の地域研究の専門知識を活用し、私は自身の専門分野を越えて学際的な研究を行い、近い将来に直面する複雑な問題に対処していきたいと考えています。

I practiced as a medical doctor in Indonesia before pursuing a PhD at Kobe University in Japan. I then continued with five years of postdoctoral work at Harvard University in the US and Osaka University in Japan, before working as an Assistant Professor in Kobe University. While I have been involved in clinical and basic studies on virology, my research from now on will address the vulnerability of the virological nexus situated between natural and human ecosystems in Indonesia. This involves comprehensively mapping the viral landscape and elucidating the more-than-human lives, i.e., encompassing both humans and non-human entities, such as animals, plants, and the environment, affected in an ecologically precarious area. I then aim to project the consequences of anthropogenic desecration toward viral spillover and translate my findings into actionable policy.

While my academic background tends to be fixated in the two respective fields of medicine and virology, the COVID-19 pandemic has shown us that the real-world problems we hope to solve are much broader, intertwining biology, public health, ecology, and even socio-cultural fabrics, including culture, economy, and political decisions. Leveraging the Hakubi program and the area study expertise in CSEAS, I hope to transcend my field toward interdisciplinarity to address the complex problems of our near future.

## Introduction of your research

Two-thirds of emerging human pathogens are zoonotic—transmitted from animals to humans—while up to 90% of animal pathogens are of multi-species origin. Cross-species viral transmission has been responsible for pandemics in animals (H5N1 “bird” flu, H1N1 “swine” flu) and humans (HIV/AIDS, SARS, COVID-19), as well as deadly endemics in animals (Ebola, pneumovirus) and humans (rabies, yellow fever). In recent years, viral spillover events have been increasing in frequency. Five deadly zoonotic viral pandemics have happened in the past century, and the probability of epidemics may increase threefold in the coming decades. The recent COVID-19

pandemic, which has cost 6.8 million human lives and 12.5 trillion USD in the global economy, is only one example of how drastic human actions have broken the ecological stability in this Anthropocene epoch. A Nature paper projected that cross-species spillover would be intensified by anthropogenic

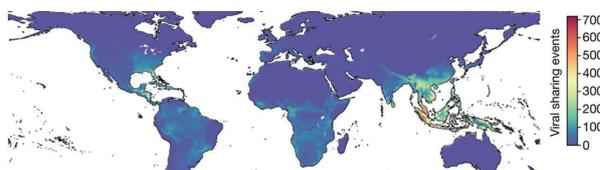


Fig. 1. Projected viral sharing events in 2070; average of nine global climate models (Carlson et al., 2022).

climate change due to geographical shifts of viral reservoirs such as bats and rodents. Tropical regions bear a disproportionately large burden of climate change. As such, Indonesia is the brightest hotspot for viral sharing events (Fig. 1).

With 17% of the global diversity and 515 species of mammals, Indonesia is the second most biodiverse country in the world after Brazil. Wildlife and humans have cohabitated since ages ago in ecological nexuses in Indonesia, as most indigenous lands are located within or near frontier forests. Over 20 million people, or 7.5% of the population, are members of the ~2,300 indigenous communities who actively protect the unsullied nature. However, following the rise of the dictatorial government of Suharto, land-grabbing and systemic depletion of indigenous rights have occurred, e.g., an out-of-Java mass transmigration and widespread deforestation for industrial logging, mining, and plantations. Since the 1970s, for instance, over 90% of the forest area near the Dayak tribes in East Kalimantan has disappeared. This trend has continued after the 1998 Indonesian political reform; between 2000 and 2021, Indonesia lost 28.6 Mha or 18% of its tree cover—equivalent to 19.7 GtCO<sub>2</sub>e or a third of total global emissions in 2023. Habitat destruction threatens biodiversity in Indonesia, which now has the second most endangered species (583) and the most endangered mammal worldwide (191). Even worse, anthropogenic threats are projected to intensify over the next 5-10 years through government and enterprise projects, such as the capital relocation to East Kalimantan or the nickel mining boom in Sulawesi.

“How can we address the vulnerability of ecological interfaces in Indonesia amidst significant anthropogenic damage?” Evaluating viral landscapes and spillover events may reveal the extent of disruption to the nature-human interface, ideally employing the so-called “One Health approach” (Fig. 2). One Health emphasizes the interconnectedness of all living beings—animals, humans, and nature—as dynamic, “coupled

systems.” Failures in One Health have resulted in disasters across Asia. In Vietnam during the 2000s, earlier policies favored the economy over animal health during the H5N1 outbreak, leading to a delayed response. Consequently, 44 million poultry had to be culled to contain the viral spread, devastating livestock economies.

A robust One Health policy framework aims to prevent catastrophes rather than constitute mere damage limitation. This is achievable through more-than-human surveillance, vaccination, and targeted interventions where necessary. Two examples of this are the Hendra virus vaccine for horses in Australia and measures to avoid Nipah virus exposure among palm sap workers in Bangladesh. I believe that adopting a One Health-centered approach is crucial for establishing data-driven, evidence-based mitigation policies.

Therefore, in this study, I aim to utilize the One Health approach to tackle the vulnerability of ecological nexus in the context of viral infections in degraded nature-human interfaces in Indonesia. The initial primary phase will comprehensively map the viral landscape among wildlife, humans, and the physical environment in a selected area with ongoing anthropogenic intrusions. Next, I will elucidate the more-than-human lives affected in this area using a multi-species ethnographic approach. Then, I aim to forecast the repercussions of anthropogenic desecration on viral spillover and translate these findings for actionable policies aligned with the Generalizable One Health Framework. A homogenization of the virosphere has been previously hypothesized as a consequence of the Anthropocene. Through this study, I seek to demonstrate the adverse impact of human expansion on viral ecology to be as evident as its impact on climate. While human growth is inevitable, understanding spillover dynamics and the potential risks to humanity may prompt prioritizing One Health in policies akin to the decoupling of economic growth to address the climate crisis.

## References

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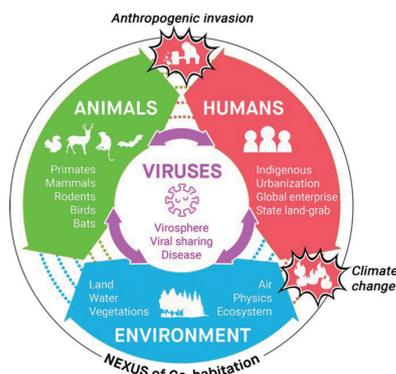


Fig. 2. A One-Health schematic to elucidate the virosphere and viral spillover in a cohabitation nexus.