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for Infectious Disease Control

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Infectious Disease Training in Vietnam for Students (2026)

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EDITORIAL

本号では、2025年度および2026年度に実施した帝京大学医学部５年生のベトナム海外実習について、その概要と参加学生による報告を掲載しました。Vietnam National Children's Hospital（VNCH）を中心とした本実習では、感染症診療、小児医療、集中治療、臨床検査などの現場を見学し、現地の医師・医療スタッフとの交流を通じて、多くの学びを得る機会となっています。実際に本号には、2025年度および2026年度の実習記録と学生報告が収載されています。私自身も2025年度から引率責任者として本実習に参加しており、学生とともに現地の医療・教育環境に接してきました。海外実習の意義は、日本とは異なる疾患や医療制度を知ることだけではありません。実際の医療現場に立ち、その国の社会、文化、生活環境を含めて医療を考える経験は、将来医師となる学生にとって大きな意味を持つものと考えています。本号の学生報告からも、それぞれが現地で見聞きしたことを自ら考え、日本での医療と比較しながら学びを深めたことが伝わってきます。今後もこの実習が継続し、さらに充実した教育プログラムへと発展していくことを願っています。

一方で、ベトナムとの交流は学生教育にとどまるものではありません。ADCでは、VNCHおよびVietnam National University–University of Medicine and Pharmacy（VNU-UMP）との連携を基盤として、今後の国際共同研究を発展させていきたいと考えています。本号でも、臨床情報と微生物学的・ゲノム情報を組み合わせた感染症研究を構築し、薬剤耐性菌のゲノム解析、病原性やバイオフィルム形成能の評価、臨床分離株を用いた基礎研究へ発展させる方針を示しています。その研究テーマの一つが、*Acinetobacter baumannii* です。今後のベトナムとの共同研究を考える過程で、私自身もあらためてこの菌について文献を調べ、その特徴の一つである乾燥耐性と医療環境における持続生存に焦点を当てたReviewを本号に執筆しました。*A. baumannii* は、多剤耐性という側面だけでなく、乾燥した環境で長期間生存し、医療環境に残存し得るという性質を有しています。本Reviewでは、乾燥耐性に関与するストレス応答、細胞表層の変化、酸化ストレス防御、代謝適応、バイオフィルム形成、viable but non-culturable状態などについて整理し、感染対策上の意義についてまとめました。

今回、このReviewを本号に掲載したことには、もう一つの意図があります。ADC Letterはこれまで、ADCにおける研究、教育、国際交流などの活動を記録し、広く発信する役割を担ってきました。その役割は今後も重要です。一方で、ADC LetterはOnline ISSN、Print ISSNを有し、J-STAGEにも掲載されている学術誌でもあります。今後は、ADCの活動報告の場であることに加え、原著論文、Review、Case Report、研究プロトコル、感染対策に関する実践報告など、感染症に関する学術的成果を発信する論文誌として、その価値を今一度高めていきたいと考えています。教育や国際交流の中から新たな研究課題が生まれ、それが共同研究へと発展し、得られた成果が論文として発信され、さらに次の教育や国際連携につながっていく。そのような循環をADCの活動の中に作っていくことが重要だと考えています。そしてADC Letterが、その成果を記録するだけでなく、新たな知見を発信し、次の研究や連携を生み出す場となることを目指していきたいと思います。

ベトナムとの学生実習、国際共同研究、そしてADC Letter。これらをそれぞれ独立した活動としてではなく、教育、臨床、研究、国際連携をつなぐ一連の取り組みとして発展させていきたいと考えています。今後とも、ADC Letterへのご支援と積極的なご投稿をよろしくお願いいたします。

This issue features reports on the overseas training program in Vietnam conducted for fifth-year medical students of Teikyo University School of Medicine in both 2025 and 2026. Centered primarily at Vietnam National Children's Hospital (VNCH), the program provides students with opportunities to observe clinical practice in infectious diseases, pediatrics, intensive care, and diagnostic laboratories, while learning directly through interactions with local physicians and healthcare professionals.

I have participated in this program as the supervising faculty member responsible since 2025. One of the greatest values of overseas clinical training is that students are exposed not only to diseases and healthcare systems that differ from those in Japan, but also to the social, cultural, and environmental context in which medical care is delivered. Such experiences are highly meaningful for future physicians. The student reports included in this issue also clearly show how each participant reflected on their observations, compared them with medical practice in Japan, and deepened their understanding. I sincerely hope that this program will continue and evolve into an even more valuable educational opportunity.

At the same time, our relationship with Vietnam extends beyond student education. ADC is seeking to further develop international collaborative research based on its partnerships with VNCH and the Vietnam National University–University of Medicine and Pharmacy (VNU-UMP). One of the research areas currently being planned focuses on antimicrobial resistance, particularly research on *Acinetobacter baumannii*. We hope to develop collaborative projects that integrate clinical information with microbiological and genomic data, including genomic analysis of clinical isolates, evaluation of antimicrobial resistance, virulence, and biofilm-forming capacity, as well as basic research using bacterial isolates.

In preparing for these future collaborative studies, I took the opportunity to review the literature on *A. baumannii* and contributed a review article to this issue focusing on desiccation tolerance and persistence in healthcare environments. *A. baumannii* is widely recognized for its multidrug resistance, but its ability to survive for prolonged periods under dry conditions and persist in hospital environments is also a key characteristic relevant to infection prevention and control. The Review summarizes current knowledge on stress responses, cell-envelope adaptation, oxidative-stress defense, metabolic adaptation, biofilm formation, and the viable but non-culturable state, as well as their implications for environmental persistence and infection control.

There is another reason for including this review article in the current issue. ADC Letter has long served as a platform for recording and disseminating the research, educational, and international activities of ADC. This role remains important and should continue. At the same time, however, I would also like to strengthen the value of ADC Letter once again as an academic journal. In addition to reports on ADC activities, I hope the journal will increasingly serve as a venue for original articles, review articles, case reports, research protocols, and practice reports related to infectious diseases and infection prevention.

Ideally, educational activities and international exchange should generate new research questions; those questions should develop into collaborative studies; and the resulting findings should then be disseminated through academic publications, leading in turn to further education and international collaboration. Creating such a cycle is, I believe, an important role for ADC. ADC Letter should not simply record what ADC has done, but should also become a platform that disseminates new knowledge and creates opportunities for future research and collaboration.

The student training program in Vietnam, international collaborative research, and ADC Letter should therefore not be regarded as separate activities. Rather, I hope to develop them as interconnected components linking education, clinical practice, research, and international collaboration. I greatly appreciate your continued support of ADC Letter and look forward to receiving further contributions from our readers.

編集長：吉野友祐 Editor-in-Chief : Yusuke Yoshino, Director　　**事務局：伊藤吹夕** Editorial Office : Fuyu Ito, Ph.D.

表紙写真： 帝京大学医学部５年生公衆衛生学実習

TAVP PLAN　Records of TAVP Training for Medical Students

帝京大学とベトナム国立小児病院および国立ハノイ医科大学との単位互換協定

医学部５年生　公衆衛生学実習【ベトナムでの感染症】

July 14th - 19th, 2025　July 13th - 18th, 2026

ベトナムにおける学生実習と新たな国際連携への展望

吉野友祐

2026年７月、帝京大学医学部の学生を対象としたベトナムでの海外実習を実施しました。今回の実習では、Vietnam National Children's Hospital（VNCH）を中心に、感染症診療の現場を見学するとともに、現地医師による講義やベッドサイドでの臨床実習を通じて、ベトナムにおける感染症医療の実際を学ぶ機会を得ました。

学生たちは、日本とは異なる医療環境の中で感染症診療がどのように行われているかを直接体験しました。特に、小児感染症の診療、感染対策、抗菌薬の使用、薬剤耐性菌への対応などについて、現地の医師・医療スタッフとの交流を通して理解を深めることができました。短期間ではありましたが、医学知識だけでなく、異なる文化や医療制度の中で患者を診ることの重要性を実感する貴重な機会となりました。

また、今回の訪問は学生教育にとどまらず、今後の国際共同研究を発展させるための重要な機会にもなりました。Asia International Institute of Infectious Disease Control（ADC）では、VNCHおよびVietnam National University–University of Medicine and Pharmacy（VNU-UMP）との連携を進めており、臨床情報と微生物学的・ゲノム情報を組み合わせた感染症研究の構築を目指しています。

特に、薬剤耐性菌を対象としたゲノム解析、病原性やバイオフィルム形成能の評価、臨床分離株を用いた基礎研究などについて、今後さらに具体的な共同研究へと発展させていく予定です。VNCHのDr. Haiをはじめ、現地の若手医師・研究者との交流も進んでおり、将来的には大学院教育や研究者育成を含めた人的交流へと発展させることを期待しています。

国際共同研究を持続的なものにするためには、研究成果を生み出すことに加えて、次世代の医師・研究者を育成することも重要です。今回の学生実習は、その第一歩として大きな意義を持つものと考えています。学生が海外の医療現場を経験し、現地の医療者や研究者と直接交流することは、将来の国際的な感染症対策を担う人材育成にもつながります。

ADC研として、今後もベトナムをはじめとするアジア各国との連携を深め、教育、臨床、研究を有機的に結びつけた国際感染症ネットワークの構築を進めていきたいと考えています。

Student Training in Vietnam and New Horizons for International Collaboration

Yusuke Yoshino

In July 2026, Teikyo University School of Medicine conducted an overseas training program in Vietnam for medical students. The program was centered at Vietnam National Children's Hospital (VNCH), where students had the opportunity to observe infectious disease care, attend lectures by local physicians, and participate in bedside clinical training.

Through this experience, students were able to directly observe how infectious diseases are managed in a healthcare environment that differs from that in Japan. In particular, discussions with local physicians and healthcare professionals enabled them to gain a deeper understanding of pediatric infectious diseases, infection prevention and control, antimicrobial use, and the management of antimicrobial-resistant organisms. Although the training period was relatively short, it provided a valuable opportunity for the students to appreciate not only medical knowledge, but also the importance of patient care within different cultural and healthcare contexts.

This visit also served as an important opportunity to further advance international research collaboration beyond student education. The Asia International Institute of Infectious Disease Control (ADC) is strengthening its partnerships with VNCH and the Vietnam National University–University of Medicine and Pharmacy (VNU-UMP), with the aim of establishing infectious disease research that integrates clinical information with microbiological and genomic data.

In particular, we plan to expand collaborative projects involving genomic analysis of antimicrobial-resistant bacteria, evaluation of virulence and biofilm-forming capacity, and basic research using clinical isolates. Exchanges with young physicians and researchers at VNCH, including Dr. Hai, are also progressing, and we hope that these collaborations will eventually extend to include graduate education and the training of future researchers.

To ensure the sustainability of international collaborative research, it is important not only to produce research outcomes but also to foster the next generation of physicians and researchers. We believe that this student training program represents an important first step in that direction. Providing students with opportunities to experience healthcare overseas and interact directly with local clinicians and researchers will also contribute to developing future professionals who can play an active role in global infectious disease control.

At ADC, we will continue to deepen our collaborations with Vietnam and other Asian countries and promote the development of an international infectious disease network that organically integrates education, clinical practice, and research.

2025 年度参加学生

A 班：小林大起、西尾耕太郎、大竹高継、阿部光莉、大久保美華、星野未有、山中麗華
B 班：青山友美、伊藤　瞳、大城敬升、小川華歩、倉岡　翔、矢部直尚、吉川未来

Participated Students

Group A：Masaki Kobayashi, Kotaro Nishio, Takahide Otake, Hikari Abe, Mika Okubo, Miyu Hoshino, Reika Yamanaka
Group B：Yumi Aoyama, Hitomi Ito, Keisho Oshiro, Kaho Ogawa, Sho Kuraoka, Naotaka Yabe, Mirai Yoshikawa

2026 年度参加学生

：田邊康平、渡邉裕佳、笠谷幸太朗、太田晴香、大田咲愛、三上　翔、山浦玄斗、細野　柊

Participated Students

：Kohei Tanabe, Hiroka Watanabe, Kotaro Kasatani, Haruka Ota, Sae Ota, Sho Mikami, Gento Yamaura, Shu Hosono

引率教員・医師：吉野友祐、鈴木章一、髙橋和浩

Supervised Teacher：Yusuke Yoshino, Shoichi Suzuki, Kazuhiro Takahashi

2025、2026年度実習概要

臨床実習：国際感染症、国際保健・予防医学、医療システム　等

・国立小児病院（ハノイ）：ICU、呼吸器、循環器、感染症、救急、臨床疫学、遺伝子解析ラボ　他
・国立ハノイ医科大学（ハノイ）：公衆衛生学　「COVID-19を含む他感染症」講義
・ハイズオン小児病院（ハイズオン）：感染症病棟及びICU見学

Training Schedule of Teikyo Students
July 14 (Mon) - 19 (Sat), 2025

	Mon. 14	Tue. 15	Wed. 16	Thu. 17	Fri. 18	Sat. 19
AM	**9:00 - 10:00** **Opening Ceremory** : Board of Director	**8:30 - 10:00** **Heart center (G1)** : Dr. Ngo Quoc Thai **NICU (G2)** : Dr. Tran Huu Dat, Dr. Tran Thi Ly	**9:00 - 10:30** **Infectious Disease Center (G1)** : Dr. Nguyen Phuong Hanh **Respiratory center (G2)** : Dr. Dang Mai Lien	**9:00 - 16:00** **Visitation** HAI DUONG CHILDREN'S HOSPITAL	**9:00 - 11:30** **Closing & Remark** : Board of Director	**9:00 - 15:00** **Public Health Inspection in Vietnam**
	10:30 - 11:30 **Laboratory** : Assoc. Prof. Phung Thi Bich Thuy **(G1+2)**	**10:10 - 11:30** **Heart center (G2)** : Dr. Ngo Quoc Thai **NICU (G1)** : Dr. Tran Huu Dat, Dr. Tran Thi Ly	**10:30 - 11:30** **Free Discussion** **(G1+2)**			
	Lunch in VNCH			Lunch outside	Lunch outside	
PM	**13:30 - 16:30** **ER** : Dr. Pham Van Tuan **(G1+2)**	**13:30 - 15:00** **PICU (G1)** : Dr. Nguyen Van Thang **Surgical ICU (G2)** : Dr. Nguyen Dung Tien	**14:00 - 15:30** **Infectious Disease Center (G2)** : Dr. Nguyen Phuong Hanh **Respiratory center (G1)** : Dr. Dang Mai Lien		**14:00 - 16:30** **HMU** : Ms.Nguyen Thu Thuy	
		15:10 - 16:30 **PICU (G2)** : Dr. Nguyen Van Thang **Surgical ICU (G1)** : Dr. Nguyen Dung Tien	**15:30 -** **Free Discussion** **(G1+2)**		**Lecture** : Dr. Nguyen The Hung (Department of Tropical Diseases and Harm Reduction)	**19:00** **Airport**

G1: Group 1, G2: Group 2, HMU: Hanoi Medical University

Training Schedule of Teikyo Students
July 13(Mon) - 18(Sat), 2026

	Mon. 13	Tue. 14	Wed. 15	Thu. 16	Fri. 17	Sat. 18
AM	9:00 - 10:00 Opening Ceremory	8:30 - 10:00 Cardiology center (G1) NICU (G2)	9:00 - 10:30 IInfectious Dept. (G1) Respiratory Dept. (G2)	9:00 - 16:00 Public Health Inspection in Vietnam	9:00 - 11:30 Closing & Remark	9:00 - 15:00 Public Health Inspection in Vietnam
	10:30 - 11:30 Laboratory (G1+2)	10:10 - 11:30 Cardiology center (G2) NICU (G1)	10:30 - 11:30 Neonatal Department (G1+2)		Dept of stem cell and Dept of Microbiology	
	Lunch in VNCH			Lunch outside	Lunch outside	
PM	13:30 - 16:30 Emergency Dept. (G1+2)	13:30 - 15:00 PICU (G1) SICU (G2)	14:00 - 15:30 Infectious Dept. (G2) Respiratory Dept. (G1)		14:00 - 16:30 Dept of stem cell and Dept of Microbiology	
		15:10 - 16:30 PICU (G2) SICU (G1)	15:30 - Presentation by Dr. Takahashi (AI-related study) etc			19:00 Airport

G1: Group 1, G2: Group 2, HMU: Hanoi Medical University

実習の様子　2026年度
国立小児病院　National Children's Hospital










帝京大学
CHÀO MỪNG
CHUYÊN GIA, HỌC VIÊN ĐẾN TỪ ĐẠI HỌC TEIKYO
ĐẾN BỆNH VIỆN NHI TRUNG ƯƠNG
WELCOME
DELEGATION OF EXPERTS AND STUDENTS FROM TEIKYO UNIVERSITY




帝京大学
LỄ TỔNG KẾT
CHƯƠNG TRÌNH LÀM VIỆC CỦA ĐOÀN ĐẠI HỌC TEIKYO
TẠI BỆNH VIỆN NHI TRUNG ƯƠNG
CLOSING CEREMONY
WORKING PROGRAM OF TEIKYO UNIVERSITY






BỆNH VIỆN NHI TRUNG ƯƠNG


HAI DUONG CHILD

謝辞　Acknowledgment

第10、11期生の「ベトナム感染症実習」は、現地の皆様のご支援により、準備・当日運営・事後対応まで円滑に実施できました。ご協力くださったベトナム国の関係各位に心より御礼申し上げます。

特に、国立小児病院（ハノイ）の各診療科の先生方およびスタッフの皆様、ならびにハイズオン小児病院の先生方・スタッフの皆様には、見学・指導の機会をご提供いただき、深く感謝いたします。あわせて、ベトナム国家大学 医科薬科大学（VNU-UMP）の教員・スタッフの皆様には、今後の連携に向けたご助言とご支援を賜り、厚く御礼申し上げます。

Thanks to the support of our local partners, the "Vietnam Infectious Disease Training Program" for the 10th and 11th cohorts was carried out smoothly, from preparation and on-site operations to post-program follow-up. We extend our sincere gratitude to all the individuals and organizations in Vietnam who cooperated with us.

We are particularly grateful to the physicians and staff across various departments at the National Children's Hospital (Hanoi) and Hai Duong Children's Hospital for providing valuable opportunities for clinical observation and instruction. We also wish to express our deep appreciation to the faculty and staff at Vietnam National University – University of Medicine and Pharmacy (VNU-UMP) for their valuable guidance and support for future collaboration.

2025年度 ベトナム実習報告会　Vietnam Training Report Session

2025年10月24日（金）、帝京大学板橋キャンパスにて関連教員参加のもと医学部５年生による衛生学公衆衛生実習報告会を行いました。

2025年７月に実施したベトナムでの臨床実習に参加した学生がパワーポイントで報告を行い、印象に残ったことや感想などを話しました。本実習では、ベトナムの医療の現状や環境、文化の違い、語学力の大切さを強く感じることができ、想像していたものや情報とは違う現状を目の当たりにして見方が変わり、あらためて大きな学びを得ることができたようです。今回の経験をもとに学生それぞれが視野を広げ、他国と日本の医療それぞれにおいての課題や解決策について考えるいい機会となったようです。

今後の医学学習や医療活動、国際的視野にたった医療人をめざすために生かしていくことを期待します。

On Friday, October 24, 2025, fifth-year medical students held a presentation session regarding their Hygiene and Public Health practicum at Teikyo University's Itabashi Campus, with participating faculty members in attendance.

Students who participated in the clinical practicum in Vietnam in July 2025 gave PowerPoint presentations, sharing their impressions and reflections. Through this program, they gained a profound understanding of the realities of healthcare in Vietnam, as well as environmental and cultural differences and the importance of language proficiency. Experiencing a reality that different from their prior expectations and background knowledge shifted their perspectives and provided valuable learning opportunities. This experience served as a meaningful occasion for each student to broaden their horizons and reflect on healthcare challenges and potential solutions in both Japan and other nations.

We hope they will apply these insights to their future medical studies and professional activities as they strive to become healthcare professionals with a global perspective.

2026年度の報告会は、10月21日に行う予定です。次号で報告します。

The presentation session for the 2026 academic year is scheduled for October 21, and a report on the event will appear in the next issue.



報 告 2025年度衛生学公衆衛生学実習「ベトナムにおける感染症」

ベトナム公衆衛生学実習で学んだこと

帝京大学医学部医学科　５年Ａ班
小林大起、西尾耕太郎、大竹高継、阿部光莉、大久保美華、星野未有、山中麗華

今回のベトナムでの公衆衛生学実習は、私たちにとって医療の在り方を多面的に考える貴重な機会となった。

Vietnam National Children's Hospitalでは、最新型のPCRを含む約10台の機器が稼働し、感染症診断に頻用されている様子を見学した。日本では限られた場面でしか行われない検査がベトナムでは日常的に実施されていることに驚き、医療資源の配分や感染症流行の状況によって診療のスタンダードが大きく異なることを実感した。また、ベトナムでは麻疹ワクチンを生後６か月で接種するという日本とは異なる予防接種スケジュールにも触れ、地域の疫学的背景が診療指針に直接反映される現実を学んだ。

さらにERでは、小児の緊急度をABCDアプローチやGCSを組み合わせて迅速に評価する様子を観察し、同じ「緊急診療」であっても小児特有のバイタルサインや発達段階を理解する必要性を改めて認識した。加えて、輸液選択の際に基礎疾患や体重変化まで考慮する姿勢から、単に症状だけでなく背景全体を把握する重要性を感じた。

NICU・PICU・SICUの見学では、重症度や臓器別にユニットが細分化された体制に触れた。特にPICUで見たメサドン中毒や黄色ブドウ球菌性髄膜炎といった日本では稀な症例を通じて、国や社会が抱える課題によって患者層が異なることを実感した。また、医療費の制度が年齢によって変化し、６歳以上は自己負担が増えるという現実から、経済的背景が診療の選択肢に直結することを学んだ。

感染症センターでは、今年上半期だけで2,500人以上の麻疹患者が受診している現状に衝撃を受けた。隔離病棟は陰圧室ではなく、窓を開け放って換気を行っており、日本の基準から見ると不十分ではあるが、限られた資源の中で最善を尽くす姿勢として理解すべきであると感じた。また、日本では稀な日本脳炎やヘルペス脳炎のMRI所見を実際に観察することができ、知識と現場を結び付ける貴重な経験となった。特に、日本脳炎の患者が民族的・文化的背景から治療開始が遅れ、結果として寝たきりとなってしまった事例から、医師は医学的判断のみならず、社会的・文化的側面にも配慮する必要があることを痛感した。

最終日の講義では、日本では馴染みのない豚連鎖球菌感染症について学び、人獣共通感染症が地域の生活習慣や文化と密接に関連していることを理解した。これら一連の経験を通して、私たちは「疾患を診るだけでなく、その人が暮らす社会や文化を含めて診ること」が医師に求められる姿勢であると実感した。

今回の実習を通して、私たちは「万人を診る」とは単に年齢や疾患の多様性に対応することではなく、文化・宗教・経済・民族といった背景を理解したうえで最適な医療を提供することだと学んだ。グローバル化が進む日本においても、今後は異なる文化的背景を持つ患者と接する機会が増えるだろう。その際に、目の前の患者を社会ごと受け止める姿勢を持つことこそ、医師として果たすべき責務であると強く感じた。

この経験を今後の学びや臨床実習に活かし、国籍や宗教、文化的価値観を超えてすべての人に寄り添える医師を目指していきたい。

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今回、このような貴重かつ素晴らしい実習の機会を賜りましたこと、吉野先生、鈴木先生、髙橋先生、Vietnam National Children's Hospitalおよびハンズオン病院の先生方・スタッフの皆様、公衆衛生学講座の皆様、そしてADC研の奥山様に心より深く御礼申し上げます。

Practical Training on Public Health: The Situation of Infectious Disease in Vietnam
What We Learned from Public Health Training in Vietnam
5th-year Medical Students, Teikyo University, Tokyo, Japan
Group A Masaki Kobayashi, Kotaro Nishio, Takahide Otake, Hikari Abe, Mika Okubo, Miyu Hoshino, Reika Yamanaka

The public health training in Vietnam was a valuable opportunity for us to reflect on and broaden our understanding of medicine from multiple perspectives.

At Vietnam National Children's Hospital, we observed nearly ten machines—including the latest PCR models—being actively used for infectious disease diagnosis. We were surprised to find that tests performed only in limited clinical situations in Japan were used routinely in Vietnam, which made us realize how medical standards can vary greatly depending on resource allocation and the prevalence of infectious diseases. We also learned that in Vietnam, the measles vaccine is administered at six months of age—different from Japan's schedule—illustrating how regional epidemiological backgrounds directly influence clinical guidelines.

In the emergency department, we observed how pediatric patients were rapidly assessed using the ABCD approach and the Glasgow Coma Scale (GCS). This taught us that even within the same field of "emergency medicine," it is essential to understand children's unique vital signs and developmental stages. Moreover, we were impressed by how physicians considered underlying conditions and body weight changes when choosing intravenous fluids, reminding us of the importance of evaluating not only symptoms but also the patient's overall background.

Through visits to the NICU, PICU, and SICU, we observed how patients were carefully categorized based on organ systems and severity. In particular, the cases of methadone poisoning and *Staphylococcus aureus* meningitis we encountered in the PICU are rare in Japan, reflecting how social and national issues shape the patient population. We also learned that medical expenses vary significantly by age in Vietnam, with children over six years old facing higher out-of-pocket costs—an example of how economic factors directly influence treatment decisions.

At the Infectious Disease Center, we were astonished to learn that more than 2,500 measles patients had been treated in just the first half of the year. The isolation ward relied on open windows for ventilation rather than negative-pressure rooms. Although this setup may seem inadequate by Japanese standards, we recognized it as a practical way to provide the best possible care within limited medical resources. Furthermore, observing MRI findings of Japanese encephalitis and herpes encephalitis helped us connect textbook knowledge to real clinical practice. One case of Japanese encephalitis, in which treatment was delayed due to cultural and ethnic factors, resulting in a bedridden state, reminded us that physicians must take social and cultural elements into account in addition to medical judgment.

On the final day, we attended a lecture about *Streptococcus suis* infection, a zoonotic disease unfamiliar in Japan. This lecture helped us understand that zoonoses are closely related to regional lifestyles and cultures.

Through these experiences, we learned that being a physician means not only "treating diseases" but also "understanding the society and culture in which patients live."

Throughout this training, we came to realize that "treating all people" does not simply mean addressing diversity in age or disease, but rather providing the best possible care while understanding each patient's cultural, religious, economic, and ethnic background. As globalization advances, Japan will continue to see an increase in patients from diverse cultural contexts. In such times, treating each patient with an understanding of their wider social background is an essential responsibility for all physicians.

We hope to apply what we learned from this experience to our future clinical training and to become physicians who can care for all people—regardless of nationality, religion, or cultural values—with respect and empathy.

Acknowledgements

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We are sincerely thankful for their warm support and guidance throughout the program.

報 告 2025年度衛生学公衆衛生学実習「ベトナムにおける感染症」

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【1】ベトナムにおける麻疹について

ベトナムでは麻疹が多く、2025年３月にアウトブレイクが発生し、現在も流行が続いている。ワクチンは生後６か月から２回接種が基本であるが、感染例がみられるため医療従事者は成人期に追加接種を行う。

都市部のベトナム国立小児病院（VNCH）では、麻疹は感染症センターで管理されていた。我々はN95マスクを着用したが、医療従事者はサージカルマスクを使用し、患者や家族は多くがマスク未着用であった。二重扉はあったが、陰圧設備や空気清浄機はなく、十分な空気感染対策とはいえなかった。また、途上国で多いビタミンＡ欠乏を背景に、重症化予防のため高用量ビタミンＡ投与が行われていた。

地方のハイズオン小児病院では、空気感染疾患が同室で管理され、見学時には麻疹と水痘が同室であった。病室不足と資金不足が背景にあり、政府や国際機関の支援が必要であると考えられた。マスク着用率が低い理由は暑さや物資不足ではなく、患者家族や医療従事者の意識不足によると説明された。

早期ワクチン接種が行われている一方で、感染管理体制は不十分であり、院内感染のリスクが高い。設備整備に加え、患者や医療従事者への教育が重要である。

【2】手足口病について

ベトナムでは、日本で多くみられるコクサッキーウイルスA10、A16などによる比較的軽症の手足口病に加え、エンテロウイルスA71（EV-A71）による症例が多く報告されている。EV-A71は中枢神経系への親和性が高く、髄膜炎や自律神経障害、ショックなど重症化リスクが高いとされるため、ベトナムでは手足口病をGrade1 ～ 4に分類し、重症度に応じた管理方針を明確にしている。Grade1は発疹と一過性の発熱を主体とし外来・自宅管理が可能だが、Grade2では持続する発熱やミオクローヌスなど中枢神経症状が出現し入院管理が必要となる。Grade3では高血圧や頻脈などの自律神経異常、Grade4ではショックや肺水腫など循環不全に至り、ICUで人工呼吸や循環管理、場合によっては透析が行われる重症例も報告された。VNCHで見学した症例もその一例であり、透析管理が行われていた。熱帯モンスーン気候による高温多湿環境や集団保育・衛生状況も流行拡大に影響し、定期的な大流行と重症小児例が社会的課題となっている。

【3】ベトナムにおける呼吸器感染症

ベトナムではRSウイルスやアデノウイルスなどによる小児の呼吸器感染症が多くみられた。RSウイルスは接触・飛沫感染で上気道炎から下気道炎まで幅広い症状を呈し、生後６か月未満では重症化しやすい。実際にVNCHでは、呼吸筋を刺激して呼吸の補助を行っている症例もあり、重篤な例が多く見られた。アデノウイルス感染症は日本ではプール熱が問題になることが多いが、ベトナムではRSウイルスと並んで主要な肺炎の原因となる。VNCHでは疾患別に専用病室が整備され感染対策も基本的に実施されているが、一部不徹底な場面もみられた。一方、ハイズオン病院は地方に位置し、医療知識が乏しい患者も多く、感染対策も十分でない傾向があった。建物構造も開放的で、VNCHほどの高度な医療提供は難しい現状が見られた。

【4】蚊媒介感染症について

ベトナムでは、熱帯から亜熱帯にかけた気候のもと、蚊を媒介とする感染症が広く流行している。その中でも、日本脳炎（Japanese Encephalitis; JE）とデング熱（Dengue Fever）は、公衆衛生上の重要課題である。これらの疾患は地域差や季節性、さらにワクチン制度や住民の認識などの社会的要因が感染拡大に深く関与していることが知られている。

日本脳炎はコガタアカイエカによって媒介され、高熱や意識障害、脳浮腫などの重篤な神経症状を呈し、致死率も高い。特に小児では重症化のリスクが高く、早期のワクチン接種が重要である。ベトナムでは主に５月から10月の夏季に流行し、北部地域での発生頻度が高い。これは媒介蚊が稲作地帯に多く生息することと関係しており、農村部で感染のリスクが高い。

一方、デング熱はネッタイシマカおよびヒトスジシマカによって媒介され、都市部での感染が多い。発熱、関節痛、発疹などの症状を呈し、重症化すると出血傾向を示すこともある。ベトナムでは南部の雨季、特に６月から10月に流行が集中している。日本脳炎とデング熱は、それぞれ異なる地域と季節で流行する点が特徴的である。

ベトナム北部には四季が存在するが、南部は雨季と乾季の２季しかなく、年間を通して高温多湿である。雨季には水たまりが増え、蚊の繁殖が盛んになるため、南部ではデング熱の罹患率が高い。このように気候と生活環境の違いが疾患分布の地域差に影響している。

実際の症例として、日本脳炎を発症した６歳女児の例では、発熱と頭痛を主訴に受診し、GCS11、CTで脳浮腫、MRIで視床に高信号を認めた。日本脳炎と診断され、マンニトールやデキサメタゾンで治療されたが、ワクチン未接種であった。その理由は、保護者の間に「ワクチンを打つと悪化する」という誤情報があったためである。地

方ではこうした情報格差や、ワクチン接種スケジュールの管理不足が依然として課題となっている。
また、デング熱を発症した11歳女児の例では、5日間の発熱の後に発疹と歯肉出血が出現し、NS1抗原陽性でデング熱と診断された。彼女もワクチン未接種であり、現地の医師によると、デング熱ワクチンは自費（約6,000円）で任意接種となっている。これはベトナムの一般家庭にとって月収の1～2割にあたる高額であり、経済的な負担が接種率を下げる一因となっている。
日本脳炎ワクチンは定期接種として無料で提供されているが、啓発不足や医療アクセスの差により地方で接種率にばらつきがある。一方、デング熱ワクチンは抗体陽性者のみが定期接種無料対象であり、接種には抗体検査が必要である。これは、デングウイルスの異なる型で再感染した際に抗体依存性感染増強（ADE）という現象が起こり、免疫反応の過剰により重症化するリスクがあるためである。抗体陰性の人がワクチンを接種すると、自然感染が“2回目”として扱われてしまい、逆に危険となる可能性がある。
現地医師の話では、「この地域の人たちは子どもの頃にデングにかかっていることが多く、抗体があるからワクチンを打たない」という考えが広まっている。実際に都市部では成人の抗体保有率が80～90%とされるが、再感染による重症化やADEのリスクについては十分に理解されていないのが現状である。
さらに、ワクチン接種スケジュールの管理にも課題がある。ベトナムではJICAと協力して作られた「MCH Handbook（母子保健手帳）」が導入されており、近年ではスマートフォンアプリや「NIIS（電子免疫台帳）」によって接種記録を管理できるようになっている。しかし、紙と電子の併用や地域間の運用格差があり、制度が存在しても実際に活用されていない例も少なくない。
このように、ベトナムにおける蚊媒介感染症には、疾患ごとの地域差や季節性に加え、ワクチン制度の格差、住民の認識の違い、記録制度の運用差といった社会的要因が大きく関与している。制度が「ある」ことと、それが「届く」ことには大きな隔たりが存在する。今後は、医療制度の整備だけでなく、教育・啓発・経済支援を含む多角的なアプローチが求められるだろう。

【5】ベトナムにおけるHIV感染症について

ベトナムではHIV感染者数が減少傾向にあるものの、現在もホーチミンやハノイなどの都市部を中心に感染が多い。ハノイ医科大学の統計によると、感染経路は注射薬使用によるものが大きく減少し、近年は男性同性間性交（MSM）やトランスジェンダー（TG）による感染が増加しており、全体の約47%を占める。また、HIV陽性者のパートナーへの感染が30%、母子感染や感染経路不明の例もみられる。
ベトナム国立小児病院ではHIV感染症の診療体制を見学した。この病院ではHIV外来を他の外来と分けて運営しており、感染予防と混雑緩和の両立を図っている。1日あたり約20人の小児HIV患者が受診し、ウイルス抑制治療が行われている。実際に見た5歳男児の症例では、重度の栄養失調と下痢を主訴に受診し、検査でHIV感染が判明した。まず肺炎とHIVの治療を優先し、その後に栄養管理を行う方針が取られていた。
地方では医療アクセスの遅れや服薬の不遵守が課題で、感染拡大や再発の要因となっている。日本では妊婦のHIVスクリーニングがほぼ全例で実施されているのに対し、ベトナムでは地域差が大きく、母子感染が依然として主要感染経路となっている。妊婦検査体制の強化、服薬支援、啓発活動の充実を通じて、早期発見と継続治療を両立させる体制づくりが求められる。

【6】ベトナムにおける新生児ケア

VNCHでは、新生児検診を見学した。おもちゃなど様々な機械を用いながら検診が行われており、日本と同じく便の色をチャートで確認する他、新生児の嘔吐物の色を確認する専用のチャートも用意されていた。日本との違いとして、1つの小部屋で1人ずつ30分程度の時間をかけて丁寧に行うため、廊下が常に検診待ちの患者で溢れかえっていた。この要因として、国立病院以外では高度な医療を提供できる設備を揃えることが難しく、私立病院が日本の様に一般的でないことがある。さらに本邦ではなかなか目にすることのない新生児ケアとして、カンガルーケアを見学した。カンガルーケアは別名skin-to-skin careとも呼ばれ、親の素肌の上に新生児を抱いて過ごすケアで、親の体温を利用して新生児の成長を促進する効果がある。児が2kg程度に達するまで行われ、児の成長のみならず、母子間のアタッチメントの形成も行うことができる母子共にメリットがあるケアとなっている。母親に限らず父や祖父母も参加が可能で、日本と比較して両親ともに仕事の休みが取りやすいベトナムの社会に寄り添った仕組みである。入院中の新生児の管理は全て親が行うことができる様、入院前に親に対して教育が提供されている。最後に、同じくVNCHで見学したハートセンター（SCICU）では発展途上国ならではの事情に考えさせられる機会となった。ここでは心疾患を持った新生児を集中的に管理し、1日4-5症例の手術が行われる。ベトナム有数の小児病院ということもあり、心室中隔欠損症（VSD）や心房中隔欠損症（ASD）から左心低形成症候群（HLHS）まで様々な手術が行われているが、心臓移植が行われることはない。この背景として、臓器売買のリスクを避けるためベトナム全体として新生児の心臓移植に規制がかけられていることがある。数は多くないにしても心臓移植のチャンス自体はある日本に対して、倫理的な観点からチャンスさえ得ることができないのは発展途上国ならではの課題であると感じた。

【7】謝辞

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Practical Training on Public Health: The Situation of Infectious Disease in Vietnam

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Group B Yumi Aoyama, Hitomi Ito, Keisho Oshiro, Kaho Ogawa, Sho Kuraoka, Naotaka Yabe, Mirai Yoshikawa

【1】Measles in Vietnam

Measles is highly prevalent in Vietnam. An outbreak was reported in March 2025 and transmission continues. Vaccination begins at six months of age with two doses, but breakthrough infections occur, so healthcare workers receive an additional booster in adulthood.

At the Vietnam National Children's Hospital, measles patients were treated in the Infectious Disease Center. We wore N95 respirators, but staff used surgical masks and most families were unmasked. Although a double-door system was present, there were no negative-pressure rooms or air purifiers. High-dose vitamin A was commonly administered because deficiency is frequent and it helps prevent severe disease.

At Hai Duong Children's Hospital, infection control was weaker. Patients with airborne diseases, including measles and varicella, were hospitalized together because of limited space and funding. Support from governmental or international organizations may be necessary. Low mask compliance was attributed not to heat or lack of supplies but to low awareness among caregivers and healthcare workers.

Despite early vaccination, infection control remains insufficient and the risk of nosocomial transmission is high. Improvement requires infrastructural support and better education for both patients and medical staff.

【2】Hand, Foot, and Mouth Disease (HFMD)

In Vietnam, in addition to the relatively mild hand, foot, and mouth disease (HFMD) caused mainly by Coxsackievirus A10 and A16, a large number of cases associated with Enterovirus A71 (EV-A71) have been reported. EV-A71 has a strong neurotropism and tends to invade the central nervous system, leading to severe complications such as meningitis, autonomic dysfunction, and even shock. Therefore, a four-grade classification system (Grades 1-4) has been established to guide the management of HFMD according to disease severity. Grade 1 presents with transient fever and vesicular eruptions on the hands, feet, and mouth, and can be managed on an outpatient basis. Grade 2 is characterized by persistent fever and neurological manifestations such as myoclonus, requiring hospitalization. Grade 3 involves autonomic disturbances such as tachycardia and hypertension, while Grade 4 progresses to circulatory failure with shock or pulmonary edema, often requiring intensive care with mechanical ventilation, circulatory support, and, in some cases, dialysis. One such severe case was observed at the Vietnam National Children's Hospital (VNCH), where dialysis management was implemented. The country's tropical monsoon climate, with its year-round high temperature and humidity, along with crowded childcare settings and sanitation issues, contribute to recurrent nationwide outbreaks and severe pediatric cases, posing a continuing public health challenge.

【3】Respiratory Infections in Vietnam

In Vietnam, many pediatric respiratory infections caused by viruses such as RSV and adenoviruses were observed. RSV is transmitted through contact and droplets, and it presents a wide range of symptoms from upper respiratory tract infections to lower respiratory tract infections. Infants under six months of age are particularly prone to severe illness. In fact, at VNCH, there were several cases requiring respiratory assistance through stimulation of the respiratory muscles, and many severe cases were observed.

Adenovirus infections, which are often associated with "pool fever" in Japan, are one of the major causes of pneumonia in Vietnam, along with RSV. At VNCH, dedicated hospital rooms were established for each disease, and basic infection control measures were generally implemented; however, some inconsistencies in infection control were noted.

On the other hand, Hai Duong Children's Hospital, located in a rural area, tended to have more patients with limited medical knowledge and insufficient infection control measures. The building structure was more open, making it difficult to provide the same level of advanced medical care as at VNCH.

【4】Mosquito-Borne Diseases in Vietnam: Focusing on Japanese encephalitis and Dengue fever

In Vietnam, where the climate ranges from tropical to subtropical, mosquito-borne infectious diseases are widespread. Among them, Japanese encephalitis (JE) and dengue fever are major public health concerns. Both diseases are strongly influenced by regional and seasonal factors, as well as by social determinants such as vaccination systems and community awareness.

Japanese encephalitis is transmitted by Culex tritaeniorhynchus and causes severe neurological symptoms such as high fever, impaired consciousness, and cerebral edema, with a high fatality rate, especially among children. In Vietnam, outbreaks mainly occur from May to October, particularly in the northern regions. The higher incidence in these areas is related to the presence of rice paddies where the vector mosquitoes breed, making rural communities more vulnerable.

Dengue fever, on the other hand, is transmitted by Aedes aegypti and Aedes albopictus. It tends to spread in urban settings with high population density. Typical symptoms include fever, joint pain, and rash, while severe cases may develop hemorrhagic tendencies. In Vietnam, dengue fever is most prevalent during the rainy season in the southern regions, from June to October. Thus, these two diseases exhibit distinct geographical and seasonal patterns of transmission.

Northern Vietnam has four distinct seasons, while the southern region experiences only two—rainy and dry seasons—with persistently high temperatures and humidity throughout the year. During the rainy season, stagnant water provides breeding sites for mosquitoes, resulting in a higher dengue incidence in the south compared to the north. Climatic and environmental differences therefore play a major role in the regional distribution of these diseases.

A case of a six-year-old girl with Japanese encephalitis illustrates some of these challenges. She presented with fever and headache for six days before admission, with a Glasgow Coma Scale score of 11. CT imaging revealed brain edema, and MRI showed high signal intensity in the thalamus, leading to a diagnosis of Japanese encephalitis. She was treated with mannitol,

dexamethasone, and antibiotics. Notably, she had not received the JE vaccine due to her parents' mistaken belief that vaccination could worsen the illness. Such misinformation and difficulties in managing vaccination schedules remain significant barriers in rural areas.

Another case involved an eleven-year-old girl with dengue fever. After five days of fever, headache, and fatigue, she developed a rash and gingival bleeding. The NS1 antigen test was positive, confirming dengue infection. She was also unvaccinated. According to local physicians, the dengue vaccine is available but only as an optional, self-paid vaccination costing approximately 6,000 yen—equivalent to 10-20% of a typical monthly household income in Vietnam. This financial burden greatly limits vaccine uptake.

The Japanese encephalitis vaccine is provided free of charge as part of the national immunization schedule, but vaccination rates vary across regions due to limited awareness and healthcare access. In contrast, the dengue vaccine (Dengvaxia) is administered only to seropositive individuals and requires prior antibody testing. This restriction is due to the risk of antibody-dependent enhancement (ADE)—a phenomenon where infection with a different dengue serotype upon reinfection can trigger an exaggerated immune response, leading to severe disease. For this reason, vaccination in antibody-negative individuals can paradoxically increase the risk of severe infection later.

Local doctors report that many residents believe vaccination unnecessary because "almost everyone had dengue as a child." Indeed, antibody prevalence among adults in urban areas exceeds 80-90%. However, public understanding of ADE and the risk of severe secondary infection remains limited.

In terms of vaccination management, Vietnam has introduced a Maternal and Child Health (MCH) Handbook, developed in collaboration with JICA, similar to Japan's maternal health record system. In recent years, digital tools such as smartphone applications and the National Immunization Information System (NIIS) have been implemented to record and track vaccination status. Nevertheless, the coexistence of paper and electronic systems, as well as regional disparities in implementation, means that the existence of a system does not always guarantee its effective use.

In summary, mosquito-borne diseases in Vietnam are shaped not only by biological and climatic factors but also by socioeconomic and educational disparities. Although vaccination systems and health record infrastructures exist, there remains a considerable gap between having such systems and ensuring their accessibility. Bridging this gap requires not only healthcare system improvements but also community education, public awareness campaigns, and socioeconomic support to promote equitable disease prevention.

【5】 HIV Infection in Vietnam

Although the number of HIV infections in Vietnam is declining, transmission remains high, particularly in urban areas like Ho Chi Minh City and Hanoi. According to statistics from Hanoi Medical University, transmission via injection drug use has significantly decreased. In recent years, infections among men who have sex with men (MSM) and transgender individuals (TGs) have increased, accounting for approximately 47% of all cases. Additionally, transmission to partners of HIV-positive individuals accounts for 30% of cases, with mother-to-child transmission and cases of unknown transmission routes also occurring.

We observed the HIV treatment system at the National Children's Hospital of Vietnam. This hospital operates its HIV outpatient clinic separately from other outpatient services, aiming to balance infection prevention and congestion reduction. Approximately 20 pediatric patients visit daily, receiving antiretroviral therapy. In one observed case involving a 5-year-old boy, he presented with severe malnutrition and diarrhea as primary complaints, and testing confirmed HIV infection. The treatment approach prioritized pneumonia and HIV treatment first, followed by nutritional management.

In rural areas, delayed access to medical care and non-adherence to medication are challenges, contributing to the spread of infection and recurrence. While HIV screening for pregnant women is performed in nearly all cases in Japan, Vietnam shows significant regional variation, with mother-to-child transmission remaining a primary route of infection. Strengthening prenatal testing systems, medication adherence support, and educational activities are essential to establish a framework that enables both early detection and sustained treatment.

【6】 Neonatal Care in Vietnam

At VNCH, we had the opportunity to observe infant checkups. The checkups were conducted using several different tools, including toys. As in Japan, the medical staff asked parents about their infants' stool color and vomit using charts for reference. One difference between infant checkups in Japan and those in Vietnam was the amount of time spent per patient. Each checkup usually took around 30 minutes, which often led to a long queue of patients waiting in the hallway. This situation can be attributed to the shortage of medical supplies and the absence of private hospitals. Only national hospitals have sufficient medical resources to conduct thorough checkups.

After that, we observed neonatal care that is unique to Vietnam: kangaroo care. Kangaroo care, also known as skin-to-skin care, is a method in which parents hold their baby on their bare chest. The warmth of the parents' skin helps the baby grow faster and fosters attachment between them. The care continues until the baby's weight reaches about 2 kg. Before hospitalization, parents are required to take lessons to learn how to perform this types of care so that they can do them themselves during the hospital stay. Not only mothers but also fathers and grandparents can participate. This system suits Vietnamese society, where it is generally easier to take time off work compared to Japan.

Finally, we visited the Heart Center (SCICU). As one of the largest pediatric hospitals in Vietnam, it performs four to five operations per day, including VSD, ASD, and HLHS surgeries. However, heart transplants are not performed there because such procedures are not yet available in Vietnam due to the risk of organ trafficking—an issue particularly relevant in developing countries.

【7】 Acknowledgements

We would like to express our sincere gratitude to the Vietnam National Children's Hospital, the Japan International Cooperation Agency, Hanoi Medical University, and Teikyo University for their valuable support and collaboration. We are also deeply grateful to all the faculty members and staff of the Asia International Institute of Infectious Disease Control for their dedicated efforts and contributions that made this study possible.

報 告 2026年度衛生学公衆衛生学実習「ベトナムにおける感染症」

ベトナム国立小児病院で学んだ小児医療と感染症対策

帝京大学医学部医学科　5年
田邊康平、渡邉裕佳、笠谷幸太朗、太田晴香、大田咲愛、三上　翔、山浦玄斗、細野　柊

【1】実習の概要

2026年7月、衛生学公衆衛生学実習の一環として、ハノイのベトナム国立小児病院（Vietnam National Children's Hospital：VNCH）を訪問した。救急科、心臓血管外科、NICU、PICU、SICU、呼吸器内科、熱帯感染症センター、臨床検査室、幹細胞センターなどを見学し、小児医療を幅広く学ぶ機会を得た。外来に多くの子どもと家族が訪れていたことも印象に残っている。

今回の実習では、疾患の地域差に加え、医療従事者の配置状況や家族の関わり方によって診療の進め方が異なることを学んだ。現地の医療を理解するためには、病院内での治療と、子どもが暮らす地域の環境を結び付けて考える必要があると感じた。

【2】救急科で学んだ初期対応

救急科では、DRS（Danger、Response、Send for help）からABCDへ進む初期評価、小児評価トライアングル、5段階のトリアージについて説明を受けた。小児評価トライアングルでは、外観、呼吸の様子、皮膚循環を短時間で評価する。患者の状態を系統的に把握し、必要な診療科へ速やかに連絡する考え方は、日本で学んだ初期対応と共通していた。

一方、現地では溺水による救急搬送も診療上の課題であると教わった。共通する評価手順を身につけるとともに、地域の生活環境や事故の背景を知ることが大切だと感じた。また、SBARを用いて状況、背景、評価、提案を整理して伝える方法を学び、情報共有も初期対応を支える重要な要素であると理解した。



【3】PICUで学んだ地域を踏まえた鑑別診断

小児集中治療室（PICU）では、トキソカラ症に関連した心筋炎の症例について説明を受けた。現地の医師から、寄生虫感染を心筋炎の鑑別に早い段階から挙げる場合があることや、治療にアルベンダゾールが使用されることを学んだ。私がこれまで日本の実習で経験していなかった病態であり、地域によって疑う疾患や問診で確認する内容が変わることを実感した。

この症例を通して、病名の知識とともに、患者がどのような環境で生活しているかを確認する姿勢が必要だと感じた。脂肪酸代謝異常症の症例も見学し、重症小児の診療では感染症と先天代謝異常症の双方を学ぶ必要があることを認識した。



【4】NICUとSICUでの集中治療

新生児集中治療室（NICU）では、頭部の位置やベッドの角度、$PaCO_2$とSpO_2の管理、光や音の刺激を抑える環境調整など、脳保護を意識したケアについて学んだ。母親が新生児を胸の前で抱くカンガルーケアも見学し、看護師が不足する状況のなかで、家族がケアに参加していると説明を受けた。

カンガルーケアの見学は、小児のケアを医療者と家族がどのように担っているかを考える機会となった。PICUでは母親の付き添いがほとんど見られず、同じ病院内でも病棟によって家族の関わり方が異なっていた。小児の病態に応じた管理と、家族が関わる機会の双方に目を向けることが大切だと感じた。

外科集中治療室（SICU）は手術室に隣接しており、術後患者を迅速に受け入れるための配置を見学した。壊死性腸炎や先天性横隔膜ヘルニアに伴う肺低形成の症例について学び、手術前後の治療と集中治療を連続して考える重要性を感じた。

【5】呼吸器内科と熱帯感染症センター

呼吸器内科では、肺炎が入院患者の主要な疾患であると教わった。乳幼児の喘鳴については、一過性のウイルス感染によるものか、気管支喘息によるものかを判断する難しさを学んだ。症状が続く期間や反復性を丁寧に確認することが、診療上重要であると感じた。

熱帯感染症センターでは、EBウイルス感染症や麻疹の診療について学んだ。特に、ワクチン接種年齢に達する前の乳児が麻疹を発症し、重症化することがあるという説明が印象に残った。予防接種の機会を確保するとともに、接種前の乳児を感染からどのように守るかを考える必要があると感じた。

一般病棟では家族の付き添いが認められていた一方、ICUでは家族の入室が制限されていた。病棟ごとの運用を知り、感染対策を理解する際には、病棟の構造や患者の動線、職員や家族への説明まで含めて考える視点が必要だと感じた。

【6】感染症診療を支える検査体制

臨床検査室では、PCRによる病原体検出や、約70分で複数の病原体を同時に検出するマルチプレックスPCR装置について説明を受けた。他施設からも検体が搬送されており、多くの検体を受け入れる検査体制が印象的であった。担当者からは、時期によって検出される病原体が変化することや、ハノイとホーチミンでは疾患の傾向が異なることも教わった。



微生物検査室では、小児の採血量に配慮した血液培養の運用と、コンタミネーションを抑える取り組みについて学んだ。担当者からは、血液培養のコンタミネーション率を２％以下、ICUでは１％以下に管理していると説明を受けた。限られた検体を有効に活用し、信頼できる結果を臨床へ返すためには、採取から報告までの過程が重要だと感じた。

幹細胞センターでは、フローサイトメトリーによるリンパ球サブセットの解析や、移植に向けたHLAタイピングについて説明を受けた。免疫不全症の診断や移植医療を学び、専門的な小児医療が検査部門との連携によって支えられていることを理解した。

【7】公衆衛生と地域の生活環境

公衆衛生実習では市内を歩き、野良犬が見られる地域の様子や、飲食店における食品の取り扱い状況を観察した。これらの見学だけで個々の感染症の原因や頻度を判断することはできないが、病院で学んだ寄生虫感染症や消化管感染症を、地域の生活環境と関連付けて考えるきっかけとなった。

患者の診療では、症状や検査値に加え、食事、動物との接触、生活環境などを尋ねることにも意味がある。子どもを取り巻く環境を知ることが、病態の理解や予防について考える出発点になると感じた。

【8】実習を終えて

今回の実習で得た大きな学びは、診療の違いを見つけた際に、その背景を確かめる姿勢である。PICUでの寄生虫感染症の鑑別や、NICUでの家族のケアへの参加は、地域の疾病状況と医療体制を踏まえて小児医療を考える具体的な経験となった。

今後の臨床実習では、疾患名と治療法を学ぶだけでなく、患者の生活環境や家族の状況にも目を向けたい。また、見学で得た情報を自分の知識と照らし合わせ、観察した事実と自分の解釈を整理しながら学びを深めていきたい。

謝辞

本実習において丁寧にご指導くださったベトナム国立小児病院の先生方とスタッフの皆様、ならびに実習の企画・運営にご尽力くださった帝京大学の先生方と関係者の皆様に、心より感謝申し上げます。

Practical Training in Public Health: The Situation of Infectious Disease in Vietnam
Pediatric Care and Infection Prevention at Vietnam National Children's Hospital
5th-year Medical Students, Teikyo University, Tokyo, Japan
Kohei Tanabe, Hiroka Watanabe, Kotaro Kasatani, Haruka Ota, Sae Ota, Sho Mikami, Gento Yamaura, Shu Hosono

【1】Overview of the Training

In July 2026, our group visited Vietnam National Children's Hospital (VNCH) in Hanoi as part of our hygiene and public health training. The training included visits to the emergency department, the cardiovascular surgery department, the neonatal, pediatric, and surgical intensive care units, the respiratory medicine department, the Tropical Infectious Diseases Center, clinical laboratories, and the Stem Cell Center. We were also struck by the large number of children and families attending the outpatient clinic.

Through this training, we learned how local disease patterns, staffing, and family involvement can shape clinical practice. We also recognized that understanding local medical care requires consideration of both hospital-based treatment and the environments in which children live.

【2】Initial Assessment in the Emergency Department

In the emergency department, we learned about initial assessment using DRS (Danger, Response, Send for help), followed by ABCD, the Pediatric Assessment Triangle, and a five-level triage system. The triangle provides a rapid assessment of appearance, work of breathing, and circulation to the skin. Systematic assessment and prompt consultation with the appropriate specialty were consistent with the principles we had learned in Japan.

Staff explained that drowning was a major concern in local emergency care. This prompted us to consider how living conditions and the circumstances of injuries relate to the conditions encountered in an emergency department. We also learned to structure clinical communication using SBAR: Situation, Background, Assessment, and Recommendation.

【3】Differential Diagnosis in the PICU

In the pediatric intensive care unit (PICU), clinicians discussed a case of myocarditis associated with toxocariasis. They explained that parasitic infection may be considered early in the differential diagnosis of myocarditis and described the use of albendazole. We had not encountered this condition during our previous clinical training in Japan. The discussion illustrated how local context can influence diagnostic considerations and the questions asked during history taking.

This case helped us connect knowledge of disease with the need to understand a patient's living environment. We also observed a case of a fatty acid metabolism disorder, which highlighted the importance of studying both infectious and inherited metabolic diseases in critically ill children.



【4】Care in the NICU and SICU

In the neonatal intensive care unit (NICU), staff described care intended to protect the developing brain, including attention to head and bed position, $PaCO_2$ and SpO_2, and exposure to light and noise. We observed mothers holding their infants against their chests during kangaroo care. Staff explained how families participated in care in a setting with nursing shortages.

Observing kangaroo care prompted us to consider how healthcare professionals and families share the care of an infant. Mothers were rarely present during our PICU visit, illustrating differences in family involvement between units within the same hospital. This experience highlighted the importance of considering both the care required by a child's condition and opportunities for family involvement.

The surgical intensive care unit (SICU) was located next to the operating rooms, allowing prompt transfer of postoperative patients. We learned about cases of necrotizing enterocolitis and pulmonary hypoplasia associated with congenital diaphragmatic hernia. These experiences emphasized the continuity between surgical treatment and intensive care.

【5】Respiratory Medicine and Tropical Infectious Diseases

In the respiratory medicine department, staff explained that pneumonia was a major reason for admission. We learned about the difficulty of distinguishing transient wheezing associated with viral infections from asthma in young children. The discussion

emphasized the importance of carefully assessing the duration and recurrence of symptoms.

At the Tropical Infectious Diseases Center, we learned about the care of children with Epstein–Barr virus infection and measles. Staff described infants who developed measles before reaching the eligible age for vaccination and could become severely ill. The discussion prompted us to consider how to protect infants who have not yet been vaccinated, alongside ensuring access to vaccination.

Family accompaniment was permitted in general wards, whereas entry to intensive care units was restricted. Learning about these arrangements encouraged us to consider ward design, patient flow, and communication with staff and families when trying to understand how infection prevention measures are implemented.

【6】Laboratories Supporting Infection Diagnosis

In the clinical laboratory, staff introduced PCR-based pathogen detection and a multiplex PCR platform that could detect several pathogens in approximately 70 minutes. Samples also arrived from external facilities. We learned how the laboratory managed this workload and were told that the pathogens detected varied over time and that disease patterns differed between Hanoi and Ho Chi Minh City.

In the microbiology laboratory, we learned about blood culture practices that took into account the limited blood volumes obtainable from children and efforts to minimize contamination. Staff reported blood culture contamination rates of no more than 2% overall, and no more than 1% in intensive care units. The visit highlighted the importance of the entire process, from sample collection to reporting, in providing reliable results to clinicians.

At the Stem Cell Center, staff explained the use of flow cytometry to analyze lymphocyte subsets and HLA typing in preparation for transplantation. Learning about the diagnosis of immunodeficiencies and transplant care demonstrated how specialized pediatric medicine depends on collaboration with laboratory services.

【7】Public Health and the Local Environment

During the public health component of our training, we walked through the city and observed areas where stray dogs were present and environments in which food was handled. These observations alone could not determine the causes or frequency of particular infections. They did, however, prompt us to connect the parasitic and gastrointestinal infections discussed in the hospital with questions about everyday living conditions.

Diet, contact with animals, and living environments can therefore be important topics to explore alongside symptoms and test results. Understanding a child's surroundings can provide a starting point for thinking about disease and prevention.

【8】Reflections on the Training

One of the main lessons from this training was the importance of investigating the context behind differences in clinical practice. The discussion of parasitic infections in the PICU and the participation of families in NICU care provided concrete opportunities to consider pediatric medicine in relation to local disease patterns and the organization of care.

In our future clinical training, we hope to pay closer attention to patients' living environments and family circumstances while learning about diagnosis and treatment. We also intend to relate what we learn during clinical visits to our existing knowledge and to distinguish observed facts from our own interpretations.

Acknowledgements

We sincerely thank the clinicians and staff of Vietnam National Children's Hospital for their teaching, and the faculty and staff of Teikyo University and everyone involved in organizing and supporting this training.

Short-term training from the Vietnam National Children's Hospital in Hanoi

2026年４月３日～７日帝京大学板橋キャンパス ADC研において、ベトナム国ハノイ国立小児病院からDr. Tran Huu Datら医師４名を迎え、短期研修を実施しました。

ハノイ国立小児病院と帝京大ADC研とは、2016年から医学部５年生が公衆衛生学実習の中で感染症研究・医療研修として毎年訪問させて頂いています。また、ハノイ国立小児病院からもこれまでに３名を帝京大学大学院博士課程に受け入れ、さらに2015年からはJSTの「さくらサイエンスプラン」の一環として、医師、看護師の方々と毎年交流を続けてきました。

今後も、ベトナムをはじめとするアジア諸国の医療機関と帝京大学との連携をますます進めていけることを願っています。

From April 3 to 7, 2026, the ADC Research Center at Teikyo University hosted a short-term training program for four physicians from the Vietnam National Children's Hospital in Hanoi, including Dr. Tran Huu Dat.

The relationship between the Vietnam National Children's Hospital and Teikyo University's ADC Research Center dates back to 2016; since then, fifth-year medical students have visited the hospital annually for infectious disease research and clinical training as part of their public health practicum. Additionally, Teikyo University has accepted three physicians from the hospital into its doctoral program, and since 2015, has maintained annual exchanges with its medical and nursing staff through the Japan Science and Technology Agency (JST) "Sakura Science Plan."

We look forward to further strengthening collaboration between Teikyo University and medical institutions in Vietnam and other Asian countries.

■研修プログラム

招へい期間 2026年４月３日（金）～７日（火）

４月３日（金）		入国
４月４日（土）	10時	開会記念撮影および挨拶・自己紹介など　２号館地下１階セミナー室
	10時30分	帝京大学附属病院病棟見学 小児科　髙橋和浩
	14時	帝京大学微生物学講座にてレクチャー 佐藤義則、木村佳貴、吉野友祐 微生物学講座研究室見学
	15時30分	ADC研　研究紹介・研究室見学
	夜	会食
４月５日（日）	終日	国内施設見学
４月６日（月）	11時	国立健康危機管理研究機構臨床研究センター データサイエンス部部長　椎野禎一郎
	14時	コミュニティセンター akta　見学およびレクチャー 岩橋恒太
４月７日（火）		帰国

参加メンバー　Name
- Dr. Tran Huu Dat
- Dr. Bui Thi Hai
- Dr. Le Thi Hoa
- Dr. Tran Minh Vuong



集合写真

１日目　微生物講座でのレクチャー





懇親会　　東京田事　にて



国立健康危機管理研究機構臨床研究センター、コミュニティセンター akta





2025年度　ADC研運営委員会
Steering Committee Report

March, 2026

2025年度　ADC研運営委員会記録　（文書審議）

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1　2025年度 事業報告　吉野友祐（運営委員長）

1）研究所の現状報告

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研究所実績

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Reproducible Cerebral Palsy Animal Model and Behavioral Assessment with Three Distinct Tests. 2025年 3 月18日（火），APPW2025，第130回日本解剖学会・第102回日本生理学会・第98回日本薬理学会　合同大会　**吉岡　昇**，**伊藤吹夕**，岸本泰司，近藤晶子，田代晴子，河内正治

Comparison of the therapeutic effects of anti-ApoA2 and recombinant VasSF in a mouse model of Kawasaki disease the 22nd International Vasculitis Workshop, February 2026（poster）　**Fuyu Ito**

Retrospective Analysis of HIV Treatment Satisfaction Questionnaire Scores in Well-Controlled People Living with HIV, APACC2025（E-poster）, May 2026　**Yusuke Yoshino**, Takatoshi Kitazawa

Biktarvy PTP 製剤の使用感と治療満足度について：単施設での予備的評価，一般演題（ポスター），第39回日本エイズ学会学術集会，熊本，12月 6 日　**吉野友祐**　若林義賢　北沢貴利

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2） 海外医療機関との研究交流
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編集長挨拶（初ページEDITORIAL内）

＜2026年度事業計画案＞　2026年度事業計画案の承認：運営委員数25名
・海外医療機関との研究交流、共同研究
・医学部５年生海外BSL
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*Acinetobacter baumannii*の乾燥耐性：機序と院内環境での持続生存への影響

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Desiccation Tolerance of *Acinetobacter baumannii*: Mechanisms and Implications for Hospital Persistence

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要　約

*Acinetobacter baumannii*は、医療関連感染症を引き起こす重要な病原体であり、その院内定着には多剤耐性だけでなく、乾燥環境での高い生存能力が関与する。臨床分離株は乾燥表面上で数週間、条件によっては数カ月生存するが、その期間は菌株、増殖段階、接種菌量、湿度、表面材質、判定法により大きく異なる。乾燥耐性は、BfmRS/BfmRを介したストレス応答、細胞表層の再編成、タンパク質・DNAの保護、酸化ストレス防御、代謝適応などの多様な機構によって支えられる。さらに、バイオフィルム形成やviable but non-culturable状態への移行は、持続生存と培養法による過小検出に関与し得る。環境中での長期生存は、高頻度接触表面や共用機器をリザーバー化し、医療従事者の手指、手袋、機器を介した間接伝播の機会を拡大する。したがって、日常の清掃、手指衛生、接触予防策、患者スクリーニング、共用機器管理、環境サーベイランス、UV照射などの補助的非接触除染を組み合わせる必要がある。本Reviewでは、*A. baumannii*の乾燥耐性の機構と院内持続性、感染対策上の意義を概説する。

Abstract

Acinetobacter baumannii is a major healthcare-associated pathogen whose success in hospitals reflects not only multidrug resistance but also an exceptional ability to survive under desiccating conditions. Clinical isolates can remain culturable on dry surfaces for weeks or, under some experimental conditions, months, although survival varies markedly according to strain, growth phase, inoculum, humidity, surface material, and viability assay. Desiccation tolerance is supported by coordinated cellular responses, including BfmRS/BfmR-mediated stress regulation, cell-envelope remodeling, protection of proteins and DNA, oxidative-stress defense, and metabolic adaptation. Biofilm formation may protect subpopulations from water loss, whereas entry into a viable but non-culturable state may permit survival despite negative routine cultures. Environmental persistence creates reservoirs on high-touch surfaces and shared equipment and extends opportunities for indirect transmission through healthcare workers' hands, gloves, and devices. Genomic epidemiological and intervention studies support the contribution of environmental reservoirs to onward transmission, while also showing that desiccation tolerance alone does not determine epidemic success. Effective control therefore requires a multimodal approach combining standardized daily and terminal cleaning, hand hygiene, contact precautions, patient screening, equipment management, targeted environmental surveillance, and selective use of adjunct no-touch technologies. This Review summarizes current evidence on the mechanisms and infection-control implications of desiccation tolerance in *Acinetobacter baumannii*.

Key words: *Acinetobacter baumannii*; desiccation tolerance; environmental persistence; biofilm; infection prevention

Introduction

Acinetobacter baumannii is an important Gram-negative pathogen that causes severe healthcare-associated infections, including ventilator-associated pneumonia, bloodstream infections, and wound infections, particularly among critically ill patients in intensive care units[1]. Carbapenem-resistant *A. baumannii* remains classified as a critical-priority pathogen because of its global clinical burden, extensive antimicrobial resistance, and the limited availability of effective therapeutic options[2]. In addition to its ability to acquire and maintain antimicrobial resistance determinants, *A. baumannii* is notable for its capacity to persist in healthcare environments and cause prolonged hospital outbreaks[3].

The successful persistence of *A. baumannii* in hospitals is attributable in part to its remarkable tolerance to desiccation. Jawad et al. demonstrated that 39 clinical isolates remained viable on dry glass surfaces for a mean of approximately 27 days under simulated hospital conditions[4]. In actual healthcare environments, Thom et al. recovered multidrug-resistant *A. baumannii* from 47 of 479 environmental samples (9.8%) and from at least one surface in 24 of 50 patient rooms (48%)[5]. Prolonged environmental survival may therefore facilitate a

cycle of contamination from colonized or infected patients to surrounding surfaces, followed by indirect transfer through healthcare workers or contaminated medical equipment[1]. However, reported survival periods vary considerably because of differences in bacterial strain, inoculum size, growth phase, relative humidity, surface material, nutrient composition, sampling interval, and the method used to define viability[6].

Experimental studies indicate that desiccation tolerance is mediated by multiple coordinated biological processes rather than by a single resistance determinant. These processes involve two-component stress-response systems, hydrophilic protective proteins, metabolic reprogramming, biofilm formation, and potential transition into a viable but non-culturable state[7-11]. Nevertheless, the extent to which these experimentally identified mechanisms contribute to environmental persistence and transmission under actual healthcare conditions remains incompletely understood.

This Review summarizes the available evidence regarding the survival of *A. baumannii* on dry surfaces, outlines the principal biological mechanisms underlying desiccation tolerance, and discusses their implications for environmental surveillance and infection prevention and control.

Survival on Dry Healthcare Surfaces

A. baumannii can remain culturable on dry inanimate surfaces for periods ranging from several weeks to several months. However, survival varies substantially among strains, and outbreak-associated isolates do not uniformly exhibit greater desiccation tolerance than sporadic isolates. Jawad et al. compared 39 clinical isolates, comprising 22 isolates from eight well-defined hospital outbreaks in Germany and 17 epidemiologically unrelated sporadic isolates recovered from hospitalized patients in the same geographic area[4]. The isolates were deposited on glass coverslips and maintained at 31%±3% relative humidity and 22±3°C. The mean survival time was 27.29 days (range, 21-32 days) for sporadic isolates and 26.54 days (range, 21-33 days) for outbreak-associated isolates, with no significant difference between the groups. In contrast, the reference strain ATCC 19606 survived for a mean of only 6 days, compared with a mean of 27 days among the 39 clinical isolates. These findings indicate that prolonged survival on dry surfaces is not restricted to outbreak-associated strains, although the magnitude of desiccation tolerance differs among individual isolates.

Wendt et al. examined five clinical or environmental *A. baumannii* strains together with five comparator strains on four surface materials: ceramic, polyvinyl chloride, rubber, and stainless steel[6]. A total of 1,800 surface samples were maintained at 22±2°C and 50%±5% relative humidity and examined for up to 16 weeks. Of the 40 resulting survival curves, 20 (50%) retained bacterial counts exceeding 10^2 CFU per sample for at least two weeks. In the five curves showing the greatest persistence, approximately 10^7 CFU per sample remained detectable after four months. Survival-curve type was not significantly associated with surface material ($P = 0.41$) but was strongly associated with bacterial strain ($P < 0.0005$). In particular, isolates recovered from dry sources, including a pillow and a working surface, survived better than isolates obtained from wet sources, such as urine and sewage.

Direct comparison of the survival durations reported by these studies requires caution. Jawad et al. deposited approximately 2×10^7 CFU on glass coverslips, maintained them at approximately 31% relative humidity, and assessed culturability every 24 h[4]. Survival was considered to have ended when no viable organisms were detected on three consecutive days. In contrast, Wendt et al. inoculated approximately 8×10^6 CFU onto four different surface materials and quantified viable bacteria at predetermined intervals for up to 16 weeks under approximately 50% relative humidity[6]. Differences in inoculum size, relative humidity, surface material, sampling intervals, recovery procedures, and definitions of survival can therefore produce substantially different estimates. Wendt et al. also noted that their inoculum was likely higher than the level of contamination typically present in hospitals, whereas protective organic material, such as respiratory secretions, had been removed from the experimental suspension. Reported survival times should therefore be interpreted as condition-dependent experimental measurements rather than as a fixed property of the species.

Clinical investigations have likewise demonstrated frequent contamination of surfaces surrounding colonized or infected patients. Thom et al. obtained 479 environmental samples from up to ten sites in each of 50 intensive care unit rooms occupied by patients with multidrug-resistant *A. baumannii*[5]. Overall, 47 of 479 samples (9.8%) and 24 of 50 rooms (48%) were culture-positive. The most frequently contaminated sites were supply-cart drawer handles in 10 of 50 rooms (20%), floors in 8 of 50 (16%), infusion pumps in 7 of 50 (14%), ventilator touch pads in 5 of 44 (11.4%), and bed rails in 5 of 49 (10.2%). Among 20 cases in which both patient and environmental isolates were available, the isolates were genetically similar in 17 (85%). Environmental contamination was identified in 51% of rooms occupied by patients with a recent positive culture and in 36% of rooms occupied by patients whose most recent positive culture had been obtained more than two months earlier; this difference was not significant ($P = 0.50$). Although this study did not directly measure the duration of surface survival, it provides clinical evidence that the patient environment can act as a prolonged reservoir.

Strain-specific biological traits may further influence persistence under dry conditions. Espinal et al. reported that biofilm-forming *A. baumannii* strains remained viable on dry surfaces for up to 36 days, compared with 15 days for non-biofilm-forming strains ($P < 0.001$)[10]. Nevertheless, desiccation tolerance alone is unlikely to determine whether a strain becomes epidemic. In the study by Wendt et al., a strain responsible for an outbreak lasting approximately three years survived better than isolates from wet sources but less well than isolates recovered from dry sources[6]. Desiccation tolerance should therefore be regarded as an important underlying trait supporting adaptation to healthcare environments, while successful hospital transmission is likely to depend on its interaction with patient colonization, biofilm formation, transfer through healthcare workers or medical equipment, antimicrobial selection pressure, and infection-control practices.

Biological Mechanisms Underlying Desiccation Tolerance

Desiccation tolerance in *A. baumannii* is not attributable to a single gene or metabolic pathway. Instead, it is supported by coordinated biological processes involving the physiological state at drying onset, stress-response signaling, maintenance of the cell envelope, protein and DNA protection, oxidative stress defense, and metabolic adaptation.

The physiological state at the onset of drying strongly influences survival. Green et al. reported that early-stationary-

phase *A. baumannii* retained nearly 100% viability during the first several days of desiccation on polystyrene, and that a fraction of the initial population remained culturable after seven months[8]. In contrast, exponentially growing cells rapidly lost viability following drying. Recent clinical isolates also exhibited approximately 10-fold greater survival after 28 days of desiccation than the laboratory-adapted strain ATCC 17978. Using transposon sequencing in strain AB5075, Green et al. further demonstrated that the intrinsically disordered hydrophilins DtpA and DtpB selectively promote survival during water loss[8]. DtpA and DtpB act as molecular shields that protect cellular proteins from unfolding or aggregation. Expression of these hydrophilins is controlled via BfmR, and addition of purified DtpA to β-lactamase prior to drying preserved enzymatic activity upon rehydration to a degree superior to bovine serum albumin controls. These observations indicate that stress responses induced during stationary phase provide substantial preadaptation to water loss.

Central to this stress regulation is BfmR, the response regulator of the BfmRS two-component system. Farrow et al. passaged the highly desiccation-tolerant strain ATCC 17961 and recovered drying-sensitive clones harboring nonsynonymous mutations in *bfmR*[7]. An isogenic *ΔbfmR* mutant completely lost viability within four days of drying, whereas genetic complementation with intact *bfmR* fully restored desiccation tolerance. BfmR integrates multiple stress signals and shifts the bacterial population into a protected physiological state. Following exposure to 10 mM hydrogen peroxide for 30 min, wild-type survival decreased by ~5% compared with ~50% in the *ΔbfmR* mutant. Nutrient starvation for one hour cross-protected exponentially growing wild-type cells against subsequent drying, but this protective effect was absent in the *ΔbfmR* mutant. Furthermore, the *ΔbfmR* mutant exhibited marked sensitivity to elevated osmolarity and prolonged nutrient starvation.

Desiccation is accompanied by active restructuring of cellular morphology and proteomic composition. Gayoso et al. examined clinical isolate AbH12O-A2 during drying and observed that surviving cells became more rounded and developed a thicker cell envelope[12]. Proteomic profiling via label-free quantification and iTRAQ identified 584 overlapping proteins, highlighting increased abundance of membrane- and periplasm-associated proteins, antimicrobial efflux systems, and factors involved in macromolecular stabilization. These findings demonstrate that survival involves dynamic structural remodeling and macromolecular protection rather than passive metabolic arrest alone.

Protection from desiccation-induced oxidative damage is provided by the catalase KatE and the factor DtpC. Farrow et al. reported that an ATCC 17961 *ΔdtpCΔkatE* double mutant exhibited approximately 45-fold lower survival after seven days of drying than the wild type, and reintroduction of either gene restored tolerance[13]. Under low relative humidity (<5%), oxygen removal increased double-mutant survival during 14 days of desiccation by 100- to 1,000-fold across different genetic backgrounds. Furthermore, desiccation increased the frequency of rifampicin-resistant mutants 4.5-fold in the wild type but 30-fold in the *ΔdtpCΔkatE* mutant. These results indicate that endogenous reactive oxygen species accumulate during desiccation and cause DNA damage if not counteracted by KatE and DtpC.

Metabolic reprogramming constitutes another key pillar of desiccation survival. Lucidi et al. examined reference strain ATCC 19606 and epidemic strain ACICU during drying for up to eight weeks[9]. Desiccated cells down-regulated energy-consuming pathways and protein synthesis, accumulated protective metabolites (L-cysteine and L-glutamate), and up-regulated the glyoxylate shunt. Disruption of *aceA*, encoding isocitrate lyase, impaired recovery upon rehydration, confirming that energy suppression and alternative carbon metabolism facilitate survival and subsequent revival.

Biofilm Formation and the VBNC State

Biofilm formation and the viable but non-culturable (VBNC) state represent distinct yet complementary persistence strategies. A biofilm provides a spatially organized extracellular matrix that physically slows water loss and shields cells from environmental stressors. Conversely, entry into the VBNC state represents a physiological adaptation where individual cells remain metabolically active but temporarily lose colony-forming ability on routine media.

Espinal et al. demonstrated that biofilm-forming *A. baumannii* isolates survived on dry glass coverslips for up to 36 days compared with 15 days for non-biofilm formers ($P < 0.001$)[10]. Electron microscopy demonstrated a polysaccharide layer and surface appendages around biofilm-forming strains, supporting the possibility that extracellular structures reduce water loss or desiccation-induced surface damage.

In addition to structural matrix protection, Gayoso et al. observed that during prolonged drying, a small subpopulation (~0.5% of initial inoculum) embedded within a biofilm-like matrix survived initial population loss and rapidly repopulated when moisture and nutrients were restored[12]. This "bust-and-boom" strategy implies that a temporary drop in culturable bacterial counts on environmental surfaces does not necessarily indicate total eradication of the bacterial population.

For the VBNC state, absence of colony growth on routine plates must not be equated with cell death. König et al. showed that under high-salt stress, culturable counts of ATCC 19606^T dropped below detection limits, yet ~1.4×10^7 CFU/mL regained culturability after two days of incubation in stress-free buffer[11]. Viability assays and resuscitation experiments confirmed entry into the VBNC state. Testing across seven diverse strains revealed that entry into and resuscitation from the VBNC state occurred under desiccation, thermal stress, and anaerobiosis, with resuscitation rates varying from 1.8×10^{-3}% to 36.9% depending on strain and condition.

Shared metabolic pathways may link biofilm regulation with VBNC-state transition. Harkova et al. found that deletion of the phenylacetic acid (PAA) catabolic operon (*paa*) abolished colony formation after drying while cells remained viable in a VBNC state and simultaneously disrupted PAA-dependent biofilm regulation[14]. These findings suggest that PAA catabolism may influence both biofilm regulation and whether cells retain colony-forming ability or enter the VBNC state after desiccation.

The VBNC state has notable implications for environmental surveillance. Visaggio et al. demonstrated that ESKAPE pathogens, including *A. baumannii*, exhibited reduced culturability after one week of desiccation on abiotic surfaces but partially or completely recovered colony formation following 24 h resuscitation in carbon-free buffer[15]. Adding a resuscitation step improved recovery of Gram-negative bacteria from experimentally contaminated surfaces and pilot environmental samples compared with direct culture. However, entry into the VBNC state is not universal; Bravo et

al. observed that strain ATCC 19606^T and clinical isolate 06-2790 maintained long-term survival under nutrient deprivation and drying via persistent culturable subpopulations without undergoing VBNC transition[16]. Consequently, rigorous demonstration of the VBNC state requires multiple approaches, including assessment of membrane integrity, respiratory activity, and recovery of culturability after stress removal.

Representative experimental studies are summarized according to the tested strains, experimental conditions, quantitative findings, and principal implications (Table[1]). Desiccation survival in *A. baumannii* therefore appears to be supported by three complementary and partly overlapping processes: intrinsic cellular stress responses and metabolic adaptation, biofilm-mediated protection, and changes in culturability, including persistence of residual culturable cells and entry into the VBNC state.

Persistence and Transmission in Healthcare Environments

The ability of *A. baumannii* to survive on dry surfaces facilitates persistent environmental reservoirs in hospital settings. Establishing an environmental reservoir as the origin of patient acquisition requires integrating genomic sequencing, temporal patient movement data, and intervention dynamics.

Ng et al. conducted a point-prevalence survey in a medical ICU, finding carbapenem-resistant *A. baumannii* (CRAB) in 53.3% of patients and 62.5% of rooms occupied by CRAB-positive patients[17]. Whole-genome sequencing (WGS) revealed intra-room clonal clustering. A patient admitted five days after the survey subsequently developed nosocomial pneumonia caused by a genetically related CRAB strain. This temporal and genomic association was consistent with onward transmission from a contaminated room environment, although an indirect route involving healthcare workers or shared equipment could not be excluded.

Surviving environmental populations frequently transfer to healthcare personnel. Morgan et al. observed 199 care interactions, detecting MDR *A. baumannii* on gloves/gowns in 38.7% and on hands post-PPE removal in 4.5% of interactions[18]. Independent risk factors included wound dressing manipulation (aOR, 25.9), airway manipulation (aOR, 2.1), and room stay >5 min (aOR, 4.3). Thom et al. similarly detected *A. baumannii* on healthcare worker hands/gloves in 30% of 254 observed interactions[19]. Specific risk activities included touching bed rails (OR, 2.19), performing wound care (OR, 8.35), and contacting tracheostomy sites (OR, 5.15).

Environmental reservoirs extend to wet sites such as handwashing sinks. Wei et al. sampled 158 ICU sinks across 16 ICUs, identifying CRAB in 10.16% of sinks[20]. WGS demonstrated close genetic relationships between some sink and clinical isolates, including a cluster with 0-2 single-nucleotide polymorphism differences. These temporal and genomic findings support the role of contaminated sinks as potential reservoirs.

Outbreak intervention studies further support an epidemiologically active role for environmental reservoirs, including dry high-touch surfaces. Meschiari et al. investigated a CRAB outbreak in an Italian ICU using WGS[21]. Routine terminal cleaning with sodium hypochlorite left CRAB detectable on monitor controls, an intravenous pole, a medical-equipment cart, and a patient bed (4/10 surfaces positive), whereas conventional cotton swabs from the same surfaces were negative. Following implementation of a multimodal bundle, ICU-acquired CRAB declined from a maximum of 30.4 cases per 1,000 patient-days to zero. The findings support the value of a comprehensive intervention, but the independent contribution of environmental decontamination could not be

Table. Representative experimental studies of desiccation tolerance and persistence in *Acinetobacter baumannii*

Study	Strains and experimental model	Main quantitative findings	Principal implication
Wendt et al., 1997 (6)	Five *A. baumannii* strains and five comparator strains; ceramic, polyvinyl chloride, rubber, and stainless steel; 22 ± 2°C and 50% ± 5% relative humidity; 16 weeks	20/40 survival curves retained >10^2 CFU/sample for ≥2 weeks. In the five most persistent curves, approximately 10^7 CFU/sample remained after 4 months. Survival was associated with strain ($P < 0.0005$), but not surface material ($P = 0.41$)	Environmental survival is strongly strain-dependent and cannot be predicted solely from surface material
Jawad et al., 1998 (4)	Thirty-nine clinical isolates: 22 outbreak-associated and 17 sporadic isolates; glass coverslips; 22 ± 3°C and 31% ± 3% relative humidity	Mean survival was 26.54 days for outbreak isolates and 27.29 days for sporadic isolates ($P \leq 0.44$). ATCC 19606 survived for a mean of 6 days	Prolonged survival is common among clinical isolates and is not restricted to epidemic strains
Espinal et al., 2012 (10)	Biofilm-forming and non-biofilm-forming strains dried on glass coverslips	Biofilm-forming strains remained viable for up to 36 days, compared with 15 days for non-biofilm-forming strains ($P < 0.001$)	Biofilm formation may prolong survival by protecting cells from water loss and surface damage
Gayoso et al., 2014 (12)	Clinical isolate AbH12O-A2 examined by culture, proteomics, and electron microscopy during desiccation	After a marked decline during the first week, a residual population of approximately 0.5% persisted. Proteomic analyses detected 727 proteins by label-free analysis and 765 by iTRAQ; 584 were identified by both methods	Survival involves active remodeling of the cell envelope and protection of cellular macromolecules
Farrow et al., 2018 (7)	Desiccation-to lerant ATCC 17961, serially passaged derivatives, and an isogenic *ΔbfmR* mutant	No viable *ΔbfmR* cells were recovered after > 4 days. Exposure to 10 mM H_2O_2 reduced survival by approximately 5% in the wild type and approximately 50% in the mutant	BfmR integrates responses to desiccation, oxidative stress, osmotic stress, and nutrient deprivation
Green et al., 2022 (8)	AB5075, ATCC 17978, recent clinical isolates, transposon mutants, and purified DtpA	A subpopulation remained culturable after 7 months. Recent clinical isolates showed approximately 10-fold greater survival than ATCC 17978 after 28 days. *dtpA* ans *dtpB* mutants showed reduced survival	DtpA and DtpB protect proteins during drying; stationary-phase physiology promotes tolerance
König et al., 2023 (11)	Seven strains, including ATCC 19606^T, AB5075, AYE-T, ACICU, and three clinical isolates; multiple stresses	ATCC 19606^T lost culturability after 63 days, whereas ACICU remained culturable for at least 147 days. Recovery from the non-culturable state ranged from 1.8×10^{-3}% to 36.9%	Entry into and recovery from the VBNC state are highly strain- and stress-dependent
Lucidi et al., 2025 (9)	ATCC 19606 and ACICU desiccated for up to 8 weeks; transcriptomic and metabolic analyses	Drying suppressed energy generation and protein synthesis and increased L-cysteine, L-glutamate, and glyoxylate-shunt activity. An *aceA* mutant showed reduced recovery	Metabolic suppression and the glyoxylate shunt support survival and recovery
Farrow et al., 2026 (13)	ATCC 17961 and AB5075 backgrounds with *ΔdtpCΔkatE* double mutants	The ATCC 17961 double mutant showed approximately 45-fold lower survival after 7 days. Oxygen removal increased survival by approximately 1,000-fold and 100-fold in the two backgrounds	KatE and DtpC protect against reactive oxygen species and DNA damage generated during desiccation
Harkova et al., 2026 (14)	Transcriptomic analysis and deletion of the phenylacetic acid catabolic *paa* operon	Deletion abolished colony formation after desiccation despite preserved viability and disrupted phenylacetic-acid-dependent biofilm regulation	Phenylacetic acid metabolism maylink biofilm regulation with maintenance of culturability or VBNC-state entry

Abbreviations: CFU, colony-forming units; iTRAQ, isobaric tags for relative and absolute quantitation; VBNC, viable but non-culturable.

Note: The studies were selected to illustrate representative experimental evidence rather than through a formal systematic-review process. Reported survival durations should not be compared directly because inoculum size, growth phase, surface material, relative humidity, nutrient composition, sampling intervals, and definitions of viability differed among studies.

separated from screening, contact precautions, hand hygiene reinforcement, and other components.

Taken together, these studies support a transmission sequence from colonized or infected patients to environmental reservoirs and subsequently to healthcare workers, shared equipment, or other patients. However, genetic similarity between patient and environmental isolates alone cannot establish the direction of transmission; the strongest evidence combines genomic data with temporal and patient-location information.

Implications for Environmental Surveillance and Infection Prevention

Effective infection control for *A. baumannii* requires interrupting the patient–environment–healthcare worker transmission cycle. Core measures encompass standardized daily and terminal cleaning, hand hygiene, contact precautions, screening, and cohorting. Automated no-touch decontamination technologies should supplement rather than replace thorough manual cleaning and organic load removal.

Qiu et al. evaluated a four-phase program across 560 ICU patients, incorporating cleaner training, standardized terminal cleaning, microbiological audit with feedback, aerosolized hydrogen peroxide, and hand hygiene enforcement[22]. Healthcare-associated multidrug-resistant-organism infection incidence dropped from 17.8% in phase 1 to 2.7% in phase 4 (adjusted hazard ratio, 0.14), with the decline driven largely by fewer CRAB infections. Because the study was non-randomized and several measures were introduced sequentially, the independent effect of each component could not be determined.

Increasing cleaning frequency alone may be insufficient in highly endemic environments. Seok et al. compared conventional cleaning with enhanced twice-daily cleaning in an ICU, observing no significant reduction in CRAB acquisition incidence (16.3 vs 13.9 per 1,000 patient-days; $P = 0.156$) or colonization pressure ($P = 0.825$)[23]. This highlights that cleaning frequency must be coordinated with hand hygiene, staffing, and colonization pressure management.

Adjunct no-touch decontamination methods, such as vaporized or aerosolized hydrogen peroxide and ultraviolet-C (UV-C) irradiation, may reduce residual bioburden. Ray et al. reported no further nosocomial acquisition after vaporized hydrogen peroxide was introduced during an outbreak in a long-term acute care hospital together with contact precautions, screening, and enhanced environmental cleaning[24]. The outbreak response therefore cannot be attributed to vaporized hydrogen peroxide alone. Moghnieh et al. further demonstrated that the benefit of periodic terminal disinfection with hydrogen peroxide and silver ions waned over time: acquisition incidence rose from 5.4 per 1,000 patient-days in week 1 after disinfection to 35.7 in week 16 ($P = 0.003$)[25].

Kelly et al. found that UV-C irradiation reduced surface bioburden by 96.75% in non-shaded locations but was less effective in shaded areas, whereas aerosolized hydrogen peroxide achieved a mean reduction of 50.71% across tested sites[26]. In sampling of actual high-touch surfaces, 15% remained culture-positive after manual cleaning, whereas no microorganisms were recovered after either no-touch procedure. These microbiological findings do not by themselves establish a reduction in CRAB acquisition or infection.

Environmental surveillance should be targeted toward outbreak investigation, cleaning audits, and post-intervention verification. High-touch surfaces (bed rails, monitor controls, infusion pumps, ventilators) and sink drains should be sampled using standardized pre-moistened swabs/sponges and enrichment protocols. A single negative culture should not be interpreted as absolute sterility due to potential VBNC populations or low-level persistence.

Conclusion

The ability of *Acinetobacter baumannii* to tolerate desiccation on inanimate surfaces is an important adaptation that contributes to environmental persistence and may facilitate hospital outbreaks. This phenotype is supported by a multifaceted network of cellular stress responses, including BfmRS/BfmR-regulated signal transduction, structural remodeling of the cell envelope, protein protection by the hydrophilins DtpA and DtpB, enzymatic defense against oxidative stress involving KatE and DtpC, and metabolic adaptation through energy conservation and the glyoxylate shunt. Biofilm-associated protection, persistence of residual culturable cells, and transition into a viable but non-culturable state may further support survival and complicate routine culture-based detection.

Contaminated high-touch surfaces and medical equipment can function as persistent environmental reservoirs and facilitate indirect transmission through healthcare workers' hands, gloves, or shared devices. Because desiccation tolerance operates alongside antimicrobial selection pressure, patient colonization, and infection-control practices, control cannot rely on a single intervention or automated device. A comprehensive strategy should integrate standardized daily and terminal cleaning, personnel training and audit, hand hygiene, contact precautions, patient screening, management of shared equipment, targeted environmental surveillance, and judicious use of adjunct no-touch technologies. Future research should focus on standardized phenotypic assays, genomic determinants across diverse clinical lineages, and the clinical relevance of VBNC detection in healthcare environments.

Acknowledgments

None.

Conflict of Interest

Nothing to declare.

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第9回帝京大学研究交流会シンポジウム
The 9th Teikyo University Research Exchange Symposium

Aug 28, 2026

第９回帝京大学研究交流シンポジウムが2026年８月28日に板橋キャンパスで開催されました。

この研究交流会は2018年より毎年開催されており、人文・社会系、理工系、医学・生命系の10学部をもつ総合大学として、学部やキャンパスを超えた連携体制の構築を目指して開催されるものです。ADC研のメンバーも、それぞれが他学部との共同研究や先端総研研究チームに参加しており５件のポスター発表に参加しました。

The 9th Teikyo University Research Exchange Symposium was held on August 28, 2026.

This exchange meeting has been held every year since 2018 with the aim of building a collaborative system that transcends faculties and campuses as a comprehensive university with 10 faculties in the humanities and social sciences, science and technology, and medicine and life sciences. Here is a brief overview. Members of the ADC Lab also participated in joint research and research teams with other faculties, and gave five poster presentations.

【主な発表ポスタータイトル】

▶ 鈴木章一
- 各種臓器におけるラクトペルオキシダーゼの発現意義の解明

▶ 吉岡　昇、伊藤吹夕（先端総研チーム研究）
- 骨髄単核球髄腔内移植による脳性麻痺の治療－モデル動物での治癒機構解析から臨床研究へ

▶ 伊藤吹夕
- 川崎病モデルマウスに対する抗ApolipoproteinA2抗体の有効性および新規バイオマーカーの探索

▶ Shoichi Suzuki
- Elucidation of the Biological Significance of Lactoperoxidase Expression in Various Organs

▶ Noboru Yoshioka and Fuyu Ito (Advanced Research Institute Team Research Project)
- Treatment of Cerebral Palsy by Intrathecal Transplantation of Bone Marrow Mononuclear Cells: From Mechanistic Studies in Animal Models to Clinical Research

▶ Fuyu Ito
- Efficacy of Anti-Apolipoprotein A2 Antibodies in a Mouse Model of Kawasaki Disease and Identification of Novel Biomarkers

EVENTS LIST

開催したイベント（2025.7.1～2026.9.30）

日程	イベント名	演者、参加者など	
2025年7月14日(月)～18日(金)	TAVP Training for 14 Students (5-year)	国立小児病院、ハノイ医科大学ほか	
2025年8月29日(金)	第8回 帝京大学研究交流シンポジウム	ADC研	大学棟
2025年9月9日(火)	2025年度 バイオセーフティ講習会	棚林 清 感染研バイオセーフティ管理室	大学棟
2025年10月24日(金)	TAVP 報告会（ベトナム感染症）	医学部５年生 14名、教員	大学棟
2026年3月3日(火)～3月7日(土)	ショートスタディコース	ベトナムハノイ小児病院から医師４名	２号館　ゼミ室４
2026年3月	2025年度 ADC運営委員会		
2026年7月13日(月)～18日(土)	TAVP Training for 8 Students (5-year)	国立小児病院、ハノイ医科大学ほか	
2026年8月28日(金)	第9回 帝京大学研究交流シンポジウム		大学棟
2026年9月4日(金)	2026年度 第1回 バイオセーフティ講習会	棚林 清 感染研バイオセーフティ管理室	大学棟
2026年9月30日(水)	ベトナム国家大学とのMOU調印式	吉野友祐所長ほか	

今後のイベント情報（2026.10.1～2026.12.31）

日程	イベント名	演者、参加者など	
2026年10月21日(金)	TAVP 報告会（ベトナム感染症）	医学部５年生 ８名、教員	本部棟
2026年10月	帝京大学大学院医学研究科修了	Dr. Do Dinh Hai	
2026年11月	学位論文発表会	Dr. Ngo Thi Huong	

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