

We report a case of disseminated *M. genavense* infection resulting from neutralizing anti-IFN- $\gamma$  autoantibodies in the patient. *M. genavense* infection should be considered in the differential diagnosis of mycobacteria detected with AFB staining but not with culture, even in patients without known evidence of immunodeficiency. Adult-onset immunodeficiency acquired by neutralizing anti-IFN- $\gamma$  autoantibodies, in addition to HIV infection, can lead to disseminated NTM infection.

Dr. Asakura is a medical doctor in the Division of Pulmonary Medicine, Department of Medicine, Keio University School of Medicine, in Tokyo, Japan. His research interests include nontuberculous mycobacterial infection and non-cystic fibrosis bronchiectasis.

## References

- Bessesen MT, Shlay J, Stone-Venohr B, Cohn DL, Reves RR. Disseminated *Mycobacterium genavense* infection: clinical and microbiological features and response to therapy. *AIDS*. 1993; 7:1357–61. <http://dx.doi.org/10.1097/00002030-199310000-00009>
- Hoefsloot W, van Ingen J, Peters EJ, Magis-Escurra C, Dekhuijzen PN, Boeree MJ, et al. *Mycobacterium genavense* in the Netherlands: an opportunistic pathogen in HIV and non-HIV immunocompromised patients. An observational study in 14 cases. *Clin Microbiol Infect*. 2013;19:432–7. <http://dx.doi.org/10.1111/j.1469-0691.2012.03817.x>
- Charles P, Lortholary O, Dechartres A, Doustdar F, Viard JP, Lecuit M, et al.; French *Mycobacterium genavense* Study Group. *Mycobacterium genavense* infections: a retrospective multicenter study in France, 1996–2007. *Medicine (Baltimore)*. 2011;90:223–30. <http://dx.doi.org/10.1097/MD.0b013e318225ab89>
- Pai S, Esen N, Pan X, Musser JM. Routine rapid *Mycobacterium* species assignment based on species-specific allelic variation in the 65-kilodalton heat shock protein gene (*hsp65*). *Arch Pathol Lab Med*. 1997;121:859–64.
- Browne SK, Burbelo PD, Chetchotisakd P, Suputtamongkol Y, Kiartiburanakul S, Shaw PA, et al. Adult-onset immunodeficiency in Thailand and Taiwan. *N Engl J Med*. 2012;367:725–34. <http://dx.doi.org/10.1056/NEJMoa1111160>
- Chi CY, Lin CH, Ho MW, Ding JY, Huang WC, Shih HP, et al. Clinical manifestations, course, and outcome of patients with neutralizing anti-interferon- $\gamma$  autoantibodies and disseminated nontuberculous mycobacterial infections. *Medicine (Baltimore)*. 2016;95:e3927. <http://dx.doi.org/10.1097/MD.0000000000003927>
- Valour F, Perpoint T, Sénéchal A, Kong XF, Bustamante J, Ferry T, et al.; Lyon TB Study Group. Interferon- $\gamma$  autoantibodies as predisposing factor for nontuberculous mycobacterial infection. *Emerg Infect Dis*. 2016;22:1124–6. <http://dx.doi.org/10.3201/eid2206.151860>
- Browne SK, Zaman R, Sampaio EP, Jutivorakool K, Rosen LB, Ding L, et al. Anti-CD20 (rituximab) therapy for anti-IFN- $\gamma$  autoantibody-associated nontuberculous mycobacterial infection. *Blood*. 2012;119:3933–9. <http://dx.doi.org/10.1182/blood-2011-12-395707>
- Piersimoni C, Scarparo C. Extrapulmonary infections associated with nontuberculous mycobacteria in immunocompetent persons. *Emerg Infect Dis*. 2009;15:1351–8, quiz 1544. <http://dx.doi.org/10.3201/eid1509.081259>
- Realini L, De Ridder K, Hirschel B, Portaels F. Blood and charcoal added to acidified agar media promote the growth of

*Mycobacterium genavense*. *Diagn Microbiol Infect Dis*. 1999;34:45–50. [http://dx.doi.org/10.1016/S0732-8893\(99\)00014-0](http://dx.doi.org/10.1016/S0732-8893(99)00014-0)

Address for correspondence: Akira Nakamura, Department of Internal Medicine, Asahi General Hospital, 1326 I, Asahi, Chiba 289-2511, Japan; email: zap11674@nifty.ne.jp; or Takanori Asakura, Division of Pulmonary Medicine, Department of Medicine, Keio University School of Medicine, Shinanomachi 35, Shinjuku, Tokyo 160-8582, Japan; email: takanori.asakura@gmail.com

## Live Cell Therapy as Potential Risk Factor for Q Fever

Maja George, Andreas Reich, Klaus Cussler, Herrmann Jehl, Florian Burckhardt

Author affiliations: Robert Koch Institute, Berlin, Germany (M. George); European Centre for Disease Prevention and Control, Stockholm, Sweden (M. George); Institute for Infectious Disease Prevention Landau, Landau, Germany (M. George, F. Burckhardt); Bavarian Health and Food Safety Authority, Oberschleissheim, Germany (A. Reich); Paul Ehrlich Institut, Langen, Germany (K. Cussler); Health Department of the Bad Duerckheim District, Bad Duerckheim, Germany (H. Jehl)

DOI: <http://dx.doi.org/10.3201/eid2307.161693>

During an outbreak of Q fever in Germany, we identified an infected sheep flock from which animals were routinely used as a source for life cell therapy (LCT), the injection of fetal cells or cell extracts from sheep into humans. Q fever developed in 7 LCT recipients from Canada, Germany, and the United States.

Gram-negative intracellular bacteria (*Coxiella burnetii*) cause Q fever, a zoonotic disease usually subclinical in livestock and humans. Typically, human patients show signs and symptoms, such as fever, severe headache, nausea, pneumonia, or hepatitis, 2–3 weeks after infection. Chronic Q fever develops in  $\approx$ 1%–5% of patients (1).

On August 5, 2014, a local health department in the Federal State of the Rhineland Palatinate in southern Germany alerted the Federal State Agency for Consumer and Health Protection (FSACHP) (Landau, Germany) after detecting a cluster of 8 patients with pneumonia in a rural community during a 6-week period. The local health department and FSACHP started a joint outbreak

investigation to identify cases, find the source of the outbreak, and stop disease transmission.

On August 12, five of 8 patients tested by ELISA and immunofluorescence test (IFT) by the local health department had results consistent with acute *C. burnetii* infection. The local health department issued a public health warning in the local media and advised anyone in the affected community with influenza-like symptoms or pneumonia in the past 4 months to be tested for Q fever by their general practitioner. In addition, the department offered free testing to pregnant women and persons with cardiovascular risk factors (e.g., heart valve defects), irrespective of symptoms (2).

Case-patients were defined as persons who had phase II IgM or IgG titers for Q fever by ELISA or IFT in 2014. Data for these case-patients were entered into the German Electronic Surveillance System for Infectious Disease Outbreaks (3). Thirteen residential case-patients (6 men, 7 women) who lived in the affected county (Bad Duerkheim) were identified; 11 reported symptoms compatible with Q fever, of whom 6 were hospitalized (Figure). Median age for residential case-patients was 50 (range 32–59) years for women and 44 (range 26–56) years for men.

Because all residential case-patients lived within 1.5 km of a flock of 1,000 sheep, the FSACHP tested random samples from these sheep. Of 61 sheep tested, 25 were positive for *C. burnetii* by ELISA of serum samples and 2 by PCR of vaginal swab specimens. During the investigation, the local health department discovered that young rams and pregnant ewes in the flock had been used as donor animals for live cell therapy (LCT) at 2 medical facilities in a district 10 km from the farm. LCT is injection of fetal cells or cell extracts from sheep into humans. The flock was banned for LCT production, and veterinary control measures (e.g., indoor housing and immunization of sheep) were initiated to stop transmission.

Staff members of LCT facilities were offered serologic testing by ELISA or IFT. Sixteen persons with occupational cases (3 men, 13 women) were reported; 10 showed onset

of disease, and 2 were hospitalized (Figure). Median age for occupational case-patients was 48 (range 28–62) years for women and 45 (range 35–50) years for men.

LCT is an alternative treatment (without medical evidence of effectiveness) that is marketed worldwide online. It consists of intramuscular injections of cell suspensions from fetal sheep to human recipients for rejuvenation (anti-aging) and other ailments. Apart from national recipients, medical tourists from North America and Asia travel to Germany to receive injections. In August, the FSACHP was notified of a patient from Canada who received LCT injections on May 28, 2014, and became ill in June, before *C. burnetii* was detected in the asymptomatic donor sheep herd (4,5).

Newspaper coverage in October of the Q fever outbreak and the potential link to the LCT recipient from Canada alerted an LCT recipient in Germany who had recovered from a previously unidentified illness after receiving LCT in Rhineland Palatinate (4,6). The patient became ill (fever, severe diarrhea, and fatigue) 1 day after receiving LCT injections on July 14, lost 9 kg, and was hospitalized for 10 days. She was positive for Q fever by IFT in October 2014 and had a phase II IgG titer (1:65,536) that was higher than her phase I IgG titer (1:4,096), which indicated a recent infection. She had no other contact with sheep or sheep products during her stay at the LCT facility or thereafter.

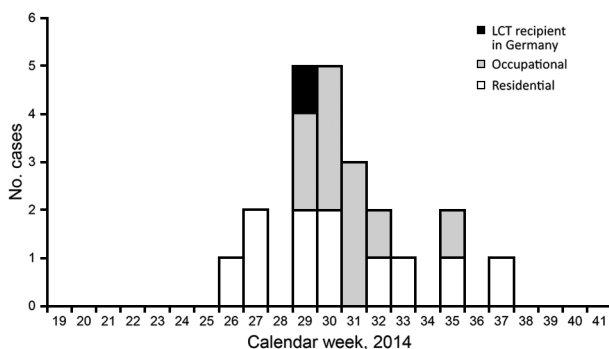
A pharmacovigilance report by the Paul Ehrlich Institut (Langen, Germany) indicated that LCT treatment was the probable cause of the Q fever (7). The county ordered both LCT facilities to advise all 830 LCT recipients treated since January 2014 to consult their general practitioner about their possible risk for Q fever. This advice prompted 5 US citizens who received injections on May 30 in one of the clinics to be tested for Q fever. An investigation by the US Centers for Disease Control and Prevention (Atlanta, GA, USA) identified recent Q fever in all 5 patients (phase II IgG titers  $\leq$ 1:65,536 at 2–6 months postinjection) (5).

Several facilities offer LCT in Germany, although the federal ministry of health recently released an assessment stating that the use of LCT is unsafe (8). Therefore, practitioners worldwide should be informed that working at an LCT clinic or receiving LCT injections should be considered potential risk factors for Q fever.

### Acknowledgments

We thank Katharina Alpers, Irina Czogiel, and Christian Winter for revising the manuscript and Christian Cegla for participating in the study.

Dr. George is an epidemiologist at the Ministry of Social Affairs and Integration of the Federal State of Hesse, Wiesbaden, Germany. Her research interests are intervention epidemiology and refugee health.



**Figure.** Residential (n = 11), occupational (n = 10), and recipient (n = 1) cases of Q fever related to live cell therapy (LCT), by week of symptom onset compatible with Q fever, Rhineland-Palatinate, Germany, 2014

## References

1. Maurin M, Raoult D. Q fever. *Clin Microbiol Rev*. 1999; 12:518–53.
2. District Administration of Bad Dürkheim. Q fever information [in German] [cited 2015 Dec 6]. [http://www.kreis-bad-duerkheim.de/kv\\_bad\\_duerkheim/B%C3%BCrgerservice/Eintr%C3%A4ge/?bsinst=0&bstype=l\\_get&bsparam=217128](http://www.kreis-bad-duerkheim.de/kv_bad_duerkheim/B%C3%BCrgerservice/Eintr%C3%A4ge/?bsinst=0&bstype=l_get&bsparam=217128)
3. Faensen D, Claus H, Benzler J, Ammon A, Pfoch T, Breuer T, et al. SurvNet@RKI—a multistate electronic reporting system for communicable diseases. *Euro Surveill*. 2006;11:100–3.
4. Zentis S. Q fever: infection possibly by fresh cell therapy/outbreak in Germany. *ProMed*. October 6, 2014 [cited 2015 Dec 6]. <http://www.promedmail.org>, archive no. 20141006.2828583.
5. Cussler K, Funk MB, Schilling-Leiß D. Suspected transmission of Q fever by fresh cell therapy [in German]. *Bulletin zur Arzneimittelsicherheit*. 2015;5:13–5.
6. Robyn MP, Newman AP, Amato M, Walawander M, Kothe C, Nerone JD, et al. Q fever outbreak among travelers to Germany who received live cell therapy—United States and Canada, 2014. *MMWR Morb Mortal Wkly Rep*. 2015;64:1071–3. <http://dx.doi.org/10.15585/mmwr.mm6438a3>
7. Becker A. Q fever from Palatinate to Canada? [in German]. The Palatinate of the Rhine. October 8, 2014 [cited 2015 Dec 6]. <http://www.rheinpfalz.de/nachrichten/titelseite/artikel/q-fieber-aus-der-pfalz-nach-kanada/>
8. Federal Health Office. Consolidated summary of the opinions of the Paul Ehrlich Institute and the Federal Institute for Drugs and Medical Devices on parenteral application of fresh cells and xenogenic organ extracts in humans [in German] [cited 2017 Jan 13]. <http://www.bundesgesundheitsministerium.de/service/publikationen/gesundheits/details.html?bmg%5Bpubid%5D=2972>

Address for correspondence: Maja George, Consumer and Health Protection Rhineland-Palatinate, Institute for Infectious Disease Prevention Landau, Bodelschwingstr. 19, Landau 76829, Rhineland-Palatinate, Germany; email: [maja.george@gmail.com](mailto:maja.george@gmail.com)

## Novel Avulaviruses in Penguins, Antarctica

**Víctor Neira, Rodrigo Tapia, Claudio Verdugo, Gonzalo Barriga, Sunil Mor, Terry Fei Fan Ng, Victoria García, José Del Río, Pedro Rodrigues, Cristóbal Briceño, Rafael A. Medina, Daniel González-Acuña**

Author affiliations: Universidad de Chile Facultad de Ciencias Veterinarias y Pecuarias, Santiago, Chile (V. Neira, R. Tapia, V. García, J. Del Río, C. Briceño); Universidad Austral de Chile Facultad de Ciencias Veterinarias, Valdivia, Chile (C. Verdugo, P. Rodrigues); Pontificia Universidad Católica de Chile, Santiago (G.P. Barriga, R.A. Medina); University of Minnesota College of Veterinary Medicine, St. Paul, Minnesota, USA (S. Mor); University

of Georgia College of Veterinary Medicine, Athens, Georgia, USA (T.F.F. Ng); Icahn School of Medicine at Mount Sinai, New York, New York, USA (R.A. Medina); Millennium Institute on Immunology and Immunotherapy, Santiago (R.A. Medina); Universidad de Concepción, Chillán, Chile (D. González-Acuña)

DOI: <https://dx.doi.org/10.3201/eid2307.170054>

We identified 3 novel and distinct avulaviruses from Gentoo penguins sampled in Antarctica. We isolated these viruses and sequenced their complete genomes; serologic assays demonstrated that the viruses do not have cross-reactivity between them. Our findings suggest that these 3 new viruses represent members of 3 novel avulavirus species.

Avian paramyxovirus (APMV) belongs to the genus *Avulavirus*, family *Paramyxoviridae*. There are 13 recognized *Avulavirus* species, each with 1 member, called avian paramyxovirus 1–13 (APMV-1–APMV-13) (1). A putative APMV-14 also has been recently described but not yet formally recognized (2).

In the past decade, APMV-10 through APMV-14 have been reported because of the intensification of surveillance of avian influenza A viruses (3–6). Most of the avulaviruses have been detected in wild birds associated with mild or no clinical disease; only Newcastle disease virus (a strain of APMV-1), APMV-2, and APMV-3 might cause substantial disease in poultry (7). Previous studies have described the presence of APMV-1, APMV-3, APMV-7, APMV-8, and other as-yet uncharacterized avulaviruses in Antarctic penguins (8). As a part of avian influenza surveillance expeditions in Antarctica during 2014–2016, we identified 3 novel avulaviruses in Gentoo penguins.

Cloacal, fecal, and serum samples were collected from Gentoo penguins (*Pygoscelis papua*) and Adélie penguins (*P. adeliae*), at 7 Antarctic locations (online Technical Appendix Figure 1, <https://wwwnc.cdc.gov/EID/article/23/7/17-0054-Techapp1.pdf>) during 2014–2016. Diagnostic tests, virus isolation, and serologic assays confirmed the identity of these paramyxoviruses (online Technical Appendix).

We successfully isolated virus from 12 cloacal samples from Gentoo penguins on Kopaitic Island; these viruses showed positive hemagglutination titers ranging from 4 to 128 hemagglutination units. From these 12 isolates, only 5 were further confirmed by reverse transcription PCR and Sanger sequencing (9), suggesting the presence of new avulaviruses. All PCR-positive isolates were pooled and submitted for next-generation sequencing by using MiSeq 250 paired cycle run (Illumina, San Diego, CA, USA) (10).

By using next-generation sequencing, we obtained the genomic sequences of 3 novel avulaviruses that were