**NOTES on database: Systematic Review of published Ebola immunoglobulin G antibody seroprevalence studies in ‘asymptomatic’ populations, 1961 – 2015**

**Variable explanations**

**Start year, End year:** denotes the period over which the publication reports samples were collected

**Population type:** records the description of the sample population in terms of exposure used in the publication. Only study populations reported to have had no symptoms of EVD during the outbreak period are included in this dataset.

**Group**: denotes subpopulations in three groups based on exposure: note all are populations reported

A household or known case-contact;

B subjects living in outbreak or epidemic areas but without reported case-contact;

C subjects living in areas with no recorded cases of ebolavirus disease.

**Species:** denotes the species for which the samples were positive

**No. of samples:** total number of individuals tested. Some of these figures are revised according to explanations in the published text regarding symptomatic cases (see notes below)

**IgG+ve**: number of individuals found to be IgG positive

**Cut-off**: denotes the threshold used by the researchers to define positivity

**Notes**

*Readme note number links to the variable of the same name in the database and gives extra information where available on the any assay validation performed and the antigens tested for. Note the antigen to which samples were found positive are detailed in the data base in the variable ‘species’.*

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| **Readme Notes #** | **Antigen tested** | **Validation information** | **Other comments** |
| 1 | Polyvalent ELM (Ebola-Lassa-Marburg viruses) & monovalent EBOV (Mayinga): all sera reacting with ELM also reacted with monovalent EBOV antigen but not with monovalent Marburg and Lassa. |  | Samples from symptomatic Yellow Fever-negative individuals also tested: 12% positive. |
| 2 | EBOV (May. 80826) |  |  |
| 3 | Not stated |  | Sera taken in 1973 and investigated for Lassa and ebolavirus in ~1986. Ebola statistic reported without further information.  |
| 4 | Not specified in report: Kuhn63 notes antigen as EBOV |  | Areas sampled had no known outbreak |
| 5 |  EBOV |  Repeat testing of the 4 antibody positive with no known contact gave the same results. 32/33 (97%) positive samples (including samples from cases) confirmed positive by CDC (US)4 (p141)  |  |
| 6 | SUDV  | 42 of 48 clinically diagnosed survivors from Nzara (87%) were considered positive using the same IFA protocol. Several samples from Nzara were retested and confirmed positive by CDC (US) using the same protocol.  | 9 antibody positive family contacts had symptoms and have been excluded from these figures. Not clear if all subjects in this group were interviewed about symptoms. |
| 7 | SUDV  | 42 of 48 clinically diagnosed survivors from Nzara (87%) were considered positive using the same IFA protocol. Several samples from Nzara were retested and confirmed positive by CDC (US) using the same protocol.  | 4 nurses; 1 cleaner, 1 toilet cleaner, 1 water carrier were positive |
| 8 | SUDV  | 42 of 48 clinically diagnosed survivors from Nzara (87%) were considered positive using the same IFA protocol. Several samples from Nzara were retested and confirmed positive by CDC (US) using the same protocol.  | Among factory workers titre range was 1:16 - 1:32 |
| 9 | SUDV  | 42 of 48 clinically diagnosed survivors from Nzara (87%) were considered positive using the same IFA protocol. Several samples from Nzara were retested and confirmed positive by CDC (US) using the same protocol.  | Only 6/31 (19.4%) of clinically diagnosed subjects were antibody positive, and none had levels > 1:32 |
| 10 | Not specified in report: Kuhn63 notes antigen as EBOV |  | Areas sampled had no known outbreak. Method of selection not known |
| 11 | EBOV |  | One doctor, who tested positive in 1977 and 1978 and had history of severe illness after attending the autopsy of a haemorrhagic fever victim in 1972, is excluded. Some individuals gave samples in both the 1977 and 1978 groups |
| 12 | Antigens: unspecified ebolavirus, Marburg & Lassa viruses. No sera positive for ebolavirus was positive for MARV or LASV. |  | No known outbreak. Titre range: 1:16 to 1:1024 |
| 13 | Unspecified |  |  |
| 14 | Unspecified |  | Unknown if these people were exposed in 1976 outbreak, which could explain the high prevalence  |
| 15 | Antigen: Polyvalent of unspecified ebolavirus, MARV & LASV, followed by monovalent test for positive samples. Positive sera sent to CDC (US) for repeat testing; results not reported. |  | Areas sampled had no known outbreak |
| 16 | Unspecified: ebolavirus provided by CDC (US)  |  | No known outbreak. Positives in all areas, range 3%-23%. Highest in Pygmies and rain forest farmers. 6% in the capital, Yaoundé. Report to OCEAC in the same year gave positivity of 6.2% (51/821) in Moloundou, compared to 13.2% for the same location in this study, and 29% (20/70) in Mbatika, but positivity threshold used is not reported.63 |
| 17 | Antigens: monospecific, triple (unspecified ebolavirus, MARV, LASV) and poly-antigen (CCHFV, RVFV, ebolavirus, LASV, MARV). | Validation: sera examined at National Institute of Virology, Johannesburg and CDC(US): labs used different thresholds, so positive confirmed only where both found ≥1:16 | Area in Western Kenya, close to Nzoia. Samples collected during investigation of 2 MARV suspect cases who were later shown to be ebolavirus positive.  |
| 18 | Antigens: inactivated unspecified ebolavirus, MARV, CCHFV, RVFV, & LASV; positives tested against EBOV(May) & SUDV (Boniface & Maleo). Authors report ‘most’ of the Nzoia samples were only tested against EBOV(May) |  | No known outbreak but Nzoia cohort reported to include suspected cases and their contacts. Highest prevalence: Lodwar 7.8% (north-west Kenya). Note referenced paper includes some sera reported on in other papers.64 |
| 19 | Antigens: inactivated polyvalent unspecified ebolavirus/LASV MARV: positives tested against EBOV(802850) & SUDV(802681). |  | Samples from the Occupational Health Services, plus 28 women & their newborns |
| 20 | Antigens: inactivated polyvalent unspecified ebolavirus/LASV MARV: positives tested against EBOV(802850) & SUDV(802681). |  | One sample positive ≥1:64 on both EBOV & SUDV |
| 21 | Polyvalent CCHFV, RVFV, LASV, MARV, unspecified ebolavirus slides provided by CDC (US): positives tested against individual antigens (EBOV & SUDV) | 4 of 5 positive samples sent to CDC (US) were ≥1:128 in repeat IFA testing.  | None were positive for SUDV. |
| 22 | Polyvalent CCHFV, RVFV, LASV, MARV, unspecified ebolavirus; also tested against monovalent antigens |  | Pool region is on the border with the Democratic Republic of Congo. Areas sampled had no known outbreak but populations were selected for close contact with animals |
| 23 | Polyvalent CCHFV, RVFV, LASV, MARV, EBOV (May), SUDV(Bon) (known as CRE2LM); positives retested against individual antigens. | Difficulties with non-specific binding led researchers to replicate and use blinded observers to read results. Only samples with unequivocally positive results by 2 observers were considered positive. | No known outbreak. Similar proportion positive in each participant group. 38% of epilepsy patients had had a febrile illness 1-4 weeks before onset of epilepsy, but no significant difference in seroprevalence in those with and without febrile history. Paper says 30 positives in total but one counted twice as it was positive for EBOV and SUDV. Titres ranged from 32-128 for EBOV; 6/29 had antibodies to more than 1 virus. 12 of positives were members of six households.  |
| 24 | Polyvalent CRE2LM; positives tested against unspecified ebolavirus-specific antigens. |  | In addition 188 contacts of possible and probable cases were tested; 28 were positive at ≥1:64 but all had had symptoms fitting the definition of a possible or clinical case. It is not clear how many of the other contacts had symptoms. |
| 25 | EBOV | In 2003, 6 of original 14 positives were re-bled (others unavailable): 2 were still positive. 14 controls (relatives and ‘cohorts’) were unreactive | 6 seropositives were from north-eastern Gabon where outbreaks had occurred; 8 were from western communities more than 500km from known epidemics. Authors also investigate and correlate animal with human outbreaks. Conclude that less virulent strains of EBOV affected western areas. |
| 26 | EBOV |  | Areas sampled had no known outbreak  |
| 26 |  |  |  |
| 27 | EBOV, SUDV |  | Unpublished data cited by Gonzalez *et al* (2005): no further information, not specified which ebolavirus antigen samples were reactive to. |
| 28 | Polyvalent ELM (Ebola-Lassa-Marburg viruses) & monovalent EBOV (May) |  | Areas sampled had no known outbreak |
| 29 | Polyvalent CCHFV, RVFV, LASV, MARV, EBOV (May), SUDV(Bon) (CRE2LM); positives retested against individual antigens. |  | No known outbreak. Not clear if some samples had antibodies to both EBOV & SUDV. Not specified how many > 1:64. All samples < 1: 128.  |
| 30 | EBOV | All? samples were tested using both assays | Year of sample collection is not recorded. Paper reports a high level of cross reactivity with MARV, lasting a number of years after infection. |
| 31 | Polyvalent CCHFV (IB-AR-10200 Nigeria), RVFV (ZH-501 Egypt), LASV (Josiah), MARV (Musoki), EBOV (May), SUDV(Bon) (CRE2LM); positives retested against individual antigens. |  | No known outbreak |
| 32 | EBOV (May), SUDV (Bon), MARV (Mus) |  | No known outbreak but Zemio which borders DRC accounted for 43% of EBOV positives |
| 32 |  |  |  |
| 33 | Polyvalent EBOV (May), SUDV (Bon), MARV (Mus), LASV (Jos), CCHFV (10200), RVFV(ZH501); positives (≥ 1:16) retested against monovalent antigen.  | 185 samples were reanalysed by ELISA in 1996: results confirmed original analysis.21 | Study linked to one above in Central African Republic (ref?25) but using different set of sera sampled in the same period. Two different denominators are cited in the study: 4296 people are reported for all titre levels; 4078 people are reported in the table describing only samples showing titres ≥ 1:128. Highest prevalence in woods and forest regions. 86% of titres ≥ 1:64 but reached as high as 1:2048  |
| 34 | Polyvalent unspecified ebolavirus, CCHRV, RVFV, MARV) |  | These samples were included in the following multi-country study which used a different threshold.ref 28 One sample was positive for both ebolavirus and RVFV |
| 35 | Polyvalent EBOV (May), SUDV (Bon), MARV (Mus), LASV (Jos), CCHFV (10200), RVFV(ZH501); positives (≥ 1:16) retested against monovalent antigen. |  | Areas sampled had no known outbreak  |
| 36 | Polyvalent CCHFV, RVFV, LASV, MARV, EBOV (May), SUDV(Bon): positives re-tested against monovalent antigens. |  | Areas sampled had no known outbreak. Unable to separate results for the symptomatic group. Only reaction found was against RVFV. Testing performed in Paris. |
| 37 | Polyvalent EBOV (May), SUDV (Bon), MARV (Mus), LASV (Jos), CCHFV (10200), RVFV(ZH501); positives (≥ 1:16) retested against monovalent antigen, considered reactive if ≥ 1:128. | 296 samples from this study and 185 samples from the CAR 1984-85 study above were re-analysed in 1996 using ELISA (≥1:400 & sum of 4 ODs ≥ 1.000). 6.2% were Ebola IgG positive (30/481) compared to 6.4% in these samples previously by IFA.21,26 | Area with no known outbreak. Of the positives, 45 reacted to both EBOV & SUDV: it is not possible to identify how this splits between the groups.  |
| 38 | Polyvalent CCHFV, RVFV, LASV, MARV, EBOV (May), SUDV(Bon): positives with titre ≥ 1:10 retested against monovalent antigens. Known positive/negative controls used |  | Areas sampled had no known outbreak. All positive samples came from savannah areas (Benue/Gongola). Of the positives, none reacted to EBOV alone. |
| 39 | Polyvalent CCHFV, RVFV, LASV, MARV, EBOV (May), SUDV(Bon): positives retested against monovalent antigens |  | Areas sampled had no known outbreak. Range of titres: 1:16 to 1:512; highest prevalence in the capital Antanarivo 13.3%. |
| 40 | EBOV, SUDV, Reston ebolavirus (RESTV), MARV. | Confirmed by western Blot  | This paper summarises 2 others 65,66 Results are for positivity to at least one of the four antigens, which include Marburg. |
| 41 | EBOV (May), RESTV, Marv(Mus) | Validation: Considered positive if ELISA confirmed by IFA or WB. Confirmation: ELISA vs IFA 75%; ELISA vs Western Blot 77%.  | Authors state that the sample groups showed no significant differences in the prevalence of antibody against the 3 filoviruses and so they treated as one group for analysis and only overall results reported. WB results: “most” sera reacted with the NP protein, “less” with VP40, VP35 & VP30, and ‘few’ with VP24. None reacted to GP or L proteins. |
| 42 | Unspecified but Kuhn63 reports EBOV; sera tested in CDC (US) Special Pathogens Lab. |  | Differentiation between forest and city workers was difficult: publicity brought people out of their areas: self identified occupations. 95% of participants including all 9 positives said they knew someone with Ebola. |
| 43 | Unspecified but Kuhn63 reports EBOV; sera tested in CDC (US) Special Pathogens Lab. |  | Although the sample was categorised as unaffected, 5/15 positives knew someone who had had Ebola |
| 44 | Unspecified but probably EBOV; sera tested in CDC (US) Special Pathogens Lab. |  | Paper cites 5 positive sera but 1 miscarried 3 days before giving her positive specimen so fits case definition for Ebola. One of the remaining 4 may have acquired Ebola by sexual transmission from a convalescent. Out of 81 sero-negative household contacts, 15 had episodes of illness fitting case definition at some point during follow-up. |
| 45 | EBOV, MARV, RVFV, LASV, Yellow fever (YF) Hantaviruses (Seoul, Puumala and Thottapalayam) | 244 sera taken in Lobaye in 1995 (11.6% ELISA positive to EBOV) were retested with IFA to EBOV (May) & SUDV (Bon): 34% were positive. | Prevalence of EBOV seropositivity varied between 2% and 13% in different participant groups. |
| 46 | EBOV (May) Marv(Mus); tests performed by Institut Pasteur, Bangui. | 14 positive & 54 negative samples sent to CDC (US) to be tested against strain antigens: all results confirmed. | Primary or secondary forest areas with some agricultural activities |
| 47 | EBOV, SUDV, RESTV with known positive/negative controls |  | 1 positive serum from a survivor excluded from encampment group; unclear how many known case contacts are included in this group. |
| 48 | EBOV |  | The 8 positives were from a group of 12 samples which were “borderline positive” on 1st test. Only 4 of these samples were retested: all were negative and have been excluded. 129 of the 402 subjects reported being ill during Ebola period. Two with fever and haemorrhage (tested EBOV negative) have been excluded. |
| 49 | EBOV | Confirmed with western blot on NP and VP40 proteins | Subjects were asymptomatic throughout and were sampled several times. 1st samples showed no antibodies suggesting no prior immunity; IgG appeared 15-18 days after first possible exposure. Paper also describes results of viral RNA detection after 2 rounds of RT-PCR, finding positive results in 7/11 antibody-positive individuals tested and 0/13 antibody-negative individuals. |
| 50 | Ebolavirus Gabon 95-39/3 (Centre International de Recherches Medicales de Franceville) |  | All subjects reported fever and diarrhoea at least once in 1-year period of study, but not haemorrhagic symptoms. IgG positive titre range (OD 310-2,666). Age, sex, ethnic group not associated with seropositivity. Non- significant difference in seropositivity in people on site during 1995 epidemic (8.2%) and not on site (3.7%), among those with no reported contact. |
| 51 | EBOV, performed in National Institute for Communicable Diseases South Africa.  | All positives plus a random selection of 28 negatives were retested with same protocol in CDC (US) – all were confirmed with response mainly directed to NP, VP40, VP35 and sGP viral proteins.  | Serosurvey done in 1997; questionnaires done in 1999 on 10 positives: only 1 had contact, none were ill.  |
| 52 | EBOV (May), MARV (Voege) LASV (Jos)  |  | Authors suggest positive results among foreign visitors reflect historic infection/ recovered cases, and unexpected results reflect cross-reactivity with infections such as malaria, HIV and influenza. Other observers suggest the results are just as likely to be artifact.63 |
| 53 | EBOV. ODs were expressed as percent positivity of a confirmed EBOV-positive sample; negative controls were from 60 South African subjects ‘almost certain’ to be seronegative.  |  | A total of 300 people were sampled from 39 communities. 137 who reported experiencing haemorrhagic fever symptoms sometime in their life are excluded from this summary. 22% of those reporting symptoms were IgG positive. |
| 54 | EBOV | Random sample of 138 positives were tested by western blot in 2008 and all were positive to at least one EBOV antigen.67  | Gabon experienced 7 outbreaks between 1994 & 2002 affecting >20 villages and towns; in total there were 208 cases and 151 deaths. |
| 55 | EBOV, SUDV, Tai Forest ebolavirus (TAFV), Bundibugyo ebolavirus (BDBV), MARV(Mus) | 28/36 confirmed cases tested positive to BDBV, 20/36 to EBOV, 10/36 to SUDV, 12/36 to TAFV & 29/39 to any of the 4 strains. | 15/223 contacts positive but 13 were symptomatic at the time of the outbreak, therefore only the 2 asymptomatic contacts are included in the table. |
| 56 | EBOV (ATCC 1978), MARV (Popp 1967). Authors state: ‘double IFA’ technique has higher specificity than ‘regular’ IFA because only antibodies that detect filoviral antigens in co-localisation with a monoclonal antibody are considered. |  | Seropositivity ranged from 1.6% - 4% depending on city/rural location; 4% in Pointe Noire. |
| 57 | EBOV  |  | Preliminary results. Study excluded from meta-analysis of known case contact group (A) because unclear what proportion of participants were symptomatic. |
| 58 | EBOV GP | Validation: 30 PCR-confirmed EVD survivors, and 132 individuals from 3 villages without reported cases: 96.7% sensitivity, 97.7% specificity | 2 other positives had fever. Not clear if negatives were asked about symptoms |
| 59 | EBOV GP. “Positive” only if repeat test positive.  |  93/97 PCR-confirmed EVD survivors and 0/339 community controls from 3 villages in Western Area without reported EVD cases were positive: sensitivity 95.9% (95%CI 89.9 – 98.9%); specificity 100% (95%CI 98.9 – 100%) | Tests were done on oral fluid.  |