



## Vaccination Coverage and Prevalence of Contagious Bovine Pleuropneumonia (1999 - 2008) in Two Transboundary States of North-Western Nigeria

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### SUMMARY

Veterinary records from the Ministries of Animal Health of Sokoto and Kebbi states between January 1999 and December 2008 were retrieved and analysed. The information obtained included the cattle population (estimate) per year, number of CBPP outbreaks, mortality, vaccination coverage, number of cattle slaughtered and examined for CBPP and number with CBPP lesions. A total of 5,115,798 cattle were slaughtered within the period. Of this figure, 22,515 (0.44%) had typical CBPP lesions. The overall abattoir-based prevalence rate was 0.44%, with Sokoto and Kebbi states recording 0.32% and 0.51%, respectively, not differing significantly ( $P > 0.05$ ). Similarly, the overall average percentage CBPP vaccination coverage was 38.6%, whilst the average percentage vaccination coverage for the two states (Sokoto and Kebbi) was 34.5% and 5.41%, respectively, and differed significantly ( $P < 0.05$ ). Across the states, the highest and lowest vaccination coverage was observed in year 1999 and 2001 for Sokoto; and, 2000 and 2008 for Kebbi states. The correlation coefficient between the overall prevalence and vaccination coverage (%) in the study area was statistically insignificant ( $r = 0.4686$ ,  $P > 0.05$ ). Significantly, more cattle 0.51% had CBPP lesions from Kebbi state compared with 0.32% from Sokoto state ( $P < 0.05$ ), so also was the CBPP outbreaks for Kebbi (47) and Sokoto (19). The prevalence of CBPP in this area although low, is significant as a potential cause of substantial economic losses to livestock farmers. It is therefore imperative that measures aimed at prevention and control of the disease be institutionalized in all herds and institutional farms.

**KEYWORDS:** CBPP, Abattoir, prevalence, vaccination coverage, Nigeria.

### INTRODUCTION

In Africa, south of the Sahara, no planned breeding programme or successful farming operation with cattle can be undertaken without controlling Contagious Bovine Pleuropneumonia (CBPP) (FAO, 2002; Yaya *et*

*al.*, 2008; Tambuwal, 2009). The disease has been known to be prevalent in the continent with wide spread devastation of the cattle population (Tambi *et al.*, 2006). It is caused by *Mycoplasma mycoides subspecies mycoides* small colony (MmmSC) and is characterized clinically by severe coughing, weakness, emaciation and sometimes by elevated temperature (Egwu *et al.*, 1996; Mbulu *et al.*, 2004).

Available veterinary records show that CBPP is endemic in Nigeria and is spread via movement of trade cattle, seasonal migration and transhumance activities (Aliyu *et al.*, 2000; Ajuwape *et al.*, 2004). Outbreaks of the disease still occur in the country particularly in the northern region which harbours three-quarter of the country's 16.3 million cattle (PACE, 2004; Ikhatua, 2011). Most cattle in Nigeria are owned by nomadic Fulani herdsmen who move for long distances within and outside the country thereby exacerbating the spread of CBPP. The programmes (test and slaughter policy, annual vaccination and abattoir surveillance) put in place in Nigeria aimed at control and eradication of the disease suffered some set back largely due to inconsistency in the policies of successive governments and incessant civil and religious unrest (Nwankpa, 2004). This phenomenon drastically affected the utilization of public veterinary services resulting in the resurgence of CBPP and other related diseases from late 1980 onwards (Egwu *et al.*, 1996).

Amongst the measures recommended for CBPP control, vaccination is currently the most reliable and effective (Maina, 2004). CBPP vaccine has been produced in Nigeria by National Veterinary Research Institute (NVRI) Vom since 1924. The minimum age of vaccination of cattle is six months and the immunity lasts for 12 months

(NVRI, 2007). Obi (1997) had earlier observed serious limitations of the vaccine, which are short duration of action, cold chain dependence and adverse tissue reaction.

Several epidemiological studies have been conducted to assess the situation of CBPP in North-eastern region (Nawathe, 1992; Ameh *et al.*, 1998; Helle *et al.*, 1998; Aliyu *et al.*, 2000; 2003), North-central region (Nwanpka *et al.*, 2004; Danbirni *et al.*, 2010; Mailafia *et al.*, 2010), and South-western region (Ajuwape *et al.*, 2004; Babalobi, 2007). Information about the disease in the North-western part of the country is however very scanty in spite of the region's rich livestock resources. The main objective of this study was to determine the prevalence of CBPP in two cattle states in the region as well as to assess the annual vaccination coverage and other contributing factors.

## MATERIALS AND METHODS

### Study area

Sokoto and Kebbi States are located in the extreme north-western part of Nigeria. The two states share a common border and are geographically located between latitudes 10° and 14°N and longitudes 3° and 7°E of the equator, respectively (Abdullahi, 1985). Sokoto shares international boundary with republic of Niger in the north while Kebbi State borders with Benin republic in the west, and the two states are bounded by Niger and Zamfara States of Nigeria in the South and East, respectively (Fig.1). The states account for 6,110,000 (37.48%) of the total estimated cattle population of 16.3 million in the country ((MOCIT, 2002). The climate in the area is semi-arid in nature coupled with severe water problem from October to May and water availability only in July to September with an annual average rainfall of less than 30 inches (RIM, 1992). The mean monthly temperature ranges between 13°C in December through February, and 40°C in April and May. The relative humidity in the area varies from 10% in February to 90% in August (Abdullahi, 1985). The main occupation of the people is arable farming and livestock rearing with cattle, sheep and goats being predominant. Livestock production is under-taken by both settled, semi-settled farmers and pastoralists.

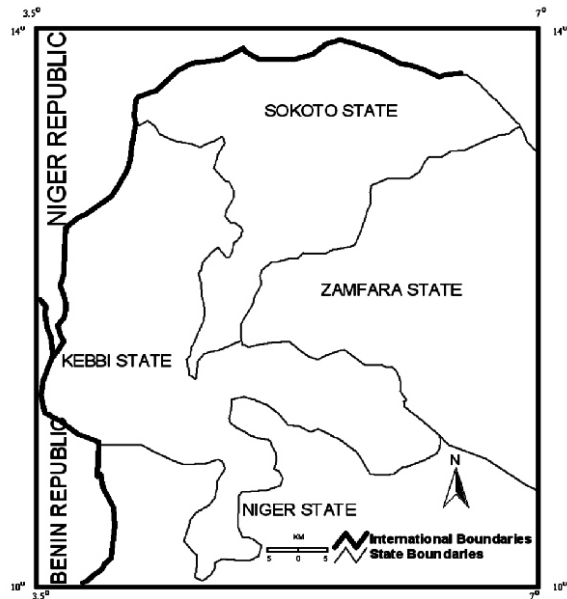


Fig.1: Map of the study areas (Sokoto and Kebbi States) showing international and inter-states boundaries.

### Data collection

Ten year (1999 – 2008) data from abattoir and Ministries of Animal Health records were obtained. The relevant information retrieved included an estimate of the cattle population, the number of cattle slaughtered and examined for CBPP in abattoirs, number with suspected CBPP lesions, number of animals vaccinated against CBPP, number of CBPP outbreaks as well as the number of cattle and mortality due to the disease. The percentage vaccination coverage and prevalence rate of CBPP were calculated for the two states.

### Statistical analysis

The chi-square ( $X^2$ ) test was used to compare prevalence and average percentage vaccination coverage of the two states. The overall prevalence and vaccination coverage (%) were further subjected to correlation statistical analysis (Pearson correlation).  $P < 0.05$  was considered statistically significant.

## RESULTS

Yearly estimates of cattle population, vaccination coverage, CBPP outbreaks and prevalence of suspected CBPP lesions in cattle slaughtered in abattoirs in Sokoto and Kebbi States of Nigeria between 1999 and 2008 are represented in Tables I and II. The mean combined CBPP vaccination coverage for the two states was 19.6% (Table III). The mean vaccination

coverage was significantly higher ( $P < 0.05$ ) in Sokoto state (34.5%) than in Kebbi state (5.4%). The highest vaccination coverage of 59.6% and 10.5% was attained in 2001 and 2004, whilst the lowest vaccination coverage of 17.3% and 1.27% were in 1999 and 2000 in the two states (Sokoto and Kebbi), respectively. The correlation coefficient between percentage vaccination coverage and prevalence was positive and significant ( $r = 0.4686$ ,  $P > 0.05$ ). A combined total of 56 outbreaks in cattle (Sokoto State; 19 and Kebbi State; 37) with a mortality of 221 (Sokoto State and Kebbi state) representing an average of 5.6 outbreak per year (Sokoto State 1.9, Kebbi State 3.7) and a case mortality of 3.9 (Sokoto 9.2, Kebbi, 1.3) were recorded. The highest numbers of 5 and 12 CBPP outbreaks were recorded in 2006 and 2008 in Sokoto and Kebbi States, respectively. Out of the overall total of 5,115,798 cattle slaughtered in abattoirs in the 10 year period in the two states, 22,515 were recorded with suspected CBPP lesions, giving a prevalence rate of 0.44%. Kebbi State, however, recorded a significantly higher ( $P < 0.05$ ) mean prevalence of 0.51% compared with Sokoto State (0.32%). The highest abattoir prevalence of suspected CBPP in both the states was recorded in 2008.

TABLE I: Cattle population (estimate), vaccination coverage, CBPP outbreaks, mortality and prevalence of slaughtered cattle with suspected CBPP lesions in Sokoto state (1999–2008).

Year	Cattle Population (estimate)	Outbreaks	Mortality	Vaccination coverage	% vaccination coverage	No of cattle slaughtered and examined for CBPP	No with suspected CBPP lesions	Prev. (%)
1999	1157689	NA	NA	200165	17.3	99657	230	0.23
2000	1200579	NA	NA	361415	30.1	100214	120	0.12
2001	1317402	4	64	785614	59.6	98406	1020	1.04
2002	1325385	1	8	392354	29.6	163504	330	0.2
2003	1385167	NA	NA	427573	30.8	160879	230	0.14
2004	1505427	3	16	448075	29.7	182454	460	0.25
2005	1580351	1	6	476796	30.1	205550	751	0.36
2006	1628250	5	67	502695	30.8	318106	816	0.26
2007	2712435	2	5	1500367	55.3	258856	997	0.39
2008	2372450	3	8	483747	20.3	300000	1009	0.34
Total	16,185,135	19	174	5578801	33.4	1887626	5963	0.32

\*Source: Ministry of Forestry and Animal Health Sokoto state.  
NA = not available

TABLE II: Number of outbreaks, mortality, percentage vaccination coverage and number of cattle detected with suspect Contagious Bovine Pleuropneumonia (CBPP) lesions in Kebbi state (1999–2008).

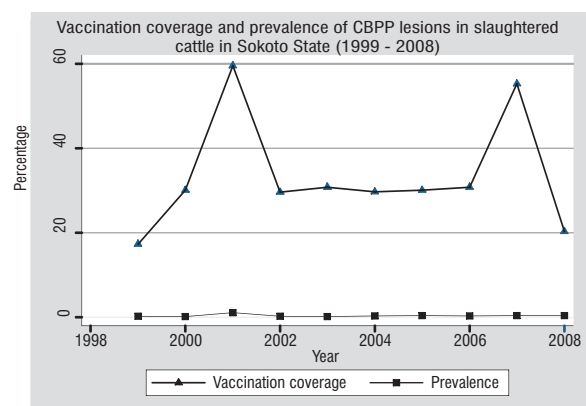
Year	No of Cattle (estimate)	Outbreaks	Mortality	Vaccination coverage	% vaccination coverage	No of cattle slaughtered and examined for CBPP	No with CBPP lesions	Prev. (%)
1999	1,475,847	4	4	37921	2.56	71966	367	0.50
2000	1,520,123	NA	NA	19443	1.27	154249	411	0.26
2001	1,565,726	1	3	NA	NA	138820	162	0.12
2002	1,612,698	2	7	98709	6.12	312049	984	0.32
2003	1,661,079	2	2	111159	6.69	541327	1144	0.21
2004	1,710,911	6	10	180224	10.53	516414	1210	0.23
2005	1,762,239	NA	NA	NA	NA	458265	2411	0.52
2006	1,815,106	1	NA	NA	NA	345408	2706	0.78
2007	1,869,559	9	5	118428	6.33	350000	3147	0.89
2008	1,983,415	12	16	351709	17.7	339674	4010	1.18
Total	16,976703	37	47	917,593	5.41	3228172	16552	0.51

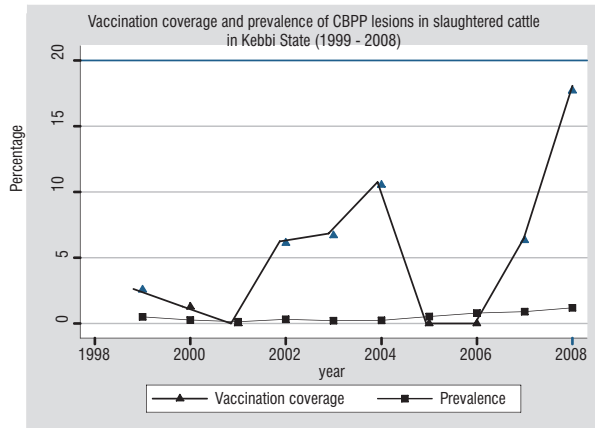
Source: Ministry of Agriculture and Fisheries Kebbi state  
NA: Not available

TABLE III: Number of cattle (estimate), vaccination coverage, percentage vaccination coverage, number of cattle slaughtered and examined for CBPP and number detected with suspect CBPP lesions in both Sokoto and Kebbi States (1999-2008)

YEAR	No. of cattle (estimate)	Vaccination coverage	Percentage vaccination (%)	No. of cattle slaughtered and examined for CBPP	No. with suspected CBPP lesions	Prev. (%)
1999	2,633,536	238,086	9.04	171,623	597	0.35
2000	2,720,702	380,858	13.9	254,463	531	0.21
2001	2,883,128	785,614	27.2	237,226	1,182	0.49
2002	2,938,083	491,063	16.7	475,553	1,314	0.27
2003	3,046,246	538,732	17.7	702,206	1,374	0.20
2004	3,216,338	628,299	19.5	698,868	1,670	0.23
2005	3,342,590	476,796	14.3	663,815	3,162	0.47
2006	3,443,356	502,695	14.6	663,514	3,522	0.53
2007	4,581,994	1,618,795	35.3	608,856	4,144	0.68
2008	4,355,865	835,456	19.1	639,674	5,019	0.78
TOTAL	33,161,838	6,496,394	19.6	5,115,798	22,515	0.44

\*Source: Ministry of Animal Health, Sokoto and Kebbi States





## DISCUSSION

With increasing globalization, the continued presence of CBPP in Nigeria constitutes a serious threat to the country's food security and international trade (Obi, 2005). Nigeria with an estimated cattle population of 13.9 million in West Africa (RIM, 1992; Maina, 2004) may be threatened by CBPP (Egwu *et al.*, 1996; Ajuwape *et al.*, 2004). In the present study, the prevalence of CBPP was found to be 0.44% (95% CI, 0.28 to 0.55). This figure is within the range of 0.51% reported by Nawathe (1992) for 1980 – 1989 and 0.29% (Aliyu *et al.*, 2000) for 1988 – 1997 for north-eastern Nigeria. The prevalence rate recorded could have been relatively higher as illegal slaughters of suspected animals in endemic remote areas, where abattoirs do not exist are often missed. This is in addition to other infected animals slaughtered at ceremonial and religious activities annually as observed in the study area. Furthermore, the slaughter of sick animals at undesignated places (home) instead of at approved slaughter slab(s) for fear of quarantine, condemnation or payment of slaughter fees was a common practice in the study area. The prevalence of CBPP recorded in this study did not differ between the Sokoto and Kebbi states ( $P > 0.05$ ). The continued existence of this Transboundary disease in Nigeria could be linked to incomplete and irregular vaccination programme over the years as well as the introduction of infected cattle into these areas (Aliyu *et al.*, 2000). The very low vaccination coverage (19.6%) observed in this study could be attributed to high cost of mass vaccination campaigns which most state governments in Nigeria were unable to carry out due to dearth of funds and or misplaced priority. This view is supported by finding of Baba (1999) that poor funding of veterinary services in the North-

western states of Nigeria was a major impediment to the implementation of CBPP control programme in the area. Although there was insignificant correlation between prevalence and vaccination coverage ( $r = 0.4686$ ,  $P > 0.05$ ) in the study area, the high percentage vaccination coverage observed in some years could be as a result of repeated outbreaks recorded at those times, and the gradual and steady increase in the number of cattle detected with CBPP lesions which attracted the concern of veterinary authorities. The number of outbreaks reported might have been under estimated, because of ineffective disease reporting system that might not have captured outbreaks in remote areas of the states. The steady and gradual increase in the incidence of cattle with suspected CBPP lesions in this study warns on the threat of this transboundary disease. Nigeria shares international boundaries with three countries where people and animals move freely in and out. Trade animals (cattle, sheep and goats) are mainly imported or smuggled through these porous borders without recourse to the health status of these animals.

## CONCLUSION AND RECOMMENDATIONS

The present study has established that CBPP is still endemic in the two North-western states of Nigeria. It has also demonstrated irregular vaccination coverage in the study areas. To achieve control, we recommend that government, as a matter of priority must apply strict stamping out policy. This strategy involves the combination of vaccination campaigns, detection and slaughter of infected cattle with provision of adequate compensation to owners as well as effective control of animal movements. Collaboration between traditional institution and Ardos (village heads of Fulani settlements) in CBPP control is not only desirable but imperative if control measures are to be institutionalized. Aggressive veterinary extension services to educate farmers on the dangers of keeping CBPP infected cattle in their herds should be pursued. Further research is needed to improve the CBPP vaccine (T1/44) currently used in Nigeria.

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## REFERENCES

- ABDULLAHI, A.K. (1985): An economic analysis of a settlement model for Fulani Pastoralists in Sokoto state. Unpublished PhD Thesis. University of Nottingham, School of Agriculture, Leicestershire, UK: 58
- AJUWAPE, A.T.P., ADETOSOYE, A.I., IKHELOA, J.O., ALAKA, O.O., TAIWO, V.O., TALABI, O.A., OTESILE, E.B. and OJO, M.O. (2004): Pathogenicity of *Mycoplasma capricolum* subspecies *capripneumoniae* for cattle immunosuppressed by *Trypanosoma congolense*, *Trop. Vet.*, **22**(1):29-36.
- ALIYU, M.M., OBI, T.U. and EGWU, G.O. (2000): Prevalence of Contagious Bovine Pleuropneumonia (CBPP) in Northern Nigeria. *Prev. Vet. Med.*, **47**: 263-266.
- ALIYU, M.M., OBI, T.U., OLADOSU, L.A., EGWU, G.O. and AMEH, J.A. (2003): The use of competitive Enzyme Linked Immunosorbent Assay with abattoir survey for CBPP surveillance in Nigeria. *Trop. Vet.*, **21**(2): 35-41.
- AMEH, J.A., NAWATHEA, D.R. and EMMANS, T.A. (1998): The role of agar gel diffusion test (AGPT) in diagnosis and eradication of Contagious Bovine Pleuropneumonia. *Bull. Ani. Hlth and Prod. Afr.*, **43**:187-189.
- BABA, K.M. (1999): Structural Reform of Veterinary Services in North-Western Nigeria: Herders' Response to service cost and feasibility of private delivery. A Ph.D Thesis, Ahmadu Bello University, Zaria. 50.
- BABALABI, O. (2007): Participatory approach to the monitoring and surveillance of Contagious Bovine Pleuropneumonia disease outbreak among settled pastoralists at Ingangan grazing reserve, Oyo State Southwest, Nigeria: Pre-ISVEE XII workshop, August 6-8, Durban, Republic of South Africa.
- DANBIRNI, S., OKAIYETO, S.O., PEWAN, S.B. and KUDI, A.C. (2010): Concurrent infection of Contagious Bovine Pleuropneumonia and Bovine tuberculosis in Bunaji nomadic cows. *Res. J. Anim. Sci.*, **4**(1): 23-25.
- EGWU, G.O., NICHOLAS, R.A.J., AMEH, J.A. and BASHIRUDDIN, J.B. (1996): Contagious Bovine Pleuropneumonia: An update. *Vet. Bull.*, **66**:875-888.
- FAO (2002): Recognizing contagious Bovine Pleuropneumonia. FAO Animal Manual, No. 13 Rev. 1. Food and Agricultural Organization of the United Nations, Rome, 2002. 3-17.
- HELLE, D.D., AJOGI, I., MUZONG, B. and ZAIFI, M.D. (1998): A retrospective study on the incidence of Contagious Bovine Pleuropneumonia (CBPP) in Mubi, Adamawa State, Nigeria. *Trop. Vet.*, **16**:143-147.
- IKHATUA, U.J. (2011): Nigerian Institute of Animal Science (NIAS) beef cattle production report. Timestamp: 2011-02-18 10:48:18. Available at <http://www.nias.gov.ng/?=read&id=9>. Accessed on 30th June, 2011
- MAILAFIA, S., ONAKPA, M.M. and DANDAM, K.P. (2010): A ten year study on the prevalence of ruminant diseases encountered at the Ministry of the Federal Capital Territory veterinary clinics Gwagwalada, Abuja, Nigeria, *Sahel J. Vet. Sci.*, **9** (2): 4-6.
- MAINA, J. (2004): Challenges of animal health services in Nigeria: The next decade. *Trop. Vet.*, **22**(2): 44-52.
- MOCIT (2002): Guide to Sokoto state economic potentials. Commerce department, Ministry of Commerce, Industry and Tourism, Sokoto State. 4-18.
- MBULU, R.S., TJIPURA-ZAIRE, G., LELLU, R., FREY, J., PILO, P., VILEI, E.M., METTLER, F. and NICHOLAS, R.A.J. (2004): Contagious Bovine Pleuropneumonia (CBPP) caused by vaccine strain T1/44 of *Mycoplasma mycoides subspecies mycoides small colony*. *Vet. Microbiol.*, **98**: 229-234.
- NVRI (2007): National Veterinary Research Institute, Vom: Its activities and opportunities to Veterinary Professionals. A presentation to the 44<sup>th</sup> Annual Congress of the Nigerian Veterinary Medical Association, Conference Centre, Petroleum Training Institute Effurun, Delta state. 22nd-26th October, 2007
- NAWATHE, D.R. (1992): Resurgence of Contagious Bovine Pleuropneumonia in Nigeria. *Rev. Sci. Tech. Off. Int. Epiz.*, **11**:799-804.
- NWANKPA, N.D., MURAINA, I., OGUNJUMO, S.O., OKEWOLE, P.A., CHUKWU, O.C., LUTHER, N.J., JAMBALANG, A.R. and ABIAYI, E. (2004): Incidence of Contagious Bovine Pleuropneumonia (CBPP): A comparison of local Zebu and imported cattle. *The proceedings of the 41<sup>st</sup> Annual General Congress of the Nigerian Veterinary Medical Association (NVMA), 22nd -26th November, 2004, Jos.* 27-29.
- OBI, T.U. (1997): On-Parasitic livestock diseases in Nigeria: An over view. *Trop. Vet.*, **15**:85-95.
- OBI, T.U. (2005): Transboundary animal diseases and our national food security: Strategy for control/eradication. A lead paper presented at the plenary session of the 42<sup>nd</sup> Annual Congress. Nigerian Veterinary Medical Association, University of Maiduguri, 14th - 17th November, 2005.
- PACE (2004): Pan African Control of Epizootics. Newsletter No. 6:2
- RIM, (1992): Livestock Resources. Four volume report to the Federal Government of Nigeria by Resource Inventory and Management Ltd: I - Executive Summary and Atlas; II - National Synthesis; III - States Reports; IV - Urban Reports and Commercially managed Livestock Survey Report: 33-39.
- TAMBI, N.N., MAINA, W.O. and NDI, C. (2006): An estimation of the economic impact of Contagious Bovine Pleuropneumonia in Africa. *Rev. Sci. Tech. Off. Int. Epi.*, **25** (3): 999-1012.
- TAMBUWAL, F.M. (2009): Epidemiology of *Mycoplasma mycoides subspecies mycoides small colony type* and *Mycoplasma bovis* in cattle in two Transboundary states (Sokoto and Kebbi), Nigeria. Unpublished Thesis, Usmanu Danfodiyo University, Sokoto, Nigeria 125.
- YAYA, A., MANSO-SILVAN, L., BLANCHARD, A. and THIAUCOURT, F. (2008): Genotyping of *Mycoplasma mycoides subspecies mycoides small colony type* by multilocus sequence analysis allows molecular epidemiology of contagious bovine pleuropneumonia (CBPP). *Vet. Res.*, **39**: 14.