EPIDEMIOLOGY AND CONTROL OF THE AMERICAN FOULBROOD IN GERMANY

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OUTBREAKS IN INTERVALS

In Germany about one million bee colonies are kept on approximately hundred thousand apiaries. In the last fifty-three years in Germany the American foulbrood appeared at nearly regular intervals. The number of outbreaks varied from about 100 to 400 affected apiaries each year. The intervals between low and high levels of occurrence ranged between approximately eight and twelve years (Figure 1).

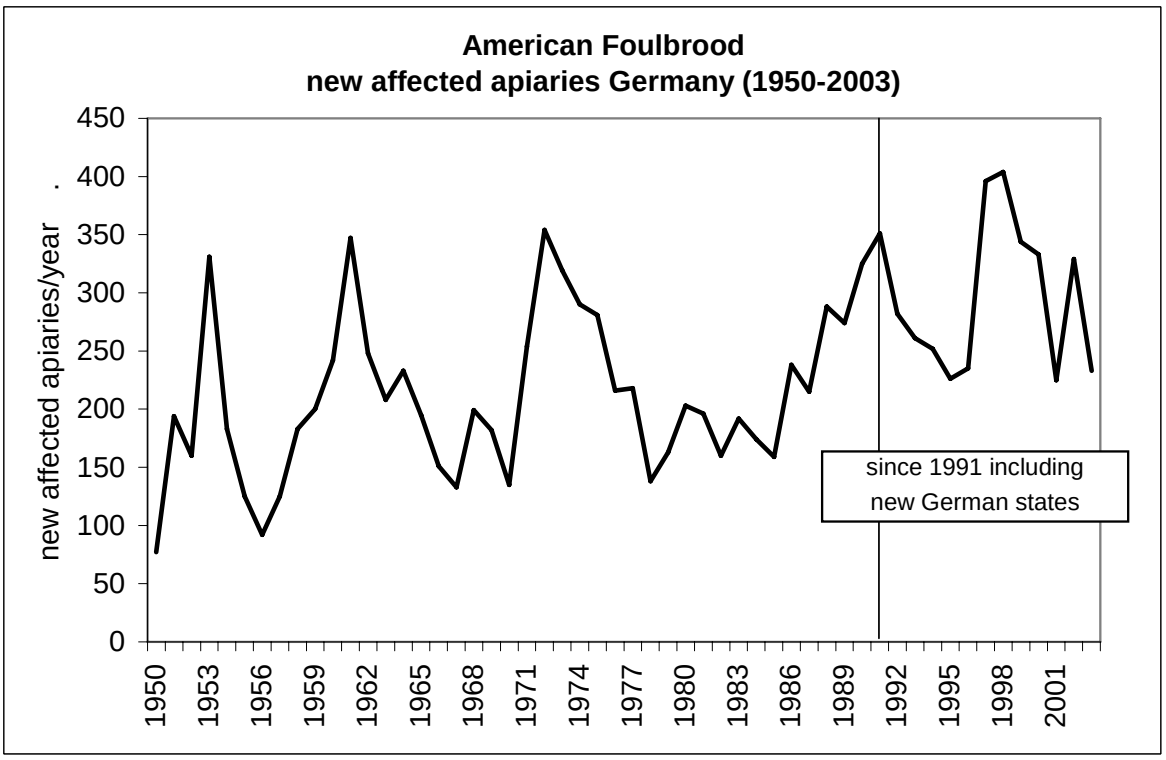

Figure 1: Cases of AFB in Germany (1950-2003)

REGIONAL DIFFERENCES

By comparing the states of the Federal Republic of Germany regional differences in the number of new cases of the AFB appeared (Figure 2:). The lowest number of outbreaks within the last twelve years were found in Baden-Wurttemberg, Bavaria and Saxony-Anhalt (0,2 effected apiaries/1.000

colonies), whereas for example in North Rhine-Westphalia 0,8 apiaries referring 1.000 colonies showed a fourfold rate of outbreaks. The density of colonies seems to have no influence on this, because in the states Baden-Wurttemberg and Bavaria the

highest density of colonies are kept (5,1 respectively 4,9 colonies/square kilometres), but the lowest number of outbreaks were registered. On the other hand in North Rhine-Westphalia with a low density of colonies many more outbreaks are being observed. Perhaps climatic influences, the amount of beekeeping migratory or different strains of Paenibacillus larvae larvae (REICHE et. al, (1997); OTTEN, 1998; GENERSCH and OTTEN, 2003) may cause these regional distinctions.

Table 1: New cases of AFB in the states of the Federal Republic of Germany (1992-2003)

state	area (square kilometers)	No. of colonies	colonies /square kilometers	No. of outbreaks (1992 - 2003)	outbreaks/year (1992-2003)	No. of outbreaks/ thousand colonies
Schleswig-Holstein	15.731	26.000	1,6	210	17,5	0,7
Hamburg	755	2.000	2,6	14	1,2	0,6
Lower Saxony	47.343	76.000	1,6	580	48,3	0,6
Bremen 1)	404	*)		41	3,4	
North Rhine-Westphalia	34.070	68.000	2,0	687	57,3	0,8
Hesse	21.114	57.000	2,7	196	16,3	0,3
Rhineland-Palatinate	19.846	37.000	1,9	168	14,0	0,4
Baden-Wurttemberg	35.751	182.000	5,1	375	31,3	0,2
Bavaria	70.553	342.000	4,9	732	61,0	0,2
Saarland	2.570	9.000	3,6	59	4,9	0,5
Berlin	889	3.000	3,7	49	4,1	1,3
Brandenburg	29.053	17.000	0,6	98	8,2	0,5
Mecklenburg-Western Pomerania	23.170	17.000	0,8	72	6,0	0,3
Saxony	18.338	30.000	1,7	138	11,5	0,4
Saxony-Anhalt	20.443	14.000	0,7	28	2,3	0,2
Thuringia	16.251	20.000	1,2	73	6,1	0,3

Data: DIB (2001); BMVEL (1993-2003)

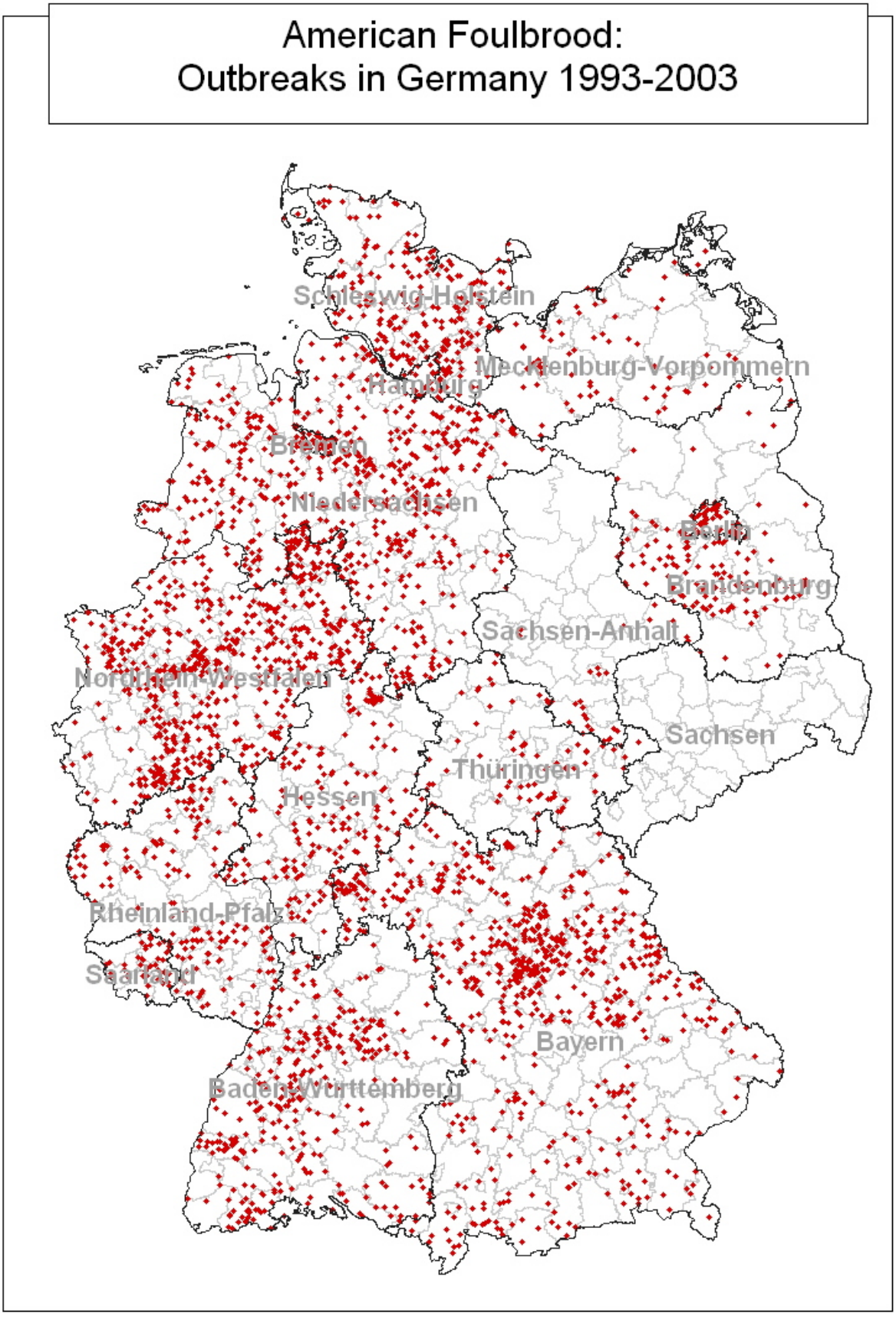

Figure 2: Location of AFB in Germany 1993-2003 (Data: BMVEL)

RISK OF SUCCEEDING OUTBREAKS IN AFFECTED COUNTIES

The mean risk of a new outbreak within a German county can be defined as outbreaks/year/number of counties in Germany. By comparing the risk in counties which had one or more outbreaks in a previous year with the mean risk of all counties it could be shown, that after a case of AFB the risk of succeeding outbreaks in the affected counties is increased within more than ten subsequent years (Figure 3).

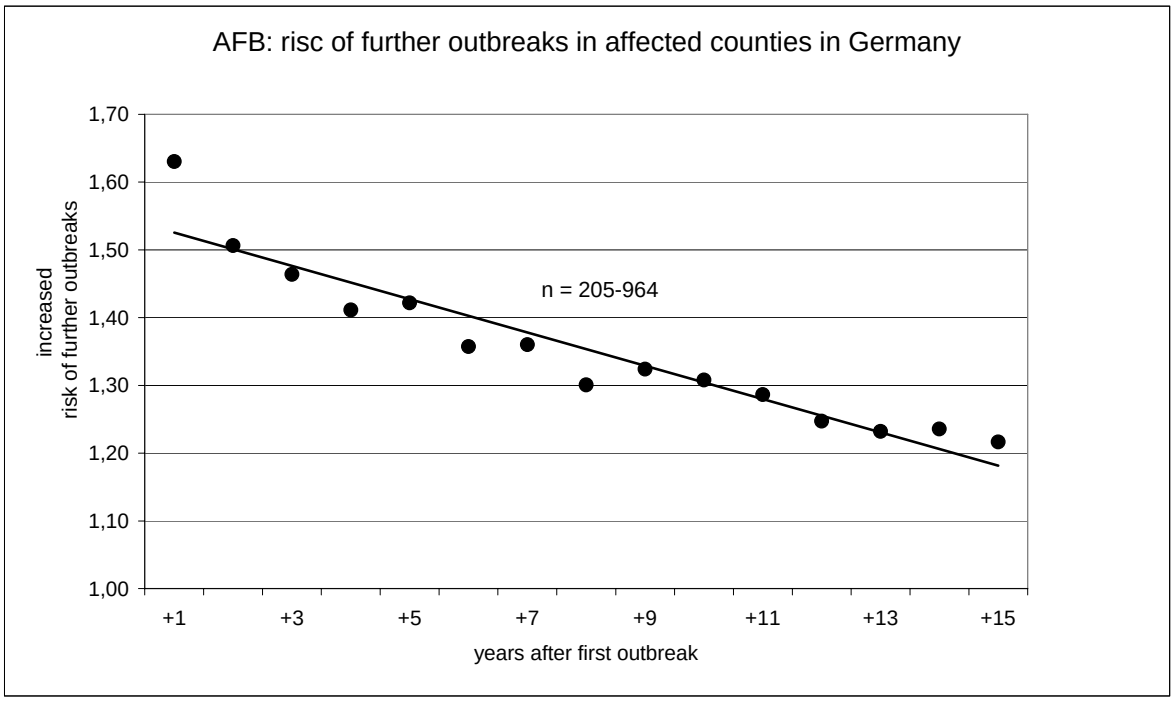

Figure 3: Risc of further outbreaks in affected counties in Germany

Based on preliminary data, it seems that in regions in which colonies in the surrounding of effected apiaries were tested for an infection with spores by bacteriological analysis the risk of further outbreaks of AFB is reduced.

SPREAD OF SPORES

In less than eight percent of more than 2.400 randomised apiaries in the year 2003 in Rhineland-Palatinate and North Rhine-Westphalia spores of Paenibacillus larvae larvae could be proven (Figure 4:), five percent on a low level (0-4.500 spores/g (food)) and only two percent on a high level (>4.500 spores/g(food)). Similar data for Germany were published by RITTER (1993) or VON DER OHE and DUSTMANN (1997). Outbreaks normally only were found within the high infected colonies. The lower limit of the amount of spores within the contamination class “high” seems to form a threshold, from which upwards most of the colonies will become diseased in the near future (VON DER OHE and DUSTMANN (1997).

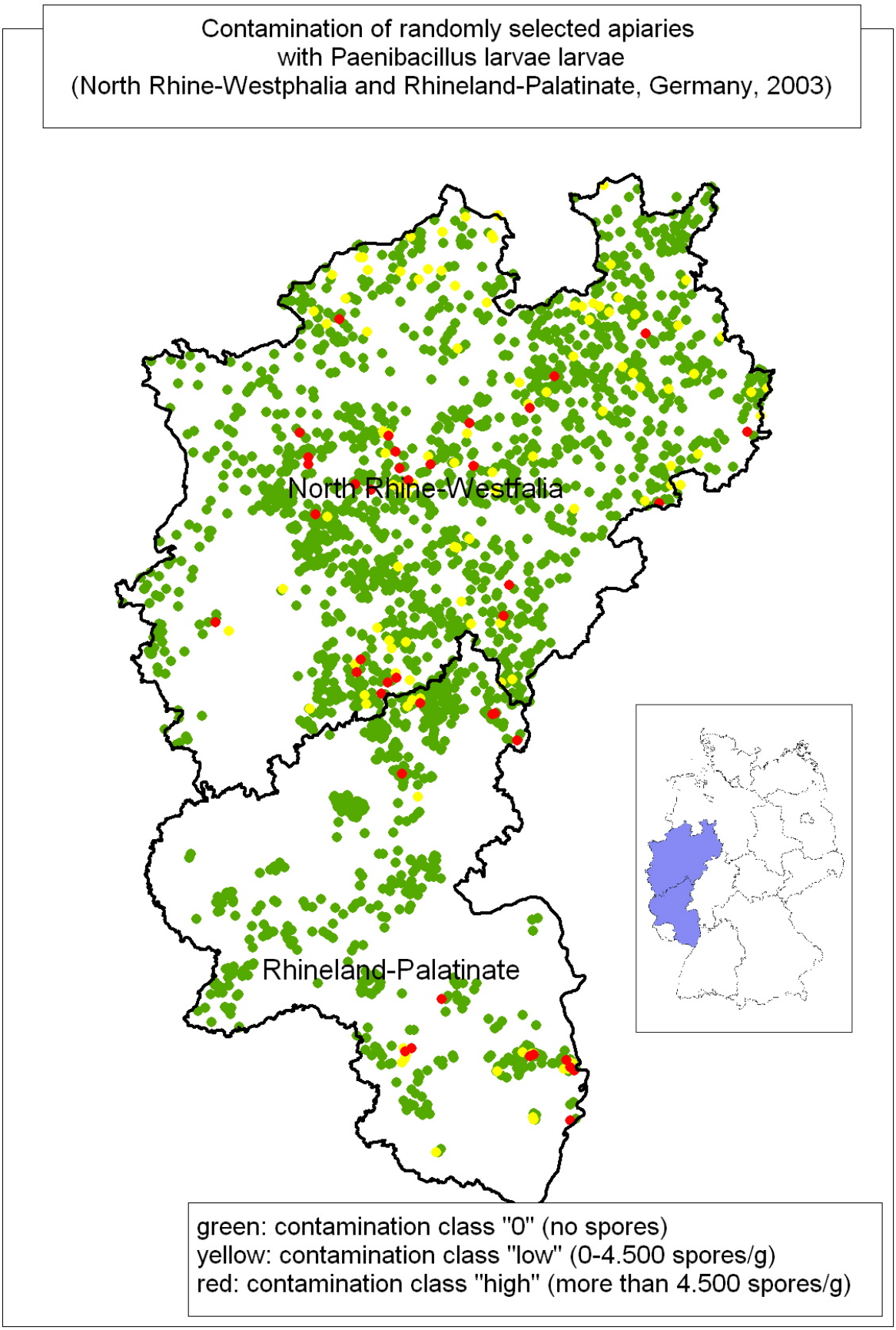

Figure 4: Contamination of randomly selected apiaries (OTTEN and OTTO unpublished; KLÜNERT pers. communication)

CONTROL METHODS

To control AFB in Germany two different methods were applied: artificial swarm method for diseased but strong colonies and stamping out of extremely diseased or weak colonies. Experience show that with the artificial swarm method, if done right, most colonies can be cured and no more spores can be detected afterwards. There is no need for the use of medical drugs.

RECOGNITION OF CLINICAL SYMPTOMS BY BEEKEEPERS

In 2002 and 2003 more than 70% of all brood combs with clinical symptoms in Rhineland-Palatinate and investigated parts of North Rhine-Westphalia were recognized by bee inspectors or veterinarian. Only less than 30% of all beekeepers themselves recognized the symptoms. Similar results for Germany were already reported in 1995 by OTTEN and RITTER.

REFERENCES

BMVEL (1993-2003) Tierseuchenberichte - Amtliche Mitteilung des Bundesministeriums für Verbraucherschutz, Ernährung und Landwirtschaft

DIB (2001) Bericht über die Tätigkeit des Deutschen Imkerbundes

GENERSCH, E; OTTEN, C (2003) The use of repetitive PCR fingerprinting (rep-PCR) for genetic subtyping of German field isolates of Paenibacillus larvae subsp. larvae. Apidologie 34 (3): 195-206

HANSEN, H (1984) The incidence of the foulbrood bacterium Bacillus larvae in honeys retailed in Denmark. Tidsskrift for Planteavl 88: 329-336

HANSEN, H; BRØDSGAARD, C J (1999) American foulbrood: a review of its biology, diagnosis and control. Bee World 80(1): 5-23.

JELINSKI, M (1985) Some biochemical properties of Bacillus larvae WHITE. Apidologie 16(1): 69-76.

MATHESON, A (1995) World bee health update. Bee World 76(1): 31-39.

OTTEN, C; RITTER W (1995) Untersuchungen zur Epidemiologie der Amerikanischen Faulbrut in Deutschland. In: Der XXXIV. Internationale Bienenzüchterkonkress, Lausanne, Schweiz, 1995: 213-216

OTTEN, C; REICHE, R; MARTIN, K; OTTO, A (1998) Comparative studies on Paenibacillus larvae subsp. larvae of different origin. Apidologie 29: 419

REICHE, R; OTTEN, C; MARTIN, K; HENTSCHEL E J (1997) Vergleichende Untersuchungen an Paenibacillus larvae subsp larvae - Stämmen unterschiedlicher Herkunft. Apidologie 28: 176-177.

RITTER, W (1990) Bösartige Faulbrut: Wie ist das Vorkommen von Sporen der Bösartigen Faulbrut in Honig zu bewerten? Allgemeine Deutsche Imkerzeitung 9: 13-16.

RITTER, W (1993) Eignet sich die Untersuchung von Honigproben zum erkennen der Amerikanischen (Bösartigen) Faulbrut? Allgemeine Deutsche Imkerzeitung: 13-16.

VON DER OHE, W; SCHÜTZE, K; LIENAU, F W (1996) Arealuntersuchungen auf Bacillus larvae-Sporen im Honig als Prophylaktikum. Apidologie 27(4): 123-123

VON DER OHE, W; DUSTMANN, J H (1997) Efficient Prophylactic Measures Against American Foulbrood by Bacteriological Analysis of Honey for Spore Contamination. Journal of Apicultural Research 36: 603-605