Mycoplasma buteonis sp. nov., *Mycoplasma falconis* sp. nov., and *Mycoplasma gypis* sp. nov., Three Species from Birds of Prey

J. B. POVEDA,¹ J. GIEBEL,² J. FLOSSDORF,² J. MEIER,² AND H. KIRCHHOFF^{2*}

*Departamento de Sanidad Animal, Facultad de Veterinaria de Córdoba, Azahara s/n 14071, Spain,¹
and Institut für Mikrobiologie und Tierseuchen, Tierärztliche Hochschule
Hannover, 30173 Hannover, Germany²*

Organisms with the typical characteristics of mycoplasmas were isolated from the tracheae of buzzards, saker falcons, and griffon vultures. All isolates obtained from the same bird species appeared to be serologically identical and distinct from the isolates obtained from the other two bird species and from the previously described *Mycoplasma*, *Entomoplasma*, *Mesoplasma*, and *Acholeplasma* species. The results of an indirect immunofluorescence test, a growth inhibition test, and an immunobinding assay showed that the isolates belong to three new species, for which the names *Mycoplasma buteonis* (seven strains obtained from buzzards), *Mycoplasma falconis* (six strains obtained from saker falcons), and *Mycoplasma gypis* (eight strains obtained from griffon vultures) are proposed. *M. buteonis* ferments glucose, does not hydrolyze arginine or urea, reduces tetrazolium chloride and potassium tellurite anaerobically, does not produce films and spots, and does not possess phosphatase activity. *M. falconis* does not ferment glucose, hydrolyzes arginine but not urea, reduces tetrazolium chloride and potassium tellurite anaerobically, does not produce films and spots, and does not possess phosphatase activity. *M. gypis* does not ferment glucose, hydrolyzes arginine but not urea, reduces tetrazolium chloride and potassium tellurite aerobically and anaerobically, produces films and spots, and possesses phosphatase activity. The three new species lyse avian, bovine, equine, human, ovine, porcine, rabbit, and guinea pig erythrocytes, but do not adsorb these erythrocytes. The type strain of *M. buteonis* is Bb/T2g (= ATCC 51371), the type strain of *M. falconis* is H/T1 (= ATCC 51372), and the type strain of *M. gypis* is B1/T1 (= ATCC 51370).

In an investigation of wild birds, 21 mycoplasma strains that were serologically different from the avian mycoplasma species described previously were isolated (11, 12). Strains Bb/T2a, Bb/T2b, Bb/T2c, Bb/T2d, Bb/T2e, Bb/T2f, and Bb/T2g^T (T = type strain) were isolated from buzzards (*Buteo buteo*), strains H/T1^T, H/T2, H/T3, H/T4, H/T5, and H/T6 were isolated from saker falcons (*Falco cherrug*), and strains B1/T1^T, B1/T2, B1/T3, B1/T4, B1/T5, B1/T6, B1/T7, and B1/T8 were isolated from griffon vultures (*Gyps fulvus*). Mycoplasmas were obtained by swabbing tracheae. All birds were held in captivity, the buzzards and saker falcons in a bird sanctuary near Cordoba, Spain, and the griffon vultures in a bird sanctuary in Malaga, Spain. All of the strains were obtained from birds with signs of respiratory disease. In this paper the mycoplasma strains are characterized and compared with previously described sterol-requiring species belonging to the class *Mollicutes*.

MATERIALS AND METHODS

Isolation and cultivation of mycoplasmas. The tracheae of the birds were swabbed, and the swabs were suspended in 2 ml of medium containing (per 840 ml of double-distilled water) 21 g of PPLO broth base (Difco), 10 g of yeast extract (Difco), 0.2 g of DNA (Sigma), 5 ml of 100× Eagle vitamin solution (Difco), 2.5 ml of 10% thallium acetate, 0.1 g of β-NAD (Sigma), 0.1 g of L-cysteine hydrochloride (Sigma),

10⁶ IU of penicillin G, and 150 ml of swine serum. After incubation at 37°C under aerobic conditions for 5 days, the cultures were subcultured on solid media containing 34 g of PPLO agar (Difco) per liter instead of PPLO broth, and the subcultures were incubated for 7 days at 37°C in a moist atmosphere (11). All of the strains were filter cloned three times by using 450-nm-pore-size filters (11).

Morphological studies. The colonies of the mycoplasmas were examined with a stereomicroscope (Leitz). The cellular morphology of the organisms was assessed by dark-field microscopy and transmission electron microscopy of sectioned organisms. Ultrathin sections of organisms were prepared as described previously (9).

Filtration studies. The filterability of the cells was determined by using membrane filters (Millipore) having average pore diameters of 450 and 220 nm.

Reversion experiments. The organisms were subcultured seven times by using liquid or solid medium lacking penicillin or thallium acetate and were incubated aerobically at 37°C. Agar plates and fluid cultures were examined for alterations in the morphology of colonies and cells, respectively.

Sterol requirement. Inhibition of growth was tested by using paper discs that were previously wetted with 5, 10, or 20% sodium polyanetholsulfonate (Liquoid; Roche Diagnostics) or with 1.5% digitonin (Serva) (7). The sterol requirement was determined by using a broth culture technique described previously (9).

Biochemical tests. The glucose oxidase test was performed as described by Edward and Moore (5). Tests to determine breakdown of glucose, arginine, and urea, reduction of 2,3,5-triphenyltetrazolium chloride and potassium tellurite

* Corresponding author. Mailing address: Institut für Mikrobiologie und Tierseuchen, Tierärztliche Hochschule Hannover, Bischofsholer Damm 15, 30173 Hannover, Germany. Phone: (0511) 856 7595 (7238). Fax: (0511) 856 7697.

(aerobically and anaerobically), phosphatase activity, and film and spot production were performed as described by Aluotto et al. (1).

Hemolysis and hemadsorption. Hemolysis was tested by the overlay technique (1). Hemadsorption was investigated by using the method of Sobeslavsky et al. (13). Both tests were performed with avian, bovine, equine, human, ovine, porcine, rabbit, and guinea pig erythrocytes.

Preparation of antisera. Antisera against selected and filter-cloned mycoplasma strains were produced in rabbits as described previously (10). The organisms used for to prepare antisera were cultivated in medium lacking thallium acetate but supplemented with 1% glucose (strains isolated from buzzards) or 0.2% arginine (strains isolated from saker falcons and griffon vultures).

Serological tests. A serological comparison of the new mycoplasma isolates with each other and with members of previously described *Mollicutes* species was performed by using a growth inhibition test (GIT) (3), an indirect immunofluorescence test (IIFT) (4), and an immunobinding assay (IBA) (16). Antisera were used undiluted for the GIT and were diluted 1:50, 1:100, or 1:200 for the IIFT and IBA. For the GIT, plates were inoculated by the running drop method with mycoplasma cultures diluted 1:100. The serological tests were done in two directions with all of the avian *Mollicutes* species described previously and all *Mycoplasma* species having identical biochemical features. The comparison with the other *Mycoplasma* species and the *Entomoplasma*, *Mesoplasma*, and *Acholeplasma* species was done in only one direction (i.e., reference antisera investigated previously for quality and specificity with the colonies of the type strains of the new species). The antisera and type strains used for serological investigations are listed in Table 1.

DNA. The G+C contents of DNAs were determined by isopycnic centrifugation of three DNA batches (6).

RESULTS AND DISCUSSION

Morphology and ultrastructure. All of the avian mycoplasma strains tested produced typical fried egg colonies. Figure 1 shows typical colonies of strains Bb/T2g^T, H/T1^T, and B1/T1^T, which were selected as type strains. There were substantial differences in the colony sizes of the strains isolated from buzzards, saker falcons, and griffon vultures. Independent of growth density, the strains isolated from griffon vultures produced large colonies (diameter, >0.1 mm), the strains isolated from saker falcons produced medium-sized colonies (diameter, 0.05 to 0.1 mm), and the strains isolated from buzzards produced small colonies (diameter, <0.05 mm). Pleomorphic cells were observed in broth cultures by dark-field microscopy and after staining by the Gram technique. Ultrathin sections revealed the trilaminar structure of the cell membrane and the absence of a cell wall (Fig. 2). The cells of the three strains investigated appeared to be mainly coccoid or round. Filaments or ring forms were not observed.

Filtration characteristics. The following reductions in viable counts after passage through the 450-nm-pore-size filters were observed: from 3.0×10^9 to 4.1×10^7 CFU/ml for strain Bb/T2g^T, from 4.8×10^9 to 2.5×10^6 CFU/ml for strain H/T1^T, and from 6.4×10^9 to 1.3×10^7 CFU/ml for strain B1/T1^T. The viable counts after passage through 220-nm-pore-size filters were 1.6×10^3 CFU/ml for strain Bb/T2g^T, 3.6×10^4 CFU/ml for strain H/T1^T, and 2.8×10^4 CFU/ml for strain B1/T1^T.

Reversion studies. Low passages of all isolates were tested for reversion to bacterial forms. No reversion was observed after serial subcultivation in broth or on agar medium lacking bacterial inhibitors.

Sterol requirement. Strains Bb/T2g^T and B1/T1^T were susceptible to the three concentrations of sodium polyanetholsulfonate tested and to 1.5% digitonin; strain H/T1^T was susceptible to only 1.5% digitonin. In the cultural tests used to examine the sterol requirement, there was a clear growth response to different concentrations of cholesterol. No growth occurred in medium lacking serum and in the base medium containing 0.5% bovine serum albumin and 10 µg of palmitic acid per ml. There were, however, increasing levels of growth when cholesterol was added at concentrations of 1, 5, 10, and 20 µg/ml to the base medium.

Biochemical tests. All isolates from buzzards, all isolates from saker falcons, and all isolates from griffon vultures were identical in biochemical behavior (Table 2).

Serological investigations. The results of the GIT, IIFT, and IBA showed that all of the isolates from buzzards were identical to strain Bb/T2g^T, all of the strains from saker falcons were identical to strain H/T1^T, and all of the isolates from griffon vultures were identical to strain B1/T1^T. In the serological comparisons no reactions occurred in the GIT, IIFT, and IBA among strains Bb/T2g^T, H/T1^T, and B1/T1^T. Strains Bb/T2g^T, H/T1^T, and B1/T1^T were compared with previously described *Mycoplasma*, *Entomoplasma*, *Mesoplasma*, and *Acholeplasma* species by using the GIT, IIFT, and IBA. Antisera against *Mycoplasma cloacale* and *Mycoplasma cricetuli* gave weak reactions with strain B1/T1^T in the IBA (1+), and antiserum against *M. cloacale* also produced weak reactions in the IIFT (1+) and the GIT (inhibition zone size, 0.5 mm). These reactions were significantly weaker than the reactions with the homologous antisera, which produced 3+ reactions in the IIFT and IBA and an inhibition zone size of 5 mm in the GIT. *M. cloacale* seems to share antigens with other mycoplasmas. Antiserum against *M. cloacale* also produced weak cross-reactions in the IIFT with *Mycoplasma phocacerebrale* (8), as well as *Mycoplasma bovis*, *Mycoplasma bovoculi*, *Mycoplasma collis*, *Mycoplasma molare*, and ovine serovar 7 (2). In the GIT this antiserum also reacted with *Mycoplasma lipofaciens*, *Mycoplasma neurolyticum*, and *Mycoplasma sualvi* (2). There were no positive reactions in the GIT, IIFT, and IBA between antiserum against strain B1/T1^T and *M. cricetuli* and *M. cloacale* strains. No serological reactions were observed in the GIT, IIFT, and IBA between strain Bb/T2g^T, H/T1^T, or B1/T1^T and any of the previously described *Mycoplasma*, *Entomoplasma*, *Mesoplasma*, and *Acholeplasma* species listed in Table 1.

DNA base compositions. The G+C contents of strains Bb/T2g^T, H/T1^T, and B1/T1^T were 27.0, 27.5, and 27.1 mol%, respectively.

The properties described above for strains Bb/T2g^T, H/T1^T, and B1/T1^T fulfill the criteria (14, 15) for species descriptions of members of the class *Mollicutes*. A cell wall is absent, and the cells can be filtered through 220- and 450-nm-pore-size membranes, fail to revert to walled bacteria when they are grown in antibiotic-free media, have low G+C contents, are resistant to penicillin, and produce typical fried egg colonies on solid media. The growth requirement for sterol or serum, in conjunction with the lack of helicity, place these organisms in the order *Mycoplasmatales* and the family *Mycoplasmataceae*. The inability of the strains to hydrolyze urea mandates assignment to the genus *Mycoplasma*. Finally, the lack of serological related-

TABLE 1. *Mycoplasma*, *Entomoplasma*, *Mesoplasma*, and *Acholeplasma* strains and antisera used in comparative serological tests with the avian mycoplasmas

Organism	Source(s) ^a	
	Mycoplasma	Antiserum
<i>Mycoplasma agalactiae</i> PG2 ^T	IRC	IRC
<i>M. alkalescens</i> DBS80 ^T	NIH	NIH
<i>M. alvi</i> Ilsley ^T	IRC	IRC
<i>M. anatis</i> 1340 ^T	NIH	NIH, IMT
<i>M. anseris</i> 1219 ^T	VMR	VMR
<i>M. arginini</i> G230 ^T	NIH	NIH, IMT
<i>M. arthritidis</i> PG6 ^T	NIH	NIH, IMT
<i>M. bovirhinis</i> PG43 ^T	NIH	NIH, IMT
<i>M. bovis</i> Donetta ^T	IRC	IRC, IMT
<i>M. bovovulvi</i> M165/69 ^T	IRC	IRC
<i>M. buccale</i> CH20274 ^T	NIH	NIH
<i>M. californicum</i> ST6 ^T	IRC	IRC
<i>M. canadense</i> 275C ^T	IRC	IRC, IMT
<i>M. canis</i> PG14 ^T	NIH	NIH, IMT
<i>M. capricolum</i> California Kid ^T	IRC	IRC
<i>M. caviae</i> G122 ^T	IRC	NIH, IMT
<i>M. cavipharyngis</i> 117C ^T	FCR	FCR
<i>M. citelli</i> RG-2C ^T	IRC	IRC
<i>M. cloacale</i> 383 ^T	FCR	FCR
<i>M. collis</i> 58B ^T	FCR	FCR
<i>M. columbinasale</i> 694 ^T	IRC	IRC
<i>M. columbinum</i> MMP-1 ^T	IRC	IRC
<i>M. columborale</i> MMP-4 ^T	IRC	IRC
<i>M. conjunctivae</i> HRC 581 ^T	IRC	NIH, IMT
<i>M. corogypsi</i>	CVA	IMT
<i>M. cricetuli</i> CH ^T	FCR	FCR
<i>M. cynos</i> H831 ^T	IRC	IRC, IMT
<i>M. dispar</i> 462/2 ^T	IRC	IRC, IMT
<i>M. edwardii</i> PG24 ^T	IRC	IRC, IMT
<i>M. equigenitalium</i> T37 ^T	IMT	IMT
<i>M. equirhinis</i> M432/72 ^T	LIRA	LIRA, IMT
<i>M. fastidiosum</i> 4822 ^T	IRC	IRC
<i>M. faucium</i> DC333 ^T	NIH	NIH
<i>M. felifaucium</i> PV ^T	MRC	MRC
<i>M. feliminutum</i> Ben ^T	IRC	IRC
<i>M. felis</i> CO ^T	IRC	NIH, IMT
<i>M. fermentans</i> PG18 ^T	NIH	NIH, IMT
<i>M. flocculare</i> Ms42 ^T	SVS	SVS
<i>M. gallinaceum</i> DD ^T	NIH	NIH, IMT
<i>M. gallinarum</i> PG16 ^T	NIH	NIH
<i>M. gallisepticum</i> PG31 ^T	NIH	NIH, IMT
<i>M. gallopavonis</i> WR1 ^T	IRC	IRC
<i>M. gateae</i> C1 ^T	IRC	IRC, IMT
<i>M. genitalium</i> G37 ^T	FCR	FCR
<i>M. glycophilum</i> 486 ^T	FCR	FCR
<i>M. hominis</i> PG21 ^T	NIH	NIH
<i>M. hyopharyngis</i> H3-6BF ^T	FCR	FCR
<i>M. hyopneumoniae</i> J ^T	SVS	SVS, IMT
<i>M. hyorhinis</i> BTS7 ^T	NIH	NIH, CVM
<i>M. hyosynoviae</i> S16 ^T	CVM	CVM, IMT
<i>M. iners</i> PG30 ^T	NIH	NIH
<i>M. iowae</i> 695 ^T	IRC	IRC
<i>M. leocaptivus</i> 3L2 ^T	NCTC	NCTC
<i>M. leopharyngis</i> LL2 ^T	NCTC	NCTC
<i>M. lipofaciens</i> R171 ^T	FCR	FCR
<i>M. lipophilum</i> MaBy ^T	NIH	NIH
<i>M. maculosum</i> PG15 ^T	NIH	NIH
<i>M. meleagridis</i> 17529 ^T	IRC	IRC
<i>M. moatsii</i> MK405 ^T	IRC	IRC, IMT
<i>M. mobile</i> 163K	IMT	IMT
<i>M. molaris</i> H542 ^T	IRC	IRC, IMT
<i>M. muris</i> RIII4 ^T	FCR	FCR
<i>M. mustelae</i> MX9 ^T	FCR	FCR
<i>M. mycoides</i> subsp. <i>mycoides</i> PG1 ^T	IRC	IRC
<i>M. mycoides</i> subsp. <i>capri</i> PG3 ^T	IRC	IRC

Continued

TABLE 1—Continued

Organism	Source(s) ^a	
	Mycoplasma	Antiserum
<i>M. neurolyticum</i> type A ^T	NIH	NIH, IMT
<i>M. opalescens</i> MH5408 ^T	IRC	IRC, IMT
<i>M. orale</i> CH19299 ^T	NIH	NIH
<i>M. ovipneumoniae</i> Y98 ^T	IRC	IRC, IMT
<i>M. oxoniensis</i> 128 ^T	FCR	FCR
<i>M. phocacerebrale</i> 1049 ^T	IMT	IMT
<i>M. phocarinis</i> 852 ^T	IMT	IMT
<i>M. phocidae</i> 105 ^T	MAFC	MAFC
<i>M. pirum</i> HRC 70-159 ^T	FCR	FCR
<i>M. pneumoniae</i> FH ^T	NIH	NIH, IMT
<i>M. primatum</i> HRC292 ^T	NIH	NIH
<i>M. pullorum</i> CKK ^T	IRC	IRC
<i>M. pulmonis</i> PG34 ^T	NIH	NIH, IMT
<i>M. putrefaciens</i> KS1 ^T	IRC	IRC, IMT
<i>M. salivarium</i> PG20 ^T	NIH	NIH
<i>M. simbae</i> LX ^T	NCTC	NCTC
<i>M. somnilux</i> PYAN-1 ^T	FCR	FCR
<i>M. spermatophilum</i> AH 159 ^T	FCR	FCR
<i>M. spumans</i> PG13 ^T	NIH	NIH, IMT
<i>M. sualvi</i> Mayfield B ^T	GIRA	GIRA
<i>M. subdolum</i> TB ^T	MIT	MIT
<i>M. synoviae</i> WVU 1853 ^T	IRC	IRC
<i>M. testudinis</i> 01008 ^T	MRC	MRC
<i>M. verecundum</i> 107 ^T	IRC	IRC, IMT
<i>Entomoplasma ellychniae</i> ELCN-1 ^T	FCR	FCR
<i>E. lucivorax</i> PIPN-2 ^T	FCR	FCR
<i>E. luminosum</i> PIMN-1 ^T	FCR	FCR
<i>E. melaleuca</i> M1 ^T	FCR	FCR
<i>E. somnilux</i> PYAN-1 ^T	FCR	FCR
<i>Mesoplasma entomophilum</i> TAC ^T	FCR	FCR
<i>M. florum</i> L1 ^T	FCR	FCR
<i>M. lactuca</i> 831-C4 ^T	FCR	FCR
<i>Acholeplasma axanthum</i> H86N ^T	IRC	IRC, IMT
<i>A. equifetale</i> ^T	IMT	IMT
<i>A. granularum</i> BTS39 ^T	NIH	NIH, IMT
<i>A. hippikon</i> C1 ^T	IMT	IMT
<i>A. laidlawii</i> PG8 ^T	NIH	NIH, IMT
<i>A. modicum</i> PG49 ^T	IRC	IRC, IMT
<i>A. morum</i> 72-43 ^T	FCR	FCR
<i>A. multilocale</i> PN 525 ^T	MRC	MRC
<i>A. oculi</i> 19L ^T	IRC	IRC, IMT
<i>A. parvum</i> H23M ^T	FCR, VFF	FCR, VFF
<i>Bovine serogroup strain 7PG50</i>	IRC	IRC

^a Abbreviations: CVA, V. S. Panangala, College of Veterinary Medicine, Auburn University, Auburn, Ala.; CVM, R. F. Ross, College of Veterinary Medicine, Iowa State University, Ames; FCR, J. G. Tully, Mycoplasma Section, Frederick Cancer Research Facility, Frederick, Md.; GIRA, R. M. Gourlay, Institute for Research on Animal Diseases, Compton, Newbury, Berkshire, England; IMT, H. Kirchhoff, Institut für Mikrobiologie und Tierseuchen, Tierärztliche Hochschule Hannover, Hannover, Germany; IRC, E. A. Freundt, Food and Agriculture Organization, World Health Organization International Reference Centre for Animal Mycoplasmas, Aarhus, Denmark; LIRA, R. Lemcke, Institute for Research on Animal Diseases, Compton, Newbury, Berkshire, England; MAFC, H. L. Ruhnke, Ministry of Agriculture and Food, Veterinary Laboratory Services, Guelph, Ontario, Canada; MRC, A. Hill, Medical Research Council Laboratories, Carshalton, Surrey, England; NCTC, National Collection of Type Cultures, London, England; NIH, M. F. Barile (Food and Drug Administration) and J. G. Tully, National Institutes of Health, Bethesda, Md.; SVS, N. F. Friis, Statens Veterinære Serum Laboratorium, Copenhagen, Denmark; VFF, M. Ogata, Department of Veterinary Public Health, Azabu University, Fuchinohe Sagami-hara, Kanagawa, Japan; VMR, L. Stipkovits, Veterinary Medical Research Institute, Hungarian Academy of Science, Budapest, Hungary.

FIG. 1. Typical fried egg morphology of colonies of avian mycoplasma strains Bb/T2g^T (a), H/T1^T (b), and B1/T1^T (c) on agar medium after incubation for 3 days. Note the differences in the colony sizes of the three mycoplasma strains. Bars = 125 μ m.

ness of these strains to other *Mollicutes* species demonstrates that they represent previously unrecognized species. We propose the following names: *Mycoplasma buteonis* for strain Bb/T2g^T, *Mycoplasma falconis* for strain H/T1^T, and *Mycoplasma gypis* for strain B1/T1^T. The taxonomic descriptions below summarize the properties of the three strains.

***Mycoplasma buteonis* sp. nov.** *Mycoplasma buteonis* (bu. te.o'nis L. masc. n. buzzard, *buteonis* of the buzzard). Cells lack true cell walls and are coccoid or round. Colonies on solid medium usually have a typical fried egg appearance. Chemoorganotroph. Ferments glucose aerobically and anaerobically. Arginine and urea are not hydrolyzed. Reduces tetrazolium chloride and potassium tellurite anaerobically. Film and spot production negative. Does not possess

phosphatase activity. Lyses avian, bovine, equine, human, ovine, porcine, rabbit, and guinea pig erythrocytes. Does not adsorb erythrocytes. Cholesterol or serum is required for growth. The optimum growth temperature is 37°C. Serologically distinct from other *Mycoplasma* species. Isolated from the tracheae of buzzards (*B. buteo*). The G+C content of the DNA is 27.0 mol%, as determined by isopycnic centrifugation. Pathogenicity, however, has not been proved. The type strain is strain Bb/T2g^T (= ATCC 51371).

***Mycoplasma falconis* sp. nov.** *Mycoplasma falconis* (fal. co'nis falco L. masc. n. falcon, *falconis* of the falcon). Cells lack true cell walls and are coccoid or round. Colonies on solid medium have a fried egg appearance. Chemoorganotroph. Does not ferment glucose. Hydrolyzes arginine but

FIG. 2. Electron micrographs of ultrathin sections of avian mycoplasma strains Bb/T2g^T (a), H/T1^T (b), and B1/T1^T (c), showing the absence of a cell wall and the presence of a trilaminar membrane. (a and b) Bars = 250 nm. (c) Bar = 100 nm.

TABLE 2. Biochemical properties of the new species

Strains isolated from:	Fermentation of glucose	Hydrolysis of:		Phosphatase activity	Reduction of:				Film and spot production	Avian, bovine, equine, human, ovine, porcine, rabbit, and guinea pig erythrocyte:	
		Argine	Urea		2,3,5-Triphenyl-tetrazolium chloride		Potassium tellurite			Hemolysis	Hemadsorption
					Aero-bically	Anaero-bically	Aero-bically	Anaero-bically			
Buzzards	+	—	—	—	—	+	—	+	—	+	—
Saker falcons	—	+	—	—	—	+	—	+	—	+	—
Griffon vultures	—	+	—	+	+	+	+	+	+	+	—

not urea. Reduces tetrazolium chloride and potassium tellurite anaerobically. Does not possess phosphatase activity. Film and spot production negative. Lyses avian, bovine, equine, human, ovine, porcine, rabbit, and guinea pig erythrocytes. Does not adsorb erythrocytes. Cholesterol or serum is required for growth. The optimum growth temperature is 37°C. Serologically distinct from other *Mycoplasma* species. Isolated from the tracheae and infraorbital sinuses of saker falcons (*F. cherrug*). The G+C content of the DNA is 27.5 mol%, as determined by isopycnic centrifugation. Isolated from birds with respiratory diseases. Pathogenicity, however, has not been proved. The type strain is strain H/T1^T (= ATCC 51372).

Mycoplasma gypis sp. nov. *Mycoplasma gypis* (gy'pis gyps G. and M.L. n. vulture, *gypis* M.L. genitive n. of the vulture). Cells lack true cell walls and are coccoid or round. Colonies on solid medium usually have a fried egg appearance. Chemoorganotroph. Does not ferment glucose. Hydrolyzes arginine but not urea. Reduces tetrazolium chloride and potassium tellurite aerobically and anaerobically. Possesses phosphatase activity. Films and spots are produced on agar medium containing 20% horse serum. Lyses avian, bovine, equine, human, ovine, porcine, rabbit, and guinea pig erythrocytes. Does not adsorb these erythrocytes. Cholesterol or serum is required for growth. The optimum growth temperature is 37°C. Serologically distinct from other *Mycoplasma* species. Isolated from the tracheae of griffon vultures (*G. fulvus*). The G+C content of the DNA is 27.1 mol%, as determined by isopycnic centrifugation. Isolated from birds with respiratory diseases. Pathogenicity, however, has not been proved. The type strain is strain B1/T1^T (= ATCC 51370).

ACKNOWLEDGMENTS

We thank all of the workers listed in Table 1 for providing mycoplasma strains and antisera.

REFERENCES

- Aluotto, B. B., R. G. Wittler, C. O. Williams, and J. E. Faber. 1970. Standardized bacteriologic techniques for the characterization of *Mycoplasma* species. *Int. J. Syst. Bacteriol.* **20**:35–58.
- Bradbury, J. M., and M. Forrest. 1984. *Mycoplasma cloacale*, a new species isolated from turkey. *Int. J. Syst. Bacteriol.* **34**:389–392.
- Clyde, W. A. 1964. *Mycoplasma* species identification based upon growth inhibition by specific antisera. *J. Immunol.* **92**:958–965.
- Del Giudice, R. A., F. Robillard, and T. R. Carski. 1967. Immunofluorescence identification of mycoplasma on agar by use of incident illumination. *J. Bacteriol.* **93**:1205–1209.
- Edward, D. G., and W. B. Moore. 1975. A method for determining utilization of glucose by mycoplasmas. *J. Med. Microbiol.* **8**:451–454.
- Flossdorf, J. 1983. A rapid method for the determination of the base composition of bacterial DNA. *J. Microbiol. Methods* **1**:305–311.
- Freundt, E. A., B. E. Andrews, H. Erno, M. Kunze, and F. T. Black. 1973. The sensitivity of *Mycoplasmatales* to sodium-polyanetholsulfonate and digitonin. *Zentralbl. Bakteriol. Parasitenkd. Infektionskr. Hyg. Abt. 1 Orig. Reihe A* **225**:104–112.
- Giebel, J., J. Meier, A. Binder, J. Flossdorf, J. B. Poveda, R. Schmidt, and H. Kirchhoff. 1991. *Mycoplasma phocarhinis* sp. nov. and *Mycoplasma phocacerebrale* sp. nov., two new species from harbor seals (*Phoca vitulina* L.). *Int. J. Syst. Bacteriol.* **41**:39–44.
- Kirchhoff, H., P. Beyene, M. Fischer, J. Flossdorf, J. Heitmann, B. Khattab, D. Lopatta, R. Rosengarten, G. Seidel, and C. Yousef. 1987. *Mycoplasma mobile* sp. nov., a new species from fish. *Int. J. Syst. Bacteriol.* **37**:192–197.
- Morton, H. E., and R. J. Roberts. 1966. Production of antimycoplasma (PPLO) antibodies in rabbits. *Proc. Soc. Exp. Biol. Med.* **125**:538–542.
- Poveda, J. B., J. Giebel, H. Kirchhoff, and A. Fernandez. 1990. Isolation of mycoplasmas from buzzard, falcons and vultures. *Avian Pathol.* **19**:779–783.
- Poveda, J. B., A. Miranda, J. Carranza, A. Garrido, M. Hermoso, A. Fernandez, and J. Domech. 1990. An epizootiological study of avian mycoplasmas in southern Spain. *Avian Pathol.* **19**:627–633.
- Sobeslavsky, O., B. Prescott, and R. M. Chanock. 1968. Absorption of *Mycoplasma pneumoniae* to neuraminic acid receptors of various cells and possible role in virulence. *J. Bacteriol.* **96**:695–705.
- Subcommittee on the Taxonomy of *Mollicutes*. 1979. Proposal of minimal standards for description of new species of the class *Mollicutes*. *Int. J. Syst. Bacteriol.* **29**:172–180.
- Subcommittee on the Taxonomy of *Mollicutes*. 1988. Minutes of the interim meeting, 25 and 28 August 1986, Birmingham, Alabama. *Int. J. Syst. Bacteriol.* **38**:226–230.
- Ter Laak, E. A., and J. H. Noodergaaf. 1987. An improved method for the identification of *Mycoplasma dispar*. *Vet. Microbiol.* **14**:25–31.