

## Antibodies against *Anaplasma phagocytophilum*

Human Granulocytic Anaplasmosis (HGA) was first recognized in the United States (Chen *et al.* 1994) and is the most common tick transmitted disease after Borreliosis. Causative agent of this emerging zoonosis is the rickettsial species *Anaplasma phagocytophilum*, a Gram-negative obligate intracellular pathogen infecting mammalian hosts worldwide. It is endemic in 42 countries with an overall case fatality of 5% (Atifi *et al.* 2015). Pathogenesis of HGA is an issue of global concern as the number of cases is continuously increasing due to global warming, increases in recreational outdoor activities, and worldwide trade (Atifi *et al.* 2015; Wang *et al.* 2013). In certain parts of Asia patients are even considered to develop more frequently a serious form of the disease concomitant with an increased fatality rate (Wang *et al.* 2013).

Manifestation of HGA includes mostly non-specific flulike symptoms. Therefore, patients are often initially misdiagnosed with a mild viral infection. Five percent of the patients develop life-threatening complications and delay in treatment may result in severe illness and even death (Atifi *et al.* 2015). *A. phagocytophilum* has a complex life cycle and develops within ticks typically belonging to the *Ixodes persulcatus* complex. It requires evasion of the immune system in order to persist in the mammalian host. *A. phagocytophilum* invades and replicates within neutrophils by employing an array of mechanisms to subvert their bactericidal activity. Concurrent infection of *A. phagocytophilum* with other tick-borne pathogens, transmitted by the same vector, have been reported (Atifi *et al.* 2015).

The immunodominant major surface protein 5 (Msp5) has been used for diagnosis of *Anaplasma* in mammals since several years (Palmer *et al.* 1994). During biological transmission, the 20-kDa protein is expressed in the salivary glands of infected ticks (Knowles *et al.* 1996). Visser *et al.* (1992) suggested that it is an important protein in the *Anaplasma* life cycle.

Commonly recognized by antibodies in HGA patient sera is also the p44 protein (Ijdo *et al.* 1998). It is a member of the outer membrane protein superfamily (OMP1/ Msp2/ p44), which are regarded important virulence factors of *Anaplasma* pathogens (Chávez *et al.* 2012; Park *et al.* 2003). The protein is thought to allow the bacterium to adhere to the host cell and avoid host immune surveillance (Ijdo *et al.* 1998; Wang *et al.* 2013). Presently it is a very well-known serodiagnostic protein (Gaowa *et al.* 2014).

The major outer membrane protein A (OmpA) is a peptidoglycan-binding lipoprotein promoting endocytosis of the bacterial cells. OmpA is critical for entry and infection of mammalian host cells (Kahlon *et al.* 2013; Ojogun *et al.* 2012).

DIARECT's *Anaplasma phagocytophilum* antigens Msp5, OmpA and p44 are produced in the baculovirus/insect cell expression system and *E. coli*, respectively.

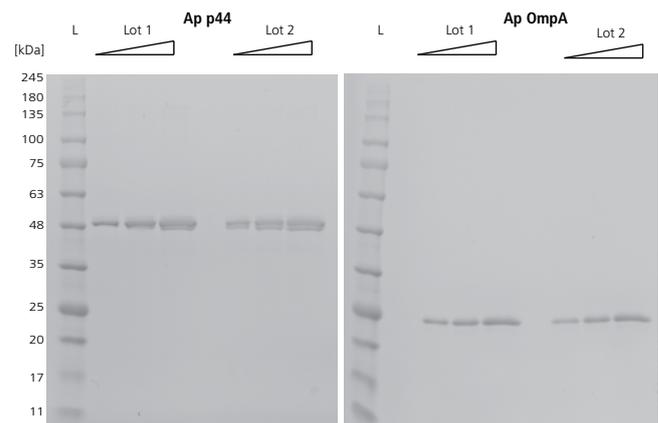


Figure: SDS-PAGE of two independent lots of *A. phagocytophilum* (Ap) p44 and OmpA. The molecular weight of protein standards included in the size ladder (L) are indicated on the left.

### References:

- Atifi *et al.* (2015) Parasitol Res. DOI 10.1007/s00436-015-4698-2
- Chávez *et al.* (2012) PLoS One. 7 (4): e36012
- Chen *et al.* (1994) J Clin Microbiol. 32: 589–595
- Gaowa *et al.* (2014) Emerg Infect Dis. 20: 508–509
- Ijdo *et al.* (1998) Infect Immun. 66: 3264–3269
- Kahlon *et al.* (2013) Infect Immun. 81: 65–79
- Knowles *et al.* (1996) J Clin Microbiol. 34: 2225–2230
- Ojogun *et al.* (2012) Infect Immun. 80: 3748–3760
- Palmer *et al.* (1994) J Clin Microbiol. 42: 5381–5384
- Park *et al.* (2003) Infect Immun. 71: 4018–4025
- Visser *et al.* (1992) Infect Immun. 60: 5139–5144
- Wang *et al.* (2013) PLoS One. 8 (10): e78189

In some countries the use of certain antigens in diagnostic tests may be protected by patents. DIARECT is not responsible for the determination of these issues and suggests clarification prior to use.

### Ordering Information

45600	<i>Anaplasma phagocytophilum</i> Msp5	0.1 mg
45601		1.0 mg
45800	<i>Anaplasma phagocytophilum</i> OmpA	0.1 mg
45801		1.0 mg
45500	<i>Anaplasma phagocytophilum</i> p44	0.1 mg
45501		1.0 mg

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