Avian Pathogenic Escherichia coli in Audouin gulls (Larus audouinii).
Could they affect the surviving of the bird colonies?

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ABSTRACT

A total of 39 E. coli strains isolated from cloacal swabs and unhatched eggs of Audouin’s gulls (Larus audouinii) living the Salento coast (Italy) were serotyped and molecular characterized for the presence of irp2, fyuA, tsh, papC, fimC, iucD, and eae genes described for Avian Pathogenic E. coli (APEC). Eight different serogroups (O1, O6, O8, O15, O75, O139, O146, O147) were distinguished: we recorded a very high rate of untypeable strains. Genotyping by PCR achieved to detect fimC and irp2, described for APEC strains, as most predominant genes circulating in the gulls population, accounting for 94.87% and 97.43% respectively. Nevertheless, a significant co-existence of virulence genes was demonstrated to belong to E. coli of eggs origin. Particularly, fimC/tsh/iucD pathotype, recognized as most responsible of illness in poultry, emerged in 8.69% of E. coli of eggs origin.

Key words: E. coli, APEC, Audouin’s gull, Virulence genes, Serogroups.

RIASSUNTO

AVIAN PATHOGENIC ESCHERICHIA COLI IN GABBIANI (LARUS AUDOUINII). POTREBBERO INFLUENZARE LA SOPRAVVIVENZA DELLE COLONIE DI UCCELLI?

Trentanove stipiti di E. coli isolati da uova embrionate non schiuse e tamponi cloacali di gabbiani corsi (Larus audouinii), facenti parte di una colonia stanziale nel Salento (Puglia), sono stati sierotipizzati e testati nei confronti dei principali geni di virulenza espressi dagli Avian Pathogenic Escherichia coli (APEC) (irp2, fyuA, tsh, papC, fimC, iucD ed eae). Sono stati distinti 8 diversi sierotipi (O1, O6, O8, O15, O75, O139, O146, O147). Elevata la percentuale di E. coli non tipizzabili. La ricerca dei geni di virulenza ha evidenziato la prevalenza dei geni fimC e irp2 (rispettivamente 94,87 e 97,43%) tipici degli Avian Pathogenic E. coli. I ceppi che veicolavano il maggior numero di geni di virulenza provenivano soprattutto dalle uova. In particolare, l’8,69% di questi apparteneva al patotipo FimC/tsh/IucD associato nel pollo a focolai di malattia.

Parole chiave: E. coli, APEC, Gabbiano corso, Geni di virulenza, Sierotipi.
Introduction

Nowadays various species of gulls are recognized worldwide (Olsen, 2004). Some of them, have modified in time their natural dietary attitudes and are able to live in close contact with human beings getting surviving in the new environment. Some other species like Audouin’s gulls (Larus audouinii) need specific habitats to survive owing to the lower ability to adapt to environmental changings. This feature could in time cause severe losses in the group even to threaten its surviving. Audouin’s gulls are scarcely diffused worldwide: some little colonies gather the Spanish coasts, while some others lay on the little isles surrounding Sardinia and Salento (Southern Italy) regions.

Then, protection and safe of this gull’s specie must be accurately considered. Monitoring animals could be a successful and easy method of investigation to provide, earlier, useful instruments to guarantee their preservation in nature.

Among the group of avian pathogens, E. coli (APEC- Avian Pathogenic E. coli) represents a very frequent and emerging cause of disease. This germ normally lives as commensal in the bowel flora as well as it can cause various clinical pictures characterized by severe enteritis, polyserositis, salpingitis, pericarditis and septicemia or asymptomatic infections. The attitude of APEC to induce disease is due to several mechanisms of virulence that allow the bacteria to gain all other host’s tissues (Schubert et al., 1998).

Then, infections from E. coli possessing invasive properties may represent a real risk factor for the surviving of the avian colonies.

In the present study, E. coli strains isolated from cloacal swabs and unhatched eggs of Audouin’s gulls (Larus auduinii) living the Southern coast of Salento region were screened to investigate the occurrence of APEC strains and to provide useful data about the pathogenic potential of these bacteria circulating in the avian colony.

Material and methods

A total of thirty-nine E. coli strains isolated from cloacal swabs and unhatched eggs from Audouin’s gulls (Larus auduinii) living the Southern coast of Salento region were tested. All the isolates were O-serogrouped and investigated for the presence of virulence genes.

Serogrouping was carried out using a monospecific panel of 37 antisera (O1, O2, O4, O6, O8, O9, O10, O11, O15, O18, O20, O21, O22, O26, O45, O49, O64, O73, O75, O78, O83, O86, O88, O101, O103, O109, O111, O115, O128, O132, O138, O139, O141, O147, O149, O153, O157), according to the national and international literature for poultry, rabbits and livestock (Blanco et al., 1998).

Irp2, FyuA, Tsh, PapC, FimC, IucD and eae sequence primers used for searching of virulence genes are reported by Janßen et al. (2001) and Oswald et al. (2000). PCR amplification programs are described by Giovanardi et al. (2005).

Results and discussion

A total of 8 O-serogroups falling into pathogenic serogroups for chickens and turkeys were distinguished (Table 1) (Giovanardi et al., 2005). In fact, in avian species, O78 (never found in our investigation) O1 and O2, O8, O15 O109 and O139 are reported to be common sources of colibacillosis. 64.10% of strains was untypeable, so we couldn’t carry a comparative analysis between O-serogroups and virulence genes.

We suppose that E. coli strains circulating among wild gulls differ antigenically from those of domestic origin.

Molecular investigations displayed that 39.76% of samples carried at least four combinations of genes: of them 75% were isolated from unhatched eggs. 8.69% of the same samples harboured combinations of six and seven genes. Interestingly, E. coli obtained from cloacal swabs exhibited a maximum number of 4 genes.
In our investigation, the latter emerged in 8.69% of E. coli isolated from eggs. Further it can be assumed that the pathogenicity of APEC strains may be enforced by accumulation and co-expression of multiple virulence genes. In 52.17% of strains of eggs origin different combinations ranging from three to seven genes were observed, while 62.5% of cloacal swabs were just positive to one or two genes. These results suggest how E. coli infections in embryos may represent one of the main causes of non-hatching. However, detection of virulent E. coli is not always related with emergence of disease as the APEC- harbouring healthy gulls confirmed.

Conclusions

Probably, the occurrence of colibacillosis among a population of birds is influenced by the action of biological and environmental stresses that predispose E. coli strains to express its virulence. Susceptibility to APEC infections is, obviously stronger for poultry living under breeding pressure than wild gulls. This may explain why severe clinical pictures from virulent E. coli did not take place in free gulls population.
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