be a new target for the strategy of disease control and vaccine development.

Keywords: Thrombocytes, Interferon, TLRs, innate immunity, interferon regulatory factor

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O-105.

Activation of DExD/H-box RNA helicases during infection of zebrafish and common carp with spring viraemia of carp virus (SVCV) and chum salmon reovirus (CSV)

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Abstract
The innate immune system detects viral infection predominantly by sensing viral nucleic acids in infected cells. The main sensors of viral RNA in cytoplasm are members of RIG-I-like receptors (RLR) such as RIG-I, MDA5 and LGP2. Recently, several non-RLR DExD/H-box RNA helicases have been also shown to play important role in sensing of viral nucleic acids in the cytoplasm and to activate downstream signaling pathways leading to type I interferons (IFN) production and anti-viral response in mammals. However, the mechanisms of action of these RNA helicases are still not fully understood, and their role in the anti-viral immune response in fish has not been studied. In the present work we aimed to study, for the first time in fish, the anti-viral role of DExD/H-box RNA helicases: DDX1, DDX3, DHX9, DDX21 and DHX36 during viral infection of two cyprinid fish: zebrafish (*Danio rerio*) and common carp (*Cyprinus carpio*). We studied expression of DExD/H-box RNA helicases, type I IFNs and antiviral proteins in zebrafish during infection with spring viraemia of carp virus (SVCV) and chum salmon reovirus (CSV) both *in vitro* (ZF4 cell line) and *in vivo*. Moreover, expression of studied genes was analyzed in common carp during *in vivo* infection with SVCV. *In vitro* studies of both viral models demonstrated a significant up-regulation of the expression of IFN type I genes in ZF4 cell line. However, SVCV did not induce changes in the gene expression of DExD/H-box RNA helicases, up-regulation of the expression of *ddx3*, *dhx9* and *ddx21* was observed in ZF4 cells upon CSV infection. *In vivo* SVCV infection of zebrafish induced a significant up-regulation of *ddx1* and *dhx36* expression while CSV infection induced a significant up-regulation of *ddx1* and *dhx9* expression. In both infection models an up-regulation of the expression of IFN type I genes and interferon stimulated genes (ISG) *mxa* and *vig-1* was observed. In common carp SVCV infection resulted in up-regulation of the expression of *ddx1*, *dhx9* and *ddx21*, IFN type I and *vig-1*. In both zebrafish and common carp, the up-regulation of the gene expression of DExD/H-box RNA helicases correlated with the increase of the viral load and in most of the cases preceded up-regulation of the IFN type I genes expression. In conclusions our data suggest that non-RLR DExD/H-box RNA helicases might be involved in fish in sensing of viral infection and induction of anti-viaral immune response.
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Keywords: DExD/H-box RNA helicases, interferons, *vig-1*, SVCV, CSV

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O-106.

The fish coagulation system could help to prevent infection by the ciliate parasite *Philasterides dicentrarchi*

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Abstract
In addition to its role in hemostasis, the coagulation system is involved in defence against pathogens in invertebrates and vertebrates. In mammals, the coagulation system has been shown to participate in entrapping pathogens and activating the early immune response. Although many studies have described different components of the fish coagulation system, there is a lack of information about the importance of the system in host defence against pathogens. In the present study, we showed that injecting turbot (*Scophthalamus maximus*) with the pathogenic ciliate *Philasterides dicentrarchi* generates the formation of macroscopic intraperitoneal clots in the fish. The clots contained abundant, immobilized ciliates, many of which were lysed. We observed that the plasma clots immobilize and kill the ciliates in vitro. However, fish plasma treated with a tetrapeptide known to inhibit fibrinogen/thrombin clotting in mammals killed *P. dicentrarchi* slightly faster than the untreated plasma, although the overall mortality rate was similar. We also found that kaolin, a particulate activator of the intrinsic pathway in mammals, accelerates plasma clotting in turbot. PMA-stimulated neutrophils, living ciliates and several ciliate components (such as cilia, proteases and DNA) also displayed procoagulant activity in vitro. In addition to generating clots in the peritoneal cavity, i.p. injection of ciliates generated massive migration of neutrophils to the peritoneal cavity, with the formation of large cell aggregates and of numerous fibrin-like fibres in the peritoneal exudate, many of which were associated with peritoneal leukocytes and ciliates. Expression of the CD18/CD11b gene, an integrin associated with cell adhesion and the induction of fibrin formation, was upregulated in the peritoneal leukocytes. In conclusion, the results of the present study suggest that the fish coagulation system plays an important role in immobilizing *P. dicentrarchi* during early moments of infection and appears to be an important component of the protection against this pathogen in fish.
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Keywords: Coagulation system; Complement; Fish; Neutrophils; *Philasterides dicentrarchi*; Plasma

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O-107.

Pituitary adenylate cyclase-activating polypeptide (PACAP) is lethal to *Flavobacterium psychrophilum* through membrane permeabilization and by priming immune function in rainbow trout macrophages

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