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## **Exploitation of host chemokine signalling by pathogenic mycobacteria**

Torraca, V.

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## List of abbreviations

|            |                                                           |
|------------|-----------------------------------------------------------|
| AB/TL      | AB/Tupfel long fin                                        |
| AC         | Adenylyl cyclase                                          |
| Ackr       | Atypical chemokine receptor                               |
| AGM        | Aorta, gonads and mesonephros                             |
| AJ         | Ashkenazi Jewish                                          |
| ASMase     | Acid sphingomyelinase                                     |
| BALB/c     | Bagg Albino/c                                             |
| BCA        | Bicinchoninic acid                                        |
| <i>Bcc</i> | <i>Burkholderia cenocepacia</i>                           |
| BCG        | Bacillus of Calmette–Guérin                               |
| bHLH       | Basic helix-loop-helix                                    |
| BLT1       | Leukotriene B4 receptor 1                                 |
| bZip       | Basic Leucine zipper                                      |
| C/ebpβ     | CCAAT enhancer-binding protein β                          |
| cAMP       | Cyclic adenosine monophosphate                            |
| Cas9       | CRISPR-associated protein 9                               |
| Ccl1       | Cys-Cys motif chemokine ligand                            |
| Ccr1       | Cys-Cys motif chemokine receptor                          |
| Cdc42      | Cell division control protein 42 homologue                |
| CFU        | Colony forming unit                                       |
| CHT        | Caudal haematopoietic tissue                              |
| CLEAR      | Coordinated lysosomal expression and regulation           |
| Coro-1a    | Coronin 1a                                                |
| COX        | Cyclooxygenase                                            |
| CRISPR     | Clustered regularly interspaced short palindromic repeats |
| CV         | Caudal vein                                               |
| Cx3cl      | Cys-X3-Cys motif chemokine ligand                         |
| Cx3cr      | Cys-X3-Cys motif chemokine receptor                       |
| Cxcl       | Cys-X-Cys motif chemokine ligand                          |
| Cxcr       | Cys-X-Cys motif chemokine receptor                        |
| Cxl        | Cys-X motif chemokine ligand                              |
| Cxr        | Cys-X motif chemokine receptor                            |
| CYPD       | Cyclophilin D                                             |
| DAG        | Diacylglycerol                                            |
| DARC       | Duffy antigen chemokine receptor                          |
| DC         | Dendritic cell                                            |
| DMSO       | Dimethyl sulfoxide                                        |
| Dpf        | Days post fertilisation                                   |
| Dpi        | Days post infection/injection                             |
| DRY        | Asp-Arg-Tyr                                               |
| dsDNA      | Double-stranded DNA                                       |
| DUOX       | Dual oxidase                                              |
| <i>Ec</i>  | <i>Escherichia coli</i>                                   |
| ECM        | Extracellular matrix                                      |
| eGFP       | Enhanced Green fluorescent protein                        |
| Eif        | Eukariotic initiation factor                              |
| ELR        | Glu-Leu-Arg                                               |
| ENA78      | Epithelial-derived neutrophil-                            |

|                  |                                                    |
|------------------|----------------------------------------------------|
|                  | activating peptide 78                              |
| ER               | Endoplasmic reticulum                              |
| ERP              | Exported repeated protein                          |
| ESAT-6           | Early secretory antigenic target 6 kDa             |
| ESX-1            | ESAT-6 secretion system 1                          |
| FACS             | Fluorescence-activated cell sorting                |
| Fli1a            | Friend leukemia integration 1a                     |
| GCP2             | Granulocyte chemotactic protein 2                  |
| Gcsf             | Granulocyte colony stimulating factor              |
| GDP, GTP         | Guanosine 5'-diphosphate, triphosphate             |
| GEF              | Guanine nucleotide exchange factor                 |
| GPCR             | G-protein-coupled receptor                         |
| GPR35            | G-protein-coupled receptor 35                      |
| GR               | Glucocorticoid receptor                            |
| Grb2             | Growth factor receptor-bound protein 2             |
| GROα, GROβ, GROγ | Growth-regulated protein alpha, beta, gamma        |
| HA               | Human influenza haemagglutinin                     |
| HB               | Hindbrain                                          |
| HEXA, HEXB       | Hexosaminidase A, B                                |
| Hif-1α, Hif-2α   | Hypoxia-inducible factor 1 alpha, 2 alpha          |
| Hpf              | Hours post fertilisation                           |
| Hpi              | Hours post infection/injection                     |
| Hpw              | Hours post wounding                                |
| HSPC             | Haematopoietic stem and progenitor cell            |
| I-TAC            | Interferon-inducible T-cell alpha chemoattractant  |
| Ifny             | Interferon gamma                                   |
| Il1β, Il8, Il13  | Interleukin 1 beta, 8, 13                          |
| iNOS             | Inducible nitric oxide synthase                    |
| IP-10            | Interferon gamma-inducible protein 10              |
| IP3              | inositol 1,4,5-trisphosphate                       |
| Irf8             | Interferon regulatory factor 8                     |
| Irg1             | Immunoresponsive gene 1                            |
| JAK              | Janus kinase                                       |
| kDa              | kilo Dalton                                        |
| Kdr1             | Kinase insert domain receptor-like                 |
| KO               | Knockout                                           |
| Lamp3            | Lysosomal associated membrane protein 3            |
| Lc3              | Microtubule-associated protein 1A/1B-light chain 3 |
| Lck              | Lymphocyte cell-specific protein-tyrosine kinase   |
| Lp/Lcp1          | Leukocyte plastin/ Lymphocyte                      |

|             |                                                                |
|-------------|----------------------------------------------------------------|
|             | cytosolic protein 1                                            |
| LSD         | Lysosomal storage disorder                                     |
| Lta4h       | Leukotriene A4 hydrolase                                       |
| LTB4        | Leukotriene B4                                                 |
| Lyz         | Lysozyme                                                       |
| M( $\Phi$ ) | Monocyte/macrophage                                            |
| MAPK        | Mitogen-activated protein kinases                              |
| MIF         | Macrophage migration inhibitory factor                         |
| MIG         | monokine induced by interferon $\gamma$                        |
| miRNA       | Micro RNA                                                      |
| Mitf        | Microphthalmia-associated transcription factor                 |
| MLCK        | Myosin light-chain kinase                                      |
| <i>Mm</i>   | <i>Mycobacterium marinum</i>                                   |
| Mmp 9       | Matrix metalloproteinase 9                                     |
| Mpeg1       | Macrophage expressed gene 1                                    |
| mPTPC       | Mitochondrial permeability transition pore complex             |
| Mpx         | Myeloperoxidase                                                |
| <i>Mtb</i>  | <i>Mycobacterium tuberculosis</i>                              |
| Myd88       | Myeloid differentiation primary response gene 88               |
| M $\Phi$    | Macrophage                                                     |
| NADPH       | Nicotinamide adenine dinucleotide phosphate                    |
| NAI         | Nfkb activation inhibitor                                      |
| NAP2        | Neutrophil-activating peptide 2                                |
| Nfkb        | Nuclear factor kappa-light-chain-enhancer of activated B cells |
| NK          | Natural killer cell                                            |
| Nlr         | Nod-like receptor                                              |
| NSAID       | Non-steroid antinflammatory drug                               |
| N $\Phi$    | Neutrophil                                                     |
| P/DAMP      | Pathogen and Damage-associated molecular pattern               |
| PAM         | Protospacer adjacent motif                                     |
| PBS, PBSTx  | Phosphate buffer saline, triton x                              |
| pC3         | Previously chromosome 3                                        |
| PCR         | Polymerase chain reaction                                      |
| PDIM        | Phthiocerol dimycocerosate                                     |
| PGL         | Phenolic glycolipid                                            |
| PGP         | Pro-Gly-Pro                                                    |
| PH          | Plekstrin homology                                             |
| PHOX        | Phagocytic oxidase                                             |
| PI3K        | Phosphatidylinositol-4,5-bisphosphate 3-kinase                 |
| PIP2        | Phosphatidylinositol 4,5-bisphosphate                          |
| PIP3        | Phosphatidylinositol (3,4,5)-trisphosphate                     |
| PITPNM3     | Phosphatidylinositol transfer protein, membrane-associated 3   |
| PKC         | Protein kinase C                                               |
| PLA, PLC    | Phospholipase A, C                                             |
| Ppiab       | Peptidylprolyl isomerase ab                                    |
| PRR         | Pattern recognition receptor                                   |
| PTK         | Protein tyrosine kinase                                        |

|                  |                                                                                                          |
|------------------|----------------------------------------------------------------------------------------------------------|
| Ptpn6/Shp1       | Protein tyrosine phosphatase, non-receptor type 6/ Src homology region 2 domain-containing phosphatase 1 |
| Ptpcr/Cd45       | Protein tyrosine phosphatase receptor type C/Cd45                                                        |
| PTU              | Phenylthiourea                                                                                           |
| PVP              | Polyvinylpyrrolidone                                                                                     |
| qRT-PCR          | Quantitative real time polymerase chain reaction                                                         |
| Rac1             | Ras-related C3 botulinum toxin substrate                                                                 |
| RD1              | Region of difference 1                                                                                   |
| RhoA             | Ras homologue gene family member A                                                                       |
| RNS              | Reactive nitrogen species                                                                                |
| ROCK             | Rho-associated protein kinase                                                                            |
| ROS              | Reactive oxygen species                                                                                  |
| shgRNA           | Short guide RNA                                                                                          |
| SNARE            | Soluble NSF attachment protein receptor                                                                  |
| Spi1/Pu.1        | Spleen Focus Forming Virus (SFFV) Proviral Integration Oncogene 1/Pu.1                                   |
| Sqstm1/p62       | Sequestosome 1/Ubiquitin-binding protein of 62 kDa                                                       |
| ssDNA            | Single-stranded DNA                                                                                      |
| <i>St</i>        | <i>Salmonella enterica</i> Serovar Typhimurium                                                           |
| STAT             | Signal transducer and activator of transcription                                                         |
| SV40pA           | Simian virus 40 polyadenylation signal                                                                   |
| T3SS             | Type III secretion system                                                                                |
| T7SS             | Type VII secretion system                                                                                |
| TALEN            | Transcription activator-like effector nuclease                                                           |
| TB               | Tuberculosis                                                                                             |
| Tfeb, Tfec, Tfe3 | Transcription factor E, C, 3                                                                             |
| Tg               | Transgenic                                                                                               |
| Tiam1            | T-lymphoma invasion and metastasis-inducing protein 1                                                    |
| Tlr              | Toll-like receptor                                                                                       |
| TM               | Transmembrane                                                                                            |
| TMT              | Transmembrane transporter                                                                                |
| Tnfa             | Tumour necrosis factor alpha                                                                             |
| Traf6            | TNF receptor-associated factor 6                                                                         |
| UAS              | Upstream activating sequence                                                                             |
| Vegf             | Vascular endothelial growth factor                                                                       |
| Vegfr            | Vascular endothelial growth factor receptor                                                              |
| WGD              | Whole genome duplication                                                                                 |
| WHO              | World health organisation                                                                                |
| Wt               | Wildtype                                                                                                 |
| Xcl              | X- Cysteine motif chemokine ligand                                                                       |
| Xcr              | X- Cysteine motif chemokine receptor                                                                     |
| YPD              | Yeast extract peptone dextrose                                                                           |
| ZFN              | Zinc finger nuclease                                                                                     |

## Nomenclature of zebrafish chemokine ligands

| Name in this thesis | Ensembl gene name  | zfin gene name | Ensembl gene ID/Alignment position | Ensembl protein ID                                             | Previous /synonymous names and notes                                                                                                |
|---------------------|--------------------|----------------|------------------------------------|----------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| ccl18ab             | CR762483.1         | -              | ENSDARG00000074487                 | ENSDARP00000101228                                             | -                                                                                                                                   |
| ccl19aa             | ccl19a.1           | ccl19a.1       | ENSDARG00000058389                 | ENSDARP00000090385                                             | ccl-c5a, dr-scNA10579-CCL19-34.3%-DN, si:ch211-89f7.4                                                                               |
| ccl19ab             | ccl19a.2           | ccl19a.2       | ENSDARG00000035632                 | ENSDARP00000051667                                             | ccl-c5b, DrUn_WGA13047_1_39000, WGA710_1_710182, zgc:194112, zgc:194121                                                             |
| ccl19b              | ccl19b             | ccl19b         | ENSDARG00000039351                 | ENSDARP00000114954                                             | ccl19, ccl-c10a, Dr10_WGA780_1_413112, si:dkey-20015.2                                                                              |
| ccl20aa             | -                  | -              | unmappable                         | no protein assigned                                            | -                                                                                                                                   |
| ccl20ab             | ENSDARG00000100432 | -              | ENSDARG00000100432                 | ENSDARP00000138620                                             | -                                                                                                                                   |
| ccl20ac             | ccl20a.3           | ccl20a.3       | ENSDARG00000101040                 | ENSDARP00000138701                                             | chemokine-1, CH73-320117.1, LOC100004509GN, zgc:195209, zgc:195195                                                                  |
| ccl20ad             | -                  | -              | 2:45319950-45317434 (-)            | no protein assigned                                            | Incomplete sequence/pseudogene                                                                                                      |
| ccl20b              | ccl20b             | ccl20b         | ENSDARG00000094511                 | ENSDARP00000122800<br>ENSDARP00000122912                       | ccl20, ccl-c24a, Dr24_WGA1806_1_416955, dr-chr24-CCL20-34.6%-DN, si:dkey-150a13.1                                                   |
| ccl25a              | CU693369.1         | -              | ENSDARG00000089534                 | ENSDARP00000111107                                             | -                                                                                                                                   |
| ccl25b              | ccl25b             | ccl25b         | ENSDARG00000070873                 | ENSDARP00000095178                                             | ccl21, ccl-c11a, Dr11_WGA839_1_159228, dr-chr11-CCL21-36.7%-DN                                                                      |
| ccl27a              | ccl27a             | ccl27a         | ENSDARG00000058570                 | ENSDARP00000075898<br>ENSDARP00000137864                       | ccl1, Dr8_WGA606_1_66363, wu:fa96a04                                                                                                |
| ccl27b              | ccl27b             | ccl27b         | ENSDARG00000079713                 | ENSDARP00000104032                                             | ccl-c10b, Dr9_WGA697_1_854420, dr-chr9-CCL13-28.2%-DN, dr-chr9-CCL17-22.3%-DN                                                       |
| ccl32ab             | ccl32a.2           | ccl32a.2       | ENSDARG00000095049                 | ENSDARP00000122846<br>ENSDARP00000141410                       | ccl-c2c, Dr7_WGA489_1_245599, si:ch211-122124.2                                                                                     |
| ccl32ac             | -                  | -              | 2:40365520-40370475 (+)            | no protein assigned                                            | -                                                                                                                                   |
| ccl32ad             | -                  | -              | 2:40387422-40388412 (+)            | no protein assigned                                            | -                                                                                                                                   |
| ccl32ae             | -                  | -              | unmappable                         | no protein assigned                                            | -                                                                                                                                   |
| ccl32bc             | CT574575.1         | -              | ENSDARG00000098656                 | ENSDARP00000137910<br>ENSDARP00000140796                       | -                                                                                                                                   |
| ccl32ca             | -                  | -              | KN149905:570-1 (-)                 | no protein assigned                                            | -                                                                                                                                   |
| ccl32cb             | -                  | -              | KN149905:2766-1821 (-)             | no protein assigned                                            | -                                                                                                                                   |
| ccl32d              | -                  | -              | KN150005:21462-23168 (+)           | no protein assigned                                            | -                                                                                                                                   |
| ccl33aa             | -                  | -              | 25:25106427-25106501 (+)           | no protein assigned                                            | Incomplete sequence/pseudogene                                                                                                      |
| ccl33ab             | ccl33.2            | ccl33.2        | ENSDARG00000102519                 | ENSDARP00000130735<br>ENSDARP00000138153<br>ENSDARP00000138433 | ccl-c25h, dr-chr25-CCL8-35.6%-EP41974b, si:ch211-149o7.6                                                                            |
| ccl33ac             | ccl33.3            | ccl33.3        | ENSDARG00000099401                 | no protein assigned                                            | ccl-c25a, ccl-c25g, Dr25_WGA1873_1_709505, Dr25_WGA1872_1_17999, dr-chr25-CCL8-30.8-EP41974a, chr25-CCL24-35.6-DN, si:ch211-149o7.4 |
| ccl34aa             | -                  | -              | unmappable                         | no protein assigned                                            | -                                                                                                                                   |
| ccl34ab             | -                  | -              | unmappable                         | no protein assigned                                            | -                                                                                                                                   |
| ccl34ac             | ccl34a.3           | ccl34a.3       | ENSDARG00000094983                 | no protein assigned                                            | ccl-c2e, Dr11_WGA879_1_762108, Dr11_WGA879_1_759152, Dr11_WGA879_1_755946, si:ch211-122124.5                                        |
| ccl34ad             | ccl34a.4           | ccl34a.4       | ENSDARG00000090873                 | no protein assigned                                            | ccl-c2d, CC-Chemokine, dr-chr11-CCL19-33.7%-DN, dr-chr11-CCL19-32.7%-DN, si:ch211-122124.4                                          |
| ccl34ba             | ccl34b.1           | ccl34b.1       | ENSDARG00000093608                 | ENSDARP00000116086<br>ENSDARP00000136441                       | ccl-c24m, Dr22_WGA1631_1_283786, dr-chr22-CCL19-30.3%-DN, si:dkey-25o1.6                                                            |
| ccl34bb             | -                  | -              | 24:27327959-27327535 (-)           | no protein assigned                                            | -                                                                                                                                   |
| ccl34bb             | -                  | -              | unmappable                         | no protein assigned                                            | -                                                                                                                                   |

## Nomenclature of zebrafish chemokine ligands

| Name in this thesis | Ensembl gene name | zfin gene name | Ensembl gene ID/Alignment position | Ensembl protein ID                                                | Previous /synonymous names and notes                                                                           |
|---------------------|-------------------|----------------|------------------------------------|-------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|
| ccl34bc             | ccl34b.3          | ccl34b.3       | ENSNDARG00000032993                | ENSNDARP000000041769                                              | ccl-c24k,<br>DrUn_WGA7827_1_9830, dr-scNA5340-CCL19-30.5%-DN, si:dkey-25o1.9                                   |
| ccl34bd             | ccl34b.4          | ccl34b.4       | ENSNDARG00000094002                | ENSNDARP00000117348<br>ENSNDARP00000136530                        | ccl-c24j,<br>DrUn_WGA7827_1_17321, si:dkey-25o1.5                                                              |
| ccl34be             | CR383669.1        | -              | ENSNDARG00000099782                | ENSNDARP00000137755                                               | -                                                                                                              |
| ccl34bf             | CR383669.2        | -              | ENSNDARG00000100520                | ENSNDARP00000137901                                               | -                                                                                                              |
| ccl34bg             | -                 | -              | KN150005:21462-21536 (+)           | no protein assigned                                               | -                                                                                                              |
| ccl34bh             | ccl34b.8          | ccl34b.8       | ENSNDARG00000093098                | ENSNDARP00000121266                                               | ccl-c24c, si:dkey-25o1.4                                                                                       |
| ccl34bi             | ccl34b.9          | ccl34b.9       | ENSNDARG00000078205                | ENSNDARP00000098604                                               | ccl-c24b, si:dkey-25o1.3                                                                                       |
| ccl34bl             | -                 | -              | 24:27403153-27402859 (-)           | no protein assigned                                               | Incomplete sequence/pseudogene                                                                                 |
| ccl34bm             | -                 | -              | 24:27411537-27411245 (-)           | no protein assigned                                               | Incomplete sequence/pseudogene                                                                                 |
| ccl34bn*            | si:dkey-25o1.7    | si:dkey-25o1.7 | ENSNDARG00000093570                | ENSNDARP00000121438<br>ENSNDARP00000130107<br>ENSNDARP00000135013 | -                                                                                                              |
| ccl34ea             | CABZ01001434.1    | -              | ENSNDARG00000098602                | ENSNDARP00000133785<br>ENSNDARP00000133418                        | -                                                                                                              |
| ccl34eb             | -                 | -              | unmappable                         | no protein assigned                                               | -                                                                                                              |
| ccl35aa             | ccl35.1           | ccl35.1        | ENSNDARG00000103466                | ENSNDARP00000132604                                               | ccl-c25y, Dr1_WGA6_1_97332, dr-chr1-CCL26-33.3%-EP26489, zgc:193743, zgc:193706                                |
| ccl35ab             | ccl35.2           | ccl35.2        | ENSNDARG00000070378                | ENSNDARP00000093979                                               | ccl-c25ab,<br>DrUn_WGA2406_1_18581, Dr25_WGA1872_1_197377, zgc:193706                                          |
| ccl36aa             | -                 | -              | 7:39442461-39442771 (+)            | no protein assigned                                               | Incomplete sequence/pseudogene                                                                                 |
| ccl36ab             | BX908792.2        | -              | ENSNDARG00000105263                | ENSNDARP00000138949                                               | -                                                                                                              |
| ccl38aa             | ccl38.1           | ccl38.1        | ENSNDARG00000041919                | ENSNDARP00000061433<br>ENSNDARP00000113398<br>ENSNDARP00000128783 | ccl-c20g,<br>Dr20_WGA1544_1_1446828, dr-chr20-CCL7-40.0%-DN, si:dkey-217m5.3                                   |
| ccl38ac             | -                 | ccl38a.3       | unmappable                         | no protein assigned                                               | ccl-c20e,<br>Dr20_WGA1544_1_375272, Dr20_WGA1544_1_390316, dr-chr20-CCL14-32.9%-DN, si:dkeyp-59a8.5            |
| ccl38ad             | ccl38a.4          | ccl38a.4       | ENSNDARG00000041917                | ENSNDARP00000061431                                               | ccl-c20d,<br>Dr20_WGA1544_1_386533, zgc:171266, si:dkeyp-59a8.3                                                |
| ccl2 (ccl38ae)      | ccl38a.5          | ccl38a.5       | ENSNDARG00000041835                | ENSNDARP00000061310                                               | ccl-c20c,<br>Dr20_WGA1544_1_382837, si:dkeyp-59a8.2                                                            |
| ccl38af             | ccl38.6           | ccl38.6        | ENSNDARG00000041923                | ENSNDARP00000061436<br>ENSNDARP00000120680<br>ENSNDARP00000123921 | ccl-c20b,<br>Dr20_WGA1544_1_380308, Dr20_WGA1544_1_390316, dr-chr20-CCL7-35.6%-DN, wu:fj16d01, si:dkeyp-59a8.1 |
| ccl39aa             | ccl39.1           | ccl39.1        | ENSNDARG00000101041                | ENSNDARP00000130968                                               | ccl-c25q, dr-chr25-CCL13-38.9%-DN, si:dkeyp-55h4.5                                                             |
| ccl39ab             | ccl39.2           | ccl39.2        | ENSNDARG00000102945                | ENSNDARP00000138051<br>ENSNDARP00000141835                        | ccl-c25p, dr-chr25-CCL2-37.5%-DN, si:ch211-149o7.5                                                             |
| ccl39ac             | ccl39.3 (ch. 25)  | ccl39.3        | ENSNDARG00000100295                | ENSNDARP00000141922<br>ENSNDARP00000138620                        | ccl-c25o, dr-chr25-CCL13-35.9%-DN, si:dkeyp-55h4.6                                                             |
| ccl39ad             | ccl39.4           | ccl39.4        | ENSNDARG00000104002                | ENSNDARP00000130829<br>ENSNDARP00000138036                        | ccl-c25n,<br>Dr25_WGA1872_1_141073, dr-chr25-CCL11-31.2%-DN, si:dkeyp-55h4.7                                   |
| ccl39ae             | ccl39.5           | ccl39.5        | ENSNDARG00000098460                | ENSNDARP00000141305                                               | ccl-c25m, dr-chr25-CCL2-35.0%-DN, dr-chr25-CCL2-36.4%-DN, si:dkeyp-55h4.8                                      |
| ccl39af             | ccl39.6           | ccl39.6        | ENSNDARG00000105089                | ENSNDARP00000132580                                               | ccl-c25l, si:dkeyp-55h4.9                                                                                      |
| ccl39ag             | ccl39.7           | ccl39.7        | ENSNDARG00000099982                | ENSNDARP00000133318<br>ENSNDARP00000138980                        | ccl-c25k,<br>Dr25_WGA1873_1_857912, si:dkeyp-55h4.10                                                           |
| ccl39ah             | CR450808.1        | -              | ENSNDARG00000100484                | ENSNDARP00000135517                                               | -                                                                                                              |
| ccl39ai             | -                 | -              | 25:12816818-12816285 (-)           | no protein assigned                                               | Incomplete sequence/pseudogene                                                                                 |
| ccl39aj*            | ccl39a.10         | ccl39a.10      | ENSNDARG00000096060                | ENSNDARP00000125562                                               | ccl-c25z, si:ch211-202c4.2                                                                                     |
| ccl39ba*            | ccl39.3 (ch. 6)   | -              | ENSNDARG00000101499                | ENSNDARP00000130440                                               | Incomplete sequence/pseudogene                                                                                 |
| ccl44               | ccl44             | ccl44          | ENSNDARG00000074772                | ENSNDARP00000101027                                               | -                                                                                                              |
| cxcl8a              | CT826376.2        | cxcl8a         | ENSNDARG00000104795                | ENSNDARP00000137520                                               | ccl-c11b,<br>Dr11_WGA839_1_233313                                                                              |
| cxcl8ba             | -                 | -              | 7:7671156-7665921 (-)              | no protein assigned                                               | cxcl8a, cxcl-c1a,<br>CXCL8_L1_chrl, dr-chr1-CXCL8, si:dkey-151b16.2                                            |

| Name in this thesis | Ensembl gene name  | zfin gene name | Ensembl gene ID/Alignment position | Ensembl protein ID                         | Previous /synonymous names and notes                                                              |
|---------------------|--------------------|----------------|------------------------------------|--------------------------------------------|---------------------------------------------------------------------------------------------------|
| cxcl8bb             | cxcl8b.1           | cxcl8b.1       | ENSDARG00000102299                 | ENSDDARP00000131403<br>ENSDDARP00000136965 | iil82, cxcl8_l2_chr17                                                                             |
| cxcl8bc             | cxcl8b.3           | cxcl8b.3       | ENSDARG00000099169                 | ENSDDARP00000136707                        | cxcl-c13d, CXCL8_l2_chr7, dr-scNA16716-CXCL8                                                      |
| cxcl11aa            | CXCL11 (1 of many) | cxcl11.1       | ENSDARG00000100662                 | ENSDDARP00000135444                        | cxcl11l, cxcl-c5d, dr-chr5-CXCL11, vig7, SCYB9B, b-R1, IP-9, H174, SCYB11, I-TAC                  |
| cxcl11ab            | -                  | cxcl11.2       | 5:42290344-42290046 (-)            | no protein assigned                        | dr-chr5-CXCL11-27.4-DN<br>Incomplete sequence/pseudogene                                          |
| cxcl11ac            | ENSDARG00000102514 | cxcl11.3       | ENSDARG00000102514                 | ENSDDARP00000136965                        | cxcl-c66, cxcl-c5e, dr-chr5-CXCL11-37.2-EK12810                                                   |
| cxcl11ad            | CXCL11 (1 of many) | cxcl11.4       | ENSDARG00000101138                 | ENSDDARP00000133434                        | cxcl11l2, cxcl-c56, cxcl-c5f, dr-chr5-CXCL9-35.1-EK43819, SCYB9B, b-R1, IP-9, H174, SCYB11, I-TAC |
| cxcl11ae            | cxcl11.5           | cxcl11.5       | ENSDARG00000092423                 | ENSDDARP00000115162<br>ENSDDARP00000136838 | cxcl-c5g, dr-chr1-CXCL11-37.1-DN, si:ch211-202a12.7                                               |
| cxcl11af            | cxcl11.6           | cxcl11.6       | ENSDARG00000094706                 | ENSDDARP00000112794                        | cxcl-c5h, si:ch211-202a12.8                                                                       |
| cxcl11ag            | cxcl11.7           | cxcl11.7       | ENSDARG00000093779                 | ENSDDARP00000116772                        | cxcl-c5i, dr-chr1-CXCL9-37.2-EK42273, si:ch211-202a12.9                                           |
| cxcl11ah            | cxcl11.8           | cxcl11.8       | ENSDARG00000095747                 | ENSDDARP00000123477                        | cxcl-c64, cxcl-c5b, dr-chr5-CXCL11-25.2-EP22087, si:dkey-58f10.5                                  |
| cxcl12a             | cxcl12a            | cxcl12a        | ENSDARG00000037116                 | ENSDDARP00000053945                        | cxcl12, sdf1, sdf1a, umm t30516, umm t30516, wu:fa55e10, wu:fc16h12, wu:ff84c02                   |
| cxcl12b             | cxcl12b            | cxcl12b        | ENSDARG00000055100                 | ENSDDARP00000071878                        | sdf1b, zgc:136720                                                                                 |
| cxcl13              | si:dkey-58f10.3    | -              | ENSDARG00000095112                 | no protein assigned                        | -                                                                                                 |
| cxcl14              | cxcl14             | cxcl14         | ENSDARG00000056627                 | ENSDDARP00000109550                        | scyba, fb67g04, wu:fb67g04                                                                        |
| cxcl18aa            | -                  | -              | 13:30566063-30568522 (+)           | no protein assigned                        | Incomplete sequence/pseudogene                                                                    |
| cxcl18b             | cxcl18b            | cxcl18b        | ENSDARG00000075045                 | ENSDDARP00000102296                        | cxcl-c1c, dr-chr25-CXCL11-28.0-EP27297, si:ch73-6k14.1GN                                          |
| cxcl19              | cxcl19             | cxcl19         | ENSDARG00000102776                 | ENSDDARP00000135787                        | cxcl-c13d, dr-scNA11550-CXCL2-36.0%-DN                                                            |
| cxcl20b             | cxcl20             | cxcl20         | ENSDARG00000075163                 | ENSDDARP00000102486                        | cxcl-c5c, dareCXcC, dr-chr5-CXCL10-28.6%-DN                                                       |
| cxcl32ba            | cxcl32b.1          | cxcl32b.1      | ENSDARG00000071499                 | ENSDDARP00000096549                        | cxcl-c24e, si:ch211-260d11.1, scNA16670-CCL8-33.3-DN                                              |
| cxcl32bb            | CT574575.2         | -              | ENSDARG00000099822                 | ENSDDARP00000131333                        | -                                                                                                 |
| cxl34bj             | -                  | -              | 24:27385246-27384292 (-)           | no protein assigned                        | -                                                                                                 |
| cxl34bk             | cxl34b.11          | cxl34b.11      | ENSDARG00000092283                 | ENSDDARP00000115786                        | cxl-c24a, cxl1, si:dkey-25o1.2                                                                    |
| cxl34c              | cxl34c             | cxl34c         | ENSDARG00000096664                 | ENSDDARP00000126667                        | cxl-c12a, wu:fb09d09, si:ch211-125g7.3                                                            |
| cxl34d              | -                  | -              | 7:57100469-57102607 (+)            | no protein assigned                        | -                                                                                                 |
| cxl32aa             | cxl32a.1           | cxl32a.1       | ENSDARG00000093906                 | ENSDDARP00000118951                        | cxl-c2a, si:ch211-122124.3                                                                        |

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# Nomenclature of zebrafish chemokine receptors

| Name in this thesis | Ensembl gene name   | zfin gene name    | Ensembl gene ID/Alignment position | Ensembl protein ID                           | Previous /synonymous names and notes                     |
|---------------------|---------------------|-------------------|------------------------------------|----------------------------------------------|----------------------------------------------------------|
| ackr2/d6*           | CU633991.1          | -                 | ENSDARG000000086314                | ENSNDARP000000108059                         | -                                                        |
| ackr3a/cxcr7a       | ackr3 (1 of many)   | ackr3a            | ENSDARG000000062478                | ENSNDARP000000084847                         | drRDC1a, si:dkey-191g15.12, si:dkeyp-74a11.11            |
| ackr3b/cxcr7b       | ackr3b              | ackr3b            | ENSDARG000000058179                | ENSNDARP000000063664                         | drRDC1b, sb:cb900, si:dkey-96h14.2                       |
| ackr4a/ccr11a       | ackr4a              | ackr4a            | ENSDARG000000078729                | ENSNDARP000000116973                         | zfCCR11-1                                                |
| ackr4b/ccr11b       | ackr4b              | ackr4b            | ENSDARG000000040133                | ENSNDARP000000058702                         | drCCR11b, zfCCR11-2, sb:eu250                            |
| ackr6/pitpnm3*      | pitpnm3             | pitpnm3           | ENSDARG000000055255                | ENSNDARP000000072049                         | wu:fk08b02, fk08b02                                      |
| ccr4laa             | ccr8.1              | ccr8.1            | ENSDARG000000095789                | ENSNDARP000000125541                         | ccr411, dr-chr16-CCR4-43.1-EK47490, zfCCR8-1             |
| ccr4lab             | CABZ01093075.1      | CABZ01093075.1    | ENSDARG000000086616                | ENSNDARP000000105159                         | zfCCR8-2                                                 |
| ccr4lac             | ccr8                | si:cabz01093077.1 | ENSDARG000000105467                | ENSNDARP000000142256                         | GPR-CY6, CMKB88, TER1, CY6, CKR-L1, CDw198, CMKBRL2      |
| ccr6a               | ccr6a               | ccr6a             | ENSDARG000000087474                | ENSNDARP000000106824                         | zfCCR6-2, si:bx813304.1, zgc:86782, si:dkey-47g2.1       |
| ccr6b               | ccr6b               | ccr6b             | ENSDARG000000038968                | ENSNDARP000000128924<br>ENSNDARP000000056883 | zfCCR6-1, wu:fk31f08                                     |
| ccr7                | ccr7                | ccr7              | ENSDARG000000044561                | ENSNDARP000000118528                         | zfCCR7, zgc:165629                                       |
| ccr9a               | ccr9a               | ccr9a             | ENSDARG000000055186                | ENSNDARP000000071978                         | ccr9, zfCCR9-1, dr-chr2-CCR9-44.2-EK8447, sb:eu630       |
| ccr9b               | ccr9b               | ccr9b             | ENSDARG000000099738                | ENSNDARP000000134711<br>ENSNDARP000000137365 | ccr9l, dr-chr9-CCR9-39.2-EK48843, zfCCR9-2, LOC100006078 |
| ccr10               | ccr10               | ccr10             | ENSDARG000000040643                | ENSNDARP000000099267                         | zgc:91924                                                |
| ccr11aa             | ccr11.1             | ccr11.1           | ENSDARG000000070755                | ENSNDARP000000094951<br>ENSNDARP000000142387 | cx3cr11, zfCCR2-1, dr-chr21-CX3CR1-40.7%-EK41814,        |
| ccr2 (ccr11ab)      | si:ch211-207g17.2   | si:ch211-207g17.2 | ENSDARG000000079829                | ENSNDARP000000142081<br>ENSNDARP000000094958 | -                                                        |
| ccr11ac             | si:ch211-207g17.3   | si:ch211-207g17.3 | ENSDARG000000105363                | ENSNDARP000000142057                         | -                                                        |
| ccr12a              | ccr12a              | ccr12a            | ENSDARG000000038541                | ENSNDARP000000122747                         | ccr12.3, zfCCR3-3, si:ch211-106n13.2                     |
| ccr12ba             | ccr12b.1            | ccr12b.1          | ENSDARG000000059410                | ENSNDARP000000126464                         | ccr12.1, zfCCR3-1, si:dkey-225n22.5                      |
| ccr12bb             | ccr12b.2            | ccr12b.2          | ENSDARG000000026417                | ENSNDARP000000066871                         | ccr5.2, ccr12.2, CCR12bb, CCR5-35.0%-EK36093, zfCCR3-2   |
| cxcr1 (cxcr1ba)     | si:ch73-54b5.2      | si:ch73-54b5.2    | ENSDARG000000052088                | ENSNDARP000000068360                         | zmp:0000001086                                           |
| cxcr2 (cxcr1bb)     | cxcr2               | cxcr2             | ENSDARG000000054975                | ENSNDARP000000071727                         | si:ch73-54b5.1                                           |
| cxcr3.1 (cxcr3ab)   | cxcr3.1             | cxcr3.1           | ENSDARG000000007358                | ENSNDARP000000137552                         | dr-chr16-CXCR3-41.8-EK27498, sb:eu378                    |
| cxcr3.2 (cxcr3l)    | cxcr3.2             | cxcr3.2           | ENSDARG000000041041                | ENSNDARP000000122984                         | dr-chr16-CXCR3-37.5-EK27053, zgc:92301                   |
| cxcr3.3 (cxcr3aa)   | cxcr3.3             | cxcr3.3           | ENSDARG000000070669                | ENSNDARP000000119122                         | si:dkey-269d20.3                                         |
| cxcr4a              | cxcr4a              | cxcr4a            | ENSDARG000000057633                | ENSNDARP000000074800<br>ENSNDARP000000123851 | cb824                                                    |
| cxcr4b              | cxcr4b              | cxcr4b            | ENSDARG000000041959                | ENSNDARP000000061498                         | cxcr4, odysseus, ody, cb403, drCXCR4b1, zgc:109863       |
| cxcr5               | cxcr5               | cxcr5             | ENSDARG000000010514                | ENSNDARP000000010091                         | MDR15, BLR1, CD185                                       |
| cxcr8a/gpr35a*      | ENSDARG000000075877 | -                 | ENSDARG000000075877                | ENSNDARP000000103013                         | -                                                        |
| cxcr8ba/gpr35ba*    | gpr35.1             | gpr35.1           | ENSDARG000000074633                | ENSNDARP000000133176<br>ENSNDARP000000103106 | zgc:171586                                               |
| cxcr8bb/gpr35bb*    | ENSDARG000000086776 | gpr35.2           | ENSDARG000000086776                | ENSNDARP000000111768                         | zmp:0000001226                                           |
| xcr1aa              | xcr1a.1             | xcr1a.1           | ENSDARG000000054847                | ENSNDARP000000071590<br>ENSNDARP000000103498 | xcr1, xcr1a                                              |
| xcr1ab              | si:ch73-217b7.4     | xcr1a.2           | ENSDARG000000054846                | no protein assigned                          | Incomplete sequence/pseudogene                           |

| Name in this thesis | Ensembl gene name | zfin gene name | Ensembl gene ID/Alignment position | Ensembl protein ID  | Previous /synonymous names and notes |
|---------------------|-------------------|----------------|------------------------------------|---------------------|--------------------------------------|
| xcr1ac              | si:ch73-217b7.3   | xcr1a.3        | ENSDARG00000087978                 | no protein assigned | Incomplete sequence/pseudogene       |
| xcr1ba              | CABZ01053221.1    | xcr1b.2        | ENSDARG00000058774                 | ENSDARP00000076150  | drXCR1b                              |
| xcr1be              | XCR1 (1 of many)  | xcr1b.1        | ENSDARG00000052988                 | ENSDARP00000069429  | xcr1b, GPR5, CCXCR1, zmp:0000001090  |
| xcr1bd              | CABZ01053219.1    | xcr1b.3        | ENSDARG00000089840                 | ENSDARP00000110709  | ccr8.3, zfcCR8-3                     |

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## *Curriculum vitae*

Vincenzo Torraca was born on September 6<sup>th</sup>, 1987 in Salerno, Italy. He obtained his high school diploma and professional certificate in Industrial and Food Chemistry in 2006, at the Technical and Industrial Institute B. Focaccia, in Salerno. At Salerno University, he obtained his bachelor degree in 2009 (*summa cum laude*) in computational and molecular biology, after completing an internship on the molecular characterisation of different natural and commercial accessions of *Origanum vulgare* (CRA-ORT, research centre for the horticulture, Battipaglia, Italy, under supervision of dr. F. Campanile and dr. M. Zaccardelli) and on the catalytic activity of genomic DNA for the Michael reaction (Salerno University, under supervision of dr. M. De Rosa and prof. dr. A. Soriente). In 2010, he was selected for the European Erasmus summer school “multidisciplinary approaches to microarray data analysis”, Ascea Italy. In 2011, he obtained his master degree (*summa cum laude*) in Biology by Salerno University, after having carried a research internship at Leiden University (the Netherlands), through the European LLP-Erasmus exchange program. Under the supervision of dr. A. Chatzopoulou, dr. M.J. Schaaf (Leiden University) and prof. dr. E.A. Illingworth (Salerno University), he investigated the function of an alternative splicing isoform of the glucocorticoid receptor, using the zebrafish (*Danio rerio*) model. In 2011, he obtained the national qualification as professional senior biologist, by the University of Sannio (Benevento, Italy). In 2012, he joined the group of prof. dr. A.H. Meijer (Institute of Biology, Leiden University) as a PhD candidate, funded by the Marie Skłodowska-Curie Initial Training Network FishForPharma. During his PhD he obtained extensive training on the zebrafish *in vivo* model for infectious diseases and specifically analysed in-depth the function of host chemokine signalling during infection with *Mycobacterium marinum*. In 2016, he was awarded with an individual Marie Skłodowska-Curie postdoctoral fellowship to join the group of dr. S. Mostowy (Imperial College London, UK), where he will continue his research on the zebrafish-*M. marinum* host-pathogen model and study the function of cytoskeleton dynamics during mycobacterial infections.

## List of publications

**Torraca V, in't Veld E, Meijer AH. Disruption of chemotactic signaling primes the lysosomal function of macrophages to counteract mycobacterial parasitism. *Manuscript in preparation.***

**Tulotta C, Stefanescu C, Torraca V, Meijer AH, Snaar-Jagalska BE. CXCR4 signaling in the tumor microenvironment orchestrates experimental metastasis formation by controlling myeloid cell motility and response to malignant cells. *Manuscript in preparation.***

**Torraca V, Otto NA, Tavakoli-Tameh A, Meijer AH. The inflammatory chemokine Cxcl18b exerts neutrophil-specific chemotaxis via the promiscuous chemokine receptor Cxcr2 in zebrafish. *Submitted manuscript.***

**Torraca V, Tulotta C, Snaar-Jagalska BE, Meijer AH. The chemokine receptor CXCR4 promotes granuloma formation by sustaining a mycobacteria-induced angiogenesis program. *Submitted manuscript.***

**Torraca V and Mostowy S. Septins and Bacterial Infection. *Front Cell Dev Biol. In press.***

**Masud S, Torraca V, Meijer AH. Modeling infectious diseases in the context of a developing immune system. *Curr Top Dev Biol. In press.***

**Torraca V, Cui C, Boland R, Bebelman JP, van der Sar AM, Smit MJ, Siderius M, Spaink HP, Meijer AH. The CXCR3/CXCL11 signaling axis mediates macrophage recruitment and dissemination of mycobacterial infection. *Dis Model Mech.* 2015, 8:253-69.**

**Torraca V, Masud S, Spaink HP, Meijer AH. Macrophage-pathogen interactions in infectious diseases: new therapeutic insights from the zebrafish host model. *Dis Model Mech.* 2014 7:785-97.**

**Spaink HP, Cui C, Wiweger MI, Jansen HJ, Veneman WJ, Marín-Juez R, de Sonnevile J, Ordas A, Torraca V, van der Ent W, Leenders WP, Meijer AH, Snaar-Jagalska BE, Dirks RP. Robotic injection of zebrafish embryos for high-throughput screening in disease models. *Methods.* 2013, 62:246-54.**

**Zhou X, Laroche F, Lamers GEM, Torraca V, Voskamp P, Lu T, Chu F, Spaink HP, Abrahams JP, Liu Z. Ultra-small graphene oxide functionalized with polyethylenimine (PEI) for very efficient gene delivery in cell and zebrafish embryos. *Nano Res.* 2012, 5:703-709.**