GROUP IV VIRUSES

- **Viruses are listed alphabetically within the Baltimore scheme: Family, Genus and Species. Where necessary, references are further divided according to research topic. Publications are listed alphabetically by first author**
- **Multiple entries from the same first author are listed chronologically.**
- **For a detailed methodology of Group IV viruses see OptiPrep™ Application Sheets V18-V22. V06 is a methodological review of OptiPrep™ technology.**

1. Arteriviridae

Porcine reproductive and respiratory syndrome virus

Chen, W-Y., Schniztlein, W.M., Calzada-Nova, G. and Zuckermann, F.A. (2018) *Genotype 2 strains of porcine reproductive and respiratory syndrome virus dysregulate alveolar macrophage cytokine production via the unfolded protein response* J. Virol., **92**: e01251-17

Delputte, P.L., Meerts, P., Costers, S. and Nauwynck, H.J. (2004) *Effect of virus-specific antibodies on attachment, internalization and infection of porcine reproductive and respiratory syndrome virus in primary macrophages* Vet. Immunol. Immunopathol., **102**, 179-188

Li, J. and Murtaugh, M.P. (2012) *Dissociation of porcine reproductive and respiratory syndrome virus neutralization from antibodies specific to major envelope protein surface epitopes* Virology, **433**, 367–376

Li, J. and Murtaugh, M.P. (2015) *Functional analysis of porcine reproductive and respiratory syndrome virus N-glycans in infection of permissive cells* Virology, **477**, 82–88

Li, J., Tao, S., Orlando, R. and Murtaugh, M.P. (2015) *N-glycosylation profiling of porcine reproductive and respiratory syndrome virus envelope glycoprotein 5* Virology **478**, 86–98

Van Noort, A., Nelsen, A., Pillatzki, A.E., Diel, D.G., Li, F., Nelson, E. and Wang, X. (2017) *Intranasal immunization of pigs with porcine reproductive and respiratory syndrome virus-like particles plus 2', 3'-cGAMP VacciGrade™ adjuvant exacerbates viremia after virus challenge* Virol. J., **14**: 76

2. Caliciviridae

Bertolotti-Ciarlet, A., White, L.J., Chen, R., Prasad, B.V.V. and Estes, M.K. (2002) *Structural requirements for the assembly of Norwalk virus-like particles* J. Virol., **76**, 4044-4055

Crisci, E., Fraile, L., Moreno, N., Blanco, E., Cabezónd, R., Costa, C., Mussá, T., Baratelli, M., Martinez-Orellana, P., Ganges, L., Martínez, J., Bárcenac, J. and Montoya, M. (2012) *Chimeric calicivirus-like particles elicit specific immune responses in pigs* Vaccine **30**, 2427–2439

Teixeira, L., Marques, R.M., Aguas, A.P. and Ferreira, P.G. (2011) *A simple and rapid method for isolation of caliciviruses from liver of infected rabbits* Res. Vet. Sci., **91**, 164–166

Teixeira, L., Marques, R.M., Águas, A.P. and Ferreira, P.G. (2012) *Regulatory T cells are decreased in acute RHDV lethal infection of adult rabbits* Vet. Immunol. Immunopathol., **148**, 343– 347

3. Coronaviridae

3a. Middle East respiratory syndrome virus

De Wit, E., Prescott, J., Baseler, L., Bushmaker, T., Thomas, T., Lackemeyer, M.G., Martellaro, C., Milne-Price, S., Haddock, E., Haagmans, B.L., Feldmann, H. and Munster, V.J. (2013) *The Middle East respiratory syndrome coronavirus (MERS-CoV) does not replicate in Syrian hamsters* PLoS One, **8**: e69127

3b. Human-Coronavirus

Milewska, A., Kaminski, K., Ciejka, J., Kosowicz, K., Zeglen, S., Wojarski, J., Nowakowska, M., Szczubiałka, K. and Pyrc, K. (2016) *HTCC: broad range inhibitor of coronavirus entry* PLoS One, **11**: e0156552

Milewska, A., Nowak, P., Owczarek, K., Szczepanski, A., Zarebski, M., Hoang, A., Berniak, K., Wojarski, J., Zeglen, S. et al (2018) *Entry of human coronavirus NL63 into the cell* J. Virol., 92: e01933-17

Naskalska, A., Dabrowska, A., Szczepanski, A., Milewska, A., Jasik, K.P. and Pyrca, K. (2019) *Membrane protein of human coronavirus NL63 is responsible for interaction with the adhesion receptor* J. Virol., **93**: e00355-19

3c. Nidovirales
Infectious bronchitic virus
Amarasinghe, A., De Silva Senapathi1, U., Abdul-Cader, M.S., Popowich, S., Marshall, F., Cork, S.C., van der Meer, F., Gomis, S. and Abdul-Careem, M.F. (2018) *Comparative features of infections of two Massachusetts (Mass) infectious bronchitis virus (IBV) variants isolated from Western Canadian layer flocks* BMC Vet. Res., **14**: 391

3d. SARS-Coronavirus
Beniac, D.R., deVarennes, S.L., Andonov, A., He, R. and Booth, T.F. (2007) *Conformational reorganization of the SARS Coronavirus spike following receptor binding: implications for membrane fusion* PLoS ONE, **10:e1082**
Berry, J.D., Jones, S., Drebot, M.A., Andonov, A., Sabara, M., Yuan, X.Y., Weingartl, H., Fernando, L. et al (2004) *Development and characterization of neutralizing monoclonal antibody to the SARs-coronavirus* J. Virol. Methods, **120**, 87-96
Gubbins, M. J., Plummer, F.A., Yuan, X.Y., Johnstone, D., Drebot, M., Andonova, M., Andonov, A. and Berry, J.D. (2004) *Molecular characterization of a panel of murine monoclonal antibodies specific for the SARS-coronavirus* Mol. Immunol., **42**, 125-136
Hatakeyama, S., Matsuoka, Y., Ueshiba, H., Komatsu, N., Itoh, K., Shichijo, S., Kanai, T., Fukushi, M., Ishida, I., Kirikae, T., Sasazuki, T. and Miyoshi-Akiyama, T. (2008) *Dissection and identification of regions required to form pseudoparticles by the interaction between the nucleocapsid (N) and membrane (M) proteins of SARS coronavirus* Virology, **380**, 99-108
Huang, Y., Yang, Z-Y., Kong, W-P. and Nabel, G.J. (2004) *Generation of synthetic severe acute respiratory syndrome coronavirus pseudoparticles: implications for assembly and vaccine production* J. Virol., **78**, 12557-12565
Kuo, L., Hurst-Hess, K.R., Koetzner, C.A. and Masters, P.S. (2016) *Analyses of coronavirus assembly interactions with interspecies membrane and nucleocapsid protein chimeras* J. Virol., **90**, 4357-4368
Milewska, A., Zarebski, M., Nowak, P., Stozek, K., Potempa, J. and Pyrca, K. (2014) *Human coronavirus NL63 utilizes heparan sulfate proteoglycans for attachment to target cells* J. Virol., **88**, 13221–13230
Milewska, A., Kaminski, K., Ciejka, J., Kosowicz, K., Zeglen, S., Wojarski, J., Nowakowska, M., Szczubiałka, K. and Pyrc, K. (2016) *HTCC: broad range inhibitor of coronavirus entry* PLoS One, **11**: e0156552
Tseng, Y-T., Wang, S-M., Huang, K-J., Lee, A.I-R., Chiang, C-C. and Wang, C-T. (2010) *Self-assembly of severe acute respiratory syndrome coronavirus membrane protein* J. Biol. Chem., **285**, 12862–12872
Tseng, Y-T., Wang, S-M., Huang, K-J. and Wang, C-T. (2014) *SARS-CoV envelope protein palmitoylation or nucleocapid association is not required for promoting virus-like particle production* J. Biomed. Sci., **21**: 34
Yang, Z-Y., Huang, Y., Ganesh, L., Leung, K., Kong, W-P., Schwartz, O., Subbarao, K. and Nabel, G.J. (2004) *pH-dependent entry of severe acute respiratory syndrome coronavirus is mediated by the spike glycoprotein and enhanced by dendritic cell transfer through DC-sign* J. Virol., 78, 5642-5680

4. Flaviviridae
4a. Bovine diarrhea virus
Fredericksen, F., Delgado, F., Cabrera, C., Yáñez, A., Gonzalo, C., Villalba, M. and Olavarría, V.H. (2015) *The effects of reference genes in qRT-PCR assays for determining the immune response of bovine cells (MDBK) infected with the Bovine Viral Diarrhea Virus 1 (BVDV-1)* Gene, **569**, 95–103
Fredericksen, F., Carrasco, G., Villalba, M. and Olavarría, V.H. (2015) *Cytopathic BVDV-1 strain induces immune marker production in bovine cells through the NF-κB signaling pathway* Mol. Immunol., **68**, 213–222
Maurer, K., Krey, T., Moennig, V., Thiel, H-J. and Rümenapf, T. (2004) *CD46 is a cellular receptor for bovine viral diarrhea virus* J. Virol., **78**, 1792-1799

4b. Dengue virus
Alayli, F. and Scholle, F. (2016) *Dengue virus NS1 enhances viral replication and pro-inflammatory cytokine production in human dendritic cells* Virology, **496**, 227–236
Ayala-Nuñez, N.V., Wilschut, J. and Smit, J.M. (2011) *Monitoring virus entry into living cells using DiD-labeled dengue virus particles* Methods **55**, 137–143
Briggs, C.M., Smith, K.M., Piper, A., Huitt, E., Spears, C.J., Quiles, M., Ribeiro, M., Thomas, M.E., Brown, D.T. and Hernandez, R. (2014) *Live attenuated tetravalent dengue virus host range vaccine is immunogenic in African green monkeys following a single vaccination* J. Virol., **88**, 6729–6742
Hacker, K., White, L. and de Silva, A.M. (2009) *N-Linked glycans on dengue viruses grown in mammalian and insect cells* J. Gen. Virol., **90**, 2097–2106

Hadjilaou, A., Green, A.M., Coloma, J. and Harris, E. (2015) *Single-cell analysis of B cell/antibody cross-reactivity using a novel multicolor FluoroSpot assay* J. Immunol., **195**, 3490–3496
Hallez, C., Li, X., Suspène, R., Thiers, V., Bouzidi, M.S., Dorobantu, C.M., Lucansky, V., Wain-Hobson, S., Gaudin, R. and Vartanian, J-P., (2019) *Hypoxia-induced human deoxyribonuclease I is a cellular restriction factor of hepatitis B virus* Nat. Microbiol., **1196**, 1196–1207
Heaton, N.S., Perera, R., Berger, K.L., Khadka, S., LaCount, D.J., Kuhn, R.J. and Randall, G. (2010) *Dengue virus nonstructural protein 3 redistributes fatty acid synthase to sites of viral replication and increases cellular fatty acid synthesis* Proc. Natl. Acad. Sci. USA, **107**, 17345–17350
Raheel, U., Jamal, M. and Zaidi, N.U.S.S. (2015) *A molecular approach designed to limit the replication of mature DENV2 in host cells* Viral Immunol., **28**, 378–384
Rodenhuis-Zybert, I.A., van der Schaar, H.M., da Silva Voorham, J.M., van der Ende-Metselaar, H., Lei, H-Y., Jan Wilschut, J. and Smit, J.M. (2010) *Immature dengue virus: a veiled pathogen?* PLoS Pathogens, **6**:e1000718
Smith, K.M., Nanda, K., McCarl, V., Spears, C.J., Piper, A., Ribeiro, M., Quiles, M., Briggs, C.M., Thomas, G.S., Thomas, M.E., Brown, D.T. and Hernandez, R. (2012) *Testing of novel dengue virus 2 vaccines in African green monkeys: safety, immunogenicity, and efficacy* Am. J. Trop. Med. Hyg., **87**, 743–753
Vancini, R., Kramer, L.D., Ribeiro, M., Hernandez, R. and Brown, D. (2013) *Flavivirus infection from mosquitoes in vitro reveals cell entry at the plasma membrane* Virology **435**, 406–414
Wahala, W.M.P.B., Kraus, A.A., Haymore, L.B., Accavitti-Loper, M.A. and de Silva, A.M. (2009) *Dengue virus neutralization by human immune sera: Role of envelope protein domain III-reactive antibody* Virology **392**, 103–113
Wahala, W.M.P.B., Donaldson, E.F., de Alwis, R., Accavitti-Loper, M.A., Baric, R.S. and de Silva, A.M. (2010) *Natural strain variation and antibody neutralization of dengue serotype 3 viruses* PLoS Pathogens, **6**: e1000821
White, L.J. Parsons, M.M., Whitmore, A.C., Williams, B.M., de Silva, A. and Johnston, R.E. (2007) *An immunogenic and protective alphavirus replicon particle-based Dengue vaccine overcomes maternal antibody interference in weanling mice* J. Virol., **81**, 10329-10339
Zaitseva, E., Yang, S-T., Melikov, K., Pourmal, S., Chernomordik, L.V. (2010) *Dengue virus ensures its fusion in late endosomes using compartment-specific lipids* PloS Pathogens, **6**: e1001131
Zicari, S., Arakelyan, A., Fitzgerald, W., Zaitseva, E., Chernomordik, L.V., Margolis, L. and Grivel, J-C. (2016) *Evaluation of the maturation of individual Dengue virions with flow virometry* Virology, **488**, 20–27
Zybert, I.A., van der Ende-Metselaar, H., Wilschut, J. and Smit, J.M. (2008) *Functional importance of dengue virus maturation: infectious properties of immature virions* J. Gen. Virol., **89**, 3047–3051

4c. Hepatitis C virus

4c-1. Anti-scavanger receptor (B type)

Vercauteren, K., Van Den Eede, N., Mesalam, A.A., Belouzard, S., Catanese, M.T. et al (2014) *Successful anti-scavenger receptor class B type I (SR-BI) monoclonal antibody therapy in humanized mice after challenge with HCV variants with in vitro resistance to SR-BI-targeting agents* Hepatology, **60,** 1508-1518

4c-2. Assembly and cell release of virus particles

Adair, R., Patel, A.H., Corless, L., Griffin, S., Rowlands, D.J. and McCormick, C.J. (2009) *Expression of hepatitis C virus (HCV) structural proteins in trans facilitates encapsidation and transmission of HCV subgenomic RNA* J. Gen. Virol., **90**, 833–842
Bankwitz, D., Doepke, M., Hueging, K., Weller, R., Bruening, J., Behrendt, P., Lee, J-Y., Vondran, F.W.R. et al (2017) *Maturation of secreted HCV particles by incorporation of secreted ApoE protects from antibodies by enhancing infectivity* J. Hepatol., **67**, 480–489
Bayer, K., Banning, C., Bruss, V., Wiltzer-Bach, L. and Schindler, M. (2016) *Hepatitis C virus is released via a noncanonical secretory* route J. Virol., **90**, 10558-10573
Belouzard, S., Danneels, A., Fénéant, L., Séron, K., Rouillé, Y. and Dubuisson, J. (2017) *Entry and release of hepatitis C virus in polarized human hepatocytes* J. Virol., 91: e00478-17
Benga, W.J.A., Krieger, S.E., Dimitrova, M., Zeisel, M.B., Parnot, M., Lupberger, J., Hildt, E., Luo, G., McLauchlan, J., Baumert, T.F. and Schuster, C. (2010) *Apolipoprotein E interacts with hepatitis C virus nonstructural protein 5A and determines assembly of infectious particles* Hepatology, **51**, 43-53
Bentham, M.J., Foster, T.L., McCormick, C. and Griffin, S. (2013) *Mutations in hepatitis C virus p7 reduce both the egress and infectivity of assembled particles via impaired proton channel function* J. Gen. Virol., **94**, 2236–2248
Counihan, N.A., Rawlinson, S.M. and Lindenbach, B.D. (2011) *Trafficking of hepatitis C virus core protein during virus particle assembly* PLoS Pathog., **7**: e1002302

De la Fuente, C. and Catanese, M.T. (2019) *Production and purification of cell culture hepatitis C virus* In Hepatitis C Virus Protocols, Meth. Mol. Biol., vol. 1911 (ed. Law, M), Springer Science+Business Media LLC New York, pp 105-119
Eyre, N.S., Aloia, A.L., Joyce, M.A., Chulanetra, M., Tyrrell, D.L. and Beard, M.R. (2017) *Sensitive luminescent reporter viruses reveal appreciable release of hepatitis C virus NS5A protein into the extracellular environment* Virology, **507**, 20–31
Fukuhara, T., Tamura, T., Ono, C., Shiokawa, M., Mori, H., Uemura, K., Yamamoto, S., Kurihara, T. et al (2017) *Host-derived apolipoproteins play comparable roles with viral secretory proteins E^{rns} and NS1 in the infectious particle formation of Flaviviridae* PLoS Pathog., **13**: e1006475
Hueging, K., Doepke, M., Vieyres, G., Bankwitz, D., Frentzen, A., Doerrbecker, J., Gumz, F., Haid, S., Wölk, B., Kaderali, L. and Pietschmann, T. (2014) *Apolipoprotein E co-determines tissue tropism of hepatitis C virus and is crucial for viral cell-to-cell transmission by contributing to a post-envelopment step of assembly* J, Virol., **88**, 1433–1446
Icard, V., Diaz, O., Scholtes, C., Perrin-Cocon, L., Ramière, C., Bartenschlager, R., Penin, F., Lotteau, V. and André, P. (2009) *Secretion of hepatitis C virus envelope glycoproteins depends on assembly of apolipoprotein B positive lipoproteins* PLoS One **4**: e4233
Jones, D.M., Atoom, A.M., Zhang, X., Kottilil, S. and Russell, R.S. (2011) *A genetic interaction between the core and NS3 proteins of hepatitis C virus is essential for production of infectious virus* J. Virol., **85**, 12351–12361
Lassen, S., Grüttner, C., Nguyen-Dinh, V. and Herker, E. (2019) *Perilipin-2 is critical for efficient lipoprotein and hepatitis C virus particle production* J. Cell Sci., **132**: jcs217042
Liefhebber, J.M.P., Hague, C.V., Zhang, Q., Wakelam, M.J.O. and McLauchlan, J. (2014) *Modulation of triglyceride and cholesterol ester synthesis impairs assembly of infectious hepatitis C virus* J. Biol. Chem., **289**, 21276-21288
Long, G., Hiet, M-S., Windisch, M.P., Lee, J-Y., Lohmann, V. and Bartenschlager, R. (2011) *Mouse hepatic cells support assembly of infectious hepatitis C virus particles* Gastroenterology **141**, 1057–1066
Ma, Y., Yates, J., Liang, Y., Lemon, S.M. and Yi, MK. (2008) *NS3 helicase domains involved in infectious intracellular hepatitis C virus particle assembly* J. Virol., **82**, 7624-7639
Ndongo, N., Selliah, S., Berthillon, P., Raymond, V-A., Trépo, C., Bilodeau, M. and Petit, M-A. (2011) *Expression of E1E2 on hepatitis C RNA-containing particles released from primary cultured human hepatocytes derived from infected cirrhotic livers* Intervirology, **54**, 1–9
Pène, V., Lemasson, M., Harper, F., Pierron, G. and Rosenberg, A. (2017) *Role of cleavage at the core-E1 junction of hepatitis C virus polyprotein in viral morphogenesis* PLoS One, **12**: e0175810
Puig-Basagoiti, F., Fukuhara, T., Tamura, T., Ono, C., Uemura, K., Kawachi, Y., Yamamoto, S., Mori, H. et al (2016*) Human cathelicidin compensates for the role of apolipoproteins in hepatitis C virus infectious particle formation* J. Virol., **90**, 8464-8477
Salloum, S., Wang, H., Ferguson, C., Parton, R.G. and Tai1, A.W. (2013) *Rab18 binds to hepatitis C virus NS5A and promotes interaction between sites of viral replication and lipid droplets* PLoS Pathog., **9**: e1003513
Shimakami, T., Honda, M., Shirasaki, T., Takabatake, R., Liu, F., Murai, K., Shiomoto, T. et al (2014) *The acyclic retinoid Peretinoin inhibits hepatitis C virus replication and infectious virus release in vitro* Sci. Rep., **4**: 4688
Yi, M., Ma, Y., Yates, J. and Lemon, S.M. (2007) *Compensatory mutations in E1, p7, NS2, and NS3 enhance yields of cell culture-infectious intergenotypic chimeric hepatitis C virus* J. Virol., **81**, 629-638
Yi, M-K., Ma, Y., Yates, J. and Lemon, S.M. (2009) *Trans-complementation of an NS2 defect in a late step in hepatitis C virus (HCV) particle assembly and maturation* PLoS Pathog., **5**:e1000403
Yin, C., Goonawardane, N., Stewart, H. and Harris, M. (2018) *A role for domain I of the hepatitis C virus NS5A protein in virus assembly* PloS Pathog., **14**: e1006834
Zayas, M., Long, G., Madan, V. and Bartenschlager, R. (2016) *Coordination of hepatitis C virus assembly by distinct regulatory regions in nonstructural protein* 5A PLoS Pathog., **12**: e1005376

4c-3. Assembly – lipid droplets

Beilstein, F., Lemasson, M., Pène, V., Rainteau, D., Demignot, S. and Rosenberg, A.R. (2017) *Lysophosphatidylcholine acyltransferase 1 is downregulated by hepatitis C virus: impact on production of lipo-viro-particles* Gut, **66**, 2160–2169
Lee, J-Y., Cortese, M., Haselmann, U., Tabata, K., Romero-Brey, I., Funaya, C., Schieber, N.L., Qiang, Y. et al (2019) *Spatiotemporal coupling of the hepatitis C virus replication cycle by creating a lipid droplet-proximal membranous replication compartment* Cell Rep., **27**, 3602–3617
Rösch, K., Kwiatkowski, M., Hofmann, S., Schöbel, A., Grüttner, C., Wurlitzer, M., Schlüter, H. and Herker, E. (2016) *Quantitative lipid droplet proteome analysis identifies annexin A3 as a cofactor for HCV particle production* Cell Rep., **16**, 3219–3231

Salloum, S., Wang, H., Ferguson, C., Parton, R.G. and Tai1, A.W. (2013) *Rab18 binds to hepatitis C virus NS5A and promotes interaction between sites of viral replication and lipid droplets* PLoS Pathog., 9: e1003513
Schweitzer, C.J., Zhang, F., Boyer, A., Valdez, K., Cam, M. and Liang, T.J. (2018) *N-Myc downstream-regulated gene 1 restricts hepatitis C virus propagation by regulating lipid droplet biogenesis and viral assembly* J. Virol., 92: e01166-17

4c-4. Cultured cell infection

Belouzard, S., Danneels, A., Fénéant, L., Séron, K., Rouillé, Y. and Dubuisson, J. (2017) *Entry and release of hepatitis C virus in polarized human hepatocytes* J. Virol., 91: e00478-17
Bridge, S.H., Sheridan, D.A., Felmlee, D.J., Nielsen, S.U., Neely, R.D.G., Toms, G.L. and Bassendine, M.F. (2010) *Insulin resistance correlates with low density hepatitis C virus particles in genotype 1 infection* J. Hepatol., **52**, S319–S457
Buck, M. (2008) *Direct infection and replication of naturally occurring hepatitis C virus genotypes 1, 2, 3 and 4 in normal human hepatocyte cultures* PLoS One, **3:**e2660
Da Costa, D., Turek, M., Felmlee, D.J., Girardi, E., Pfeffer, S., Long, G., Bartenschlager, R., Zeisel, M.B. and Baumert, D.F. (2012) *Reconstitution of the entire hepatitis C virus life cycle in nonhepatic cells* J. Virol., **86**, 11919-11925
Doerrbecker, J., Friesland, M., Riebesehl, N., Ginkel, C., Behrendt, P., Brown, R.J.P., Ciesek, S., Wedemeyer, H., Sarrazin, C., Kaderali, L. et al (2014) *Incorporation of primary patient-derived glycoproteins into authentic infectious hepatitis C virus particles* Hepatology, **60,** 508-520
Haid, S., Windisch, M.P., Bartenschlager, R. and Pietschmann, T. (2010) *Mouse-specific residues of claudin-1 limit hepatitis C virus genotype 2a infection in a human hepatocyte cell line* J. Virol., **84**, 964-975
Helle, F., Brochot, E. Fournier, C., Descamps, V., Izquierdo, L., Hoffmann, T.W., Morel, V. et al (2013) *Permissivity of primary human hepatocytes and different hepatoma cell lines to cell culture adapted hepatitis C virus* PLoS One, **8**: e70809
Helle, F., Brochot, E., Fournier, C., Descamps, V., Izquierdo, L., Hoffmann, T.W., Morel, V. Herpe, Y-E. et al (2019) *Correction: Permissivity of primary human hepatocytes and different hepatoma cell lines to cell culture adapted hepatitis C virus* PLoS One, **14**: e0223022
Kato, T., Matsumura, T., Heller, T., Saito, S., Sapp, R.K., Murthy, K., Wakita, T. and Liang, T.J. (2007) *Production of infectious hepatitis C virus of various genotypes in cell cultures* J. Virol., **81**, 4405-4411
Lindenbach, B.D., Meuleman, P., Ploss, A., Vanwolleghem, T., Syder, A.L., McKeating, J.A., Lanford, R.E. et al (2006) *Cell culture-grown hepatitis C virus is infectious in vivo and can be recultured in vitro* Proc. Natl. Acad. Sci. USA, **103**, 3805-3809
Long, G., Hiet, M-S., Windisch, M.P., Lee, J-Y., Lohmann, V. and Bartenschlager, R. (2011) *Mouse hepatic cells support assembly of infectious hepatitis C virus particles* Gastroenterology 2011;141:1057–1066
Mathiesen, C.K., Jensen, T.B., Prentoe, J., Krarup, H., Nicosia, A., Law, M., Bukh, J. and Gottwein, J.M. (2104) *Production and characterization of high-titer serum-free cell culture grown hepatitis C virus particles of genotype 1* Virology **458-459**, 190–208
Molina-Jimenez, F., Benedicto, I., , Dao Thi, V.L., Gondar, V., Lavillette, D., Marin, J.J., Briz, O. et al (2012) *Matrigel-embedded 3D culture of Huh-7 cells as a hepatocyte-like polarized system to study hepatitis C virus cycle* Virology, **425**, 31–39
Ndongo-Thiam, N., Berthillon, P., Errazuriz, E., Bordes, I., De Sequeira, S., Trépo, C. and Petit, M-A. (2011) *Long-term propagation of serum hepatitis C virus (HCV) with production of enveloped HCV particles in human HepaRG hepatocytes* Hepatology, **54**, 406-417
Pietschmann, T., Zayas, M., Meuleman, P., Long, G., Appel, N., Koutsoudakis, G., Kallis, S., Leroux-Roels, G., Lohmann, V. and Bartenschlager, R. (2009) *Production of infectious genotype 1b virus particles in cell culture and impairment by replication enhancing mutations* PLoS Pathog., **5**:e1000475
Pihl, A.F., Offersgaard, A.F., Mathiesen, C.K., Prentoe, J., Fahnøe, U., Krarup, H., Bukh, J. and Gottwein, J.M. (2018) *High density Huh7.5 cell hollow fiber bioreactor culture for high-yield production of hepatitis C virus and studies of antivirals* Sci. Rep., **8**: 17505
Podevin, P., Carpentier, A., Pène, V., Aoudjehane, L., Carriere, M., Zaïdi, S., Hernanadez, C., Calle, V. et al (2010) *Production of infectious hepatitis C virus in primary cultures of human adult hepatocytes* Gastroenterology, **139**, 1355-1364
Podevin, P., Carpentier, A., Pène, V., Aoudjehane, L., Hernandez, C., Calle, V., Demignot, S., Scatton, O. et al (2010) *Culture of hepatitis C virus (HCV) in primary human adult hepatocytes: a physiological model for the production of authentic infectious particles* J. Hepatol., **52**, S183–S317
Shiokawa, M., Fukuhara, T., Ono, C., Yamamoto, S., Okamoto, T., Watanabe, N., Wakita, T. and Matsuura, Y. (2014) *Novel permissive cell lines for complete propagation of hepatitis C virus* J. Virol., **88**, 5578–5594

Skardasi, G. and Michalak, T.I. (2013) *Hepatitis C virus propogation in human $CD4^+$ and $CD8^+$ T lymphocytes* J. Hepatol., 58, S477-S578
Skardasi, G., Chen, A.Y. and Michalak, T.I. (2018) *Authentic patient-derived hepatitis C virus infects and productively replicates in primary $CD4^+$ and $CD8^+$ lymphocytes in vitro* J. Virol., **92:** e01790-17
Sugiyama, N., Murayama, A., Suzuki, R., Watanabe, N., Shiina, M., Liang, T.J., Wakita, T. and Kato, T. (2014) *Single strain isolation method for cell culture-adapted hepatitis C virus by end-point dilution and infection* PLoS One, **9**: e98168
Yi, M., Villanueva, R.A., Thomas, D.L., Wakita, T. and Lemon, S.M. (2006) *Production of infectious genotype 1a hepatitis C virus (Hutchinson strain) in cultured human hepatoma cells* Proc. Natl. Acad. Sci. USA, **103**, 2310-2315

4c-5. Density heterogeneity

Andreo, U., de Jong, Y.P., Scull, M.A., Xiao, J.W., Vercauteren, K., Quirk, C., Mommersteeg, M.C., Bergaya, S. et al (2017) *Analysis of hepatitis C virus particle heterogeneity in immunodeficient human liver chimeric fah-/- mice* Cell. Mol. Gastroenterol. Hepatol., **4**, 405–417

4c-6. Encapsidation

Steinmann, E., Brohm, C., Kallis, S., Bartenschlager, R. and Pietschmann, T. (2008) *Efficient trans-encapsidation of hepatitis C virus RNAs into infectious virus-like particles* J. Virol., **82**, 7034-7046

4c-7. Entry and assembly (incl. inhibitors)

Anggakusuma, Colpitts, C.C., Schang, L.M., Rachmawati, H., Frentzen, A., Pfaender, S., Behrendt, P., Brown, R.J.P., Bankwitz, D., Steinmann, J. et al (2014) *Turmeric curcumin inhibits entry of all hepatitis C virus genotypes into human liver cells* Gut, **63**, 1137–1149
Barth, H., Schnober, E.K., Neumann-Haeflin, C., Thumann, C., Zeisel, M.B., Diepolder, H.M., Hu, Z., Liang, T.K. et al (2008) *Scavenger receptor class B is required for hepatitis C virus uptake and cross-presentation by human dendritic cells* J. Virol., **82**, 3466-3479
Behrendt, P., Perin, P., Menzel, N., Banda, D., Pfaender, S., Alves, M.P., Thiel, V., Meulemann, P., Colpitts, C.C. (2017) *Pentagalloylglucose, a highly bioavailable polyphenolic compound present in Cortex moutan, efficiently blocks hepatitis C virus entry* Antiviral Res., **147**, 19-28
Bitzegeio, J., Bankwitz, D., Hueging, K., Haid, S., Brohm, C., Zeisel, M.B., Herrmann, E., Iken, M.. Ott, M., Baumert, T.F. and Pietschmann, T. (2010) *Adaptation of hepatitis C virus to mouse CD81 permits infection of mouse cells in the absence of human entry factors* PLoS Pathogens, **6**, e:1000978
Calland, N., Albecka, A., Belouzard, S., Wychowski, C., Duverlie, G., Descamps, V., Hober, D., Dubuisson, J., Rouill, Y. and Séron, K. (2012) *(-)-Epigallocatechin-3-gallate is a new inhibitor of hepatitis C virus entry* Hepatology, 55, 720-729
Calland, N., Sahuc, M.E., Belouzard, S., Pène, V., Bonnafous, P., Mesalam, A.A., Deloison, G., Descamps, V. et al (2015) *Polyphenols inhibit hepatitis C virus entry by a new mechanism of action* J. Virol., **89**, 10053-10063
Ciesek, S. von Hahn, T., Colpitts, C.C., Schang, L.M., Friesland, M., Steinmann, J., Manns, M.P., Ott, M., Wedemeyer, H., Meuleman, P., Pietschmann, T. and Steinmann, E. (2011) *The green tea polyphenol, epigallocatechin-3-gallate, inhibits hepatitis C virus entry* Hepatology, 54, 1947-1955
Counihan, N.A., Rawlinson, S.M. and Lindenbach, B.D. (2011) *Trafficking of hepatitis C virus core protein during virus particle assembly* PLoS Pathog., 7: e1002302
Diedrich, G. (2006) *How does hepatitis C virus enter cells?* FEBS J., **273**, 3871-3885
Kato, T., Sugiyama, N., Murayama, A., Matsumura, T., Shiina, M., Asabe, S., Wakita, T. and Imawari, M. (2013) *Antimicrobial peptide LL-37 deteriorate infectivity of hepatitis C virus* Hepatology, **58** (suppl), 443A-444A
Maillard, P., Walic, M., Meuleman, P., Roohvand, F., Huby, T., Le Goff, W., Leroux-Roels, G., Pécheur, E.I. and Budkowska, A. (2011) *Lipoprotein lipase inhibits hepatitis C virus (HCV) infection by blocking virus cell entry* PLoS One, **6**: e26637
Matsumura, T., Sugiyama, N., Murayama, A., Yamada, N., Shiina, M., Asabe, S., Wakita, T., Imawari, M. and Kato, T. (2016) *Antimicrobial peptide LL-37 attenuates infection of hepatitis C virus* Hepatol. Res., **46**, 924–932
Nielsen, S.U., Bassendine, F., Burt, A.D., Bevitt, D.J. and Toms, G.L. (2004) *Characterization of the genome and structural proteins of hepatitis C virus resolved from infected human liver* J. Gen. Virol., **85**, 1497-1507
Qian, X-J., Zhang, X-L., Zhao, P., Jin, Y-S., Chen, H-S., Xu, Q-Q., Ren, H., Zhu, S-Y. et al (2016) *A schisandra-derived compound schizandronic acid inhibits entry of pan-HCV genotypes into human hepatocytes* Sci. Rep., **6**: 27268

Sabahi, A. (2009) *Hepatitis C virus entry: the early steps in the viral replication cycle* Virol. J., 6:117
Sainz Jr., B., Barretto, N., Martin, D.N., Hiraga, N., Imamura, M., Hussain, S., Marsh, K.A., Yu, X., Chayama, K., Alrefai1, W.A., and Uprichard, S.L. (2012) *Identification of the Niemann-Pick C1–like 1 cholesterol absorption receptor as a new hepatitis C virus entry factor* Nat. Med., **18**, 281-285
Vausselin, T., Calland, N., Belouzard, S., Descamps, V., Douam, F., Helle, F., François, C. et al (2013) *The antimalarial ferroquine is an inhibitor of hepatitis C virus* Hepatology, **58**, 86-97
Wahid, A., Helle, F., Descamps, V., Duverlie, G., Penin, F. and Dubuisson, J. (2013) *Disulfide bonds in hepatitis C virus glycoprotein E1 control the assembly and entry functions of E2 glycoprotein* J. Virol., 87, 1605-1617
Xu, Y., Martinez, P., Séron, K., Luo, G., Allain, F., Dubuisson, J. and Belouzard, S. (2015) *Characterization of hepatitis C virus interaction with heparan sulfate proteoglycans* J. Virol., 89, 3846-3858
Yin, C., Goonawardane, N., Stewart, H. and Harris, M. (2018) *A role for domain I of the hepatitis C virus NS5A protein in virus assembly* PloS Pathog., **14**: e1006834
Zayas, M., Long, G., Madan, V. and Bartenschlager, R. (2016) *Coordination of hepatitis C virus assembly by distinct regulatory regions in nonstructural protein* 5A PLoS Pathog., **12**: e1005376

4c-8. Entry/efflux processes – apolipoproteins/lipoproteins/LDL/VLDL

Albecka, A., Belouzard, S., Op de Beeck, A., Descamps, V., Goueslain, L., Bertrand-Michel, J., Tercé, F., Duverlie, G., Rouillé, Y. and Dubuisson, J. (2012) *Role of low-density lipoprotein receptor in the hepatitis C virus life cycle* Hepatology, **55**, 998-1007
Andreo, U., Scull, M.A., De Jong, Y.P., Ramanan, V., Flatley, B., Schwartz, R.E, Ng, S., Chen, A.A., Fisher, E.A., Bhatia, S. and Rice, C.M. (2014) *Novel in vitro models for assembly of VLDL and low-density hepatitis C virus particles* Hepatology, 60 (Suppl), 1050A-1051A
Bankwitz, D., Doepke, M., Hueging, K., Weller, R., Bruening, J., Behrendt, P., Lee, J-Y., Vondran, F.W.R. et al (2017) *Maturation of secreted HCV particles by incorporation of secreted ApoE protects from antibodies by enhancing infectivity* J. Hepatol., **67**, 480–489
Bridge, S.H., Sheridan, D.A., Felmlee, D.J., Toms, G.L., Neely, R.D.G. and Bassendine, M.F. (2010) *Low density Hepatitis C virus particles (lipoviral particles) associate with insulin resistance in genotype 1 infection* Atherosclerosis **213**, e4
Bridge, S.H., Sheridan, D.A., Felmlee, D.J., Nielsen, S.U., Thomas, H.C., Taylor-Robinson, S.D., Neely, R.D.G., Toms, G.L. and Bassendine, M.F. (2011) *Insulin resistance and low-density apolipoprotein B-associated lipoviral particles in hepatitis C virus genotype 1 infection* Gut, **60**, 680-687
Bridge, S., Sheridan, D., Felmlee, D., Crossey, M., Thomas, H., Taylor-Robinson, S., Toms, G., Neely, D. and Bassendine, M. (2011) *P50 Apolipoprotein E and low-density, apolipoprotein B associated lipoviral particles in chronic hepatitis C infection: evidence for genotype-specific modulation of lipid pathways* Gut, **60**, A24
Bridge, S.H., Sheridan, D.A., Felmlee, D.J., Crossey, M.M.E., Fenwick, F.I., Lanyon, C.V., Dubuc, G., Seidah, N.G., Davignon, J. et al (2015) *PCSK9, apolipoprotein E and lipoviral particles in chronic hepatitis C genotype 3: Evidence for genotype-specific regulation of lipoprotein metabolism* J. Hepatol., **62**, 763−770
Calattini, S., Fusil, F., Mancip, J., Thi, V.L.D., Granier, C., Gadot, N., Scoazec, J-Y., Zeisel, M.B. et al (2015) *Functional and biochemical characterization of hepatitis C virus (HCV) particles produced in a humanized liver mouse model* J. Biol. Chem., **290**, 23173–23187
Crouchet, E., Lefèvre, M., Verrier, E.R., Oudot, M.A., Baumert, T.F. and Schuster, C. (2017) *Extracellular lipid-free apolipoprotein E inhibits HCV replication and induces ABCG1-dependentcholesterol efflux* Gut, **66**, 896–907
Diedrich, G. (2006) *How does hepatitis C virus enter cells?* FEBS J., **273**, 3871-3885
Fauvelle, C., Felmlee, D.J., Crouchet, E., Lee, JY., Heydmann, L., Lefèvre, M., Magri, A., Hiet, M-S., Fofana, I., Habersetzer, F. ey al (2016) *Apolipoprotein E mediates evasion from hepatitis C virus neutralizing antibodies* Gastroenterology **150**, 206–217
Felmlee, D., Sheridan, D., Bridge, S., Packard, C., Caslake, M., Toms, G., Neely, D. and Bassendine, M. (2011) *Use of Intralipid infusion to analyse apolipoprotein B (apoB) and HCV RNA kinetics in chronic infection* Gut, **60**, A21
Fénéant, L., Potel, J., François, C., Sané, F., Douam, F., Belouzard, S., Calland, N., Vausselin, T. et al (2015) *New insights into the understanding of hepatitis C virus entry and cell-to-cell transmission by using the ionophore monensin A* J. Virol., **89**, 8346–8364
Fukuhara, T., Tamura, T., Ono, C., Shiokawa, M., Mori, H., Uemura, K., Yamamoto, S., Kurihara, T. et al (2017) *Host-derived apolipoproteins play comparable roles with viral secretory proteins E^{rns} and NS1 in the infectious particle formation of Flaviviridae* PLoS Pathog., **13**: e1006475
Hishiki, T., Shimizu, Y., Tobita, R., Sugiyama, K., Ogawa, K., Funami, K., Ohsaki, Y., Fujimoto, T. et al (2010) *Infectivity of hepatitis C virus is influenced by association with apolipoprotein E isoforms* J. Virol., **84**, 12048-12057

Hueging, K., Doepke, M., Vieyres, G., Bankwitz, D., Frentzen, A., Doerrbecker, J., Gumz, F., Haid, S., Wölk, B., Kaderali, L. and Pietschmann, T. (2014) *Apolipoprotein E co-determines tissue tropism of hepatitis C virus and is crucial for viral cell-to-cell transmission by contributing to a post-envelopment step of assembly* J, Virol., **88**, 1433–1446
Jammart, B., Michelet, M., Pécheur, E-I., Parent, R., Bartosch, B., Zoulim, F. and Durante, D. (2013) *Very-low-density lipoprotein (VLDL)-producing and hepatitis C virus-replicating HepG2 cells secrete no more lipoviroparticles than VLDL-deficient Huh7.5 cells* J. Virol., **87**, 5065–5080
Lee, J-Y., Acosta, E.G., Stoeck, I.K., Long, G., Hiet, M-S., Mueller, B., Fackler, O.T., Kallis, S. and Bartenschlager, R. (2014) *Apolipoprotein E likely contributes to a maturation step of infectious hepatitis C virus particles and interacts with viral envelope glycoproteins* J. Virol., **88**, 12422–12437
Li, Z., Li, Y., Bi, Y., Zhang, H., Yao, Y., Li, Q., Cun, W., Dong, S. (2017) *Extracellular interactions between hepatitis C virus and secreted apolipoprotein* E J. Virol., **91**: e00227-16
Maillard, P., Walic, M., Meuleman, P., Roohvand, F., Huby, T., Le Goff, W., Leroux-Roels, G., Pécheur, E.I. and Budkowska, A. (2011) *Lipoprotein lipase inhibits hepatitis C virus (HCV) infection by blocking virus cell entry* PLoS One, **6**: e26637
Nielsen, S.U., Bassendine, M.F., Burt, A.D., Martin, C., Pumeechockchai, W. and Toms, G.L. (2006) *Association between hepatitis C virus and very-low-density lipoprotein (VLDL)/LDL analyzed in iodixanol density gradients* J. Virol., **80**, 2418-2428
Nielsen, S., Sheridan, D., Bridge, S., Felmlee, D., Neely, D. Toms, G. and Bassendine, M. (2009) *Characterization of hepatitis C virus particles in human plasma: association with immunoglobulins G1, G3 and M and apolipoproteins A-I, A-II, B, C-I and E* J. Hepatol., **50** (Supp. 1) S316-S317
Oliveira, C., Fournier, C., Descamps, V., Morel, V., Scipione, C.A., Koschinsky, M.L., Boullier, A., Marcelo, P. et al (2016) *Apolipoprotein(a) inhibits hepatitis C virus entry* J. Clin. Virol., **82S**, S82-S83
Oliveira, C., Fournier, C., Descamps, V., Morel, V., Scipione, C.A., Romagnuolo, R., Koschinsky, M.L., Boullier, A., Marcelo, P. et al (2017) *Apolipoprotein(a) inhibits hepatitis C virus entry through interaction with infectious particles* Hepatology, **65**, 1851-1864
Owen, D.M., Huang, H., Ye, J. and Gale, M. (2009) *Apolipoprotein E on hepatitis C virion facilitates infection through interaction with low-density lipoprotein receptor* Virology **394**, 99–108
Pene, V., Hernandez, C., Blanc, E., Aoudjehane, L., Le Grand, B., Carpentier, A., Méritet, J-F., Conti, F. et al (2015) *Alcohol increases the production of hepatitis C virus (HCV) lipo-viro-particles in primary human hepatocytes* Hepatology, **62** (Suppl) 221A-222A
Podevin, P., Carpentier, A., Pène, V., Aoudjehane, L., Hernandez, C., Calle, V., Demignot, S., Scatton, O. et al (2010) *Culture of hepatitis C virus (HCV) in primary human adult hepatocytes: a physiological model for the production of authentic infectious particles* J. Hepatol., **52**, S183–S317
Sheridan, D., Bridge, S., Sheridan, D.A., Felmlee, D., Thomas, H., Taylor-Robinson, S., Dermot, R., Neely, G., Toms, G.L. and Bassendine, M.F. (2010) *Measurement of low density apolipoprotein B associated hepatitis C virus lipoviral particles in genotype 1 infection is more clinically relevant than total viral load* Gut, **59** Suppl 2, A6
Sheridan, D.A., Bridge, S.H., Felmlee, D.J., Crossey, M.M.E., Thomas, H.C., Taylor-Robinson, S.D., Toms, G.L., Neely, R.D.G. and Bassendine, M.F. (2012) *Apolipoprotein-E and hepatitis C lipoviral particles in genotype 1 infection: Evidence for an association with interferon sensitivity* J. Hepatol., **57**, 32–38
Yang, Z., Wang, X., Chi, X., Zhao, F., Guo, J., Ma, P., Zhong, J., Niu, J., Pan, X. and Long, G. (2016) *Neglected but important role of apolipoprotein E exchange in hepatitis C virus infection* J. Virol., **90**, 9632-9643
Zhu, W., Pei, R., Jin, R., Hu, X., Zhou, Y., Wang, Y., Wu, C., Lu, M. and Chen, X. (2014) *Nuclear receptor 4 group A member 1 determines hepatitis C virus entry efficiency through the regulation of cellular receptor and apolipoprotein E expression* J. Gen. Virol., **95**, 1510–1521

4c-9. Entry process – glycocalyx/glycoproteins/proteins/proteoglycans

Baktash, Y., Madhav, A., Coller, K.E. and Randall, G. (2018) *Single particle imaging of polarized hepatoma organoids upon hepatitis C virus infection reveals an ordered and sequential entry process* Cell Host Microbe, **23**, 382–394
Carlsen, T.H.R., Scheel, T,K,H, Ramirez, S., Foung, S.K.H. and Bukha, J. (2013) *Characterization of hepatitis C virus recombinants with chimeric E1/E2 envelope proteins and identification of single amino acids in the E2 stem region important for entry* J. Virol., **87**, 1385-1399
Grigorov, B., Reungoat, E., Gentil dit Maurin, A., Varbanov, M., Blaising, J., Michelet, M., Manuel, R., Parent, R., Bartosch, B. et al (2017) *Hepatitis C virus infection propagates through interactions between Syndecan-1 and CD81 and impacts the hepatocyte glycocalyx* Cell. Microbiol., **19**: e12711

Haid, S., Pietschmann, T. and Pécheur, E.I. (2009) *Low pH-dependent hepatitis C virus membrane fusion depends on E2 integrity, target lipid composition, and density of virus particles* J. Biol. Chem., **284**, 17657–17667
Haddad, J.G., Rouillé, Y., Hanoulle, X., Descamps, V., Hamze, M., Dabboussi, F., Baumert, T,F., Duverlie, G., Lavie, M. and Dubuisson, J. (2017) *Identification of novel functions for hepatitis C virus envelope glycoprotein E1 in virus entry and assembly* J. Virol., **91**: e00048-17
Lavie, M., Sarrazin, S., Montserret, R., Descamps, V., Baumert, T.F., Duverlie, G., Séron, K., Penin, F. and Dubuissona, J. (2014) *Identification of conserved residues in hepatitis C virus envelope glycoprotein E2 that modulate virus dependence on CD81 and SRB1 entry factors* J. Virol., **88**, 10584–10597
Tamura, T., Fukuhara, T., Uchida, T., Ono, C., Mori, H., Sato, A., Fauzyah, Y., Okamoto, T., Kurosu, T. et al (2018) *Characterization of recombinant Flaviviridae viruses possessing a small reporter tag* J. Virol., **92**: e01582-17
Xu, Y., Martinez, P., Séron, K., Luo, G., Allain, F., Dubuisson, J. and Belouzard, S. (2015) *Characterization of hepatitis C virus interaction with heparan sulfate proteoglycans* J. Virol., 89, 3846-3858

4c-10. Envelope proteins/glycoproteins (E1/E2)/structure

Atoom, A.M., Jones, D.M. and Russell, R.S. (2013) *Evidence suggesting that HCV p7 protects E2 glycoprotein from premature degradation during virus production* Virus Res., **176**, 199– 210
Calattini, S., Fusil, F., Mancip, J., Thi, V.L.D., Granier, C., Gadot, N., Scoazec, J-Y., Zeisel, M.B. et al (2015) *Functional and biochemical characterization of hepatitis C virus (HCV) particles produced in a humanized liver mouse model* J. Biol. Chem., **290**, 23173–23187
Carlsen, T.H.R., Scheel, T,K,H, Ramirez, S., Foung, S.K.H. and Bukha, J. (2013) *Characterization of hepatitis C virus recombinants with chimeric E1/E2 envelope proteins and identification of single amino acids in the E2 stem region important for entry* J. Virol., **87**, 1385-1399
Catanese, M.T., Uryu, K., Kopp, M., Edwards, T.J., Andrus, L., Rice, W.J., Silvestry, M., Kuhn, R.J. and Rice, C.M. (2013) *Ultrastructural analysis of hepatitis C virus particles* Proc. Natl. Acad. Sci. USA, **110**, 9505–9510
Denolly, S., Mialon, C., Bourlet, T., Amirache, F., Penin, F., Lindenbach, B., Boson, B. and Cosset, F-L. (2017) *The amino-terminus of the hepatitis C virus (HCV) p7 viroporin and its cleavage from glycoprotein E2-p7 precursor determine specific infectivity and secretion levels of HCV particle types* PLoS Pathog. **13**: e1006774
Doerrbecker, J., Friesland, M., Riebesehl, N., Ginkel, C., Behrendt, P., Brown, R.J.P., Ciesek, S. et al (2014) *Incorporation of primary patient-derived glycoproteins into authentic infectious hepatitis C virus particles* Hepatology, **60,** 508-520
Felmlee, D.J., Fauvelle, C., Heydmann, L., Hiet, M-S., Fofana, I., Bartenschlager, R., Stoll-Keller, F., Zeisel, M.B.. Fafi-Kremer, S. and Baumert, T.F. (2013) *Hepatitis C virus liver transplantation escape variant is characterized by both enhanced triglyceride-rich lipoprotein association and sensitivity to apoE antibodies* J. Hepatol., **58**, S468
Fénéant, L., Potel, J., François, C., Sané, F., Douam, F., Belouzard, S., Calland, N., Vausselin, T. et al (2015) *New insights into the understanding of hepatitis C virus entry and cell-to-cell transmission by using the ionophore monensin A* J. Virol., **89**, 8346–8364
Grove, J., Nielsen, S., Zhong, J., Bassendine, M.F., Drummer, H.E., Balfe, P. and McKeating, J.A. (2008) *Identification of a residue in hepatitis C virus E2 glycoprotein that determines scavenger receptor BI and CD81 receptor dependency and sensitivity to neutralizing antibodies* J. Virol., **82**, 12020–12029
Haddad, J.G., Rouillé, Y., Hanoulle, X., Descamps, V., Hamze, M., Dabboussi, F., Baumert, T,F., Duverlie, G., Lavie, M. and Dubuisson, J. (2017) *Identification of novel functions for hepatitis C virus envelope glycoprotein E1 in virus entry and assembly* J. Virol., **91**: e00048-17
Icard, V., Diaz, O., Scholtes, C., Perrin-Cocon, L., Ramière, C., Bartenschlager, R., Penin, F., Lotteau, V. and André, P. (2009) *Secretion of hepatitis C virus envelope glycoproteins depends on assembly of apolipoprotein B positive lipoproteins* PLoS One **4**: e4233
Koutsoudakis, G., Dragun, J., Pérez-del-Pulgar, S., Coto-Llerena, M., Mensa, L., Crespo, G., González, P., Navasa, M. and Forns, X. (2012) *Interplay between basic residues of hepatitis C virus glycoprotein E2 with viral receptors, neutralizing antibodies and lipoproteins* PLoS One, **7**: e52651
Lavie, M., Sarrazin, S., Montserret, R., Descamps, V., Baumert, T.F., Duverlie, G., Séron, K., Penin, F. and Dubuissona, J. (2014) *Identification of conserved residues in hepatitis C virus envelope glycoprotein E2 that modulate virus dependence on CD81 and SRB1 entry factors* J. Virol., **88**, 10584–10597
Lee, J-Y., Acosta, E.G., Stoeck, I.K., Long, G., Hiet, M-S., Mueller, B., Fackler, O.T., Kallis, S. and Bartenschlager, R. (2014) *Apolipoprotein E likely contributes to a maturation step of infectious hepatitis C virus particles and interacts with viral envelope glycoproteins* J. Virol., **88**, 12422–12437
Lee, M., Yang, J., Jo, E., Lee, J-Y., Kim, H-Y., Bartenschlager, R., Shin, E-C., Bae, Y-S. and Windisch, M.P. (2017) *A novel inhibitor IDPP interferes with entry and egress of HCV by targeting glycoprotein E1 in a genotype-specific manner* Sci. Rep., **7**: 44676

Moustafa, R.I., Haddad, J.G., Linna, L., Hanoulle, X., Descamps, V., Mesalam, A.A., Baumert, T.F., Duverlie, G., Meuleman, P., Dubuisson, J. and Lavie, M. (2018) *Functional study of the C-terminal part of the hepatitis C virus E1 ectodomain* J. Virol. **92**: e00939-18
Pécheur, E-I., Diaz, O., Molle, J., Icard, V., Bonnafous, P., Lambert, O. and André, P. (2010) *Morphological characterization and fusion properties of triglyceride-rich lipoproteins obtained from cells transduced with hepatitis C virus glycoproteins* J. Biol. Chem., **285**, 25802–25811
Pène, V., Lemasson, M., Harper, F., Pierron, G. and Rosenberg, A. (2017) *Role of cleavage at the core-E1 junction of hepatitis C virus polyprotein in viral morphogenesis* PLoS One, **12**: e0175810
Prentoe, J., Jensen, T.B., Meuleman, P., Serre, S.B.N., Scheel, T.K.H., Leroux-Roels, G., Gottwein, J.M. and Bukh, J. (2011) *Hypervariable region 1 differentially impacts viability of hepatitis C virus strains of genotypes 1 to 6 and impairs virus neutralization* J. Virol., **85**, 2224-2234
Prentoe, J., Velázquez-Moctezuma, R., Augestad, E.H., Galli, A., Wang, R., Law, M., Alter, H. and Bukha, J. (2019) *Hypervariable region 1 and N-linked glycans of hepatitis C regulate virion neutralization by modulating envelope conformations* Proc. Natl. Acad. Sci. USA **116**, 0039–10047
Wahid, A., Helle, F., Descamps, V., Duverlie, G., Penin, F. and Dubuisson, J. (2013) *Disulfide bonds in hepatitis C virus glycoprotein E1 control the assembly and entry functions of E2 glycoprotein* J. Virol., 87, 1605-1617

4c-11. Exosome association

Elgner, F., Ren, H., Medvedev, R., Ploen, D., Himmelsbach, K., Boller, K. and Hildt, E. (2016) *The intracellular cholesterol transport inhibitor U18666A inhibits the exosome-dependent release of mature hepatitis C virus* J. Virol., **90**, 11181-11196
Liu, Z., Zhang, X, Yu, Q. and He, J.J. (2014) *Exosome-associated hepatitis C virus in cell cultures and patient plasma* Biochem. Biophys. Res. Comm., **455**, 218–222

4c-12. Genome/genome manipulation

Chan, K., Cheng, G., Beran, R.K.F., Yang, H., Appleby, T.C., Pokrovskii, M.V., Mo, H., Zhong, SW., Delaney IV, W.E. (2012) *An adaptive mutation in NS2 is essential for efficient production of infectious 1b/2a chimeric hepatitis C virus in cell culture* Virology, **422**, 224–234
Nielsen, S.U., Bassendine, F., Burt, A.D., Bevitt, D.J. and Toms, G.L. (2004) *Characterization of the genome and structural proteins of hepatitis C virus resolved from infected human liver* J. Gen. Virol., **85**, 1497-1507
Vassilaki, N., Friebe, P., Meuleman, P., Kallis, S., Kaul, A., Paranhos-Baccalà, G., Leroux-Roels, G., Mavromara, P. and Bartenschlager, R. (2008) *Role of the hepatitis C virus core+1 open reading frame and core cis-acting RNA elements in viral RNA translation and replication* J. Virol., **82**, 11503-11515

4c-13. Immune responses/antibodies/infectivity

Angus, A.G.N., Loquet, A., Stack, S.J., Dalrymple, D., Gatherer, D., Penin, F. and Patela, A.H. (2012) *Conserved glycine 33 residue in flexible domain I of hepatitis C virus core protein is critical for virus infectivity* J. Virol., **86**, 679-690
Bankwitz, D., Steinmann, E., Bitzegeio, J., Ciesek, S., Friesland, M., Herrmann, E., Zeisel, M.B., Baumert, T.F. et al (2010) *Hepatitis C virus hypervariable region 1 modulates receptor interactions, conceals the CD81 binding site, and protects conserved neutralizing epitopes* J. Virol., **84**, 5751–5763
Bentham, M.J., Foster, T.L., McCormick, C. and Griffin, S. (2013) *Mutations in hepatitis C virus p7 reduce both the egress and infectivity of assembled particles via impaired proton channel function* J. Gen. Virol., **94**, 2236–2248
Bitzegeio, J., Bankwitz, D., Hueging, K., Haid, S., Brohm, C., Zeisel, M.B., Herrmann, E., Iken, M.. Ott, M., Baumert, T.F. and Pietschmann, T. (2010) *Adaptation of hepatitis C virus to mouse CD81 permits infection of mouse cells in the absence of human entry factors* PLoS Pathogens, **6**, e:1000978
Blanchet, M., Sureau, C., Guévin, C., Seidah, N.G. and Labonté, P. (2015) *SKI-1/S1P inhibitor PF-429242 impairs the onset of HCV infection* Antiviral Res., **115**, 94–104
Bocchetta, S., Maillard, P., Yamamoto, M., Gondeau, C., Douam, F., Lebreton, S., Lagaye, S., Pol, S. et al (2014) *Up-regulation of the ATP-binding cassette transporter A1 inhibits hepatitis C virus infection* PLoS One, **9**: e92140
Brault, C., Lévy, P., Duponchel, S., Michelet, M., Sallé, A., Pécheur, E-I., Plissonnier, M-L., Parent, R., Véricel, E. et al (2016) *Glutathione peroxidase 4 is reversibly induced by HCV to control lipid peroxidation and to increase virion infectivity* Gut, **65**, 144–154
Bridge, S.H., Sheridan, D.A., Felmlee, D.J., Nielsen, S.U., Neely, R.D.G., Toms, G.L. and Bassendine, M.F. (2010) *Insulin resistance correlates with low density hepatitis C virus particles in genotype 1 infection* J. Hepatol., **52**, S319–S457

Bush, C.O., Pokrovskii, M.V., Saito, R., Morganelli, P., Canales, E., Clarke, M.O., Lazerwith, S.E., Golde, J. et al (2014) *A small-molecule inhibitor of hepatitis C virus infectivity* Antimicrob. Agents Chemother., **58**, 386–396
Carlsen, T.H.R., Scheel, T,K,H, Ramirez, S., Foung, S.K.H. and Bukha, J. (2013) *Characterization of hepatitis C virus recombinants with chimeric E1/E2 envelope proteins and identification of single amino acids in the E2 stem region important for entry* J. Virol., **87**, 1385-1399
Denolly, S., Mialon, C., Bourlet, T., Amirache, F., Penin, F., Lindenbach, B., Boson, B. and Cosset, F-L. (2017) *The amino-terminus of the hepatitis C virus (HCV) p7 viroporin and its cleavage from glycoprotein E2-p7 precursor determine specific infectivity and secretion levels of HCV particle types* PLoS Pathog. **13**: e1006774
Elmowalid, G.A., Qiao, M., Jeong, S-H., Borg, B.B., Baumert, T.F., Sapp, R.K., Hu, Z., Murthy, K. and Liang, T.J. (2007) *Immunization with hepatitis C virus-like particles results in control of hepatitis C virus infection in chimpanzees* Proc. Natl. Acad. Sci. USA, **104**, 8427-8432
Farquhar, M.J., Harris, H.J., Diskar, M., Jones, S., Mee,, C.J., Nielsen, S.U., Brimacombe C.L. et al (2008) *Protein kinase A-dependent step(s) in hepatitis C virus entry and infectivity* J. Virol., **82**, 8797-8811
Fauvelle, C., Felmlee, D.J., Crouchet, E., Lee, JY., Heydmann, L., Lefèvre, M., Magri, A., Hiet, M-S., Fofana, I., Habersetzer, F. ey al (2016) *Apolipoprotein E mediates evasion from hepatitis C virus neutralizing antibodies* Gastroenterology **150**, 206–217
Garrone, P., Fluckiger, A-C., Mangeot, P.E., Gauthier, E., Dupeyrot-Lacas, P., Mancip, J., Cangialosi, A. et al (2011) *A prime-boost strategy using virus-like particles pseudotyped for HCV proteins triggers broadly neutralizing antibodies in Macaques* Sci. Transl. Med., **3**: 94ra71
Gastaminza, P., Kapadia, S.B. and Chisari, F. (2006) *Differential biophysical properties of infectious intracellular and secreted hepatitis C virus particles* J. Virol., **80**, 11074-11081
Grove, J., Nielsen, S., Zhong, J., Bassendine, M.F., Drummer, H.E., Balfe, P. and McKeating, J.A. (2008) *Identification of a residue in hepatitis C virus E2 glycoprotein that determines scavenger receptor BI and CD81 receptor dependency and sensitivity to neutralizing antibodies* J. Virol., **82**, 12020–12029
Haid, S., Windisch, M.P., Bartenschlager, R. and Pietschmann, T. (2010) *Mouse-specific residues of claudin-1 limit hepatitis C virus genotype 2a infection in a human hepatocyte cell line* J. Virol., **84**, 964-975
Johnson, D.F., Chin, R., Earnest-Silveira, L., Zentgraf, H., Bock, T., Chua, B., Jackson, D.C. and Torresi, J. (2010) *Recombinant mammalian cell derived hepatitis C virus-like particles induce neutralizing antibody responses to hepatitis C virus* Clin. Microbiol. Infect., **16**, S319
Jones, D.M., Atoom, A.M., Zhang, X., Kottilil, S. and Russell, R.S. (2011) *A genetic interaction between the core and NS3 proteins of hepatitis C virus is essential for production of infectious virus* J. Virol., **85**, 12351–12361
Koutsoudakis, G., Dragun, J., Pérez-del-Pulgar, S., Coto-Llerena, M., Mensa, L., Crespo, G., González, P., Navasa, M. and Forns, X. (2012) *Interplay between basic residues of hepatitis C virus glycoprotein E2 with viral receptors, neutralizing antibodies and lipoproteins* PLoS One, **7**: e52651
Lambotin, M., Baumert, T.F. and Barth, H. (2010) *Distinct intracellular trafficking of hepatitis C virus in myeloid and plasmacytoid dendritic cells* J Virol., **84**, 8964–8969
Marnata, C., Saulnier, A., Mompelat, D., Krey, T., Cohen, L., Boukadida, C., Warter, L., Fresquet, J., Vasiliauskaite, I., Escriou, N. et al (2015) *Determinants involved in hepatitis C virus and GB virus B primate host restriction* J. Virol., **89**, 12131-12144
Mathiesen, C.K., Prentoe, J., Meredith, L.W., Jensen, T.B., Krarup, H., McKeating, J.A., Gottwein, J.M. and Bukha, J. (2015) *Adaptive mutations enhance assembly and cell-to-cell transmission of a high-titer hepatitis C virus genotype 5a core-NS2 JFH1-based recombinant* J. Virol., **89**, 7758-7775
Meredith, L.W., Farquhar, M.J., Tarr, A.W. and McKeating, J.A. (2014) *Type I interferon rapidly restricts infectious hepatitis C virus particle genesis* Hepatology, **60**, 1891-1901
Owen, D.M., Huang, H., Ye, J. and Gale, M. (2009) *Apolipoprotein E on hepatitis C virion facilitates infection through interaction with low-density lipoprotein receptor* Virology **394**, 99–108
Plissonnier, M-L., Cottarel, J., Piver, E., Kullolli, M., Centonze, F.G., Pitteri, S., Farhan, H., Meunier, J-C., Zoulim, F. and Parent, R. (2019) *LARP1 binding to hepatitis C virus particles is correlated with intracellular retention of viral infectivity* Virus Res., **271**: 197679
Podevin, P., Carpentier, A., Pène, V., Aoudjehane, L., Carriere, M., Zaïdi, S., Hernanadez, C., Calle, V. et al (2010) *Production of infectious hepatitis C virus in primary cultures of human adult hepatocytes* Gastroenterology, **139**, 1355-1364
Prentoe, J. and Bukh, J. (2011) *Hepatitis C virus expressing flag-tagged envelope protein 2 has unaltered infectivity and density, is specifically neutralized by flag antibodies and can be purified by affinity chromatography* Virology **409**, 148–155
Prentoe, J., Jensen, T.B., Meuleman, P., Serre, S.B.N., Scheel, T.K.H., Leroux-Roels, G., Gottwein, J.M. and Bukh, J. (2011) *Hypervariable region 1 differentially impacts viability of hepatitis C virus strains of genotypes 1 to 6 and impairs virus neutralization* J. Virol., **85**, 2224-2234

Sabahi, A., Marsh, K.A., Dahari, H., Corcoran, P., Lamora, J.M., Yu, X., Garry, R.F. and Uprichard, S.L. (2010) *The rate of hepatitis C virus infection initiation in vitro is directly related to particle density* Virology, **407**, 110–119
Sheridan, D.A., Bridge, S.H., Felmlee, D.J., Crossey, M.M.E., Thomas, H.C., Taylor-Robinson, S.D., Toms, G.L., Neely, R.D.G. and Bassendine, M.F. (2012) *Apolipoprotein-E and hepatitis C lipoviral particles in genotype 1 infection: Evidence for an association with interferon sensitivity* J. Hepatol., **57**, 32–38
Sheridan, D.A., Hajarizadeh, B., Fenwick, F.I., Matthews, G.V., Applegate, T., Douglas, M., Neely, D., Askew, B. Dore, G.J., et al (2016) *Maximum levels of hepatitis C virus lipoviral particles are associated with early and persistent infection* Liver Int., **36**, 1774–1782
Shimizu, Y., Hishiki, T., Sugiyama, K., Ogawa, K., Funami, K., Kato, A., Ohsaki, Y., Fujimoto, T., Takaku, H. and Shimotohno, K. (2010) *Lipoprotein lipase and hepatic triglyceride lipase reduce the infectivity of hepatitis C virus (HCV) through their catalytic activities on HCV-associated lipoproteins* Virology, **407**, 152-159
Vausselin, T., Séron, K., Lavie, M., Mesalam, A.A., Lemasson, M., Belouzard, S., Fénéant, L., Danneels, A., Rouillé, Y. et al (2016) *Identification of a new benzimidazole derivative as an antiviral against hepatitis C virus* J. Virol., **90**, 8422-8434
Vercauteren, K., Van Den Eede, N., Mesalam, A.A., Belouzard, S., Catanese, M.T. et al (2014) *Successful anti-scavenger receptor class B type I (SR-BI) monoclonal antibody therapy in humanized mice after challenge with HCV variants with invitro resistance to SR-BI-targeting agents* Hepatology, **60,** 1508-1518

4c-14. Insulin resistance

Bridge, S.H., Sheridan, D.A., Felmlee, D.J., Nielsen, S.U., Neely, R.D.G., Toms, G.L. and Bassendine, M.F. (2010) *Insulin resistance correlates with low density hepatitis C virus particles in genotype 1 infection* J. Hepatol., **52**, S319–S457
Bridge, S.H., Sheridan, D.A., Felmlee, D.J., Nielsen, S.U., Thomas, H.C., Taylor-Robinson, S.D., Neely, R.D.G., Toms, G.L. and Bassendine, M.F. (2011) *Insulin resistance and low-density apolipoprotein B-associated lipoviral particles in hepatitis C virus genotype 1 infection* Gut, **60**, 680-687
Das, G.C. and Hollinger, F.B. (2012) *Molecular pathways for glucose homeostasis, insulin signaling and autophagy in hepatitis C virus induced insulin resistance in a cellular mode*l Virology, **434**, 5–17

4c-15. Intracellular trafficking

Baktash. Y. and Randall, G. (2019) *Live cell imaging of hepatitis C virus trafficking* In Hepatocytes In Hepatitis C Virus Protocols, Meth. Mol. Biol., vol. 1911 (ed. Law, M), Springer Science+Business Media LLC New York, pp 263-274

4c-16. LARP-1

Plissonnier, M-L., Cottarel, J., Piver, E., Kullolli, M., Centonze, F.G., Pitteri, S., Farhan, H., Meunier, J-C., Zoulim, F. and Parent, R. (2019) *LARP1 binding to hepatitis C virus particles is correlated with intracellular retention of viral infectivity* Virus Res., **271**: 197679

4c-17. Lipids and lipoprotein metabolism (see also "Phospholipases")

Boyer, A., Park, S.B., de Boer, Y.S., Li, Q. and Liang, T.J. (2018) *TM6SF2 Promotes lipidation and secretion of hepatitis C virus in infected hepatocytes* Gastroenterology **115**, 1923–1935
Brault, C., Lévy, p., Duponchel, s., Michelet, M., Sallé, A., Pécheur, E-I., Plissonnier, M-L., Parent, R., Véricel, E. et al (2016) *Glutathione peroxidase 4 is reversibly induced by HCV to control lipid peroxidation and to increase virion infectivity* Gut, **65**, 144–154
Caldwell, S., Hoehn, K.K. and Hahn, Y.S. (2013) *The strange and critical intersection of hepatitis C and lipoprotein metabolism: ''C-zing'' the Oil* Hepatology, 57, 1684-1687**Maillard, P.**, Walic, M., Meuleman, P., Roohvand, F., Huby, T., Le Goff, W., Leroux-Roels, G., Pécheur, E.I. and Budkowska, A. (2011) *Lipoprotein lipase inhibits hepatitis C virus (HCV) infection by blocking virus cell entry* PLoS One, **6**: e26637
Denolly, S., Granier, C., Fontaine, N., Pozzetto, B., Bourlet, T., Guérin, M., Cosset, F-L. (2019) *A serum protein factor mediates maturation and apoB-association of HCV particles in the extracellular milieu* J. Hepatol., **70**, 626–638
Merz, A., Long, G., Hiet, M-S., Brügger, B., Chlanda, P., Andre, P., Wieland, F., Krijnse-Locker, J. and Bartenschlager, R. (2011) *Biochemical and morphological properties of hepatitis C virus particles and determination of their lipidome* J. Biol. Chem., **286**, 3018-3032
Shimizu, Y., Hishiki, T., Sugiyama, K., Ogawa, K., Funami, K., Kato, A., Ohsaki, Y., Fujimoto, T., Takaku, H. and Shimotohno, K. (2010) *Lipoprotein lipase and hepatic triglyceride lipase reduce the infectivity of hepatitis C virus (HCV) through their catalytic activities on HCV-associated lipoproteins* Virology, **407**, 152-159
Shimizu, Y., Hishiki, T., Ujino, S., Sugiyama, K., Funami, K. and Shimotohno, K. (2011) *Lipoprotein component associated with hepatitis C virus is essential for virus infectivity* Curr. Opin. Virol., **1**, 19–26

Shirasaki, T., Honda, M., Shimakami, T., Horii, R., Yamashita, T., Sakai, Y., Sakai, A. et al (2013) *MicroRNA-27a regulates lipid metabolism and inhibits hepatitis C virus replication in human hepatoma cells* J. Virol., **87**, 5270–5286

Yamane, D., McGivern, D.R., Wauthier, E., Yi, M., Madden, V.J., Welsch, C., Antes, I., Wen, Y., Chugh, P.E., McGee, C.E. et al (2014) *Regulation of the hepatitis C virus RNA replicase by endogenous lipid peroxidation* Nature Med., **20**, 927-935

4c-18. Mi-RNAs

Bourhill, T., Arbuthnot, P. and Ely, A. (2016) *Successful disabling of the 5'UTR of HCV using adeno-associated viral vectors to deliver modular multimeric primary microRNA mimics* J. Virol. Meth., **235**, 26–33

Shirasaki, T., Honda, M., Shimakami, T., Horii, R., Yamashita, T., Sakai, Y., Sakai, A., Okada, H. et al (2013) *MicroRNA-27a regulates lipid metabolism and inhibits hepatitis C virus replication in human hepatoma cells* J. Virol., **87**, 5270–5286

4c-19. Morphology

Lussignol, M., Kopp, M., Molloy, K., Vizcay-Barrena, G., Fleck, R.A., Dorner, M., Bell, K.L., Chait, B.T., Rice, C.M. and Catanese, M.T. (2016) *Proteomics of HCV virions reveals an essential role for the nucleoporin Nup98 in virus morphogenesis* Proc. Natl. Acad. Sci. USA, **113**, 2484-2489

Pène, V., Lemasson, M., Harper, F., Pierron, G. and Rosenberg, A. (2017) *Role of cleavage at the core-E1 junction of hepatitis C virus polyprotein in viral morphogenesis* PLoS One, **12**: e0175810

Romero-Brey, I., Merz, A., Chiramel, A., Lee, J-Y., Chlanda, P., Haselman, U., Santarella-Mellwig, R. et al (2012) *Three-dimensional architecture and biogenesis of membrane structures associated with hepatitis C virus replication* PLoS Pathog., **8**: e1003056

Yu, X., Qiao, M., Atanasov, I., Hu, Z., Kato, T., Liang, T.J. and Zhou, Z.H. (2007) *Cryo-electron microscopy and three-dimensional reconstructions of hepatitis C virus particles* Virology, **126**, 126-134

4c-20. NS5A protein

Eyre, N.S., Aloia, A.L., Joyce, M.A., Chulanetra, M., Tyrrell, D.L. and Beard, M.R. (2017) *Sensitive luminescent reporter viruses reveal appreciable release of hepatitis C virus NS5A protein into the extracellular environment* Virology, **507**, 20–31

Salloum, S., Wang, H., Ferguson, C., Parton, R.G. and Tai1, A.W. (2013) *Rab18 binds to hepatitis C virus NS5A and promotes interaction between sites of viral replication and lipid droplets* PLoS Pathog., **9**: e1003513

Shanmugam, S., Nichols, A.K., Saravanabalaji, D., Welsch, C. and Yi, MK. (2018) *HCV NS5A dimer interface residues regulate HCV replication by controlling its selfinteraction, hyperphosphorylation, subcellular localization and interaction with cyclophilin A* PLoS Pathog., **14**: e1007177

Yin, C., Goonawardane, N., Stewart, H. and Harris, M. (2018) *A role for domain I of the hepatitis C virus NS5A protein in virus assembly* PloS Pathog., **14**: e1006834

4c-21. Nuclear factor α

Vallianou, I., Dafou, D., Vassilaki, N., Mavromara, P., Hadzopoulou-Cladaras, M. (2016) *Hepatitis C virus suppresses Hepatocyte Nuclear Factor 4 alpha, a keyregulator of hepatocellular carcinoma* Int. J. Biochem. Cell Biol., **78**, 315–326

4c-22. Particle heterogeneity

Andreo, U., de Jong, Y.P., Scull, M.A., Xiao, J.W., Vercauteren, K., Quirk, C., Mommersteeg, M.C., Bergaya, S. et al (2017) *Analysis of hepatitis C virus particle heterogeneity in immunodeficient human liver chimeric fah-/- mice* Cell. Mol. Gastroenterol. Hepatol., **4**, 405–417

Felmlee, D.J., Sheridan, D.A., Bridge, S.H., Nielsen, S.U., Milne, R.W., Packard, C.J., Caslake, M.J. et al (2010) *Intravascular transfer contributes to postprandial increase in numbers of very-low-density hepatitis C virus particles* Gastroenterology **139**, 1774–1783

Felmlee, D.J., Fauvelle, C., Heydmann, L., Hiet, M-S., Fofana, I., Bartenschlager, R., Stoll-Keller, F., Zeisel, M.B.. Fafi-Kremer, S. and Baumert, T.F. (2013) *Hepatitis C virus liver transplantation escape variant is characterized by both enhanced triglyceride-rich lipoprotein association and sensitivity to apoE antibodies* J. Hepatol., **58**, S468

Mathiesen, C.K., Prentoe, J., Meredith, L.W., Jensen, T.B., Krarup, H., McKeating, J.A., Gottwein, J.M. and Bukha, J. (2015) *Adaptive mutations enhance assembly and cell-to-cell transmission of a high-titer hepatitis C virus genotype 5a core-NS2 JFH1-based recombinant* J. Virol., **89**, 7758-7775

Nielsen, S.U., Bassendine, M.F., Martin, C., Lowther, D., Purcell, P.J., King, B.J., Neely, D., Toms, G.L. (2008) *Characterization of hepatitis C RNA-containing particles from human liver by density and size* J. Gen. Virol., **89**, 2507-2517

Simmonds, P., Becher, P., Collett, M.S., Gould, E.A., Heinz, F.X., Meyers, G., Monath, T., Pletnev, A. et al (2012) *Hepacivirus* In Virus Taxonomy: Ninth Report of the International Committee on Taxonomy of Viruses International Committee on Taxonomy of Viruses. Elsevier Inc., pp 1003-1020
Sugiyama, N., Murayama, A., Suzuki, R., Watanabe, N., Shiina, M., Liang, T.J., Wakita, T. and Kato, T. (2014) *Single strain isolation method for cell culture-adapted hepatitis C virus by end-point dilution and infection* PLoS One, **9**: e98168
Thi, V.L.D., Granier, C., Zeisel, M.B., Guérin, M., Mancip, J., Granio, O., Penin, F. et al (2012) *Characterization of hepatitis C virus particle subpopulations reveals multiple usage of the scavenger receptor BI for entry steps* J. Biol., Chem., **287**, 31242–31257

4c-23. Patient sources

Bartolomé, J., López-Alcorocho, J.M., Castillo, I., Rodriguez-Iñigo, E., Quiroga, J.A., Palacios, R. and Carreño, V. (2007) *Ultracentrifugation of serum samples allows detection of hepatitis C virus RNA in patients with occult hepatitis C.* J. Virol., **81**, 7710-7715
Eyre, N.S., Aloia, A.L., Joyce, M.A., Chulanetra, M., Tyrrell, D.L. and Beard, M.R. (2017) *Sensitive luminescent reporter viruses reveal appreciable release of hepatitis C virus NS5A protein into the extracellular environment* Virology, **507**, 20–31
Liu, Z., Zhang, X, Yu, Q. and He, J.J. (2014) *Exosome-associated hepatitis C virus in cell cultures and patient plasma* Biochem. Biophys. Res. Comm., **455**, 218–222
Sheridan, D.A., Bridge, S.H., Crossey, M.M.E., Felmlee, D.J., Fenwick, F.I., Thomas, H.C., Neely, R.D.G., Taylor-Robinson, S.D. and Bassendine, M.F. (2014) *Omega-3 fatty acids and/or fluvastatin in hepatitis C prior non-responders to combination antiviral therapy – a pilot randomized clinical trial* Liver Int., **34**, 737–747

4c-24. Phospholipases

Menzel, N., Fischl, W., Hueging, K., Bankwitz, D., Frentzen, A., Haid, S., Gentzsch, J.et al (2012) *MAP-kinase regulated cytosolic phospholipase A2 activity is essential for production of infectious hepatitis C virus particles* PLoS Pathog., **8**: e1002829

4c-25. Proteins

Adair, R., Patel, A.H., Corless, L., Griffin, S., Rowlands, D.J. and McCormick, C.J. (2009) *Expression of hepatitis C virus (HCV) structural proteins in trans facilitates encapsidation and transmission of HCV subgenomic* RNA J. Gen. Virol., **90**, 833–842**Bentham, M.J.**, Foster, T.L., McCormick, C. and Griffin, S. (2013) *Mutations in hepatitis C virus p7 reduce both the egress and infectivity of assembled particles via impaired proton channel function* J. Gen. Virol., **94**, 2236–2248
Lussignol, M., Kopp, M., Molloy, K., Vizcay-Barrena, G., Fleck, R.A., Dorner, M., Bell, K.L., Chait, B.T., Rice, C.M. and Catanese, M.T. (2016) *Proteomics of HCV virions reveals an essential role for the nucleoporin Nup98 in virus morphogenesis* Proc. Natl. Acad. Sci. USA, **113**, 2484-2489
Nielsen, S.U., Bassendine, F., Burt, A.D., Bevitt, D.J. and Toms, G.L. (2004) *Characterization of the genome and structural proteins of hepatitis C virus resolved from infected human liver* J. Gen. Virol., **85**, 1497-1507
Prentoe, J. and Bukh, J. (2011) *Hepatitis C virus expressing flag-tagged envelope protein 2 has unaltered infectivity and density, is specifically neutralized by flag antibodies and can be purified by affinity chromatography* Virology **409**, 148–155
Salloum, S., Wang, H., Ferguson, C., Parton, R.G. and Tai1, A.W. (2013) *Rab18 binds to hepatitis C virus NS5A and promotes interaction between sites of viral replication and lipid droplets* PLoS Pathog., **9**: e1003513

4c-26. Purification

De la Fuente, C. and Catanese, M.T. (2019) *Production and purification of cell culture hepatitis C virus* In Hepatitis C Virus Protocols, Meth. Mol. Biol., vol. 1911 (ed. Law, M), Springer Science+Business Media LLC New York, pp 105-119

4c-27. Replication

Bankwitz, D., Steinmann, E., Bitzegeio, J., Ciesek, S., Friesland, M., Herrmann, E., Zeisel, M.B., Baumert, T.F., Keck, Z-y., Foung, S.K.H., Pécheur, E.I. and Pietschmann, T. (2010) *Hepatitis C virus hypervariable region 1 modulates receptor interactions, conceals the CD81 binding site, and protects conserved neutralizing epitopes* J. Virol., **84**, 5751–5763
Jammart, B., Michelet, M., Pécheur, E-I., Parent, R., Bartosch, B., Zoulim, F. and Durante, D. (2013) *Very-low-density lipoprotein (VLDL)-producing and hepatitis C virus-replicating HepG2 cells secrete no more lipoviroparticles than VLDL-deficient Huh7.5 cells* J. Virol., **87**, 5065–5080

Lindenbach, B.D., Evans, M.J., Syder, A.J., Wolk, B., Tellinghuisen, T.L., Liu, C.C., Maruyama, T., Hynes, R.O., Burton, D.R., McKeating, J.A. and Rice, C.M. (2005) *Complete replication of hepatitis C virus in cell culture* Science, **309**, 623-626
Pietschmann, T., Zayas, M., Meuleman, P., Long, G., Appel, N., Koutsoudakis, G., Kallis, S., Leroux-Roels, G., Lohmann, V. and Bartenschlager, R. (2009) *Production of infectious genotype 1b virus particles in cell culture and impairment by replication enhancing mutations* PLoS Pathog., **5**:e1000475
Salloum, S., Wang, H., Ferguson, C., Parton, R.G. and Tai1, A.W. (2013) *Rab18 binds to hepatitis C virus NS5A and promotes interaction between sites of viral replication and lipid droplets* PLoS Pathog., **9**: e1003513
Shimakami, T., Honda, M., Shirasaki, T., Takabatake, R., Liu, F., Murai, K., Shiomoto, T., Funaki, M. et al (2014) *The acyclic retinoid Peretinoin inhibits hepatitis C virus replication and infectious virus release in vitro* Sci. Rep., **4**: 4688
Shiokawa, M., Fukuhara, T., Ono, C., Yamamoto, S., Okamoto, T., Watanabe, N., Wakita, T. and Matsuura, Y. (2014) *Novel permissive cell lines for complete propagation of hepatitis C virus* J. Virol., **88**, 5578–5594
Shirasaki, T., Honda, M., Shimakami, T., Horii, R., Yamashita, T., Sakai, Y., Sakai, A., Okada, H. et al (2013) *MicroRNA-27a regulates lipid metabolism and inhibits hepatitis C virus replication in human hepatoma cells* J. Virol., **87**, 5270–5286
Vassilaki, N., Friebe, P., Meuleman, P., Kallis, S., Kaul, A., Paranhos-Baccalà, G., Leroux-Roels, G., Mavromara, P. and Bartenschlager, R. (2008) *Role of the hepatitis C virus core+1 open reading frame and core cis-acting RNA elements in viral RNA translation and replication* J. Virol., **82**, 11503-11515

4d. Japanese encephalitis virus

Tamura, T., Igarashi, M., Enkhbold, B., Suzuki, T., Okamatsu, M., Ono, C., Mori, H., Izumi, T. et al (2019) *In Vivo dynamics of reporter Flaviviridae viruses* J. Virol., **93**: e01191-19

4e. Pestivirus

Tamura, T., Igarashi, M., Enkhbold, B., Suzuki, T., Okamatsu, M., Ono, C., Mori, H., Izumi, T. et al (2019) *In Vivo dynamics of reporter Flaviviridae viruses* J. Virol., **93**: e01191-19

4f. West Nile virus

Thompson, B.S., Moesker, B., Smit, J.M., Wilschut, J., Diamond, M.S. and Fremont, D.H. (2009) *A therapeutic antibody against West Nile virus neutralizes infection by blocking fusion within endosomes* PLoS Pathog., **5**:e1000453
Vancini, R., Kramer, L.D., Ribeiro, M., Hernandez, R. and Brown, D. (2013) *Flavivirus infection from mosquitoes in vitro reveals cell entry at the plasma membrane* Virology **435**, 406–414
Vogt, M.R., Moesker, B., Goudsmit, J., Jongeneelen, M., Austin, K., Oliphant, T., Nelson, S., Pierson, T.C., Wilschut, J., Throsby, M. and Diamond, M.S. (2009) *Human monoclonal antibodies against West Nile Virus induced by natural infection neutralize at a post-attachment step* J. Virol., **83**, 6494–6507

4g. Yellow fever virus

Patkar, C.G., Jones, C.T., Chang, Y-h., Warrier, R. and Kuhn, R.J. (2007) *Functional requirements of the yellow fever virus capsid protein* J. Virol., **81**, 6471-6481

4h. Zika virus

Andrade, P., Gimblet-Ochieng, C., Modirian, F., Collins, M., Cárdenas, M., Katzelnick, L.C. Montoya, M., Michlmayr, D., Kuan, G. et al (2019) *Impact of pre-existing dengue immunity on human antibody and memory B cell responses to Zika* Nat. Commun., **10**: 938
Betancourt, D., de Queiroz, N.M.G.P., Xia, T., Ahn, J. and Barber, G.N. (2017) *Cutting edge: innate immune augmenting vesicular stomatitis virus expressing Zika virus proteins confers protective immunity* J. Immunol., **198**, 3023–3028
Garg, H., Mehmetoglu-Gurbuz, T., Ruddy, G.M. and Joshi, A. (2019) *Capsid containing virus like particle vaccine against Zika virus made from a stable cell line* Vaccine, **37**, 7123–7131
Heinzelman, P., Low, A., Simeon, R., Wright, G.A. and Chen, Z. (2019) *De novo isolation & affinity maturation of yeast-displayed virion-binding human fibronectin domains by flow cytometric screening against virions* J. Biol. Engineer., **13**: 76
Taguwa, S., Yeh, M-T., Rainbolt, T.K., Nayak, A., Shao, H., Gestwicki, J.E., Andino, R. and Frydman, J. (2019) *Zika virus dependence on host Hsp70 provides a protective strategy against infection and disease* Cell Rep., **26**, 906–920

5. Hepeviridae

5.1 Hepatitis E

Allweiss, L., Gass, S., Giersch, K., Groth, A., Kah, J., Volz, T., Rapp, G., Schöbel, A. et al (2016) *Human liver chimeric mice as a new model of chronic hepatitis E virus infection and preclinical drug evaluation* J. Hepatol., **64**, 1033–1040

Ankcorn, M.J., Ijaz, S., Haywood, B., Neuberger, J., Elsharkawy, A.M., Maggs, J. and Tedder, R.S. (2018) *Confirmation of specificity of reactivity in a solid phase ELISA for the detection of hepatitis E viral antigen improves utility of the assay* J. Virol. Meth., **252**, 42–48

Behrendt, P., Bremer, B., Todt, D., Brown, R.J.P., Heim, A., Manns, M.P., Steinmann, E. and Wedemeyer, H. (2016) *Hepatitis E virus (HEV) ORF2 antigen levels differentiate between acute and chronic HEV infection* J. Infect. Dis., **214**, 361–368

Bochud, M., Schäfer, W., Roth, N.J. and Ros, C. (2019) *Characterization of a quasi-enveloped, fast replicating hepevirus from fish and its use as hepatitis E virus surrogate* J. Virol. Meth., **263**, 111–119

Capelli, N., Marion, O., Dubois, M., Allart, S., Bertrand-Michel, J., Lhomme, S., Abravanel, F., Izopet, J. and Chapuy-Regaud, S. (2019) *Vectorial release of hepatitis E virus in polarized human hepatocytes* J. Virol., **93**: e01207-18

Chapuy-Regaud, S., Dubois, M., Plisson-Chastang, C., Bonnefois, T., Lhomme, S., Bertrand-Michel, J., You, B., Simoneau, S. et al (2017) *Characterization of the lipid envelope of exosome encapsulated HEV particles protected from the immune response* Biochimie, **141**, 70-79

Emerson, S.U., Nguyen, H.T., Torian, U., Burke, D., Engle, R. and Purcell, R.H. (2010) *Release of genotype 1 hepatitis E virus from cultured hepatoma and polarized intestinal cells depends on open reading frame 3 protein and requires an intact PXXP motif* J. Virol., **84**, 9059–9069

Feng, Z. and Lemon, S.M. (2014) *Peek-a-boo: membrane hijacking and the pathogenesis of viral hepatitis* Trends Microbiol., **22**, 59-64

Izopet, J., Lhomme, S., Chapuy-Regaud, S., Mansuy, J-M., Kamar, N. and Abravanel, F. (2017) *HEV and transfusion-recipient risk* Transfusion Clinique et Biologique, **24**, 176–181

Knegendorf, L., Drave, S.A., Thi, V.L.D., Debing, Y., Brown, R.J.P., Vondran, F.W.R., Resner, K., Friesland, M., Khera, T. et al (2018) *Hepatitis E virus replication and interferon responses in human placental cells* Hepatol. Comm., **2**, 173-187

Marion, O., Capelli, N., Lhomme, S., Dubois, M., Pucelle, M., Abravanel, F., Kamar, N. and Izopet, J. (2019) *Hepatitis E virus genotype 3 and capsid protein in the blood and urine of immunocompromised patients* J. Infect., **78**, 232–240

Montpellier, C. et al (2018) *Hepatitis E virus lifecycle and identification of 3 forms of the ORF2 capsid protein* J. Hepatol., **68** (Suppl. 1) Abstr. SAT-386

Montpellier, C., Wychowski, C., Sayed, I.M., Meunier, J-C., Saliou, J-M., Ankavay, M., Bull, A., Pillez, A. et al (2018) *Hepatitis E virus lifecycle and identification of 3 forms of the ORF2 capsid protein* Gastroenterology **154**, 211–223

Nagashima, S., Takahashi, M., Kobayashi, T., Nishizawa, T.T., Nishiyama, T., Primadharsini, P.P. and Okamoto, H. (2017) *Characterization of the quasi-enveloped hepatitis E virus particles released by the cellular exosomal pathway* J. Virol., **91**: e00822-17

Sayed, I.M., Verhoye, L., Cocquerel, L., Abravanel, F., Foquet, L., Montpellier, C., Debing, Y., Farhoudi, A. Wychowski, C. (2017) *Study of hepatitis E virus infection of genotype 1 and 3 in mice with humanised liver* Gut **66,** 920–929

Sayed, I.M., Verhoye, L., Montpellier, C., Abravanel, F., Izopet, J., Cocquerel, L. and Meuleman, P. (2019) *Hepatitis E virus (HEV) open reading frame 2 antigen kinetics in human-liver chimeric mice and its impact on HEV diagnosis* J. Infect. Dis., **220**, 811–819

Todt, D., Friesland, M., Moeller, N., Praditya, D., Kinast, V., Brüggemann, Y., Knegendorf, L., Burkard, T., Steinmann, J., Burm, R. (2020) *Robust hepatitis E virus infection and transcriptional response in human hepatocytes* Proc. Natl. Acad. Sci. USA **117**, 1731–1741

Von Nordheim, M., Boinay, M., Leisi, R., Kempf, C. and Ros, C. (2016) *Cutthroat trout virus—towards a virus model to support hepatitis E research* Viruses, **8**: 289

Yin, X., Ambardekar, C., Lu, Y. and Feng, Z. (2016) *Distinct entry mechanisms for nonenveloped and quasi-enveloped hepatitis E viruses* J. Virol., **90**, 4232-4242

6. Nidovirales

6.1 Wobbly possum disease

Giles, J.C., Perrott, M.R. and Dunowska, M. (2015) *Primary possum macrophage cultures support the growth of a nidovirus associated with wobbly possum disease* J. Virol. Methods, **222**, 66–71

Giles, J., Perrott, M., Roe, W. and Dunowska, M. (2016) *The aetiologyof wobbly possum disease: Reproduction of the disease with purified nidovirus* Virology, **491**, 20–26

Giles, J., Perrott, M., Roe, W., Shrestha, K., Aberdein, D., Morel, P. and Dunowska, M. (2018) *Viral RNA load and histological changes in tissues following experimental infection with an arterivirus of possums (wobbly possum disease virus)* Virology, **522**, 73–80

7. Nodaviridae

7.1 Orsay virus

Jiang, H., Franz, C.J., Wu, G., Renshaw, H., Zhao, G., Firth, A.E. and Wang, D. (2014) *Orsay virus utilizes ribosomal frameshifting to express a novel protein that is incorporated into virions* Virology **450-451**, 213–221

8. Picornaviridae

8.1 Coxsackie virus

Müller, L.M.E., Holmes, M., Michael, J.L., Scott, G.B., West, E.J., Scott, K.J., Parrish, C., Hall, K., Stäble, S. et al (2019) *Plasmacytoid dendritic cells orchestrate innate and adaptive anti-tumor immunity induced by oncolytic coxsackievirus A21* J. ImmunoTher. Cancer, **7**: 164

Petrik, J. (2016) *Immunomodulatory effects of exosomes produced by virus-infected cells* Transfus. Apher. Sci., **55**, 84–91

Robinson, S.M., Tsueng, G., Sin, J., Mangale, V., Rahawi, S., McIntyre, L.L., Williams, W., Kha, N. et al (2014) *Coxsackievirus B exits the host cell in shed microvesicles displaying autophagosomal markers* PLoS Pathog., **10**: e1004045

8.2 Hepatitis A

Costafreda, M.I. and Kaplan, G. (2019) *Reply to Das et al., "TIM1 (HAVCR1): an essential 'receptor' or an 'accessory attachment factor' for Hepatitis A virus?"* J. Virol., **93**, e02040-18

Das, A., Hirai-Yuki, A., González-López, O., Rhein, B., Moller-Tank, S., Brouillette, R., Hensley, L., Misumi, I. et al (2017) *TIM1 (HAVCR1) is not essential for cellular entry of either quasi-enveloped or naked hepatitis A virions* mBIO, **8**: e00969-17

Feng, Z. and Lemon, S.M. (2014) *Peek-a-boo: membrane hijacking and the pathogenesis of viral hepatitis* Trends Microbiol., **22**, 59-64

Feng, Z., Hensley, L., McKnight, K.L., Hu, F., Madden, V., Ping, L-F., Jeong, S-H., Walker, C., Lanford, R.E. and Lemon, S.M. (2013) *A pathogenic picornavirus acquires an envelope by hijacking cellular membranes* Nature **496**, 367-371

Hirai-Yuki, A., Hensley, L., Whitmire, J.K. and Lemon, S.M. (2016) *Biliary secretion of quasi-enveloped human hepatitis A virus* mBio, **7**: e01998-16

Hofer, U. (2013) *Cloak and dagger* Nat. Rev. Microbiol., **11**, 3026

Kapsch, A-M., Farcet, M.R., Antoine, G. and Kreil, T.R. (2017) *A nonenveloped virus with a lipid envelope: hepatitis A virus as used in virus-reduction studies* Transfusion **57**, 1433–1439

McKnighta, K.L., Xiec, L., González-Lópeza, O., Rivera-Serrano, E.E., Chen, X. and Lemon, S.M. (2017) *Protein composition of the hepatitis A virus quasi-envelope* Proc. Natl. Acad. Sci. USA, **114**, 6587–6592

Vaughan, G., Goncalves Rossi, L.M., Forbi, J.C., de Paula, V.S, Purdy, M.A., Xia, G. and Khudyakov, Y.E. (2014) *Hepatitis A virus: Host interactions, molecular epidemiology and evolution* Infect. Genet. Evol., **21**, 227–243

8.3 Human enterovirus

Liu, Y., Sheng, J., van Vliet, A.L.W., Buda, G., van Kuppeveld, F.J.M. and Rossmann, M.G. (2018) *Molecular basis for the acid-initiated uncoating of human enterovirus* D68 Proc. Natl. Acad. Sci. USA, **115**, E12209–E12217

8.4 Kobuviruses

Canh, V.D., Kasuga, I., Furumai, H. and Katayama, H. (2019) *Viability RT-qPCR combined with sodium deoxycholate pre-treatment for selective quantification of infectious viruses in drinking water samples* Food Environ. Virol., **11**, 40–51

8.5 Rhinovirus

Simpson, J.L., Carroll, M., Yang, I.A., Reynolds, P.N., Hodge, S., James, A.L., Gibson, P.G. and Upham, J.W. (2016) *Reduced antiviral interferon production in poorly controlled asthma is associated with neutrophilic inflammation and high-dose inhaled corticosteroids* Chest, **149**, 704-713

Xi, Y., Finlayson, A., White, O.J., Carroll, M.L., and Upham, J.W. (2015) *Rhinovirus stimulated IFN-α production: how important are plasmacytoid DCs, monocytes and endosomal pH?* Clin. Translat. Immunol., **4**, e46

9. *Picornavirales Secoviridae*

9.1 Cowpea mosaic virus

Thuenemann, E.C., Meyers, A.E., Verwey, J., Rybicki, E.P. and Lomonossoff, G.P. (2013) A *method for rapid production of heteromultimeric protein complexes in plants: assembly of protective bluetongue virus-like particles* Plant Biotechnol. J. **11**, 839–846

10. Porcine sapelovirus

Li, Y., Du, L., Jin, T., Cheng, Y., Zhang, X., Jiao, S., Huang, T., Zhang, Y. et al (2019) *Characterization and epidemiological survey of porcine sapelovirus in China* Vet. Microbiol., **232**, 13–21

11. Togaviridae

11.1 Alphavirus

Akahata, W. and Nabel, G. J. (2012) *A specific domain of the Chikungunya virus E2 protein regulates particle formation in human cells: implications for alphavirus vaccine design* J. Virol., **86**, 8879-8883

Jin, J., Sherman, M.B., Chafets, D., Dinglasan, N., Lu, K., Lee, T-H., Carlson, L-A., Muench, M.O. and Simmons, G. (2018) *An attenuated replication-competent chikungunya virus with a fluorescently tagged envelope* PLoS Negl. Trop. Dis., **12**: e0006693

Jose, J., Przybyla, L., Edwards, T.J., Perera, R., Burgner II, J.W. and Kuhn, R.J. (2012) *Interactions of the cytoplasmic domain of Sindbis virus E2 with nucleocapsid cores promote alphavirus budding* J. Virol., 86, 2585-2599

Snyder, J.E., Azizgolshani, O., Wu, B., He, Y., Lee, A.C., Jose, J., Suter, D.M., Knobler, C.M., Gelbart, W.M. and Kuhn, R.J. (2011) *Rescue of infectious particles from preassembled alphavirus nucleocapsid cores* J. Virol., **85**, 5773–5781

Snyder, J.E., Berrios, C.J., Edwards, T.J., Jose, J., Perera, R. and Kuhn, R.J. (2012) *Probing the early temporal and spatial interaction of the Sindbis virus capsid and E2 proteins with reverse genetics* J. Virol., **86**, 12372-12383

Snyder, J.E., Kulcsar, K.A., Schultz, K.L.W., Riley, C.P., Neary, J.T., Marr, S., Jose, J., Griffin, D.E. and Kuhn, R.J. (2013) *Functional characterization of the alphavirus TF protein* J. Virol., **87**, 8511–8523

Sokoloski, K.J., Snyder, A.J., Liu, N.H., Hayes, C.A., Mukhopadhyay, S. and Hardy, R.W. (2013) *Encapsidation of host-derived factors correlates with enhanced infectivity of Sindbis virus* J. Virol., **87**, 12216–12226

Tang, J., Jose, J., Chipman, P., Zhang, W., Kuhn, R.J. and Baker, T.S. (2011) *Molecular links between the E2 envelope glycoprotein and nucleocapsid core in sindbis virus* J. Mol. Biol., **414**, 442–459

Urakami, A., Sakurai, A., Ishikawa, M., Yap, M.L., Flores-Garcia, Y., Haseda, Y., Aoshi, T., Zavala, F.P. et al (2017) *Development of a novel virus-like particle vaccine platform that mimics the immature form of alphavirus* Clin. Vacc. Immunol., **24**: e00090-17

Yap, M.L., Klose, T., Urakamic, A., Hasana, S.S., Akahata, W. and Rossmann, M.G. (2017) *Structural studies of Chikungunya virus maturation* Proc. Natl. Acad. Sci., **114**, 13703–13707

Chikungunya virus – see 11.1 Alphavirus

11.2 Rubella virus

Battisti, A.J., Yoder, J.D., Plevka, P., Winkler, D.C., Prasad, V.M., Kuhn, R.J., Frey, T.K., Steven, A.C. and Rossmann, M.G. (2012) *Cryo-electron tomography of rubella virus* J. Virol., **86**, 11078-11085

11.3 Semliki Forest virus

Hammarstedt, M., Wallengren, K., Pedersen, K.W., Roos, N. and Garoff, H. (2000) *Minimal exclusion of plasma membrane proteins during retrovirus envelope formation* Proc. Natl. Acad. Sci. USA, **97**, 7527-7532

Kalvodova, L., Sampaio, J.L., Cordo, S., Ejsing, C.S., Shevchenko, A. and Simons, K. (2009) *The lipidomes of vesicular stomatitis virus, Semliki Forest virus and the host plasma membrane analyzed by quantitative shotgun mass spectrometry* J. Virol., **83**, 7996-8003

Sjøberg, M. and Garoff, H. (2003) *Interactions between the transmembrane segments of the alphavirus E1 and E2 proteins play a role in virus budding and fusion* J. Virol., **77**, 3441-3450

Sindbis virus – see 11.1 Alphavirus

11.4 Venezuelan/eastern equine encephalitis virus

Hasan, S.S., Sun, C., Kim, A.S., Watanabe, Y., Chen, C-L., Klose, T., Buda, G., Crispin, M., Diamond, M.S., Klimstra, W.B. and Rossmann, M.G. (2018) *Cryo-EM structures of eastern equine encephalitis virus reveal mechanisms of virus disassembly and antibody neutralization* Cell Rep., **25**, 3136–3147

Jurgens, C.K., Young, K.R., Madden, V.J., Johnson, P.R. and Johnston, R.E. (2012) *A novel self-replicating chimeric lentivirus-like particle* J. Virol., **86**, 246-261

Ko, S-Y., Akahata, W., Yang, E.S., Kong, W-P., Burke, C.W., Honnold, S.P., Nichols, D.K., Huang, Y-J.S., Schieber, G.L., Carlton, K. et al (2019) *A virus-like particle vaccine prevents equine encephalitis virus infection in nonhuman primates* Sci. Transl. Med., **11**: eaav3113

Lamb, K., Lokesh, G.L., Sherman, M. and Watowich, S. (2010) *Structure of a Venezuelan equine encephalitis virus assembly intermediate isolated from infected cells* Virology **406**, 261–269

Porta, J., Jose, J., Roehrig, J.T., Blair, C.D., Kuhn, R.J. and Rossmann, M.G. (2014) *Locking and blocking the viral landscape of an alphavirus with neutralizing antibodies* J. Virol., **88**, 9616–9623

12. Tombusviridae (Dianthovirus)

12.1 Red clover mosaic virus

Lockney, D.M., Guenther, R.N., Loo, L., Overton, W., Antonelli, R., Clark, J., Hu, M., Luft, C., Lommel, S.A. and Franzen, S. (2011) *The Red clover necrotic mosaic virus capsid as a multifunctional cell targeting plant viral nanoparticle* Bioconjugate Chem. **22**, 67–73

Lockney, D., Franzen, S. and Lommel, S. (2011) *Viruses as nanomaterials for drug delivery* In Biomedical Nanotechnology: Methods and Protocols, Methods Mol. Biol., **726** (ed. Hurst, S.J.), Springer Science+Business Media, pp 207-221

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