Can Hepatitis C Virus (HCV) reinfection be predicted and prevented among people who currently inject drugs?

The potential importance of understanding and intervening upon injection networks to achieve sustained aviremia

#189

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BACKGROUND

Limiting reinfection remains a challenge when treating people currently injecting drugs (PCID) for HCV. Modeling suggests that a network treatment strategy which involves treating HCV-infected injection partners concurrently may reduce rates of reinfection and consequently community HCV prevalence. Using viral phylogenetic as well as quantitative and qualitative injection network data, we sought to explore whether a network treatment strategy could have prevented HCV reinfection.

*An individual is considered a **proximal partner** if they (a) buy drug, (b) split drug in the dry form, (c) split drug in the wet form, (d) inject drugs in the same location (apartment/overpass/alley), (e) share equipment (cookers/needles/syringes), or (f) inject or receive injection, with/from a person*

METHODS

Beginning in June 2014, PCID recruited in a syringe service program (SSP) were offered on-site treatment for HCV. Pre- and on-treatment quantitative data was collected on participants' injection networks and sharing behavior. Next-generation sequencing (NGS) was performed on virus from most participants to provide a background library. Individuals with viremia post treatment participated in a qualitative interview about their injection practices, including names of others who injected near them ("proximal partners").

Next-generation sequencing
- Sequencing data obtain from hypervariable region 1
- Sequencing data uploaded into GHOST for analysis

Global Health Outbreak and Surveillance Technology
- Cloud-based bioinformatics program
- Programed to perform quality control check, detect viral heterogeneity and identify linked transmissions

Global Health Outbreak and Surveillance Technology (GHOST)[1], was used to compare viral sequences with the background library to evaluate for linked transmission pairs.

RESULTS

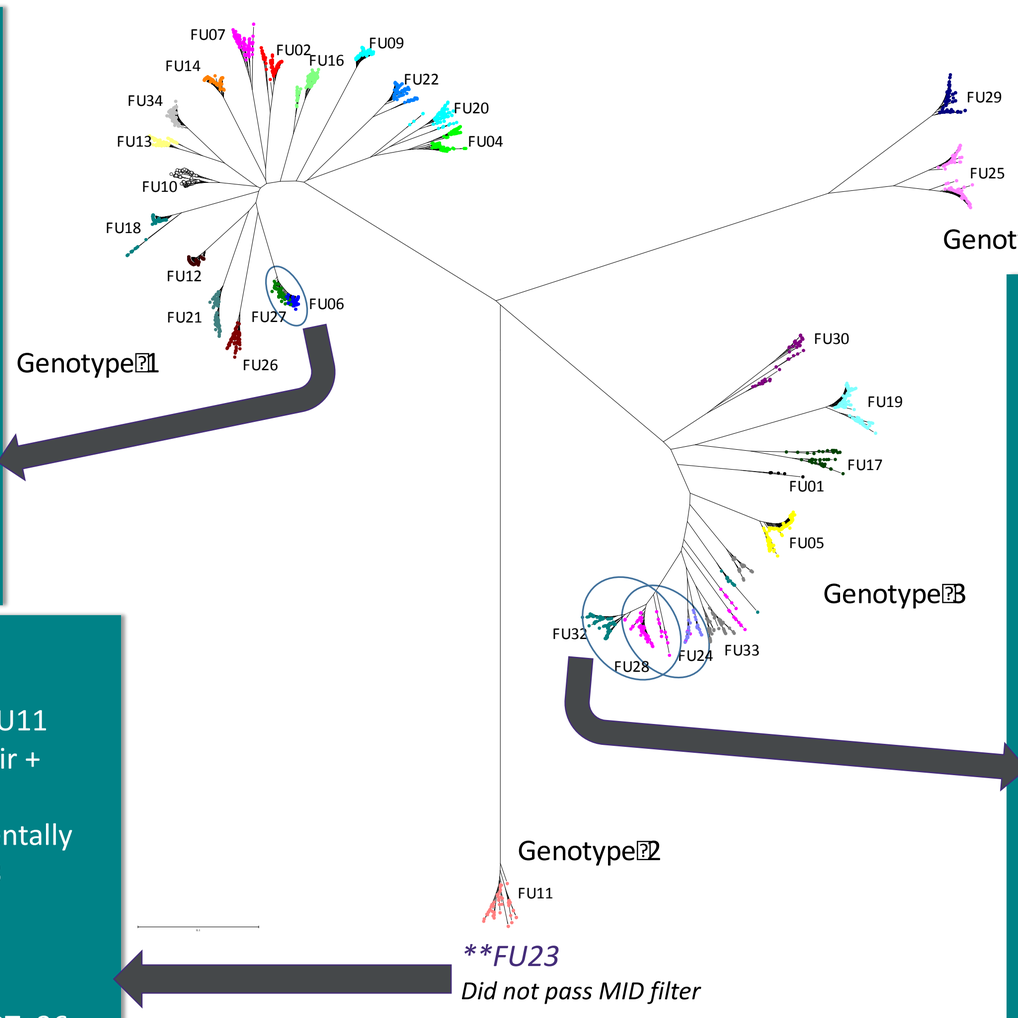
Eighty HCV-infected SSP participants were seen by an HCV provider, and 53 participants started treatment. Pre-treatment virus from 31 were analyzed by NGS. None had infection with mixed genotypes Forty-eight (91%) achieved a sustained virologic response 12 weeks after treatment completion[2]. Three presumed reinfections were identified, 2 occurring prior to 12 weeks post-treatment, and one post-SVR12. Standardized surveys of the three presumed reinfections captured no injection equipment sharing events pre-, or on-treatment. Two of three samples could be sequenced. Both clustered phylogenetically with virus from the library suggesting transmission links. In both of these cases, post-treatment qualitative interview failed to capture sharing events, but did identify the transmission network seen in GHOST results, through proximal partner naming.

REINFECTION #1

- FU06 tx for geno 1a with sofosbuvir + simepravir
- Achieved virologic response on treatment
- Completed last 4 weeks of tx in drug rehab
- 2 weeks after completing tx was viremic with commercial geno 3 virus
- Did not inject in rehab – no needle or syringe sharing upon return to community
- Named 1 **Proximal Partner** - Bought drugs, injected within same residence, and was sexual partner with FU27
- FU06 retreated concurrently with treatment of FU27
- No 2◦ reinfection in FU06 or 1 ◦ reinfection in FU27 at EOT+36

REINFECTION #2

- FU23 unable to inject self – only receive injection from FU11
- FU23 achieved SVR12 for geno 2b infection with sofobuvir + ribavirin – but re-infected prior to EOT+24
- 3 weeks before reinfection testing, reported FU11 accidentally injected himself before using same needle to inject FU23
- No other reported **Proximal Partners**
- Commercial genotype of FU23 the same as FU11 (2b)
- FU23 retreated concurrently with treatment of FU11
- No 2◦ reinfection in FU23 or 1 ◦ reinfection in FU11 at EOT+36



**FU23*
Did not pass MID filter

Transmission Pairs Identified by GHOST
- FU06 & FU27
- FU32 & FU28
- FU28 & FU24

REINFECTION #3

- FU32 tx for geno 1a infection with sofosbuvir/ledipasvir
- Achieved virologic response on treatment
- Repeat viral load 4 weeks post-treatment positive for genotype 3a infection
- Reported no sharing of needles or syringes
- Reported 1 **Proximal Partner** - buying drugs and injecting in presence of one person "PP" – "PP" was HCV Ab(+) & HCV PCR(-).
- In additional to FU32, "PP" reported buying and sharing drugs with FU24 & FU 28
- FU32 retreated concurrently with treatment of FU28 & FU24
- No 2◦ reinfection in FU32 or 1 ◦ reinfection in FU28 or FU24 at EOT+36

*** Alternative explanation: FU32 had unrecognized mixed infection at baseline. Treatment unmasked genotype 3 virus.*

CONCLUSION

- In an HCV treatment program in a SSP, proximal partner naming aligned with phylogenetic transmission links in the setting of reinfection.
- Further study is warranted to determine if a network treatment strategy will prevent HCV reinfection in high risk PWID.

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