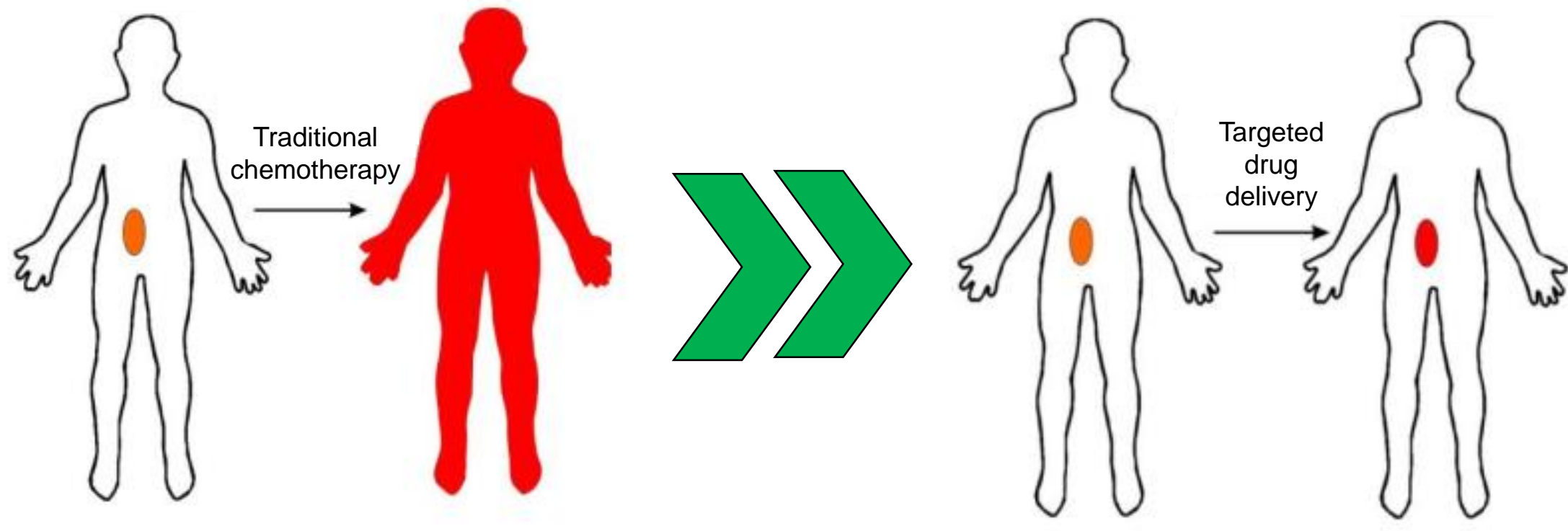


# TARGETED DRUG DELIVERY FOR LIVER CANCER: CAN WE STEER MICROPARTICLES TOWARDS TUMOR TISSUE?

## Targeted drug delivery

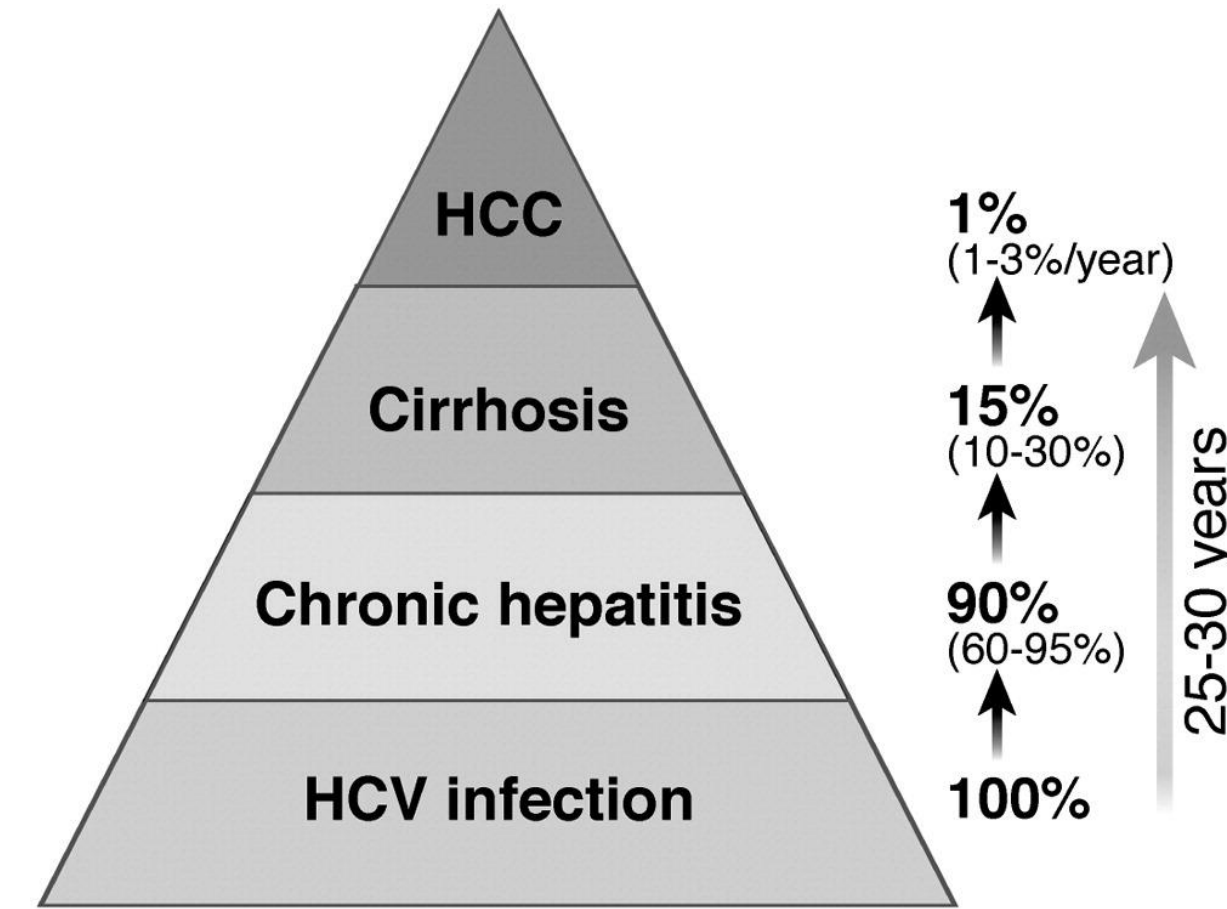


- ✓ Higher dose delivery at the tumor
- ✓ Limit toxicity for healthy tissue

S. De Smedt, Biopharmacy of biotechnological drugs (1000938), UGent, 2018

## Hepatocellular carcinoma (HCC)

✓ 2<sup>nd</sup> leading cause of cancer-related deaths worldwide



✓ Often develops from **cirrhosis**

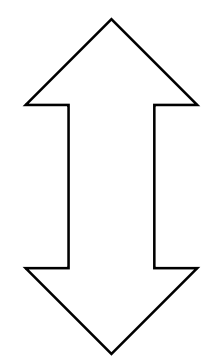
✓ WHO projection:  
 > 1 million deaths in 2030

H. B. El-Serag et al, "Hepatocellular carcinoma", Gastroenterology

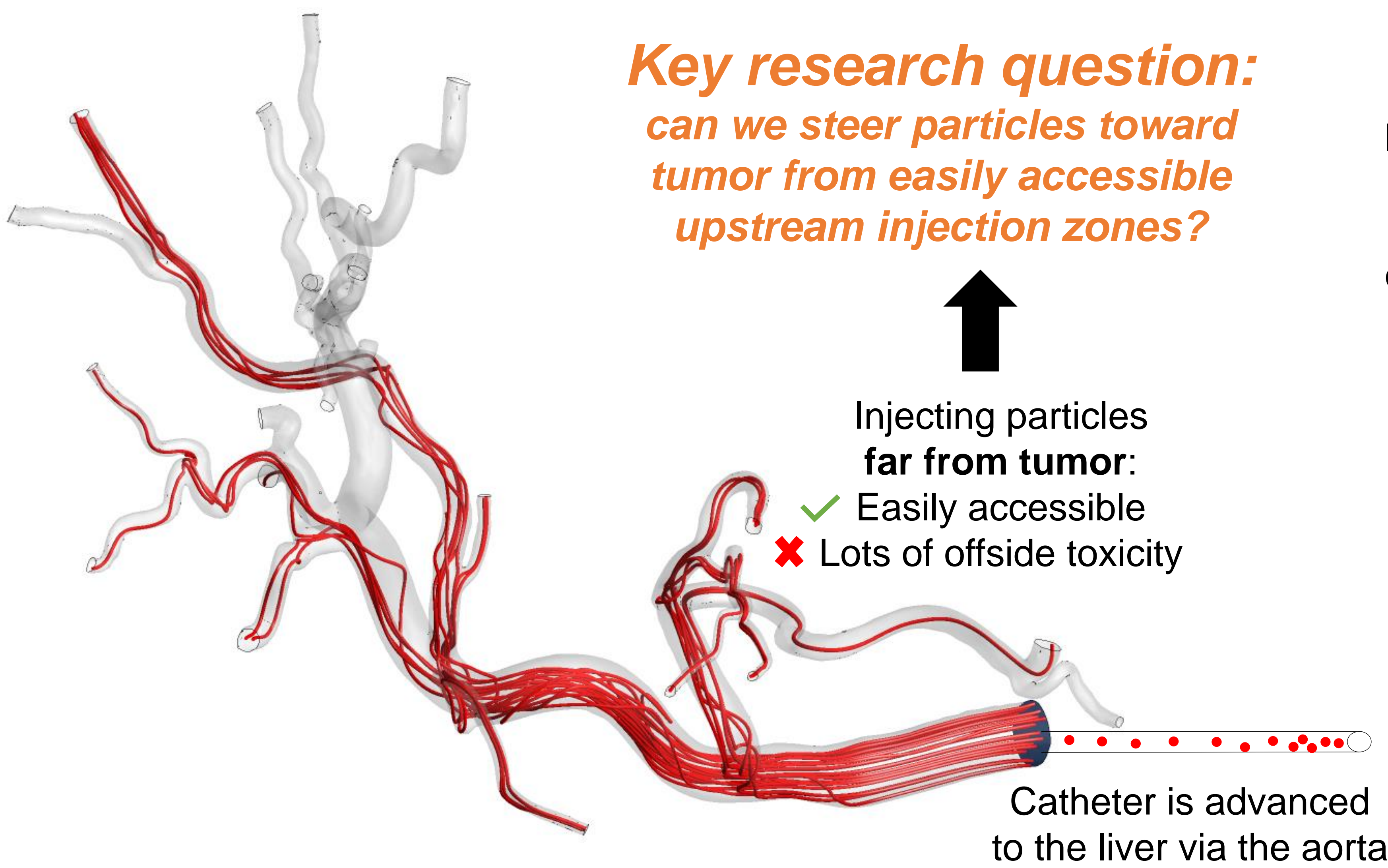
**Key research question:**  
*can we steer particles toward tumor from easily accessible upstream injection zones?*

Injecting particles close to tumor:  
 ✓ High target-specificity  
 ✗ Low accessibility

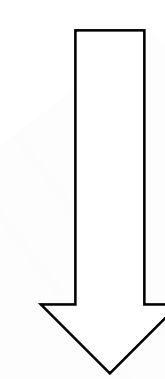
**Vascular accessibility**



**Target-specificity**



Injection of microparticles which emit high-intensity radiation or carry chemotherapeutic agents



<https://www.sirtex.com/us/patients/about-sir-spheres-microspheres/>  
<https://www.amazon.com/20Pack-10ml-Syringes-Veterinary-Disposable-Individually/>

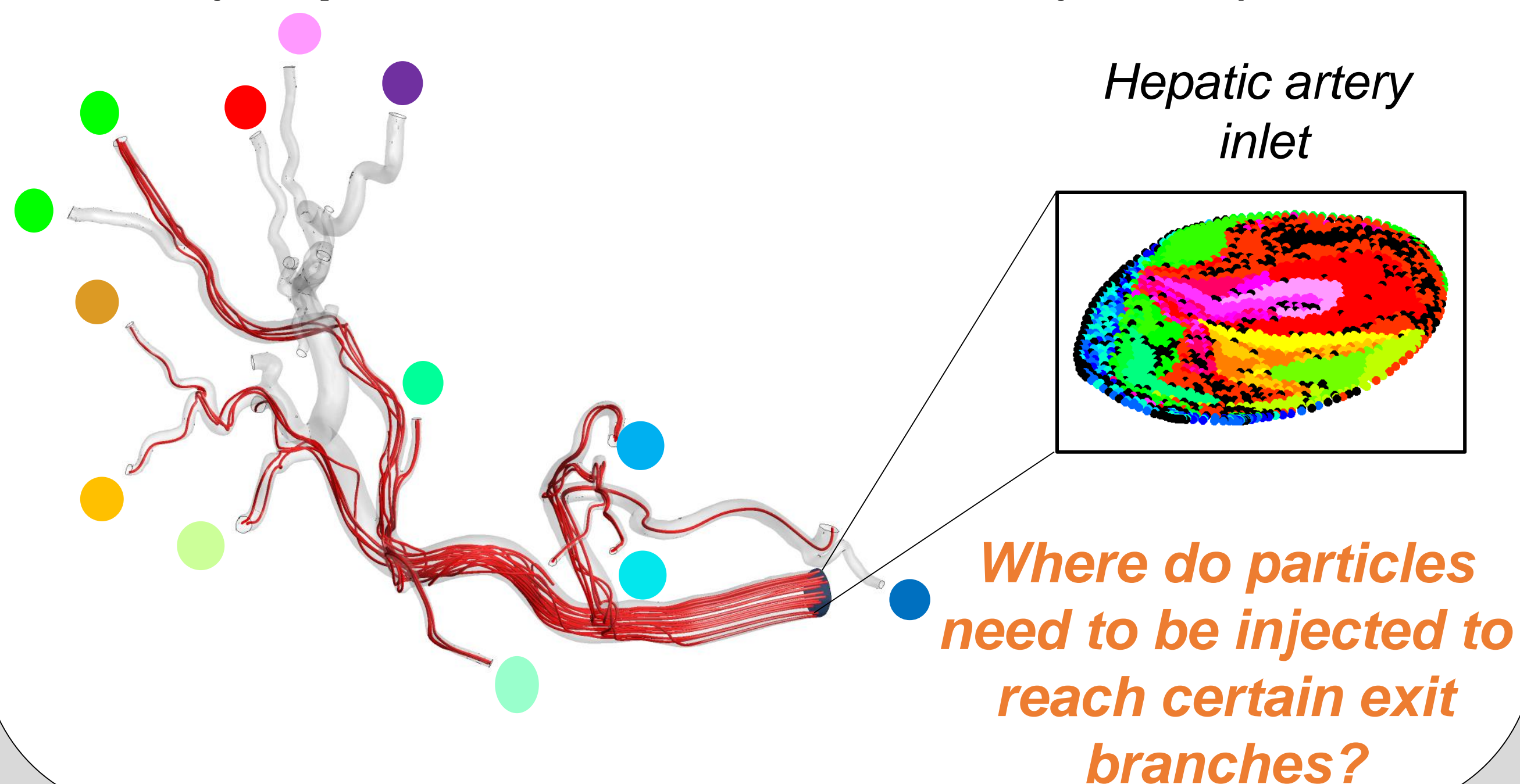
## Workflow: from image to model



1. **Segmentation** of the arterial network of a patient-specific cirrhotic liver
2. Creating a **3D model** of the geometry

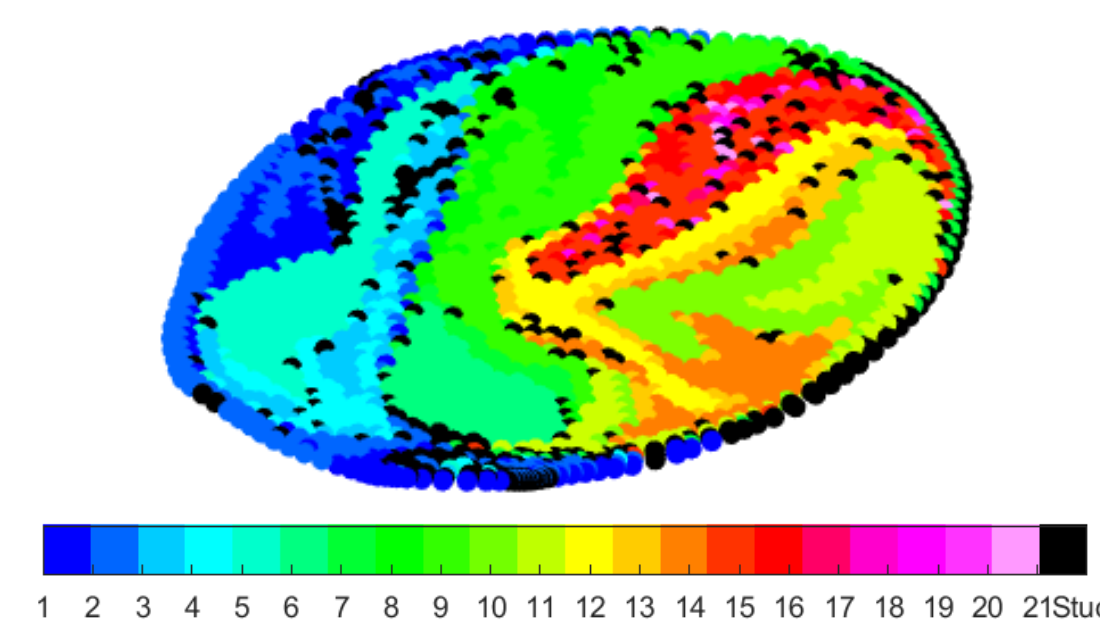
3. Use **computational fluid dynamics** to model the behavior of particles inside the bloodstream

4. Project **particle destination** on the injection plane

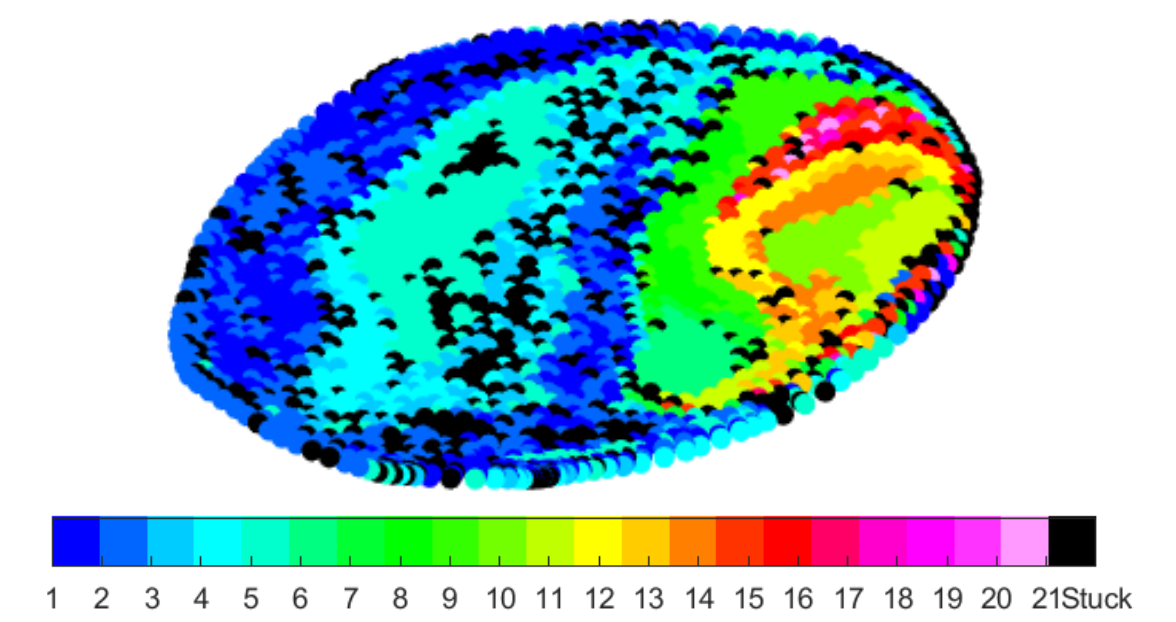


## Results: small ↔ large tumor

Small tumor (130 ml) in left lobe

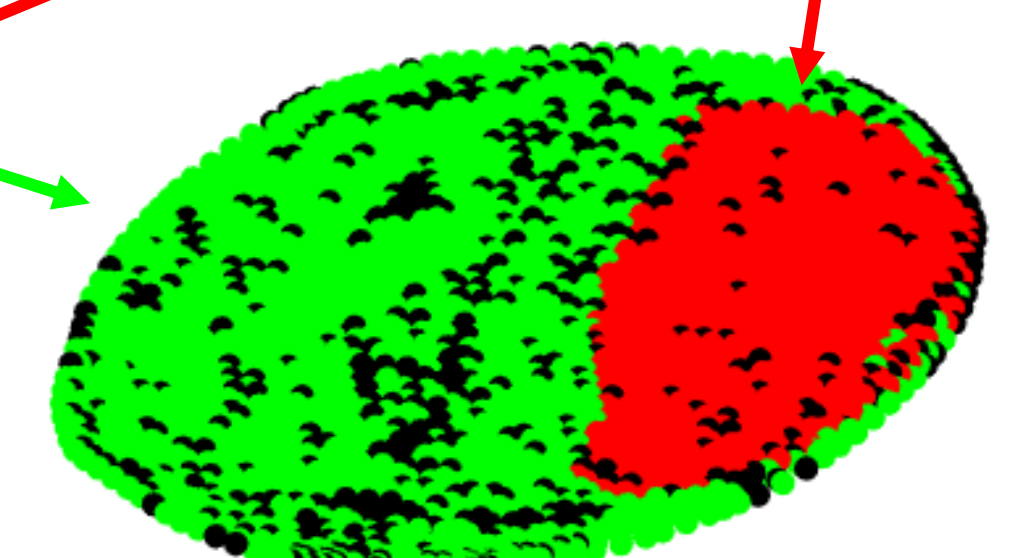


Large tumor (1150 ml) in left lobe



Injection here leads to particle deposition in tumor

Injection here leads to particle deposition in healthy tissue



By carefully controlling radial location of the catheter particles may be steered towards the tumor