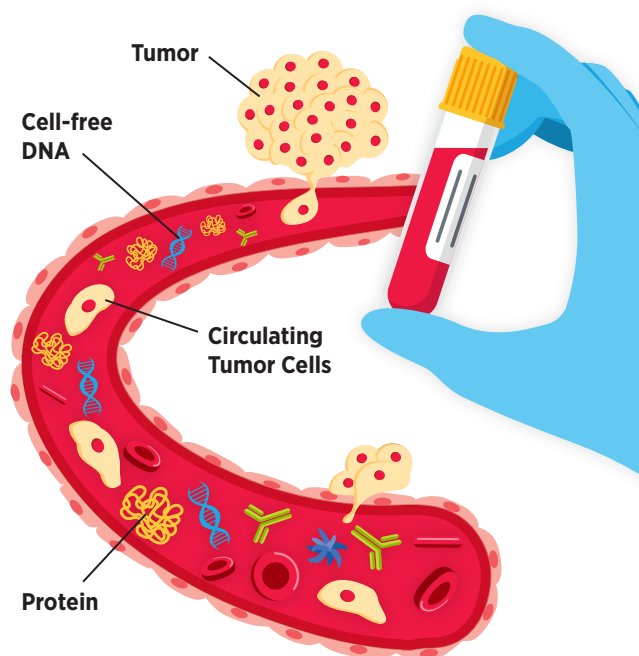


FIGURE 13

MOVING TOWARD MINIMALLY INVASIVE TESTING

What questions could liquid biopsies answer?

1. Is cancer present? Where is it?
2. Has the cancer spread?
3. What genetic changes does the tumor have?
4. What treatments might work?
5. Are treatments working? Is the cancer becoming resistant to the treatment?
6. Is there any cancer left after treatment?
7. Is there a risk of cancer recurrence?



Research has shown that tumor cells release small amounts of material—cancer cells, cell-free DNA, and lipid-encapsulated sacs called exosomes—into a person’s blood or cerebrospinal fluid. Furthermore, recent technological innovations in sequencing approaches have enhanced our ability to detect molecular changes reliably and reproducibly using small amounts of DNA or RNA. These advances have led to the development of the liquid biopsy, a procedure that is significantly less invasive compared to deriving specimens from the actual tumor tissues. Liquid biopsy involves collection of blood or other biofluids to analyze cells, lipid-encapsulated sacs called exosomes, or cell-free DNA, or potentially other cellular molecules such as RNA or protein, shed by precancerous lesions and tumors. An area of

active investigation that is already showing promise is the use of liquid biopsies to screen for early signs of multiple types of cancer at the same time. Beyond early detection, liquid biopsies can be used in cancer patients to aid in determining response to treatment and potentially early evidence of relapse when the cancer might be more responsive to other treatments. Extensive research is ongoing to identify biomarkers that can be analyzed using liquid biopsies to detect cancers early, evaluate response to treatment, assess treatment resistance, determine tumor heterogeneity, and monitor minimal residual disease, among other uses. The procedure is considered safe and less invasive than tissue biopsy and may be better representative of tumor heterogeneity.