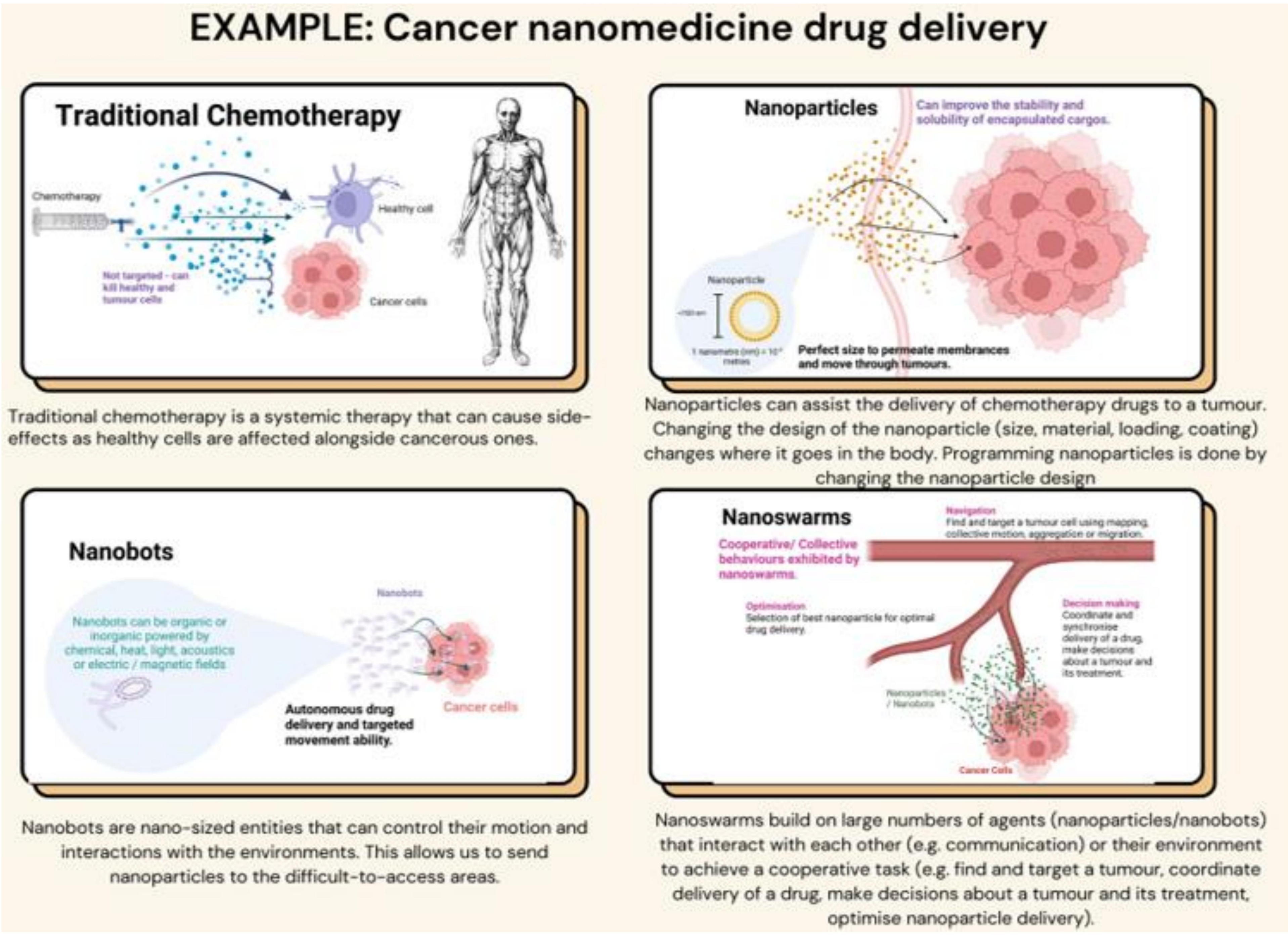
How should we regulate the first-in-human nanoswarm cancer clinical trial?

University of Bristol
Matimba.Swana@bristol.ac.uk

Matimba Swana, Jonathan Ives & Sabine Hauert

2. Nanoswarms: Targeted Drug Delivery

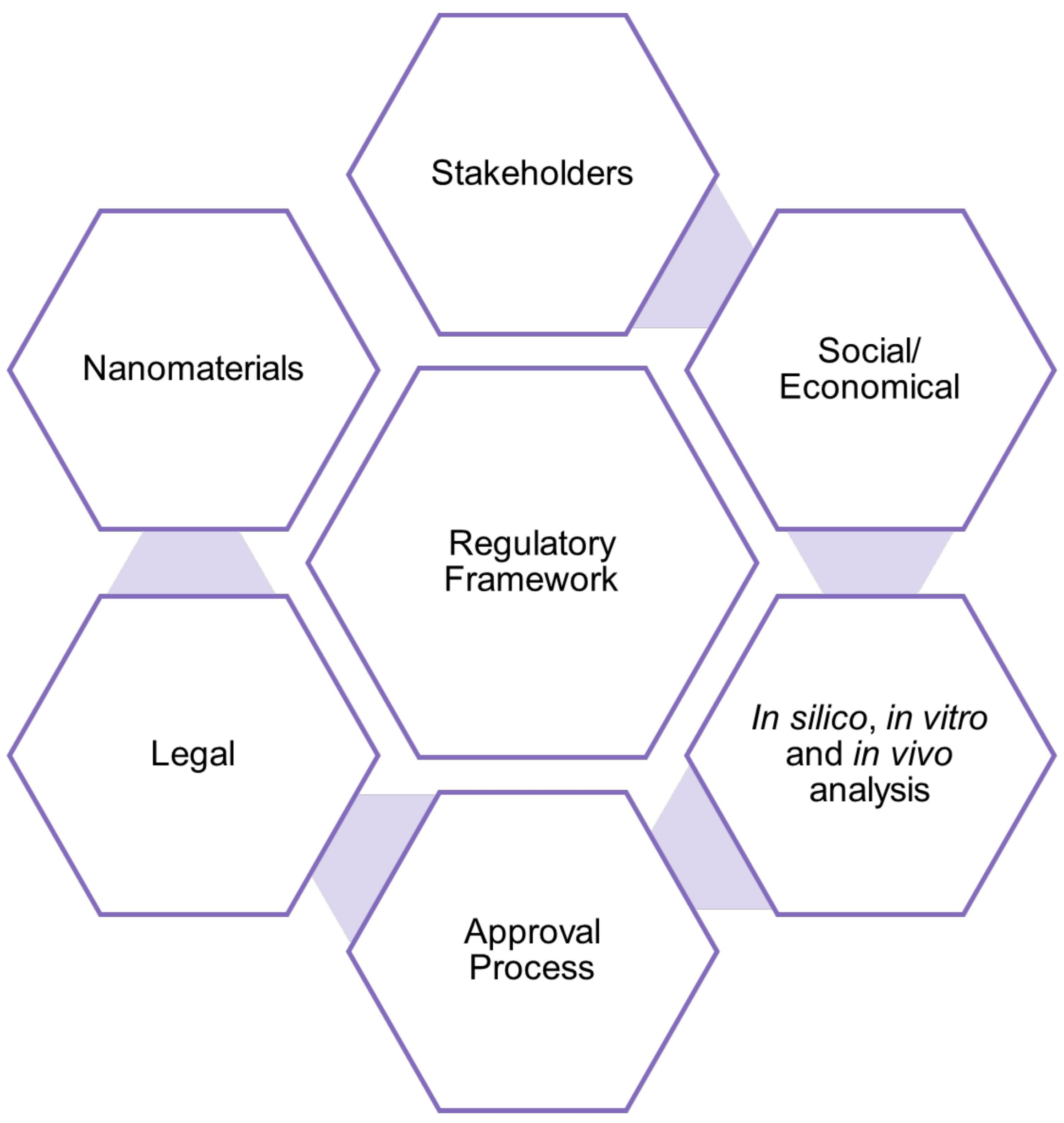
Nanoparticles or Nanobots that work collectively (nanoswarms) to deliver chemotherapy to a tumour, will be powerful against cancer. We reviewed articles, papers, policies and clinical trials with the aim of examining how research is conducted in evolving nanoparticles and to analyze gaps in current policies.



SWARM study – Small robots With collective behaviour as AI-driven cancer therapies; building Regulations for future nanoMedicines, https://tasfunctionality.bristol.ac.uk/swarm-study

3. First-in-human Nanoswarm clinical trial

We need to understand what the first-in human clinical trial of nanoswarms should/will look like, in order to anticipate ethical controversies that may arise, and to mitigate risk. In addition to aid clinical adoption of nanoswarms, a robust, specific and overarching regulatory framework is needed.



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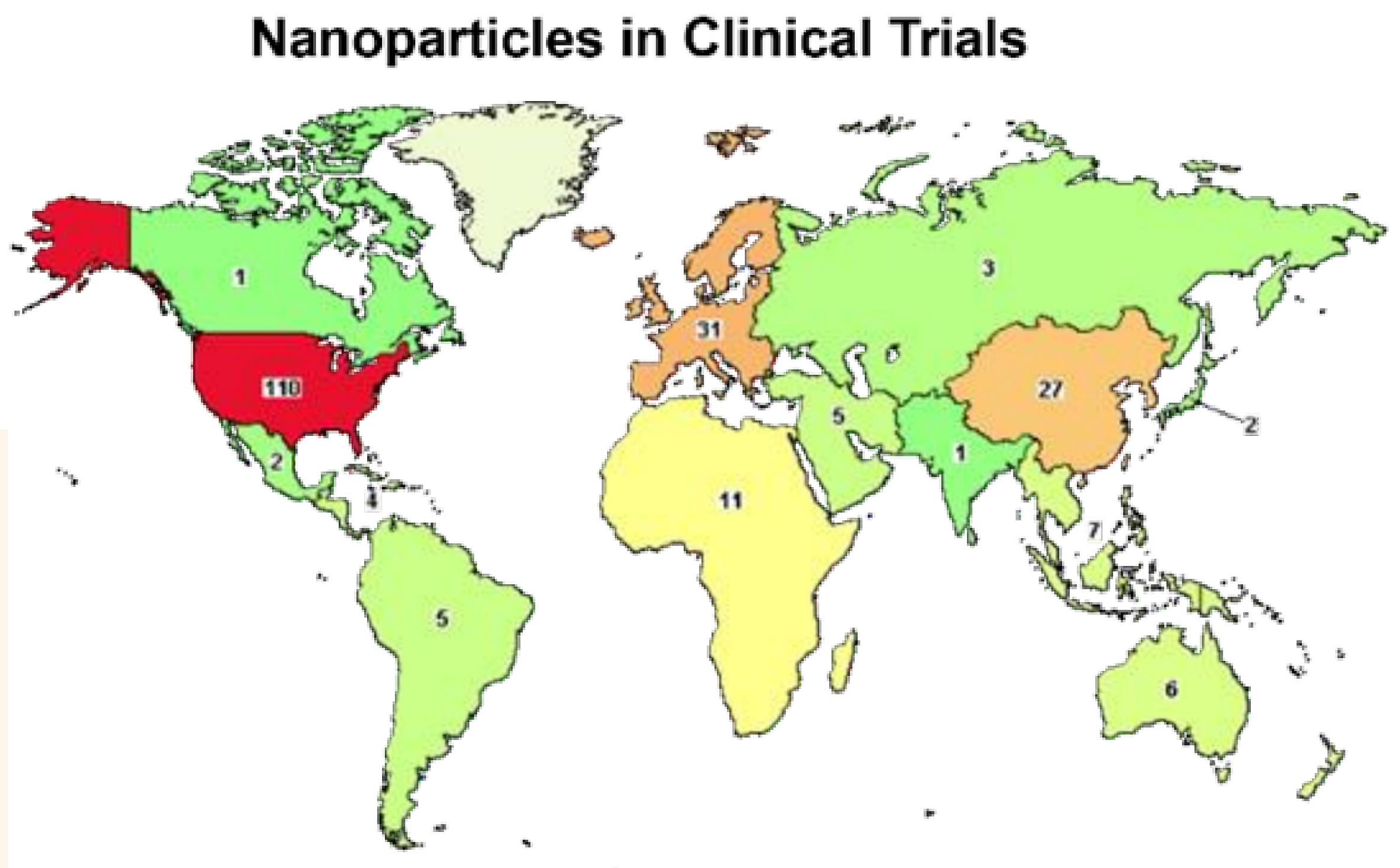
1. Cancer Nanomedicine

Nanomedicine refers to medical products developed using nanotechnology. Developments in nanomedicine engineering projects that are attempting to target cancer cells without affecting the surrounding tissues are offering promising ways of drug transportation, targeting difficult to reach sites and permeability not offered by traditional drugs such as small molecule. However, the lack of an agreed nanomaterial definition creates issues in generalizability. Even so, there are several nanoparticles approved for clinical use with the majority

Nanoparticles in Clinical Trials



211 Studies found for: **nanoparticle | Recruiting, Not yet recruiting, Available, Active, not recruiting Studies**

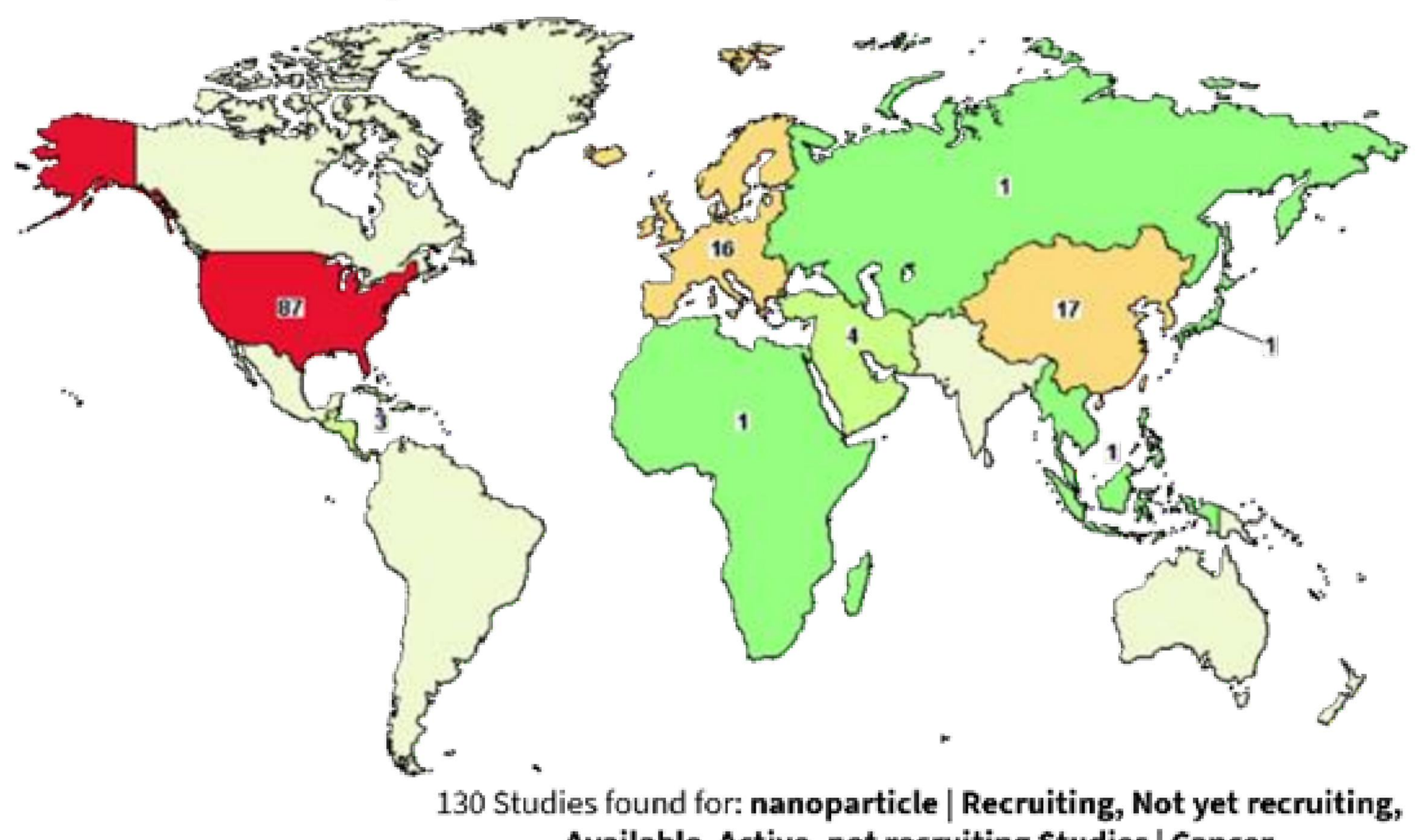
Terms and Synonyms Searched:

Terms	Search Results*	Entire Database**
nanoparticle	211 studies	541 studies

*Number of studies in the search results containing the term or synonym
**Number of studies in the entire database containing the term or synonym

Colors indicate the number of studies with locations in that region.
Least — Most
Labels give the exact number of studies.

Nanoparticles in Cancer Clinical Trials



130 Studies found for: **nanoparticle | Recruiting, Not yet recruiting, Available, Active, not recruiting Studies | Cancer**
Also searched for **Neoplasm**, **Tumor**, and **Malignancy**.

Terms and Synonyms Searched:

Terms / Synonyms	Search Results*	Entire Database**
nanoparticle	130 studies	541 studies
Cancer	130 studies	87,129 studies
Neoplasm	122 studies	77,657 studies
Tumor	33 studies	19,304 studies
Malignancy	12 studies	3,604 studies
Neoplasia	--	712 studies
Neoplastic Disease	--	24 studies
neoplastic syndrome	--	693 studies
Oncology	--	1,587 studies

-- No studies found
*Number of studies in the search results containing the term or synonym
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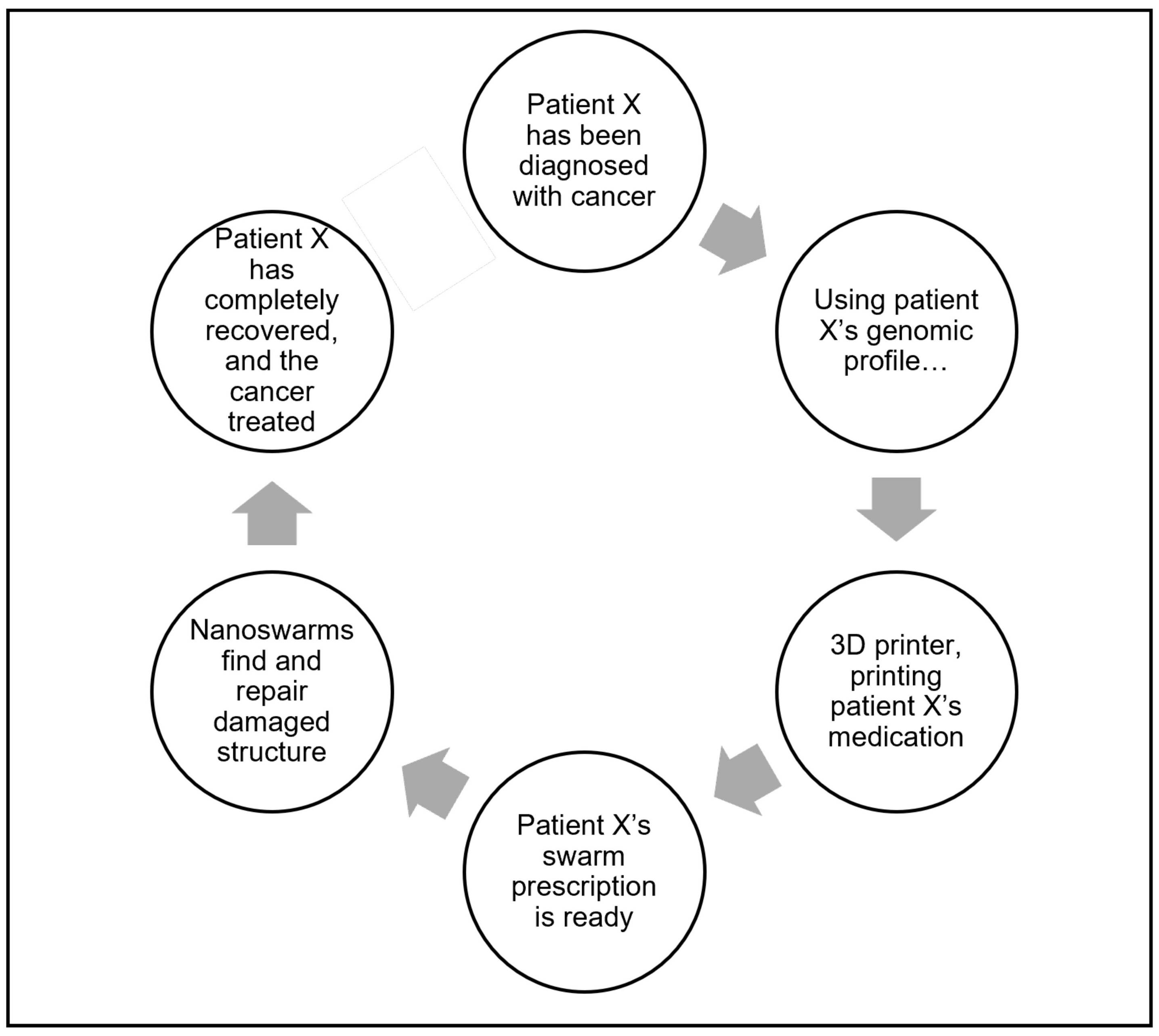
4. Swarm Medicine Prescription

Imagine a world where people no longer die from cancer and, instead, are treated by injecting nanoswarms that have been created using a 3D bioprinter encoded with the person's specific genome. Before this is a reality, we need to embed bioethics in research and policy from the beginning, by developing a framework that does not hinder innovation and ensures the well-being of patients everywhere.



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SWARM Study

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