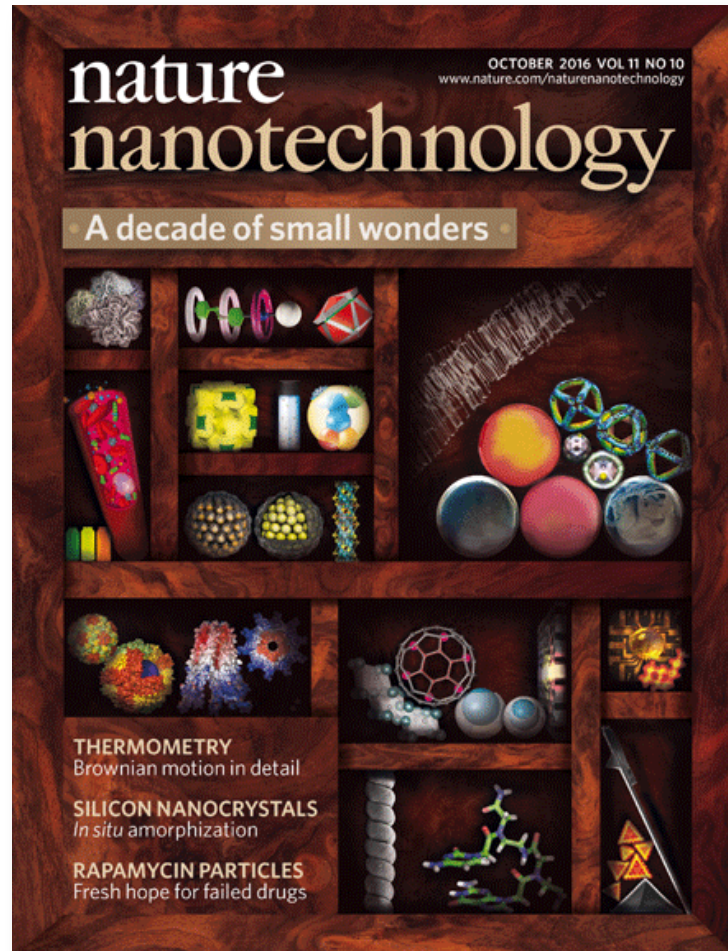


Hot Topic

Nanomedicine: An Evolution or Revolution?

January 17, 2017

Has nanomedicine yet delivered on its potential?



“We were particularly pleased to see that Congress passed the American Innovation and Competitiveness Act before adjourning its most recent session in December 2016. The Act continued to endorse and embrace the NNI, and in its trust for the Initiative...”

The President’s Council of Advisors on S&T, Jan. 2017

thesis

The long way to the market

Nanotechnology is starting to play a role in a number of commercial products, though in an evolutionary, rather than revolutionary way, says **Peter Dobson**.

In the 1990s, some of us were convinced that nanotechnology was going to be a transformative technology that would have major impacts on many sectors, would spawn a new generation of electronic and optical devices, change healthcare and give rise to many new materials. After over 20 years, it is interesting to reflect on whether and in what way the field has delivered on its potential.

I have to confess to being one of those who initially showed a degree of optimism

the titanium dioxide with manganese to transform the material from an n-type semiconductor to a slightly p-type one. So, from the initial idea we succeeded to make a material that blocked ultraviolet light but also prevented the formation of OH⁻ free radicals. We filed a patent and this was licensed to Oxonica and it very quickly attracted the attention of the pharmaceutical and healthcare company Boots, who incorporated it in its Soltan sunscreen product, and it is available to this day, in the

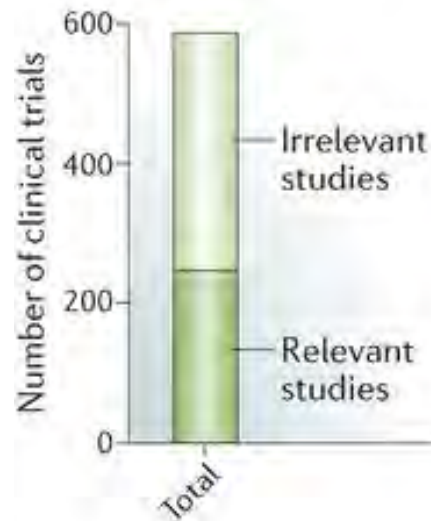
with the Stagecoach bus company being one of their largest customers.

These examples as well as my experience more generally have taught me that attempts to create new companies by simply concentrating on a ‘technology push’ seldom works. In pushing a particular technology, the engineer or scientist begins to believe in their own idea so much that they become blind to the needs of the users or customers. In fact, it is difficult to think of any such approaches that have been successful. On the other hand,

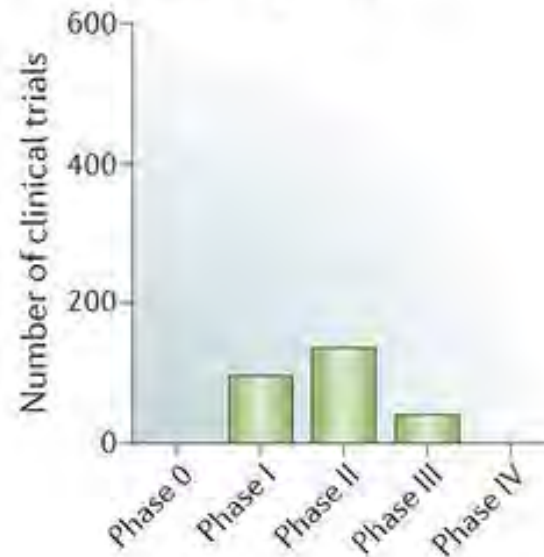
A case for evolution

- As of 2016, ~75% of clinical trials for solid tumors are reformulations of U.S. FDA-approved drugs
- The majority of nanomedicines currently incorporate off-patent cytotoxic agents to de-risk regulatory evaluation.

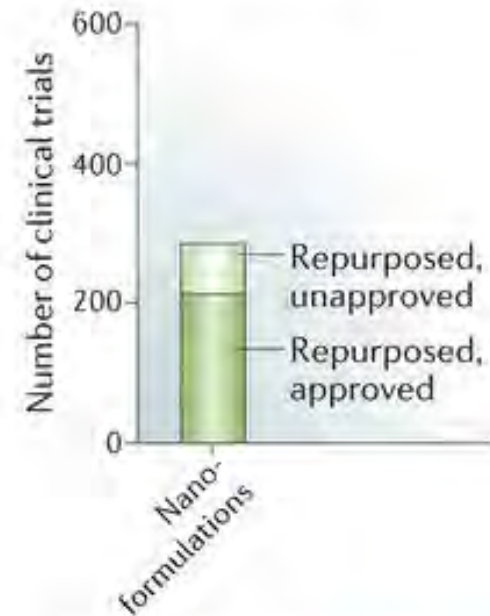
a Overview of query results



b Number of studies in clinical trial phases



c Relevant studies



What's approved for clinical use



Cell Search
Enriching Your Data

ACTIONABLE TEST

The first and only clinically validated, FDA-cleared test for capturing and enumerating circulating tumor cells (CTCs) to help inform clinical decision making.

Benefits of CELL-SEARCH[®] CTC Test Video

Clinical Data: Molecularly-based cancer

Reimbursement: Insurers, coverage and coding

Start Testing Patients: Locate a reference laboratory

Myocet[®]
(liposomal doxorubicin)



LIPODOX

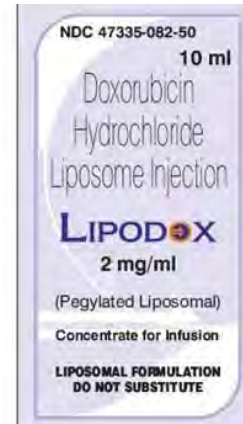
Composition: Each mL contains: Doxorubicin Hydrochloride IP 2 mg (as pegylated liposomal) Water for Injection IP q.s.

Dosage: Refer package insert. Store at 2° to 8° C in a refrigerator. Do not freeze.

The reconstituted product to be stored at 2° to 8° C and used within 24 hours. Partially used vials should be discarded.

CAUTION: It is dangerous to take this preparation except under medical supervision.

WARNING: To be sold by retail on the prescription of an Oncologist only.



 **Nanosphere**



See also: <https://nano.cancer.gov/learn/now/clinical-trials.asp>

Discussion Question 1

What are examples from your work that use some emerging feature uniquely enabled by the nanoscale?

How long does it take for a new field to yield clinically approved interventions?

Case study: biologics

ACCOUNTS
of chemical research

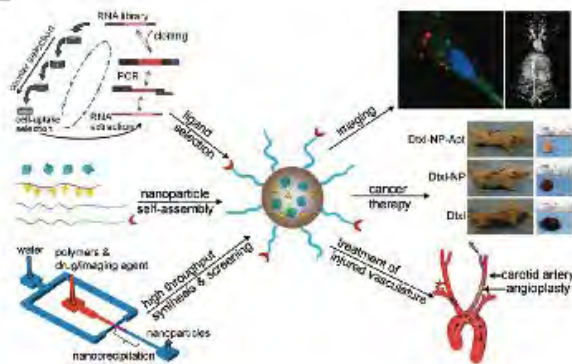
Self-Assembled Targeted Nanoparticles: Evolution of Technologies and Bench to Bedside Translation

JINJUN SHI, ZEYU XIAO, NAZILA KAMALY, AND
OMID C. FAROKHZAD*

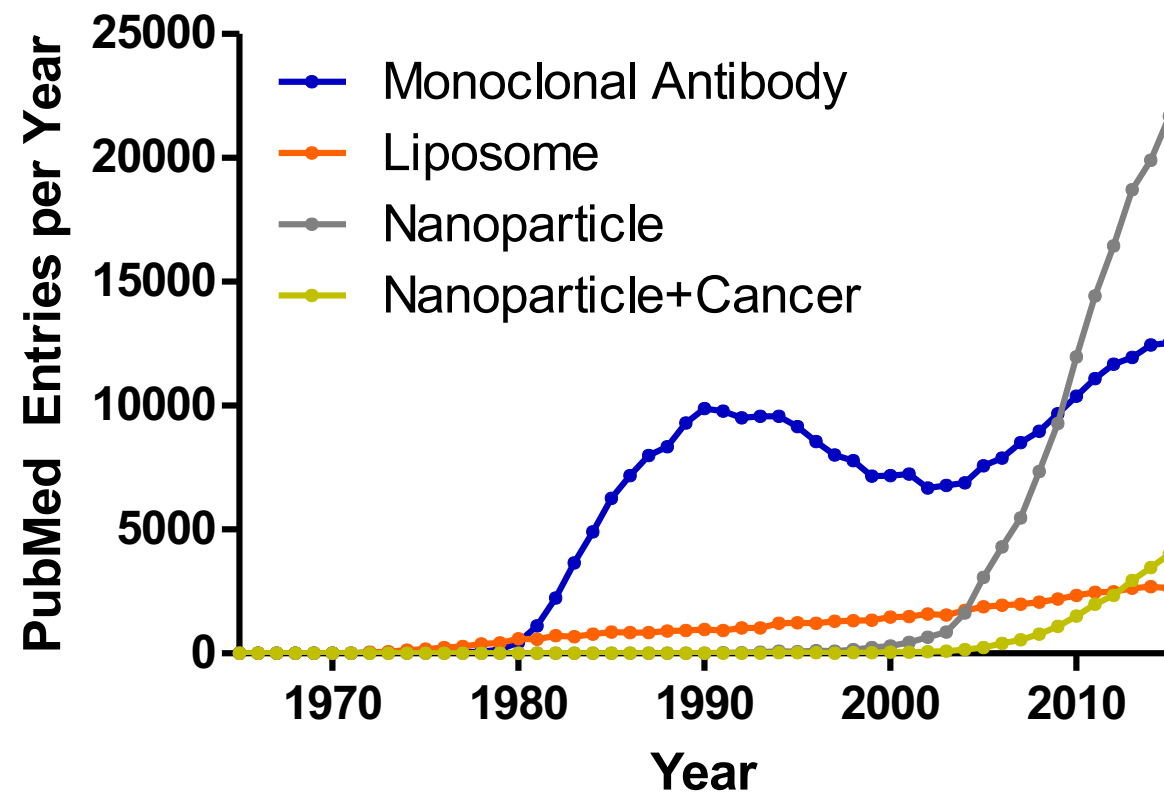
*Laboratory of Nanomedicine and Biomaterials, Brigham and
Women's Hospital, Harvard Medical School, Boston, Massachusetts
02115, United States*

RECEIVED ON FEBRUARY 25, 2011

CONSPECTUS







PubMed Results (1965-2015)



Could we “see” the next revolution?

- It took +20 years for monoclonal antibody therapies to move from the lab to the clinic
 - Majority of FDA approvals occurred after year 2000.
 - Now, we are getting more complex emergent approaches such as bispecifics.
- The next revolution:
 - Pervasive? (blurring tech. boundaries; e.g., cell phones)
 - Personalized? (saving one life at a time; e.g. immunotherapy)

Navigating the next industrial revolution

Revolution	Year	Information
	1 1784	Steam, water, mechanical production equipment
	2 1870	Division of labour, electricity, mass production
	3 1969	Electronics, IT, automated production
	4 ?	Cyber-physical systems

Source: <https://www.weforum.org/agenda/2016/01/the-fourth-industrial-revolution-what-it-means-and-how-to-respond/>

Discussion Question 2

What are the big market pulls in healthcare and biotech that nanotechnology could be applied to for revolutionary impact?

THANK YOU!

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