Disruptive targeted drug delivery system via synergistic combination of intelligent DNA molecular machines and gated mesoporous nanoparticles

Informe

Información del proyecto

SMARTRIOX

Identificador del acuerdo de subvención:
811744

Sitio web del proyecto

DOI
10.3030/811744

Proyecto cerrado

Fecha de la firma de la CE
25 Mayo 2018

Fecha de inicio
1 Junio 2018

Fecha de finalización
31 Octubre 2021

Financiado con arreglo a
INDUSTRIAL LEADERSHIP - Innovation In SMEs

Coste total
€ 2 847 667,50

Aportación de la UE
€ 1 993 367,25

Coordinado por
TRIOX NANO LTD
Israel

Periodic Reporting for period 3 - SMARTRIOX (Disruptive targeted drug delivery system via synergistic combination of intelligent DNA molecular machines and gated mesoporous nanoparticles)

Período documentado: 2020-06-01 hasta 2021-10-31

Resumen del contexto y de los objetivos generales del proyecto

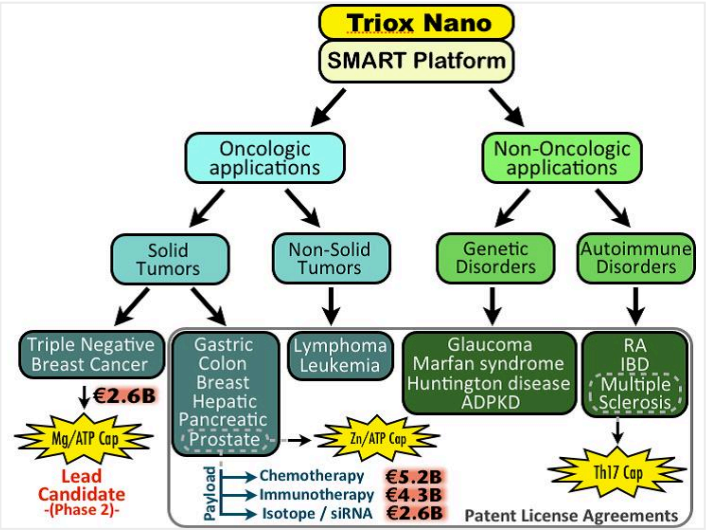
By the year 2022, thousands of APIs (Active Pharmaceutical Ingredients) were developed and approved to treat different diseases, yet not even one efficient technology was approved to deliver these different API precisely to their target tissues! Developing a targeted delivery platform will benefit these APIs by improving their efficacy and reducing their toxicity. It will broaden their treatable indications, improve their results and allow them renewed patent rights. "Traditional" delivery methods, such as Injections or tablets deliver only a small percentage of their original doses to the tissues requiring treatment, and instead, most of the dose arrives to healthy tissue causing severe toxicity. Current Drug Delivery Platforms (DDPs) such as liposomes or polymers face the same efficiency problem, not offering the possibility to target specific body tissues affected by a disease. On the other hand, Targeted Therapies such as monoclonal antibodies, target only an affected protein, but are costly and generally amenable to a small proportion of patients bearing the specific protein for which the treatment is directed. Efforts to develop Targeted Drug Delivery Platforms (T-DDPs) that overcome these limitations resulted in little success to date, creating a substantial unmet need. The logical way to design such delivery platforms is to rely on a programmable / customizable technology incorporating components that can be found in living organisms and providing the possibility to be programmed to perform the following tasks described above.
THE SOLUTION: S.M.A.R.T a Stimuli Multi Adjusted Responsive nano Technology and PCPM platform which combines two cutting edge research fields (Patents already approved in EU and US): The S.M.A.R.T platform allows the necessary versatility to design and assemble a customizable targeted delivery systems with the capacity to treat a myriad of diseases, provided we identify the disease's “molecular fingerprint”, defined as the set of variables or molecular changes that makes it unique to the rest of the patient's body.
The overall objective of SMARTRIOX project is to develop TXN770 as better treatment options for Triple Negative Breast Cancer (TNBC).
TNBC is the most aggressive type of breast cancer, accounting for 15-25% of all Breast Cancer cases: yearly over 200,000 women are diagnosed worldwide, half of which are diagnosed with metastatic disease at the time of primary diagnosis (see figure). To date there is no EFFECTIVE treatment for TNBC, because it is hormone independent (Oestrogen and Progesterone), and does not express the mutated form of human EGF receptors (HER2), meaning the targeted therapy Herceptin and its derivatives cannot be used, similar to hormone therapies10. The current treatment options for these patients are far from being considered standard-of-care, with only highly toxic and rather ineffective therapies which, represent an excessive economic burden for National Health Services: Associated costs of €75 billion . Current guidelines for TNBC treatment heavily rely on "primitive" chemotherapy agents such as Anthracyclines Taxanes and their combinations.

Trabajo realizado desde el comienzo del proyecto hasta el final del período abarcado por el informe y los principales resultados hasta la fecha

TrioxNano's progress during the third period concentrated on optimization of PCPM to improve the efficacy of the platform and to fully utilize the ground breaking potential of P.C.P.M as part of the S.M.A.R.T platform to be programmed online.
The following scientific and technological breakthroughs achieved during this period are:
1. Development of 3D prediction methods to choose be mRNA catalytic site
2. Development of methods to measure DNAzyme catalytic activity in living cells
3. Development of best in class DNAzymes
4. Increasing the number of cell based assays to test our technology, prostate and ovary cells added. The higher variability and more human TNBC cell types allows us to test many aspects of technology
5. Creation of TNBC pathway target bank
6. High efficacy result with PCPM technology
The above is complemented with improvements in the following company's prospects:
1. Recruitment of highly professional staff including postdocs from Harvard, NIH, Volcany
2. Moving in to new labs and offices allowing us to grow in the future
3. New and improved regulatory strategy including the right to treat act
4. Enhanced security of IP and submission of 3 new patents
5. Highly effective dissemination and exploitation including mentioning of EU H2020 substantial support in mass media publications.
Of note is that the above breakthroughs and improved prospects were achieved during a very challenging period of the Covid19 pandemic (curfews, quarantines and labs premises closure).

Avances que van más allá del estado de la técnica e impacto potencial esperado (incluida la repercusión socioeconómica y las implicaciones sociales más amplias del proyecto hasta la fecha)

During the third period TrioxNano achieved groundbreaking scientific and technological breakthroughs, complemented by improvement in all prospects of the company. The pinnacle of our progress is the inception and development of P.C.P.M - Point of Care Programmable Medicine technology, which is an online real time programmable medication technology.
We have been able to program over 300 program codes to control PCPM and able to show their efficacy.
TrioxNano believes that P.C.P.M online programming of medicine will pioneer the next healthcare revolution as it allows (to the best of our group' knowledge) for the first time ever the full exploitation of the huge potential of DNA programming (based on S.M.A.R.T platform).



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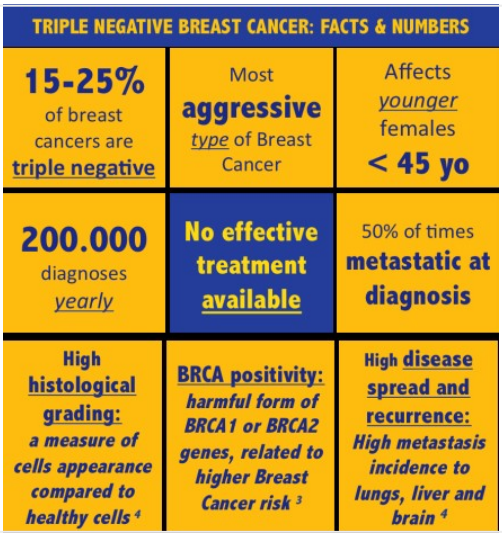

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