Early Pathologists Thought Cancer was a Parasitic Disease

December 18, 1890 Scottish pathologist William Russell reported a “cancer microbe” seen under his microscope inside cancer cells.

British Medical Journal: detailed drawings describing parasitic spores within cancer cells. (24)

Large Degenerating Organism (Red Arrows) containing Spores (Blue Arrows)

Cancer as a Parasitic Disease

“The study of parasitic disease affords us an opportunity to better understand cancer biology.”

Reference: Cracking Cancer Toolkit by Jeffrey Dach MD Medical Muse Press 2020
Theileria: intracellular parasite transmitted by ticks, resembles Borrelia Lyme parasite in humans.

T. parva highly pathogenic for cattle, causes fatal lymphoproliferative disease known as East Coast fever. Treated with buparvaquone.

Dr. Vishvanath Nene (2016) writes: “Infected cells acquire a metastatic, cancer-like phenotype and are the primary cause of pathology.” (18)

Cryptosporidium Mouse Model of Colon Cancer

Dr. Sadia Benamrouz et al. (2014)

Mice inoculated with cryptosporidium develop colon cancer.

Upregulated Wnt signalling.

In 2015, Dr. Muehlenbachs Case Report:

Immunosuppressed Pt w/ enlarged lymph nodes invaded by malignant cells.

Genomic analysis of lymph node biopsy: Tapeworm DNA (Hymenolepis nana) in the cancer cells, indicating:

“Malignant transformation of a tapeworm parasite,” apparently indicating the parasitic origin of this patient’s cancer.” (Muehlenbachs, 2015)

Anti-Parasitic Drugs – Repurposed as Anti Cancer Drugs

Anti-Malarials – Artemisinin, Mefloquine, HCQ CQ
Niclosamide
Ivermectin
Mebendazole (Vermox), Fenbendazole
Nitazoxanide (Alinia)
Pyrvinium

Artemisinin/Artesunate

2015 Tu You You (Pharmaceutical Chemist) Receives Nobel Prize for Discovering Artemisinin, IV Artesunate First Line Treatment for Malaria inexpensive and widely available outside US 60 mg vials.

Artesunate for Injection was not FDA approved until May 26, 2020 (for treatment of severe malaria). Previously, solely available from CDC as investigational new drug (IND).


Artesunate for Colon Cancer Pre-OP

2015 Dr Sanjeev Krishna Randomized Trial on 23 colon cancer pts waiting for “curative resection”.

Pt Randomized to Artesunate 200 mg tab or Placebo PO X 14 days Pre-OP.

Five years later: One Recurrence in artesunate group (10%). SIX Recurrences in placebo group (60%) (Krishna, 2015)


Artemisinin/Artesunate

- 2015 Dr Das: Artemisinin (derivatives) Effective Against 55 cancer cell lines.
- Potentiates Effect of Doxorubicin Chemo in Drug Resistant Leukemia Cell Model.
- Selective to Cancer Cells which have increased iron content and iron transport.

Artemisinin Structure

Endo Peroxide Bridge (Red Arrow)
Skeletal formula of artemisinin
Courtesy of Wikimedia Commons

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Artemisinin/Artesunate

Clinical Trials Disappointing:
“currently available phase I clinical trial results of ARTs for treating cancer are still largely limited and the number of participating patients is small.” (Xu, 2020)

DCA with Artesunate Fatal liver and bone marrow toxicity in Gliob pt. (Ohl, 2016)

Anti-Malarials – Mefloquine, Chloroquine, HydroxyChloroquine- Autophagy Inhibitors

MQ is trapped and accumulates in Lysosomes, increases pH, Prevents fusion of lysosome to autophagosome. Expands and disrupts Lysosomes.

Dr Sukai 2013: Highly Active Against Leukemia which has upregulated larger lysosomes.

Mefloquine most potent of three, effective Cancer Stem Cell Agent. Associated with Neuropsychiatric and retinal adverse side effects.

Mefloquine- Dosage for travelers 250 mg tab weekly for a few weeks before the trip.

Mefloquine Synergy w/ Tyrosine Kinase Inhibitors in Leukemia (CML)

This is true for TKI’s combined with **ANY** Autophagy Inhibitor.

2019, Dr. Hui Lam Yi: imatinib, dasatinib and ponatinib- B Cell receptor TKI’s in CML cell lines, in vitro.

Mefloquine preferentially targets CSC’s

Mefloquine in Colon Cancer in Vivo

- 2019, Dr. M Takeda: mouse xenografts
- Disruption of lysosomal activity (endosomal RAB5/7 proteins) with Mefloquine key to eliminating Cancer Stem Cells.
- Mefloquine more effective than HCQ and CQ
- Potent Inhibition Drug Efflux Pumps (Pgp-Drug -resistance)

Chemotherapy Increased CSC fraction 84%.
MQ alone decreased CSC to 9.4%.
MQ + Chemo Dramatically Decreased CSC population to 0.1%.
MQ + Chemo “Drastically Reduces” Tumor Volume.
MQ is Safe with no adverse effects.

“We expect that mefloquine may induce depletion of CSCs and, due to a synergistic effect, demolish the cancer hierarchy, including cancer precursor cells, when given in combination with cytotoxic anti-cancer drugs... Accordingly, we suggest that mefloquine is a promising candidate for colon CSC-targeting therapy.” (Takeda 2019)

Mefloquin Effective for Various Cancer Cells Types 1

- Breast cancer (23)
- Prostate cancer (31–32)
- Cervical cancer (33)
- CLL chronic lymphocytic leukemia (34)
- Esophageal squamous cell cancer
- Neuroblastoma (36)
<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colorectal cancer</td>
<td>(37) (inhibits NF-kB)</td>
</tr>
<tr>
<td>Liver cancer</td>
<td>(38) (targets Wnt/β-Catenin)</td>
</tr>
<tr>
<td>Acute myeloid leukemia (AML)</td>
<td>(24)(39)</td>
</tr>
<tr>
<td>Enhancement of chemotherapy in MDR drug</td>
<td>resistance (40–41) (inhibits p-glycoprotein)</td>
</tr>
<tr>
<td>drug resistance</td>
<td></td>
</tr>
<tr>
<td>Glioblastoma</td>
<td>(42) (inhibits ATP synthase)</td>
</tr>
<tr>
<td>Blast-phase chronic leukemia</td>
<td>—synergy with tyrosine kinase inhibitors (43–44)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Reference</th>
<th>Title and Authors</th>
</tr>
</thead>
</table>
42) Sharma, Natasha “Reduced glucose uptake and inhibition of ATP synthase by mefloquine results in death of Glioblastoma.” (2013)
Mefloquine Dosage

- Cytotoxic effects at 4-10 MicroM
- Traveler Malaria Prophylaxis (weekly 250 mg tablet) 3-4 micromolar.
- Anti-Malaria Therapy (1250 mg PO once) 2-23 microM.


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Although long-term use of MQ has psychiatric and neurological side effects (and Retinal) in some patients, its utility **may be justified** in late-stage cancer patients with limited treatment options ... *MQ’s ready and inexpensive availability and long-standing record of clinical use qualify this drug for repurposing for anti-cancer applications*”. (Mereddy 2018)

Other Safer Autophagy Inhibitors

- Chloroquine Anti-Malarial
- Clarithromycin (Azithro) Potently blocks late stage autophagy.
- Dipyridamole Anti-Platelet Agent
- Doxycycline Down-Regulates Autophagy Marker LC3B.
- Hydroxychloroquine Anti-Malarial
- Loratidine Claritin® CAD Antihistamine
- Mefloquine Anti-Malarial
- Niclosamide strongly blocks late stage autophagy by inducing lysosomal dysfunction.
- PPI's Proton Pump Inhibitors (Inhibit V-ATPase)
- Propranolol B-Blocker OXPHOS and Autophagy Inhibitor
- Pyrvinium Anti-parasitic, suppress transcription autophagy genes.
- Thymoquinone Black Seed, inhibition of autophagy at the gene transcriptional level, induces lysosomal dysfunction.
Niclosamide

1953 Niclosamide Bayer Lab Kill Snails
1962 Yomesan for Tapeworm.
1982 FDA Approved for Tapeworm.
2 Grams PO QD X 7 Days,

Niclosamide Off-Label Use

- Anti-bacterial for: C. Difficile Enterocolitis, Helicobacter Pylori
- Anti-Viral nM to microMr potency, SARS-CoV, MERS-CoV, ZIKV, HCV, and human adenovirus.
- Endometriosis.
- Anti-Cancer.

Niclosamide Anti Cancer Stem Cell Agent

Dr Pan Review 2012: Niclosamide potent inhibitor of Wnt/Beta Catenin/ and NF-kB
- Targets LRP6 Wnt Co-receptor on cell membrane
- Effective at Low Concentrations IC < 1 MicroM
- Targets NF-kB, Wnt/β-catenin, and Notch paths.
- “Holds promise in eradicating cancer stem cells.” (Pan, 2012)

Niclosamide Autophagy Inhibitor

2014 Dr Gao studied effect of Niclosamide on Lysosomes.

Niclo Inhibits mTOR which induces “protective autophagy”.

Yet Niclo Blocks Late Stage Autophagy (accumulation of LCIII and P62).

Niclo Increases pH of lysosomes, causing release of Cathepsins into Cytosol.

Niclosamide Targets Lysosomes Inhibits Antegrade Trafficking

- 2016 Dr Circu Prostate Cancer: High Thruput Screen 2,210 drugs and supplements.
- Niclosamide Identified as Best Candidate for inhibiting Antegrade Trafficking.
- Decreases Lysosomal pH, Acid Released into cytosol inhibiting GLYCOLYSIS.
- Therefore Niclosamide is Autophagy Inhibitor.


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Niclosamide Mitochondrial Uncoupling Agent – OXPHOS INHIBITOR

- Uncouples Mitochondrial OXPHOS.
- Even though electrons flow through ETC, there is No ATP production !
- This results in AMPK activation, and mTOR inhibition which induces “protective autophagy” and shift from OXPHOS to GLYCOLYSIS
- There is Synergy with GLYCOLYSIS Inhibitors (DCA)

Niclosamide for Ovarian Cancer

- 14,000 deaths annually.
- Presents late with metastatic spread to peritoneal cavity with Malignant Ascites.
- Platinum Based Chemo Remission—However, 75% relapse within 5 years.

Niclosamide for Ovarian Cancer
Niclosamide for Ovarian Cancer

2012 Dr Yi Te Yo: High Thruput Screen
1,200 approved drugs against OV CA.
Niclosamide most promising candidate.
Effective Against CSCs, Alone or Combined with Conventional Platinum based Chemo.

2014 Dr Rebecca Arend isolated Ov Ca Cells from 34 pts malignant ascites.
- OV CA cells treated w/ Niclo+Carboplatin.
- Synergy found in 32/34 samples.
- Niclosamide potent Wnt/BetaCatenin Inhibitor.

Niclosamide for Ovarian Cancer 3

2016 Dr Rebecca Arend: Ov CA Upregulated Cancer Pathways: Wnt, mTOR, STAT3.

All Three are inhibited by Niclosamide.

Niclosamide targets Chemo Resistant CD133+ OV CA stem cells.

Induces Metabolic Shift to Glycolysis (OXPHOS INHIBITOR)

Synergy with Glycolysis Inhibitor (DCA, Quercetin ?)


Niclosamide for P53 Deficient OVCA

2018 Dr R Kumar studied p53 deficient Ovarian Cancer cells and Xenografts. Hi Thruput Screen 1,600 drugs PHARMAKON Library.

Niclosamide most potent for P53 def Ov Ca at 2 Micro M.

Uncouples OXPHOS. (no ATP production even though electrons flow through ETC), AMPK activation, mTOR inhibition.

Niclosamide for Colonic Polyposis/Colon CA

- Wnt Pathway Upregulated
- 2011 Dr Takayu Osada mice with implanted human colon Ca xenografts
- Niclosamide well tolerated, achieved plasma and tumor levels associated with biologic activity, led to tumor control (26, 27)

Niclosamide for Colonic Polyposis/Colon CA

2016 Dr Susan Burock
High throughput Screen of S100A4 expression (Wnt). Niclosamide best candidate.

Human trials Niclosamide for Colon Cancer are Under Way. Susen Burock Berlin Germany


Niclosamide Dosing

2018 Dr Susen Burock: Nicolo Trial Niclosamide for Colon CA Clinical Trial.

2 Grams Niclosamide Orally per Day Until Progression or Toxicity.

Niclosamide for Lymphoma

2015 Dr Junaid Ansari Aggressive B Cell Lymphoma In Vitro.

Niclosamide Effective Induces Apoptosis low concentration of 0.1 MicroM

Normal Lymphocytes are spared.


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Niclosamide for Multiple Myeloma “Better Than Chemo”

2011 Dr FL Khanim Screened 100 drugs for anti-myeloma activity.

Niclosamide better than anti-myeloma drugs.

Rapid reduction in light chain production. (32)

Standard Anti-helminthic Dosing in humans achieves effective serum concentration used in their study (3.2 microM)


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Niclosamide for Breast Cancer Stem Cells

2013 Dr Wang screened LOPAC library 1258 compounds. Niclosamide was best inhibitor of BCSC.

2014 Dr Ye Br CA in vitro and in vivo Mouse model, increased apoptosis, decreased KI-67, VEGF pos cells, Microvessel density, reduced MDSC Myeloid derived suppressor cells, blocked pulmonary mets.

Potent STAT3 inhibitor, Targets NF-kB, Notch, Wnt, mTOR.

TME Tumor Microenvironment

Cells and tissues around the cancer mass playing a supportive role in feeding the cancer mass with nutrients and growth factors.

Dr. Freja Venning (2015): “the tumor microenvironment includes: immune cells, fibroblasts, pericytes, endothelial cells, adipocytes, and mesenchymal stem cells, and also the interstitial fluids and the extracellular matrix [ECM].” (36)

Niclosamide Reversal of Adipocyte Induced EMT

Adipocytes surrounding the cancer mass induce EMT Epithelial to Mesenchymal Transition of Breast Cancer cells through paracrine IL-6/Stat3 signaling (Inflammatory Cytokines). (Gyamfi, 2019).

Niclosamide inhibits IL-6/STAT3 which reverses adipocyte-induced EMT.

# Other Anti-Inflammatory Drugs and Natural Substances Reversing EMT

<table>
<thead>
<tr>
<th>Drug/Substance</th>
<th>Reference(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Celecoxib, ASA and Dipyridamole</td>
<td>(Harb, 2019) Lichtenberger 2019</td>
</tr>
<tr>
<td>Melatonin</td>
<td>Goncalves, 2016</td>
</tr>
<tr>
<td>Phytochemicals: Allicin/Garlic, Pterostilbene</td>
<td></td>
</tr>
<tr>
<td>(methylated version of resveratrol), Quercetin,</td>
<td></td>
</tr>
<tr>
<td>Sulforaphane (found in broccoli) Resveratrol (from grape skins), Curcumin (from turmeric) Genistein (phyto-estrogen from soy), Epigallocatechin-3-gallate (EGCG) (from green tea) Parthenolide(Feverfew)</td>
<td>Liscova, 2019</td>
</tr>
<tr>
<td>PPIs</td>
<td>Feng, 2016</td>
</tr>
<tr>
<td>Thymoquinone Black Seed Oil</td>
<td>Zhang, 2018</td>
</tr>
<tr>
<td>Tocotrienol Vit E</td>
<td></td>
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<tr>
<td>Solomons Seal (Inhibits EGFR)</td>
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<table>
<thead>
<tr>
<th>References Other Reversing EMT</th>
</tr>
</thead>
</table>
References Other Reversing EMT


Niclosamide Synergistic with Checkpoint Inhibitors

2019 Dr Luo using lung cancer cells, Niclosamide combined with Checkpoints Inhibitors blocks STAT3 binding to promoter of PDL1. Niclosamide “Enhanced cancer cell lysis mediated by T Cells in presence of PD-L1 blockade” (Luo, 2019)

Other Agents Enhancing Checkpoint Inhibitors

- Beta Glucans (DeGraff, 2018)
- Celecoxib (Yamaguchi, 2019)
- Ivermectin (Dragonov, 2021)
- Probiotics (Kroemer, 2018)
- Propranolol (Patel 2019)
- Metformin (Afzal, 2018)
- Wnt Pathway Inhibitors (Feng, 2019)
References Enhancing Checkpoint Inhibitors

Draganov, Dobrin "Ivermectin synergizes with immune checkpoint blockade for treatment of breast cancer." NPJ breast CA 7.1 (2021)
Patel, Vaibhav G., et al. "Effect of concurrent beta-blocker (BB) use in patients receiving immune checkpoint inhibitors for metastatic urothelial (mUC) and renal cell carcinomas (mRCC)." (2019):
Feng, M."Inhibition of β-catenin/BCL9 interaction overcomes resistance to immune checkpoint blockades by modulating Treg cells.” Sci Adv 2019
Ivermectin Antiparasitic - Nobel Prize

1981 William C. Campbell and Satoshi Ōmura Discover Ivermectin.

1987 FDA Approved Antiparasitic.

2015 Nobel Prize in Medicine

“Astonishingly safe... Wonder drug ... one of the Greatest Medical Accomplishments of the 20th Century.”

Eliminates Onchocerciasis River Blindness, Lymphatic Filariasis (Elephantiasis)

September 15 to 20, 2016. Community volunteers distribute Ivermectin to villagers in the District of Aboisso, southeast Cote d'Ivoire, as part of a nationwide mass campaign aimed at eliminating neglected tropical diseases. Courtesy of USAID in Africa.
## Ivermectin Antiparasitic Drug

<table>
<thead>
<tr>
<th>Treats Human Parasites: Strongyloidiasis, Ascariasis, Cutaneous larva migrans, Gnathostomiasis and Trichuriasis, Pediculosis (lice) and Scabies (mites).</th>
</tr>
</thead>
<tbody>
<tr>
<td>200 million humans globally have taken the drug for parasitic disease.</td>
</tr>
<tr>
<td>Extensive Veterinary Use: Billions of pets, horses, farm animals, Heartworm in dogs</td>
</tr>
</tbody>
</table>

Ivermectin Cancer Pathway Targets

- PI3K/AKT/mTOR pathway (Cancer Pathway)
- Wnt -TCF pathways (Cancer Stem Cells)
- Purinergic P2X receptors (ATP sensitive receptors) Tumor Micro Environment.
- Degrades PAK-1 protein (P21-Activated Kinase involved in oncogenic signalling)
- Multidrug Resistance Protein (MDR)

Anti-Cancer Effects Achievable at Antiparasitic Dosage

2018 Dr. Mandy Juarez:

“Importantly, the in vitro and in vivo anti-tumor activities of ivermectin are achieved at concentrations that can be **clinically reachable** based on the human pharmacokinetic studies done in healthy and parasite patients. Thus, existing information on ivermectin could allow its rapid move into clinical trials for cancer patients.”

2010, Dr. Sharmeen Screened 100 drugs for anti-leukemic activity. Ivermectin most promising at low MicroM concentration.

Synergy with Cytarabine and Daunorubicin.

Does Not Cross Blood Brain Barrier, no adverse neurologic effects, not suitable for brain tumors.

(2014), Dr. Alice Melotti Screened 1,040 drugs as inhibitor of Wnt/TCF pathway.

Only one agent Ivermectin perfectly tracked gene expression profile of Blocking TCF Gene and Inhibiting Wnt Pathway.

2012 Dr Hallet: Ivermectin Eradicates Breast Cancer Stem Cells.


2015, Dr. Dobrin Dragonov: Tumors have upregulated P2X7 receptors which regulate high ATP concentrations in the tumor microenvironment, promoting tumor progression.

Ivermectin sensitizes CATION channels to ATP, opening them further, allowing influx of large CATIONS, causing cancer cell death.

“Ivermectin kills mouse and human breast cancer [TNBC] cells through augmented P2X7-dependent purinergic signaling associated with caspase-1 and caspase-3 activation.”

Ivermectin Reverses Chemo Resistance

2019: Jiang using in vitro and in vivo xenografts with colorectal, breast and leukemia cells treated w/ Vincristine and Adriamycin (Doxorubicin).

Ivermectin Reverses Chemo Resistance at low concentrations.

Decreases P-glycoprotein drug efflux pump by binding to EGFR at cell surface. This inhibited its downstream signaling cascade ERK/Akt/NF-κB.

NF-κB inhibition leads to reduced P-gp Transcription.

Ivermectin Dosing

Usual Adult Dose for Scabies 0.2 mg/kg orally once, and repeated in 2 weeks. (12 mg for 60 kg)

For Covid-19: 0.2 - 0.3 mg/kg daily x 1-5 days.

3 mg tabs 20 tabs for $30.

Mebendazole (Vermox)

- 1968 First synthesized by Janssen Pharm.
- FDA-approved in 1972 (Pinworm, Ascaris Roundworm)
- Dosage 100 mg PO BID (w/fatty meal)
- Therapeutic Conc. at Disease Site.
- Good Toxicity Profile
- PO tablet, Low price.

Mebendazole Microtubule Disruptor

- Microtubule Disruptor, Impairs Spindle Formation (next slide), resulting in mitotic arrest.
- Downregulates BCL2 (anti-apoptosis protein) similar to Venetoclax. (ABT-199)
- Similar to Other Microtubule Inhibitors: taxanes, paclitaxel, docetaxel, vinblastine, vincristine, nocodazole, and colchicine, etc.
- MBZ Proposed to replace Vincristine in brain tumor Rx.

Spindle Formation / Cell Division

a, spireme stage;
b, spindle formed;
c, spindle complete;
equatorial plate formed;
d, Division completed.
Mebendazole for Melanoma

2008 Dr Doudican Hi Thruput Screen 2,000 drugs at 1 MicroM against malignant melanoma.
Mebendazole most promising agent.
Downregulates BCL2 (anti-apoptosis protein)
“the antineoplastic effects of mebendazole in human melanoma cells result from differential Bcl-2 – mediated cellular responses to mebendazole-induced tubulin disruption.” (88)

Mebendazole HNSC

2017 Dr Zhang head and neck squamous cell CA.

Mebendazole more potent than Cisplatin.

Mebendazole Synergy w/Autophagy Inhibitor

2019 Dr So Jung Sung HUVECs Endothelial Cells
MBZ: Inhibits Tumor Angiogenesis.
MBZ: dose-dependently inhibits EC proliferation.
Pronounced Induction of “Protective Autophagy”
MBZ Synergy with Chloroquine, Autophagy Inhibitors.

Mebendazole – Drug Synergies

- Autophagy inhibitors: chloroquine/hydroxychloroquine, clarithromycin, thymoquinone, loratadine, PPI’s etc.
- Metformin
- Metronomic chemotherapy (Low dose, chronic)
- Taxanes of vinca alkaloids microtubule agents
- Itraconazole (Sporonox, Anti-fungal, HKII/VDAC)
- Cimetidine (H2 blocker antiAcid/Immune stimulator)
- Diclofenac (NSAID Anti-Inflammatory)
Mebendazole Case Report
Metastatic Adrenocortical Cancer

2011 Dr Dobrosotskaya
48 Y/o metastatic adrenocortical CA.
Conventional chemoradiation unsuccessful.
100 mg PO BID Mebendazole sole treatment
Initial regression, then stable over 19 months.
24 months progressive disease
No adverse effects, improved quality of life.
Better result with addition of HCQ?

Mebendazole Case Report
Metastatic Colon Cancer

2014 Dr Peter Nygren.
74 Y/O Metastatic Colon CA refractory to chemo.
100 mg PO BID Mebendazole sole treatment
CAT Scans Show near complete remission of metastatic lung lesions, partial remission of liver lesions.
No Adverse effects, transient elevation LFT’s.
Better result with addition of HCQ?

Mebendazole - Immunotherapy

2017 Dr Blom: MBZ upregulates anti-tumor immune function (13)

MGZ Upregulates Genes related to monocyte macrophage M1 (Th-1) phenotype activation. (Not Th-2 )

2018 Dr Rubin, MB enhances T cell activation and tumor killing. (14)


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Mebendazole - Targeted Pathways

- Inactivates BCL-2 (the anti-apoptotic protein) (Doudican, 2008)
- Hedgehog inhibitor (Cancer Stem Cell Pathway) (Larsen 2015)
- Inactivates C-Myc (Pinto, 2019)
- Downregulates MDM drug resistance (Mrkvová, 2019)
- Immunotherapy- Restores Anti-Tumor Immune Function (Guerini, 2019)

6 Ongoing Human Clinical Trials
### Summary Slide

#### Cancer As Parasitic Disease

1. The Study of Parasitic Disease Provides a Model for Understanding Cancer Biology.
2. Many Anti-Parasitic Drugs Can be Repurposed as Anti-Cancer Drugs.
3. Artesunate (Antimalarial) from China.
4. Niclosamide Dual OXPHOS and Autophagy Inhibitor
5. Ivermectin Safe, Miracle Drug
6. Mebendazole Microtubule Inhibitor

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Thank You – Any Questions?

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