IVERMECTIN and Pancreatic Cancer - Ivermectin outperforms chemotherapy in this wild 2022 South Korean Study

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2022 Lee et al - Ivermectin and gemcitabine combination treatment induces apoptosis of pancreatic cancer cells via mitochondrial dysfunction

- **Pancreatic cancer is the fourth leading cause of cancer-related deaths in the world. In addition, the 5-year survival rate is less than 10%**
- **This is the first study to evaluate the anticancer effects of the combination of ivermectin and gemcitabine in pancreatic cancer.**

- **We found that the ivermectin–gemcitabine combination treatment suppressed pancreatic cancer more effectively than gemcitabine alone treatment**
- **Ivermectin–gemcitabine increased cell apoptosis by inducing mitochondrial dysfunction *via* the overproduction of reactive oxygen species and decreased the mitochondrial membrane potential**
- ***In vivo* experiments confirmed that the ivermectin–gemcitabine group had significantly suppressed tumor growth compared to the gemcitabine alone group**
- **These results indicate that ivermectin exerts synergistic effects with gemcitabine, preventing pancreatic cancer progression, and could be a potential antitumor drug for the treatment of pancreatic cancer.**

Pancreatic Cancer cell lines were treated with increasing doses of gemcitabine and ivermectin for 72 hours.

Although chemotherapy (gemcitabine) outperforms Ivermectin at lower doses, at some point, chemo is no longer able to kill a certain population of cells (Cancer Stem Cells?) and then Ivermectin significantly outperforms chemo.

In the above left graph, in Miapaca-2 cells, gemcitabine can't kill 20% of remaining cancer cells but for Ivermectin this drops to only 10% of cancer cells.

In the above right graph, in Panc-1 cells, gemcitabine can't kill 40% of remaining cancer cells but with Ivermectin this drops to 20%.

Although the combination of chemo + ivermectin does better than each at lower doses, by the time you get to the higher doses, it's very similar to Ivermectin alone.

So there is actually very little benefit that comes with chemo, in the combination of Ivermectin plus chemo.

These are stunning graphs!

FIGURE 2:

Pancreatic Cancer cell lines, PaCa-2 and PANC-1 cells were treated with 5 μM gemcitabine and increasing doses of ivermectin for 48 h.

What we see here is significant ADDITIONAL cancer cell killing accomplished with Ivermectin, than with just chemotherapy (gemcitabine) alone.

Ivermectin significantly outperforms chemotherapy in these examples.

IN VIVO (mice):

If you look at the graph on the right, Ivermectin outperforms gemcitabine in inhibiting tumor growth in mice.

DISCUSSION:

Although gemcitabine is the first-line anticancer drug for pancreatic cancer, it does not significantly improve the survival rate of patients with pancreatic cancer.

Only a few known drugs can be used in combination with gemcitabine.

Ivermectin, an antiparasitic drug, is being repurposed as an anticancer drug, and has been shown to **synergize with doxycycline or tamoxifen in breast and prostate cancer.**

Ivermectin has an anti-proliferative effect and inhibits the cell cycle in pancreatic cancer.

Combination treatment of ivermectin and gemcitabine significantly enhanced the antitumor effects via the phosphatidylinositol 3-kinase/mTOR/STAT3 pathway compared to gemcitabine treatment alone.

Ivermectin promotes programmed cell death via ROS production.

Ivermectin–gemcitabine combination significantly increased the ROS levels compared to gemcitabine alone.

The combination treatment promotes apoptosis in pancreatic cancer via mitochondrial dysfunction caused by ROS generation.

Co-treatment with ivermectin and gemcitabine can inhibit the survival rate of cancer cells by blocking mitophagy. Cancer cells get rid of damaged mitochondria (mitophagy) to avoid cell death.

CONCLUSION:

“Overall, our study showed that the combination of ivermectin and gemcitabine has a stronger antitumor effect on pancreatic cancer than gemcitabine alone.

The ivermectin–gemcitabine combination increased apoptosis of pancreatic cancer cells via ROS-induced mitochondrial dysfunction.

Moreover, the combination treatment reduced mitophagy, leading to cancer cell death, and further inhibited tumor growth in vivo.

Therefore, the ivermectin–gemcitabine combination may be a promising therapeutic agent for improving the survival rate of patients with pancreatic cancer.”

MY TAKE:

Many studies show that Repurposed drugs like Ivermectin and Fenbendazole (or Mebendazole) outperform chemotherapy.

Usually, these studies also show that the combination with chemo tends to have better outcomes than each individual agent alone. Although often, not by much.

But, what if we were to treat cancer with a combination of repurposed drugs, as opposed to one repurposed drug and one

chemotherapy?

For example: Ivermectin + Fenbendazole, or Ivermectin + Mebendazole, as opposed to Ivermectin + chemotherapy? Would we get even better outcomes?

I suspect we would.

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