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Short Communication

An Update on the Management of Toxoplasmosis with Relation to Pregnancy with Current Advances

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Toxoplasmosis is a zoonotic disease that occurs secondary to infection by the Apicomplexa protozoan parasite Toxoplasma gondii, having the capacity to infect all warm blooded animals [1]. It is a disease prevalent all over the world with Prevalence of 40%-which goes as high as 70% in Mexico based on region [2,3]. Earlier we had reviewed the impact of TORCH testing and management of pregnancy with toxoplasmosis [4]. It has the ability of inducing abortion, encephalitis, with being a major opportunistic threat in patients infected with HIV [5]. 2 phases of human Toxoplasmosis exist, namely acute as well as chronic. During acute phase, the parasite spreads in the tachyzoite stage, that is markedly invasive as well as motile asexual form. At this particular stage, the parasite has the capacity to cross across any kind of biological barrier that are placenta and blood brain barrier (BBB) [6]. The motility of the parasite is based on the actomyosin machinery present below the plasma membrane kaglideosome [7]. Toxoplasma possesses 3 particular secretory organelles with specific proteins, that get liberated in a regulated as well as particular manner in the form of parasite biological requirements: the micronemes (MIC proteins), rhoptries (ROP proteins) along with dense granules (GRA proteins) [8].

The Toxoplasma tachyzoite has the ability to perform 2 kinds of invasion, active or passive. Active invasion is the event by which each nucleated as well as non phagocytic host cells get infected. This has been extensively evaluated, is based on the well tuned lytic cycle [9]. The lesser evaluated passive invasion is the event by which each phagocytic cell gets invaded. 1st the parasite gets adherent to the plasma membrane of phagocytic activate dcel that is surrounded by the plasmatic membrane elongations a it is internalized toward cytoplasm in a phagocytic vacuole (PV) [10]. Once in the parasite gets away from immune response, converting PV into a parasitophorous vacuole through the phosphorylation of the host immune-associated GTPases (IRG's) by a complex implicating ROP and GRA proteins. This avoids oligomerization of IRG as well as their enrolment in PVM that inhibits the vacuole breakdown, thus Subsequently the clearance of the parasite by the macrophage [10,11]. Convention therapy consisted of a mixture of sulfadiazine with pyrimethamine (S-P) in 1950's but in view of teratogenicity spiramycin replaced in first trimester (see figure 1 and 2 for dosage). Only little advancements have been done in this field with minimal efficacy in chronic stage with no available vaccines either for human or animal use though in mice trials are on [12].

Dehydroepiandrosterone (DHEA) is a steroid hormone, getting generated from cholesterol, in the adrenal glands, gonads as well as brain, besides getting generated from pregnenolone by action of 17-20 desmolase. Despite being a hormone it has worked out to be an excellent antiparasite drug. *In vitro* low amounts of DHEA hamper proliferation, adhesion along with motility of Entamoeba trophozoites, whereas high amounts stimulated the parasite getting lysed. Thus Muniz-Hernandez., *et al.* [11], worked out the mechanistic modes for DHEA on T. Gondii. They illustrated for the 1st time that DHEA possesses toxoplasmicidal actions on extra cellular tachyzoites. Ultra structural evaluation of the treated parasite demonstrated that DHEA changes the cytoskeleton structures, re-

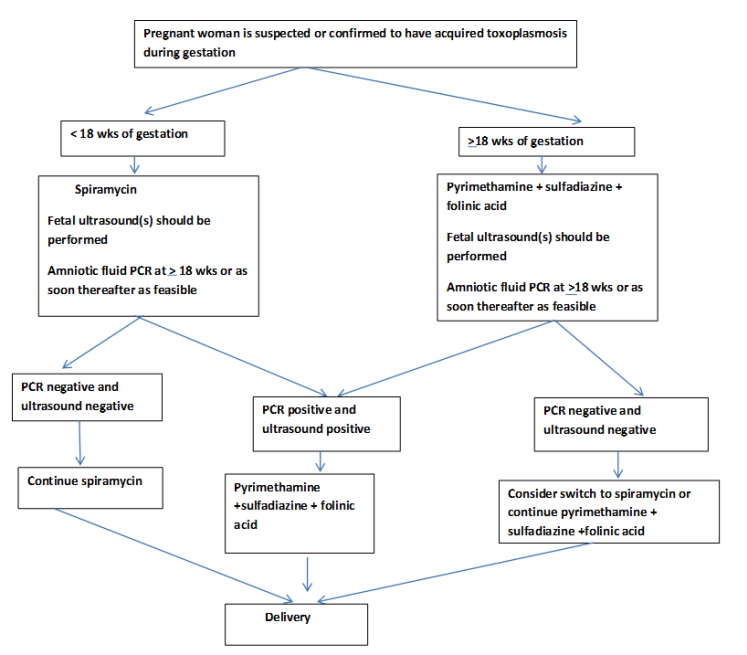

Figure 1

Treatment	Dosage	Comments
Spiramycin	1g(3 million U)every 8 h(for a total of 3g or 9 million U per day)	Not teratogenic:does not treat infection in the fetus:indicated for pregnant women suspected of having acquired the infection at 18 weeks of gestation.Spiramycin treatment should be continued until delivery in women with low suspicion of fetal infection or those with documented negative results of amniotic fluid PCR and negative findings on ultrasounds at follow up.Available in United states only through Investigational New Drug process at FDA.Prior consultation with medical consultants is required.
Pyrimethamine, sulfadiazine and folinic acid	Pyrimethamine:50 mg every 12 h for 2 days followed by 50mg daily: sulfadiazine:initial dose of 75mg/kg followed by 50mg/kg every 12 h (maximum 4g/day):folinic acid (leucovorin):10-20 mg daily (during and 1 week after completion of pyrimethamine therapy)	Pyrimethamine is teratogenic: therefore this combination should not be used before week 18 of gestation(in some centers in europe.it is used as early as week 14-16).Indicated for women suspected of having acquired infection at >18weeks of gestation and those with documented fetal infection (positive result of amniotic fluid PCR) or abnormal ultrasound findings suggestive of congenital toxoplasmosis, given when patient is at >18weeks of gestation.

Figure 2: Medicines used for pregnant women who acquired *Toxoplasma gondii* during pregnancy.

sulting the depletion of organelle structure along with organization in addition to the absence of cellular shape. *In vitro* therapy with DHEA results in reduction in viability of extracellular tachyzoites as well as the passive invasion event. Two-dimensional (2D) SDS-PAGE evaluation demonstrated that in the existence of this hormone, a Progesterone Receptor membrane component (PGRMC) in addition to the cytochrome b family heme/steroid via binding domain possessing protein got expressed, whereas the protein expression which are necessary for motility as well as virulence got significantly decreased. Lastly *in vivo* therapy with DHEA resulted in reduction of the parasitic load in male but not in female mice. Thus in this study where DHEA alone or in combination with S-P, on extra cellular tachyzoites as well as in a mice model of acute toxoplasmosis. As per their outcomes DHEA might be recognized by PGRMC in addition to the cytochrome b family heme/steroid via binding domain possessing protein, that stimulated a decrease of passive invasion by the manipulation of the expression of proteins considered necessary for the invasive events, along with certain virulence parameters (See figure 3). Furthermore, they saw that DHEA has a significant part in reduction of the parasitic load in mice. Hence, we might be on a path where simpler therapy of adding DEXA to spiramycin or other therapies as per earlier detailed drugs might aid in therapy of human toxoplasmosis. Further significance of anti- Toxoplasma gondii IgG and IgM antibodies with associated risk factors was emphasized on positivity of toxin an Iranian population [13]. The significance of testing for Toxoplasma gondii in women varies with its density in various regions in view of its vertical transmission in human toxoplasmosis resulting in permanent neurological injury as well as blindness [14].

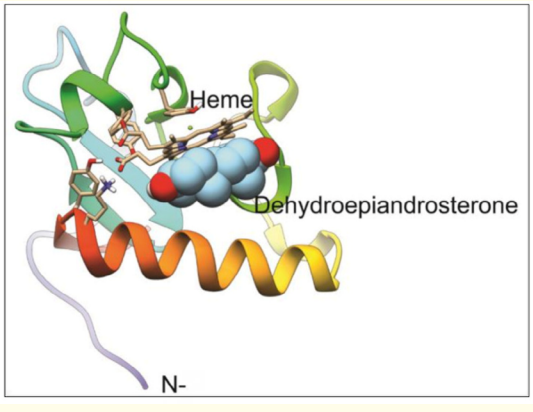

Figure 3: Courtesy ref no-11. Model for *T. gondii* progesterone receptor membrane component (PGRMC) homolog and its docking to DHEA. The model for PGRMC contains a binding pocket for a heme group that functions as the binding site for DHEA. TYR158 binds the heme group on one face, while the other binds DHEA, blocking any interaction at that site.

Bibliography

1. Weiss LM and Dubey JP. "Toxoplasmosis: A history of clinical observations". *International Journal for Parasitology* 39 (2009): 895-901.

2. Elmore SA., *et al*. "Toxoplasma gondii: epidemiology, feline Clinical aspects and prevention". *Trends Parasitology* 26 (2010): 190-196.

3. Callabero Ortega H., *et al*. "Sero Prevalence and national distribution of human Toxoplasmosis in Mexico: Analisis of the 200 and 2006 National Health Surveys". *Transactions of the Royal Society of Tropical Medicine and Hygiene* 106 (2012): 653-659.

4. Kulvinder Kochar Kaur., *et al*. "Role of routine TORCH testing with emphasis on Toxoplasmosis in pregnancy". (2014).

5. Safarpour H., *et al*. "Global status of Toxoplasma gondii infection and associated factors in people living with HIV". *AIDS* 34 (2020): 469-474.

6. Gomez-Chavez F., *et al*. "Maternal immune response during pregnancy and vertical transmission in human Toxoplasmosis". *Frontiers in Immunology* 10 (2019): 285.

7. Frenal K., *et al*. "Gliding motility powers invasion and egress in Apicomplexa". *Nature Review on Microbiology* 15 (2017): 645-660.

8. Carruthers VB and Sibley LD. "Sequential protein secretion from three distinct organelles from Toxoplasma gondii accompanies invasion of human fibroblasts". *European Journal of Cell Biology* 73 (1997): 114-123.

9. Black MW., *et al*. "Lytic cycle of Toxoplasma gondii". *Microbiology and Molecular Biology Reviews* 64 (2000): 607-623.

10. Beck JR., *et al*. "Toxoplasma palmitoyl acetyl transferase and the palmitoylated armadillo repeat protein Tg ARO govern apical rhoptry tethering and reveal a critical role for rhoptries in host cell invasion but not egress". *PLoS Pathogen* 9 (2013): e1003162.

11. Muniz-Hernandez S., *et al*. "Dehydroepiandrosterone effect on Toxoplasma gondii: molecular mechanisms associated to parasite death". *Microorganisms* (2021): 9513.

12. Wu L., *et al*. "A novel DNA Vaccine encoding Toxoplasma gondii SAG1 and ROP18provokes immunity against a lethal challenge in mice". *Acta Parasitology* (2021).

13. Soltani S., *et al*. "A detection of anti-Toxoplasma gondii IgG and IgM antibodies and associated risk factors during pregnancy in south west iran". *Infectious Diseases in Obstetrics and Gynecology* (2021): 55475547667.

14. Ahmad M., *et al*. "Toxoplasmosis in pregnancy". *European Journal of Obstetrics and Gynecology and Reproductive Biology* 255 (2020): 44-50.

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