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Review Article

Efficacies of the Medicinal Synthetic Aluminum-magnesium Silicate: A Review

Onyeachonam FIO*

Department of Veterinary Biochemistry and Animal Production, College of Veterinary Medicine, Michael Okpara University of Agriculture, Umudike, Nigeria

***Corresponding Author:** Onyeachonam FIO, Department of Veterinary Biochemistry and Animal Production, College of Veterinary Medicine, Michael Okpara University of Agriculture, Umudike, Nigeria.

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Abstract

Molecules of Aluminum-magnesium silicate (AMS), a solid mineral approved as medicine by WHO, consist of Nanoparticles (0.96 nm) that are smaller than viruses (≥ 5 nm). The Nanoparticles have positively and negatively charged ends while RNA viruses are positively charged with DNA viruses and abnormal (tumor/infected) cells, negatively charged whereas normal cells remain neutral. So, AMS-Nanoparticles mop viruses and abnormal cells by opposite charges electrostatic attraction. Presence of the two charges makes AMS` Nanoparticles hydrate in solutions to stabilize (potentiate) other medicines formulated with it. Some countries lack AMS-deposits. So, Aluminum silicate and Magnesium silicate (WHO-approved medicines, too) were used to formulate AMS-brand, named Medicinal synthetic AMS (MSAMS; Antivirt®; VITUMED®). To make the un-absorbable MSAMS act systemically, Dextrose monohydrate (simple sugar) is incorporated in its formulations to convey the electrically charged Nanoparticles into blood-circulation by the active-transport principle. These mechanisms confer on MSAMS the Antiviral; Antitumor; Adjuvant efficacies being reviewed.

Keywords: MSAMS; Adjuvant Efficacy; Anti-tumor Efficacy; Antiviral Efficacy

Antiviral and antitumor mechanisms of the MSAMS

Reason viral diseases and tumors (including cancers) are not easy to treat is that there is similarity in biochemistry of viruses and biochemistry of normal cells [1] while the normal cells have exactly same biochemistry as abnormal (tumor and infected) cells. So, any medicine designed to inhibit biochemistry of viruses or biochemistry of abnormal cells adversely affects biochemistry of normal cells leading to excessive side effects. To ensure side effects of antiviral medicines and tumor medicines are within tolerable levels, the medicines should be targeted against physical feature(s) of viruses and abnormal cells. Designing medicines to act physically demands that they reach all affected cells and all particles of invading pathogens. Otherwise, they would not be able to achieve termination of infections or termination of tumor cells-metastases [2].

To reach all virus-infected cells, medicines must be made of active principles which molecules are smaller than the virus being targeted. When medicines that cannot reach all affected cells are used for treatments immunity must be high enough, else, the infections cannot be terminated. Current approach in treating viral diseases is to suppress symptoms and enhance immunity so that immunity clears the infections. That is reason diseases caused by immunodeficiency infections are “incurable” because immunity is no longer enough to clear infections. With HIV/AIDS, all efforts made to clear infections from cells that are inaccessible to medicines fail such that those cells are termed “sanctuaries”/”reservoirs” for HIV. Thus, the disease was “incurable” while patients of COVID-19 which is caused by a virus that is much smaller than HIV recover in millions when properly managed, because the COVID-19 virus does not cause severe immunodeficiency.

That medicines which have electrical charges would mop pathogens that have opposite charges is not a new theory. Since it has been discovered that every virus is either positively charged or negatively charged and that abnormal (infected/tumor) cells are negatively charged while normal cells remain neutral (without charges), electrical charges have become biomedical markers for antiviral medicines and medicines for abnormal-cell diseases (including cancers).

Epidemics/epizootics, currently ravaging the world including HIV/AIDS, COVID–19, Lassa fever, Ebola, Monkey pox and Bird Flu are viral diseases. So, Ezeibe [2] has been advocating opposite charges electrostatic-mopping hypothesis for treatment of those diseases.

AMS is a WHO-approved medicine. It is also being used in the pharmaceutical industry as a stabilizing agent because its molecules are made of Nanoparticles (0.96 nm thick) that have both positively charged ends and negatively charged ends [3] and so form three dimensional colloidal structures when in solution. The AMS-Nanoparticles are smaller than any known virus (so that they reach viruses, anywhere in the body, to use their charges to mop them and cells they have infected [4]. As a silicate it also normalizes immunity [5] and as a stabilizing gent it enhances efficacy of antimicrobial agents for effective treatment of secondary infections. Mopping viruses; Destroying-abnormal cells; Normalizing immunity and Effective treatment of secondary infections cure viral diseases and Tumors.

Adjuvant mechanism of the MSAMS

The three dimensional colloidal structures which AMS-Nanoparticles form in solutions stabilize other medicines that are formulated with it [3]. Stabilizing drugs protects them against rapid degradation by metabolic processes thus prolonging time such drugs remain at high bioavailability. Prolonging time of high bioavailability enhances potency and so, doses of the drugs needed to achieve desired effects are reduced. When lower doses are used for treatments, immune responses of patients enhance. Synergy between enhanced efficacy and enhanced immune response clear ≥ 95% of treated infections so that antimicrobial resistance (AMR) is prevented [6]. Even resistant infections said to be "incurable" could become curable.

The invention, the equation and the innovation [7]

For countries that do not have deposits of AMS [$Al_2Mg_3(SiO_4)_3$] Aluminum silicate [$Al_4(SiO_4)_3$] and Magnesium silicate [Mg_2SiO_4] which are also WHO-approved medicines were used to formulate a brand of AMS which has been named Medicinal synthetic AMS (MSAMS, Antivirt®). To protect their invention and explain it scientifically, the inventors invented a chemical equation as formula for the medicine {$Al_4(SiO_4)_3+3Mg_2SiO_4 \rightarrow 2Al_2Mg_3(SiO_4)_3$}. To make the MSAMS function systemically (AMS is un-absorbable), Ezeibe [2], added innovation of incorporating Dextrose monohydrate (simple sugar) in its formulations so that the simple sugar conveys the electrically charged Nanoparticles across mucous membranes into blood, for circulation to all organs (active transport principle).

Antiviral efficacies of the MSAMS

Reasons existing medicines do not achieve permanent cure of some viral diseases such as HIV/AIDS include size of active principles of medicines being used for treatment. When molecules of active principles of medicines are too large they cannot cross physiological barriers to reach all virus-infected cells. For that reason, most existing antiretroviral medicines do not reach HIV infections in some cells but MSAMS is made of ultra-Nanoparticles [3]. So, it crosses physiological barriers and reaches every virus and every abnormal (infected or tumor) cell in every organ. And since it acts by a physical effect, it is safe for the long treatment-durations needed to terminate HIV-infections. A patient (adult male) whose CD4 count increased ($P \leq 0.05$) from 685 to 820 while his viral load became undetectable and he tested HIV-negative (antibody and antigen) after 20 months on the Antivirt® remained HIV-negative all through period of 10 months he was monitored, post treatment, without being on any antiretroviral medicine [8-13]. Eight confirmed COVID-19 patients reported clinical recovery after 3 days (72 hours) on the Antivirt®-treatment. The ninth patient, a 90-year old man, recovered after four days (96 hours). They all tested negative at the repeat-test [14]. Titer of two Measles virus samples reduced from HA 128 and 64 respectively to 4, each, when treated, *in vitro*, with the MSAMS [2]. Volumes of samples of Avian influenza virus incubated with the MSAMS reduced at a mean rate of 23.4 ± 5.48% while viral titers of the samples reduced ($P \leq 0.05$) from a mean HA, 73.00 ± 32.72 to 1.40 ± 0.43 and the Embryo Mortality Rates also reduced ($P \leq 0.05$) from 100% to 65%. Incubating the AIV samples with the MSAMS increased mortality time of chicken

embryos significantly (P ≤ 0.05) from 76.00 ± 4.38 to 128.00 ± 18.36 hours. In an experiment of repeating incubation of AIV with the MSAMS, titers of the viral samples reduced from HA, 128 to 2 in both a portion incubated with the MSAMS once and in two portions incubated twice and thrice, respectively. EMR of chicken eggs was 100% in the control and in the group inoculated with AIV portion treated with the MSAMS once, but their MDT increased from 64 hours in the control to 104 hours in a group of eggs inoculated with AIV portion treated with the MSAMS once. In groups of eggs inoculated with portions of the AIV treated with the MSAMS twice and thrice respectively, there was no embryonic death, 208 hours PI [15]. Incubating samples of Newcastle disease virus (NDV) with the MSAMS, *in vitro*, reduced their HA-titer (P ≤ 0.05) from 613.00 ± 86.00 to 4.50 ± 0.72 (P ≤ 0.05). Also, incubating NDV with the MSAMS once reduced its morbidity rate (P ≤ 0.05) from 100% to 20% while incubating the virus with the MSAMS twice reduced the morbidity rate from 100% to zero. When chicks were infected by i/m inoculation of NDV, both a group treated with MSAMS and the control, had 100% mortality each (P ≥ 0.05). However, when infection was by housing infected chicks with the experimental chicks (mimicking natural mode of infection), treatment with the MSAMS reduced mortality from 20% to zero (P ≤ 0.05). Also, in control group of the i/m challenge experiment, clinical signs of ND were observed 40 hours post infection (P/I) but in the group inoculated with same NDV incubated with the MSAMS only once, two chicks that became sick, showed clinical signs of ND, 5 days (120 hours) PI [16].

Quantitative Agar Gel Precipitation titer (QAGPT) of sample of Infectious bursa disease virus (BDV) treated with the MSAMS (*in vitro*) reduced from 8 to zero while sero-conversion ability of treated IBD-vaccines reduced from AGPT 13.60 ± 1.22 to 0.00 ± 0.00. When IBDV-infected chicks were treated with the MSAMS, mortality reduced from 30% to zero [17]. HA titer of samples of Egg drop syndrome (EDS) 76 virus treated with the MSAMS, *in vitro*, reduced (P ≤ 0.05) from 22.50 ± 7.59 to 2.00 ± 0.65. Also, sero-conversion ability of the viral portions treated with the medicine reduced (P ≤ 0.05) from a mean HI titer, 42.20 ± 11.19 to 00.00 ± 0.00 [18]. Incubating Fowl-pox vaccines with the MSAMS initially increased (P ≤ 0.05) passive haemagglutination (PHA) titers of the vaccines from a mean of 2.80 ± 1.10 to 11. 20 ± 4.38 but when incubation with the MSAMS was repeated, viral titers of all the vaccine batches reduced (P ≤ 0.05) to 0.00 [19].

Though HA titers of samples of Peste des petits ruminants virus (PPRV) treated with the MSAMS did not change from titers of the portions used as control, the treatment significantly reduced sero-conversion ability of PPR vaccines from a mean HI titer of 9453.70 ± 2418.30 to 64.00 ± 14.49 (P ≤ 0.05) [20]. Incubating samples of Canine parvovirus with the MSAMS reduced their HA titer from 875.60 ± 261.70 to 270.80 ± 132.10 (P ≤ 0.05). All CPV-infected dogs treated with the MSAMS (both adults and puppies) recovered while all the controls died. Gross pathology of the untreated CPV-infected dogs revealed swollen hearts with rounded apex, pale-swollen lungs and congested livers in the puppies while the adults had discolored and swollen intestines, congested and swollen livers and pale-swollen lungs. Histopathology revealed necrosis and cellular infiltration of crypts of the duodenum, necrosis of hepatocytes, presence of pyknotic hepatocytes, dilation of the hepatic central veins and necrosis of the myocardial cells but there was no gross pathology in CPV-infected dogs treated with MSAMS which were sacrificed for comparison [21].

Anti-tumor/Anti-infected cells efficacy of the MSAMS

MSAMS-Nanoparticles use their positive electrically charged ends to mop tumor cells and infected cells.

Cell cultured Peste des Petits Ruminants virus, cell cultured Measles virus and cell cultured Newcastle disease virus, tested for HA, gave negative while fowl pox vaccines so tested (PHA) yielded low viral titers (2.80 ± 1.10) but when the vaccines were treated with the MSAMS the Cell cultured Newcastle disease vaccine, the Measles vaccine and the PPR vaccine became HA-positive while titer of the FPV vaccine increased from 2.80 ± 1.10 to 11.20 ± 4.38. It was concluded that the MSAMS destroys and mops infected cells to unmask viral hem-agglutinins. It has also been reported that CD4 counts of HIV/AIDS patients treated with the medicine reduce in the first months while their viral loads increase but from subsequent months, the CD4 counts start increasing while the viral loads decrease, suggesting that the treatment starts by destroying infected cells (including infected CD4s) to unmask "hidden infections". Scan of uterus of a fibroid patient treated with the MSAMS revealed 4 "big masses" measuring a total of 5239. 52 mm^2 before treatment but after six months, the "big masses" reduced to 2, measuring only 836.94 mm^2 (84.04% reduction). A patient of brain tumor became clinically stable after treatment with the MSAMS. PSA results of 3 prostrate-cancer/hypertrophy patients reduced from > 4 to < 4 (1.5, 3.8, 0. 5) after 8 weeks` treatment [2].

Adjuvant efficacies of the MSAMS

Antimicrobial resistance (AMR) is becoming a major medical challenge in the world. To prevent the problem, it has been recommended that efforts be made to achieve at least 95% clearance of any infection treated [6] as body immunity may not be able to clear more than 5% of loads of infections if that much is left after treatments. Such infections that survive treatments often develop resistance.

Even in veterinary practice, there is need to reduce doses of drugs used to achieve desired effects because when high doses of drugs are used to treat food animals, high concentrations of residues of the drugs could be passed to human beings who eat meat, milk and/or eggs of the animals. This also leads to development of resistance by microorganisms that infect human beings, because of constant exposure to sub-therapeutic doses of the drugs. Need therefore exists for adjuvants, to improve drug- efficacies.

In addition to being a stabilizing agent, AMS Nanoparticles enhance delivery of drugs to targets and across physiological barriers, including the blood-brain barrier [22].

Drugs have both desired effects and side effects. Side effect of most antimicrobial drugs include immune-suppression when used at high doses. At lower doses, side effects of drugs are minimized. Stabilizing antimicrobials with the MSAMS makes it possible for lower doses of the antimicrobials to achieve desired effects thereby reducing their side effects to enhance immune responses of patients.

It has been reported that normal dose of Piperazine (110 mg/kg) led to only 82.94% reduction ($P \leq 0.05$) of *Helihnosomoides bakeri`s* Eggs Per Gram (EPG) of feces in infected mice but when the drug was stabilized with the MSAMS, the rate of reduction improved ($P \leq 0.05$) to 92.04%. Reducing the dose to 75% of Piparazine`s recommended-dose (82.5 mg/kg) and stabilizing it with the MSAMS improved rate of reduction of the EPG ($P \leq 0.05$) further to 96.82%.(≥ 95% required for infection termination) [23]. Normal dose of Ampicillin (10 mg/kg) led to only 80.68% reduction ($P \leq 0.05$) of CFU/ml of bile of *Salmonella gallinarum* - infected chicks. When the drug was stabilized with the MSAMS the reduction improved ($P \leq 0.05$) to 86.36%. Reducing the dose to 75% of recommended dose of Ampicillin (7.5 mg/kg) and stabilizing it with the MSAMS improved rate of reduction of the infection-load ($P \leq 0.05$) to 97.84% (≥ 95% reduction required to terminate infections) [24]. Normal dose of Ampicillin (10 mg/kg) led to reduction ($P \leq 0.05$) of load of Ampicillin-resistant *E. coli*, just by 50%. When the drug was stabilized with the MSAMS, rate of reduction of the drug-resistant infection decreased ($P \leq 0.05$) from 50% to 43.91% (instead of increasing) but use of 75% of the normal dose (7.5 mg/kg) stabilized with the MSAMS plus antioxidants in feed of the chicks led to reduction ($P \leq 0.05$) of load of the resistant infection by 95.78%. (enough reduction for both clinical recovery and for infection termination) [25].

Mean parasitaemia, 37.22 ± 11 of group of plasmodium-infected mice treated with normal dose of Chloroquine (7mg per Kg) did not vary ($P \geq 0.05$) from 42.00 ± 15.74 of the control but a group treated with 75% of the normal dose (5.25 mg/kg) stabilized with the MSAMS had 00.00 ± 0.0 parasitaemia (both clinical recovery and infection termination) [26]. All clinical signs of coccidiosis including bloody diarrhea ceased in a group of coccidian-infected chicks treated with a drug-formulation of 20% Sulphadimidine in the MSAMS, at dose of 2g per liter of drinking water (0.4 g of Sulphadimidin per liter), by the end of first three days of the treatment. The clinical signs also ceased, from the first day of the second round of treatment, in a group treated at dose of 1g per liter of drinking water with sulphadimidin powder which was not stabilized with the MSAMS. Bloody diarrhea persisted in a group of the coccidian-infected chicks treated with 5 g of the sulphadimidin-MSAMS formulation (equivalent of 1g of Sulphadimidine per liter) and in a group treated at the rate of 0.4 g of un-stabilized sulphadimidin per liter of water (under dose). The group treated at rate of 5g per liter with the Sulphadimidine-MSAMS drug and the group treated at rate of 0.4g per liter with un-stabilized Sulphadimidine had mortality of 3 (30%) each while the group treated at the same 0.4g per liter with Sulphadimidine stabilized with MSAMS had only 1 mortality (10%). The untreated group had 9 mortalities (90%). Parasitological assessment showed that the group treated at rate of 5 g per liter of water with the 20% sulphadimidin in MSAMS (equivalent of the normal dose), had the least oocyst count per gram of feces (13,000), followed by the group treated at the normal dose (1g per liter of drinking water) with Sulphadimidin without stabilizing it with the MSAMS (15,000). The group treated with 2 g of the 20% sulphadimidin (0.4g) in MSAMS per liter, had oocyst count of 16,000 per gram of

feces while the group, treated at same rate of 0.4g per liter of water with un-stabilized sulphadimidin had the highest oocyst count per gram of feces (965,000). Even the untreated group, had oocyst count of only 52,500 per gram of feces. It was therefore concluded that stabilizing Sulphadimidine with the MSAMS made the normal dose (1g per liter of drinking water) to act as over dose hence the bloody diarrhea (which is also a clinical sign for Suphadimidine-overdose) and the increased mortality while the under dose (0.4g per liter of water) which could not cure the chicks became effective treatment when the drug was stabilized with the MSAMS hence the clinical signs ceased and mortality was minimal [27].

When the normal dose of Sulphadimidine (1 g/liter of drinking water) was used to treat chicks infected with Sulphadimidine-resistant *E. coli*, colony forming units of the infection per ml of bile increased ($P \leq 0.05$) by 259.00%. When the drug was stabilized with the MSAMS, load of the resistant infection increased further ($P \leq 0.05$) by 789.10%. Reducing the dose to 0.75 g/liter of drinking water (75% of the recommended dose) and stabilizing it with the MSAMS led to reduction of load of the resistant infection ($P \leq 0.05$) by 84.34% (≥80%: enough for clinical recovery) [28].

Normal dose of Cotrimoxazole could not cure Cotrimoxazole-resistant *S. pullorum* infection (77% infection-reduction which is less than 80% that leads to clinical recovery). When the normal dose was stabilized with MSAMS, it worsened the resistant infection (-230.96% reduction-rate) but 75% of dose of Cotimoxazole stabilized with MSAMS and supported with antioxidants achieved both clinical recovery and termination of the resistant infection (96.23% reduction) [29].

Zero mean parasitaemia (0.00 ± 00) was recorded in a group of trypanosome-infected mice treated with Cotrimoxazole, stabilized with the MSAMS at its 100% antibacterial dose while 5.86 ± 0.43 ($P \leq 0.05$) was got in the group treated at same dose with Cotrimoxazole that was not stabilized with the MSAMS. When the trial was in trypanosome infected sheep, two days post treatment, mean parasitaemia, (1.00 ± 0.00) of a group treated with the Cotrimoxazole –MSAMS formulation was significantly ($P \leq 0.05$) lower than 81.60 ± 27.71 of the untreated group while by 9 days post treatment, mean zero (0.00) parasitemia was got in the treated group against 2.25 ± 1.50 ($P \leq 0.05$) of the untreated group. No relapse of infection was observed up to 70 days post treatment [30,31].

Conclusion

The Medicinal synthetic Aluminum-magnesium silicate possesses broad spectrum antiviral efficacy (inhibiting both RNA viruses and DNA viruses). It also has antitumor efficacy and is an adjuvant, potentiating efficacies of antimicrobial drugs. MSAMS-stabilized antimicrobial drugs act better at 75% of their recommended doses than at 100% of the doses. At that lower dose, antimicrobials stabilized with the MSAMS achieve the required ≥95% reduction of loads of treated infections so that development of antimicrobial resistance (AMR) is prevented. The lower doses (75%) of antimicrobial drugs stabilized with the MSAMS even regain efficacy against already resistant infections, especially if treatments are supported with antioxidants, so that AMR is also cured while use of 100% doses of antimicrobials stabilized with the MSAMS for treatments worsens resistant infections.

Authors Contributions

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