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in brain tissue in autism

n

ry of aluminum (Al) in quantities unexpectedly high in five patients with autism spectrum disorder [1] has posed to us the question: from where has this aluminum in what one leading researcher on the chemistry of called "the Aluminum Age" [2] and concerns about the sted Al were expressed over hundred years ago [3] long ne as widely used as it is today. Al is the third most ent in the earth's crust and occurs naturally in the en- dstuffs, and drinking water [4]. It is also used in: pro- aterials and articles such as, Al-containing food packa- cooking utensils and baking trays. It has long been ietary Al is the main risk source of exposure to biolo- e Al. Under physiologic conditions intestinal absorption impossible since biometals (Fe, Cu, Zn, Mn, Mo, Cr) and , Hg, Ni, Cd,) are absorbed exclusively in their 2^+ state. trivalent under physiologic conditions cannot be ab- nt Al can be absorbed through the intestinal mucosa only mucosal damage (infection, inflammation, intoxication in 1988 in England [5]). The **Camelford water pol- t** [5] involved the accidental contamination of the supply to the town of Camelford, Cornwall, in July enty tonnes of aluminium sulphate was inadvertently ater supply, raising the concentration to 3000 times the l. If present in the intestinal lumen while the mucosa is ingested in toxic quantities, Al^{3+} is absorbed probably sion. It has been suggested that acid digestion in the solubilise most of the ingested aluminum compounds. ous solutions with pH < 5 the aluminum ion exists e.g. hydrated Al^{3+} $[Al(H2O)6]^{3+}$. By passing from the intestines the increase in pH results in the formation of luminum with hydroxide and finally the formation of num hydroxide at neutral pH. Therefore as the pH is he duodenum the aluminum ion is gradually converted droxide and the majority is then expected to precipitate with subsequent fecal excretion, leaving only a minor ble for potential absorption. In conclusion, in- the pH value Al in its compounds always retains its Divalent aluminum does exist. It has been detected in fter explosion of aluminized grenades in the upper at- in stellar absorption spectra [6]. Usually humans live hese events and spaces. Aluminum can be potentially gh the skin essentially if it is shaved or irritated by ap- n care creams, rejuvenation creams, sprays against un- and sweats and after shave lotions that contain alu- wever, the use of these cosmetic products in newborns, ldren is not common. Al can be also absorbed across the y epithelia by persons working in workplaces where Al welding is carried out during electrolysis in Al p processing industries (e.g., foundries, powder pro thus clearly different routes of Al exposure and wi sized is that these are not necessarily equivalent amount delivered per unit of time and more import the age at which the person is exposed to Al. The greater probability for toxic effects. Although it is that children obtain much more Al from diet than fi this notion contradicts basic toxicological princip posure that bypasses the protective barriers of the g and/or the skin will likely require a lower dose outcome [2]. In the case of Al only approximately 0 absorbed into systemic circulation [9]. Much of t enters the human body is typically rapidly remo [10]. In contrast, Al hydroxide (the most commor jected intramuscularly may be absorbed at nearly 1 time [11]. More importantly, wherever the anatom application is, adjuvant Al enters into the circulati transferrin. This adjuvant Al bound to transferrin, h to cross the blood-brain and blood-cerebrospinal f the brain where it is deposited probably for the w adjuvant Al is poorly excreted [13]. Today we li minum. Aluminum is all around us. Therefore, one question: were Mold et al. [1] aware in their resear contamination with external aluminum during the tissue and the procedure for determining the amoun The same question can be posed to all other forme their research on the basis of which a ″Handbook o Metals″ has been written [14].

In the paper of Mold et al. [1] the strangest and is that the highest concentrations of aluminum w youngest person. The boy was only 15 years old (accepted claim that dietary aluminum is the main s aluminum, inevitably raises the question: how is it course of only 15 years of life, this boy "absorb aluminum and deposited it in his brain? On the ot that age probably did not use creams containi perspirant sprays, nor shaved. He also could not in1988 in Camelford, Cornwall (UK). At the age of worker in the aluminum industry where he would minum dust and fumes. Even less it was likely tha the place where aluminized grenades exploded! We that the boy was a cosmonaut and he travelled i where divalent aluminum is located. In the work o year of birth of persons shown in the work is not in assume that the 15-year-old boy was born around

Given all of the above under normal, usual, phys the most important, the most regular and most pre law legislated access of aluminum into the hum

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ding to the vaccination schedule which was established JSA, by the age of 18 months, approximately 4425 μg of renterally delivered into the human body through vac- er 2005 with the introducing of new vaccines, the ıvant Al has increased up to 4925 μg [15].
neurotoxicity has been shown in experiments on mice ı toxicity has been shown even in one clinical study in nts were treated with intravenous injections of nutri- hat contained different quantities of aluminum [17] but cantly less aluminum than the infants receiving alu- cines. Recently it was shown that another metal i.e. neurotoxic for children even in much less quantities in h aluminum [18]. Toxic effects of Al can be assigned to chemical properties. Owing to its 3^+ charge Al attracts ged ions and electrons but because it cannot transition on states besides 3^+, Al is not a direct component in any ; but may participate indirectly in Fenton reactions. small ionic radius and the high charge of Al^{3+} are its erties by which this metal can exert its toxic activity. 54 nm) is roughly the same size as the ferric (Fe^{3+}) ion l much smaller than magnesium (Mg; 0.072 nm) and ns (0.100 nm). Thus, in biological systems, Al can ef- e these essential biometals in many enzymatic reactions

s undoubtedly neurotoxic. The main the most important way to reach the human body is via vaccines in the form djuvant. But on the other hand, vaccines have saved many deadly infectious diseases. So-called cost-benefit overdose in favor of vaccination. **One should never olishing vaccination**, but rather to work on finding the toxicity of adjuvant aluminum and if possible to inate it.
his goal, we suggest:

n containing vaccines must be postponed until the time hild's brain shows sufficient physiological maturation. be the day when the child loses its last primitive reflex, ng the age of 6–7 months, ideally, after 12 months. By st of so-called synaptic pruning is completed and con- ıe child's brain is probably less vulnerable to the dele- ts of aluminum, in comparison with the brain vulner- he toxins given immediately after birth when the ı their first day of life are injected with 0.25 mg of Al^{3+} application of hepatitis B vaccine. The younger the time ition to Al, carries the greater harm for Al toxicity and e. This is in accordance with a recent review in which it lculated and shown, that the levels of aluminum sug- ıe currently used limits place infants at risk of acute, l possibly chronic exposures of toxic levels of aluminum accine schedules [21]. Therefore, it has been suggested tion in neonates and low birth-weight infants has to be in the sense of aluminum dosage reduction in vaccines, the birth-weights. The main obstacle to this proposal is n effect of this proposed reduction on the final anti- he vaccine [21].
ary to totally eliminate the metal(s) in all vaccines

Calcium phosphate is present in the general mo vaccines of the European Pharmacopoeia 8.0; c classified as safe and biocompatible by the US phate is a natural compound of the human body good tolerance for individuals; adsorption ca phosphate is equivalent to aluminum adjuvant paration mode, considered antigens, and pa phosphate booster antigenicity is potentially b minum adjuvants [22].

Calcium phosphate was used in France until th for the diphtheria-pertussis-tetanus vaccine group v of adverse reactions by physicians. Until the earl successfully used in the pentavalent human vac yellow fever, measles, BCG, and tetanus) and also v adverse reaction [23].

With all of this in mind it is very mysterious an 1980s, vaccines manufacturers opted for replacing which was used as adjuvant for human vaccines v adjuvant. Since then most of the clinical experienc with the use of Al as vaccines adjuvant while calc only marginally investigated [24]. **From the oth insist but to our knowledge, we would like to could be the element of choice to replace alu** lowing reasons: 1. Both metals, Zn and Al are an necessary for normal human life (zinc human body 200 and 300 mg); and finally; 3. so far, no zinc ove has been described. In animal experiments zinc toxi but normally and fortunately, humans do not liv conditions, in which experimental animals are ex toxic quantities of various substances, including zi erature data so far on the use of zinc as adjuvan nologists and immunologists must start as soon a experiments with zinc compounds (hydroxide, sul as adjuvant. If it turns out after the experiment tha have successfully replaced Al compounds as adjuv zinc that would be administered by vaccine in child of age would be about 5.000 μg (= 5 mg), which yond the domain of experimental Zn toxicity.

Naturally many scientists will not be in agreer ments on the potential role of zinc in future vaccine presently possess no critical perspective for zinc to for Al, as well. Both of these statements should no ments against our proposal for the experiments with find out whether zinc and its compounds could of aluminum.

Conflict of interest statement

The authors declare no conflict of interest.

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Childhood leukemia bottleneck phenomenon is the most mysterious corollary of the prenatal origin discovery of leukemogenic chromosome translocations. The bottleneck is evidence that leukemia initiation, by in utero acquired chromosome translocations that generate functional fusion genes, is far more common than the incidence rate of corresponding leukemia. For childhood TEL-AML1(+) acute ... [Show full abstract]

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The underlying pathophysiology of liver dysfunction in urea cycle disorders (UCDs) is still largely elusive. There is some evidence that the accumulation of urea cycle (UC) intermediates are toxic for hepatocyte mitochondria. It is possible that liver injury is directly caused by the toxicity of ammonia. The rarity of UCDs, the lack of checking of iron level in these patients, superficial ... [Show full abstract]

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Celiac disease (CD) is a common autoimmune condition. Previously it was considered to be a rare childhood disorder, but is actually considered a relatively common condition, present at any age, which may have multiple complications and manifestations. Hematological disorders of the disease are not uncommon. Among these disorders, the most frequently reported are anemias as a result of iron ... [Show full abstract]

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Résumé : L'aluminium est une neurotoxine, ce qui est démontré expérimentalement, et c'est l'adjuvant de vaccin le plus fréquemment utilisé. Alors que les adjuvants d'aluminium sont largement utilisés depuis près de 90 ans, le corps médical comprend encore très mal leurs mécanismes de fonctionnement. On remarque aussi une pénurie préoccupante de données concernant la toxicologie et la ... [Show full abstract]

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Aluminum in the central nervous system (CNS): Toxicity in humans and animals, vaccine adjuvants, and...

April 2013 · Immunologic Research

Lucija Tomljenovic · Christopher A Shaw

We have examined the neurotoxicity of aluminum in humans and animals under various conditions, following different routes of administration, and provide an overview of the various associated disease states. The literature demonstrates clearly negative impacts of aluminum on the nervous system across the age span. In adults, aluminum exposure can lead to apparently age-related neurological ... [Show full abstract]