

The illusionary WMDs and the real AMDs

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'On 5 February 2003, Secretary of State Colin Powell was scheduled to go to the United Nations and make the case that Saddam possessed an arsenal of weapons of mass destruction. But the evidence was thin—sketchy and speculative, or uncorroborated, or just not credible' (*Newsweek*, 9 June 2003).

With so much hype in both the print and audio-visual media today, even the common man understands what the abbreviation WMD stands for, namely the 'weapons of mass destruction'. These can be physical, chemical or biological, and are artifacts of human ingenuity. It is a separate issue that the same artifacts are only labelled WMD when in possession of some and not the other.

Much has happened since President George W. Bush declared in his 28 January 2003, state of the union address, 'year after year Saddam Hussein has gone to elaborate lengths, spent enormous sums, taken great risks to build and keep WMD'. Reviewing the story of how US intelligence tracked Iraq's WMD capability, pieced together from interviews with top administration and intelligence officials, *Newsweek* found it 'not encouraging'. And 'The case that Saddam possessed WMD was based, in large part, on assumptions, not hard evidence'. Even the Secretary of Defence Donal Rumsfeld is reported to have acknowledged, 'There was no dramatic new evidence on Iraq's weapons of mass destruction. It's just that Washington saw it in a dramatic new light' 'after 9/11'. At the time of writing this essay the situation has remained unchanged. The US legislative and the British Parliament are engaged in establishing the veracity of claims made by their leaders for going to war. Relying on the aphorism poison kills poison, a massive destructive war appeared to be justifiable to destroy WMDs. Cluster bombs and depleted plutonium seemed to be the answer.

Massive searches by the UN weapons inspectors extending over months, the unsuccessful efforts of the world's technologically most advanced intelligence agencies, a costly destructive war which failed to evoke the possessor of the WMD to use these in its own defence, a con-

tinuing search since the victory over the 'evil empire' have so far not been able to unearth the dreaded WMDs. This is not to say that they did not exist or will not be discovered in future. However, it is worth noting what the outgoing UN Chief Weapons Inspector Hans Blix proclaimed, 'My God, if this is the best intelligence they have and we find nothing, what about the rest?' Under the circumstances, I trust, that I cannot be blamed for calling these WMDs 'elusive' or may be 'illusionary'.

Coming to the agents of mass destruction (AMDs), proof for whose existence does not require help from any intelligence agency, let me provide some globally acknowledged information accepted even by those who indulged in a war to discover/destroy the 'illusionary' ones. By and large AMDs are the creation of nature, not directly under human control. No doubt there are others created by human greed. But in exceptional cases at least, some of these like microorganisms can be used for purposes of bio-terrorism and thus qualify to be labeled 'WMDs'. The common characteristics of both WMDs and AMDs is their ability to bring about death of large number of people. These 'real' AMDs are the cause of loss of millions of lives—mostly in the poor countries, but not sparing the richest and the mightiest. They know no national boundaries and are responsible for more misery and death in one year than all the wars combined together in recent history. The purpose of writing about the 'real' AMDs is to establish that a war against these can replace the tears of their victims with cries of joy and a faith in humanity, without causing destruction or death of 'the collaterals'. These real AMDs are poverty, hunger, disease and ignorance. To arouse the conscience of human beings—rich or poor, strong and weak, living anywhere in the world—some factual information is provided.

The world has become more polarized and the gulf between the poor and the rich of the world has widened even further in recent years. Of the \$23 trillion global GDP in 1993, \$18 trillion was in the industrial and only \$5 trillion in the developing countries, even though they

may have nearly 80% of the world's population. The poorest 20% of the world's people saw their share of global income decline from 2.3% to 1.4% in the past 30 years. Thus the gap in the per capita income between the industrial and developing worlds tripled from \$5,700 in 1960 to \$15,400 in 1993. Meanwhile, the share of the richest 20% rose from 70% to 85%. That doubled the ratio of the shares of the richest and the poorest from 30:1 to 61:1 (Human Development Report, 1996). The assets of the world's 358 billionaires exceed the combined annual incomes of countries with 45% of the world's people.

By the end of the decade, two thirds of Africans will live in 'absolute poverty'. More than half will lack safe drinking water and 70% will be without proper sanitation; 40 million children were not in primary school. Infant mortality was 55% higher than in the rest of the world's low-income developing countries, and average life expectancy of 51 years is 11 years less. Malaria and tuberculosis are increasing and in parts of central, southern, and eastern Africa 30–40% of pregnant women are now HIV positive¹.

'The cost of eradicating poverty is less than people imagine, about 1% of global income (UNDP, Human Development Report, 1997). Effective debt relief for the 20 poorest countries is even cheaper, with a price tag of \$5.5 billion—the cost of building a Euro-Disney' (Britain and Elliot in *Guardian*, 12 June 1997).

'The current rules (IPR) may in fact be hindering the technological development of the developing countries. Helping poorer countries make the transition to a knowledge-based economy is a tough challenge when the industrialized world increasingly holds all the cards in the form of patent portfolios on which are based not only individual products but whole swathes of technology.' (World Banks, World Development Report 1998/99).

The current trade and economic policies (the free flow of trade and money) around the world have brought economic growth for the fortunate in the largest and strongest economies but have also created widening gaps in wealth and health between and within the countries. HDR

1998 makes clear that pervasive market and government failures have made it impossible for many in Asia, Africa and Latin America to reach the desired consumption frontier (UNDP, Human Development Report, 1998). An independent Commission on Intellectual Property Rights constituted by the British Government, headed by John Barton, a legal luminary from Stanford University, USA, found the current patent rules unfair to the poor².

These polarizing forces have intensified in the past decade, creating a 100 million poor within rich 'core' in addition to the 1.3 billion people in the periphery who exist on \$1 a day or less. (UNDP, Human Development Report, 1997). 'China still has 730 million people, a quarter of the population in the region, that are living below the poverty line' (China's Vice Foreign Minister at ESCAP Conference, April 1996). 25 to 30% of population in India is living below the poverty line (i.e. 250 to 300 million people). In Sri Lanka at least a third of its 18 million people live below the poverty line.

Poverty is undoubtedly the single most factor directly or indirectly responsible for millions of lives lost every year. In addition to incalculable misery it adversely affects human dignity, human rights and human freedom about which some of the world's fortunate ones never stop talking about, of course only when it suits their interests.

According to FAO statistics on world hunger published in 1996 after the World Food Summit at Rome: Mild to moderate under-nutrition specially amongst the children continues to be endemic globally, nearly 195 million children under the age of 5 years are undernourished. It is surprising that even the developed countries are not spared of this curse. Indeed in 1992, an estimated 12 million American children consumed diets that were significantly below the recommended allowance by the National Academy of Science.

The global population of underweight children below 5 years of age is expected to increase from 193 million to 200 million by 2020, with most of the deterioration in Africa (FAO/WHO 1992). Underweight children are poor, prone to infections, premature death and impaired intellectual functions.

FAO (1995) has estimated that the incidence of chronic under-nutrition in the

developing countries as a whole will persist, perhaps at somewhat lower absolute level, some 730 million people in the year 2010 against some 800 million people today.

Since 1940, the amount of freshwater used by humanity had roughly quadrupled as the world population has doubled. Some water experts estimate that the practical upper limit of usable renewable freshwater lies between 9000 cubic kilometers and 14,000 cubic kilometers yearly. That suggests that a second quadrupling of world water use is unlikely while all indications suggest doubling of the population (Population Action International Sustaining Water).

Many low-income countries have already crossed the optimal level of water-related population density. Falkenmark of Sweden warned that the escalating water scarcity will become critical by 2025 AD unless a proper groundwater management strategy and 'global water ethics' are urgently evolved.

We use over half of available freshwater run off, an amount projected to rise to three quarters by 2025 through population growth^{3,4}. The number of water-short people today is estimated to be 550 million. It could well soar to 3 billion by 2025. According to latest estimates for the year 2050, total water requirements in India would be much more than the utilizable average water resources (UNDP India News, May 1999).

Today there are more people without access to safe drinking water and sanitation than in 1990. Every eighth second a child dies of a water-related disease and every year more than 5 million people die from illnesses linked to unsafe drinking water (UN conference Habitat II, Istanbul, 1996).

Fred Pearce reporting in *New Scientist*, following an international conference in Kyoto in March, 2003 commented, 'The grand ambitions of the World Water Forum trickled down the drain at Kyoto this week – dashing any immediate hopes of a – 'blue revolution' that might keep the world water crisis at bay.'

Poverty, malnutrition and lack of safe water supply remain the major causes of much of the preventable diseases and death even today.

Infectious diseases remain the most common single cause of death in the world today. Of the 51 million deaths worldwide in 1993, an estimated 16.4 million resulted from infections and

parasitic diseases. Patterns of infectious diseases are changing globally and on a massive scale. Drug resistance is increasingly reported not only in bacteria but also in viruses, fungi, protozoa and helminths. Arthropods, such as mosquitoes, lice and ticks are becoming more resistant to pesticides.

Even in the developed countries, notwithstanding all technological advances (and sometimes due to these), serious epidemics of infections occur even today: Mass processing and distribution of food has resulted in occasional massive outbreak of infections such as salmonellosis and *E. coli* 0157 : H7; large municipal water systems made it possible to infect more than 400,000 people in Milwaukee with *Cryptosporidium parvum* within a few days; air and water cooling systems have been associated with outbreaks of legionnaires disease⁵.

Fifteen million children die from infections and malnutrition every year in developing countries, i.e. 40,000 a day or nearly 2000 every hour. 98% of deaths in children occur in the developing world, mostly as a result of preventable and treatable infections⁶.

Thus, about 300–500 million clinical cases of malaria are reported every year, 750 million people are at risk of lymphatic filariasis globally, 80 million are infected, 30 million of them suffer from chronic disease, about 15 million people are infected with leishmaniasis and 40,000 cases are reported each year. In 1993, some 90 countries or territories were considered malarious, almost half of them are situated in Africa south of the Sahara. It is estimated that the incidence of malaria in the world may be in the order of 300–500 million clinical cases each year, with countries in tropical Africa accounting for more than 90%. Approximately one million deaths among children under five years of age can be attributed to malaria alone or in combination with other diseases. There is a global resurgence of tuberculosis, three million people across the world die from it, one million more than the turn of the 19th century. There is a pandemic of HIV/AIDS. From the beginning of the pandemic until mid 1996, an estimated 27.9 million people worldwide were infected with HIV, 5.8 million people have died of AIDS. WHO has projected a cumulative global total of 30–40 million HIV infections and 10 million adult AIDS, 90% of these will be in develop-

ing countries. Hantavirus pulmonary syndrome, recognized for the first time in the US in 1993 has already reached every country of the world and the cumulative world-wide total of infected people could reach 30–40 million.

It is estimated that there are about 50,000 deaths from hepatitis B-related cirrhosis and about 130,000 deaths from hepatitis B-related primary liver cancer annually in sub-Saharan Africa. It is a sad commentary on our society that this situation exists when Hepatitis B vaccine is more than 90% effective in preventing hepatitis B infection of children.

In spite of a highly effective vaccine and 78% global coverage, at least 40 million children catch measles each year, and one million of them die. Measles has been called the greatest killer of children in history. While certain island populations are practically free of the disease, the United States has experienced tremendous difficulty in controlling measles (WHO, 1996).

There is continuous addition to the number of high consumption societies as development takes place in erstwhile underdeveloped regions as in India. These diseases are the consequences of man-made unleashing of the unbridled power of mass media and soulless market forces motivated by greed rather than need.

There is another group of diseases – non-infective but preventable. These may be called diseases of affluence, consequence of unsustainable consumption.

We have got a major epidemic sweeping the world, causing a massive increase in death. The recent increase in the global prevalence of obesity qualifies it as an epidemic. The obesity epidemic is recognized by the World Health Organization as one of the top 10 global health problems. This has assumed increasing concern of both health professionals and scientists alike. *Science* has devoted a full issue highlighting the gravity of the situation and the current efforts to combat this. JM Friedman's paper in this issue⁷ calls for 'A War on Obesity, Not the Obese'. According to Trisha Gura, 'Drug-makers have been *salivating* over the prospect of creating anti-obesity medications. '(Eating right and exercising be dammed!)). Introducing the subject in the same issue Katrina Kelner and Laura Helmuth conclude, 'When the interests of corporate institutions that control the distribution of food and its advertisement (with the goal of maximizing food con-

sumption) conflict with the public good, who is to intervene and how? US Surgeon General has blamed the fast-food industry as a known accomplice. Already there are court cases against some well-known leaders of food industry demanding compensation for not advising their clients properly. It is being claimed that after tobacco it would be the food industry to face damage suits.

Obesity, which is a common denominator of several other maladies – diabetes, cardio-vascular diseases and even cancer, provides a good example of a disease of lifestyle. An increased relative risk of these diseases is seen in most adults who have a body mass index (BMI) of 25.0. It has reached epidemic proportions in the US and threatens to become a global epidemic (WHO, 1998). According to WHO classification 54% US adults are overweight (a body mass index BMI > 30 kg/m). The prevalence has increased dramatically over the past 2 decades and if this trend persists the entire US population could be overweight within a few generations. Average US women BMI is 26 – the risk of death increases by 20% for BMIs from 19–24.9%, 60% for BMIs from 27 to 28.9% and by more than 100% for BMIs of 29 and higher.

In the UK, obesity rates jumped from 6% to 15% in men and from 8 to 16.5% in women between 1980 and 1994 (ref. 8). Increasing incidence of obesity is being reported in children and adolescents from UK, Europe and the USA⁹. Similar trends have been reported from Canada, Brazil, India, erstwhile East Germany and to a varying extent from Thailand, Mauritius, Australia but only slightly so for men and not women, from Sweden, Finland, Netherlands, China and Japan.

It has been claimed that each day an average American is the target of 300 messages urging him or her to consume more, but hardly any effort to use the media to encourage people to consume more discriminately and sparingly. The main culprit is an environment which promotes behaviour that causes obesity. In the US, the Institute of Medicine says fat people are costing citizens more than 70 billion dollars annually in both direct health care costs and indirect ones such as lost productivity. Americans spend about 40 million dollars per year on weight loss and this approach is clearly not working. It has been estimated that in the US obesity contributes to 8% of all illness cost (approximately \$40 billion a year).

Like obesity the incidence of Diabetes Type 2 (adult onset) is also increasing globally. WHO predicts that in about 25 years the number of diabetics in India will leapfrog to about 57 million from the current 23 million. As early as 2005, every third diabetic in the world will be an Indian. It is generally not recognized that diabetics are twice as likely to suffer a stroke, 25 times more likely to develop blindness, 17 times more likely to develop kidney problems and 40 times more likely to undergo major amputations. That much of the mortality and morbidity is preventable but it requires major health initiatives specially lifestyle modifications at war footing.

CHD accounts for one third of all deaths in industrialized countries and its incidence is rising in most developing countries including India. WHO has predicted that by 2010, India would house 100 million patients with heart ailments which would account for 60% of the world's patients. To this may be added equally large and increasing number of patients of stroke.

Nearly 10 million new cases of cancer are diagnosed globally every year. It is estimated that by 2020, ten million persons would die of cancer every year worldwide. No doubt significant success has been achieved in our fight against these dreaded disorders. Yet, notwithstanding a war cry to win over this scourge by a former US President Richard Nixon a complete victory is nowhere in sight. Cancers in most cases are triggered by diet, tobacco smoking and chewing and infections all of which are amenable to preventive measures.

Many more examples can be cited to illustrate the innumerable agents of mass destruction which are responsible for loss of millions of lives and are a source of untold misery worldwide. The pity is that our current efforts and commitment to eradicate these pale into insignificance when compared to the investment on protecting the world from the WMDs. It has been pointed out that every gun that is made, every warship launched, every rocket fired signifies in the final sense a theft from those who are hungry and are not fed, those who are cold and are not clothed. Dwight Eisenhower reminded us that totally around 1000 billion US dollars are spent annually on arms, and armies – much more than two billion dollars a day. The Brandt Commission pointed out that:

- (a) The military expenditure of only half a day would suffice to finance the entire malaria eradication programme of WHO;
- (b) The cost of one modern tank – roughly a million dollars – could provide a thousand class rooms;
- (c) The price of one jet fighter (20 million dollars) could set up 40,000 village dispensaries.

It has been estimated that of the \$30 billion worldwide investment for research in health only 5% was devoted to the health problems of the developing countries which account for 93% of the world's preventable mortality measured in years of potential life lost. Ten per cent of the global burden of disease attracts 90% of global expenditure on research. Among the 1223 new drugs developed in 1975–1997, only 11 were those primarily needed for the developing countries. The WHO estimates that nearly 6 million people living with HIV/AIDS need access to care and support including antiviral drugs and that currently fewer than 5% of those who require treatment in developing countries have access to these medicines. In the current scenario of global health, 87% of the two trillion dollars spent on health care globally is spent on 16% of the world population. It is a sad commentary on the state of affairs when Harvard economist, Jeffrey Sachs points out that if every high income citizen of the world denied themselves the equivalent of a bag of pop-corn and a movie per year, the Global Fund to fight AIDS, TB and malaria could be supported at recommended level¹⁰. Bernard Pecoul, Director for Medicines Sans Frontières (MSF) Campaign for Access to Essential Medicines recently reminded us that millions of people in developing countries were dying every year because the only drugs to treat infectious diseases are 'old, toxic or ineffective'. Notwithstanding all the advances in biomedical sciences there have been hardly any new drugs developed against tuberculosis, malaria, kala-azar during the last several decades. Those who suffer most have the least resources, intellectual, physical and financial. Those who have the resources decide what to develop and dictate the price. To quote a distinguished US medical scientist, Barry Bloom, 'The power of medical science to make a difference, were it to address the problems of people in the poorest countries, is quite remarkable

and yet there is no leadership that is linking biomedical sciences to equity in health...'¹¹. Medicines Sans Frontières echoed similar sentiments 'It is time for WHO to offer more than passive observation. The issue of access to medicines should not be left to experts at the World Trade Organization (WTO) and World Intellectual Property Organization (WIPO) who do not have health as a central part of their mandate'.

In contrast to WMDs, nobody would require to seek support from imagined or contrived intelligence reports, nor spend fortunes first to wreak havoc on a country to discover the so-called WMDs and then to establish humanitarian credentials by rebuilding what one destroyed. It will be so easy to establish one's humanitarian credentials if the available resources of those who possess these were directed to prevent and control the devastation caused by AMDs.

I do not claim any expertise in respect to the issues related to the existence or otherwise of WMDs. Neither is it within my competence to pass judgement on the events associated with respect to protecting the humanity from risk posed by them. However, what prompted this write up was a more philosophical as well as humanitarian concern posed by paucity of resources for tackling the much more obvious agents of mass destruction in contrast to the massive expenditure involved in the quest for the elusive WMDs. It is an irony that those involved in the latter pursuit could find no dearth of resources running undoubtedly into billions of dollars (estimated to be 48 billion dollars by US Department of Defense Centre for Defense Information) yet they find it so difficult to fulfill their own commitments to wage war against the AMDs. Is it not a pity that the same leaders who have failed to fulfill their promise to allocate 0.7% of their GDP as developmental aid to the poor countries could so easily provide for the extremely costly self-assigned military action? It is an irony that the richest and the most powerful nation ranked last among 21 rich countries in development assistance, 0.10% compared to over 0.80% by Scandinavian countries and Holland¹¹.

Of course it could be argued that the dangers posed by the AMDs primarily affect the poor and it is for them to deal with it. In contrast the major threat from the so-called WMDs was to the developed world. It is therefore their responsi-

bility to protect their people in the manner they consider fit. It is, however, often overlooked by the developed world that while the risk from AMDs is much less for them, it is certainly not negligible. It has been very aptly pointed out by Nobel Laureate Joshua Lederberg that, 'The microbe that felled one child in a distant continent yesterday can reach yours today and seed a global pandemic tomorrow'. HIV/AIDS may have had its origin in poor Africa but did not spare the most developed and powerful nations. The recent SARS epidemic originating in China did not take more than 4–6 weeks to reach Canada. Just as complacency born out of winning huge battles in the war against pathogens with the development of antibiotics and vaccines resulted in lowering of the guard against infectious diseases in the developed world, so also achieving high standards of living for their people probably made them insensitive to the prevailing poverty, hunger, inhuman living conditions, rampant diseases and all pervasive inequities which are easily exploited by some unprincipled 'leaders' to foment 'terrorism', 'jihad' and 'religious fundamentalism'. Rabindra Nath Tagore thoughtfully pointed out, 'The weak in their weakness can do no less harm to the strong than the strong in their strength to the weak'. There is an old aphorism, 'Some people believe you needn't live by principle, if you have enough principal'. And yet let us not forget the words of wisdom by T. H. Huxley, 'A man's worst difficulties begin when he is able to do what he likes'. This equally applies to nations. Peace will return to our global village not simply by temporarily dealing with WMDs or rouge leaders/nations who possess them but probably more permanently by waging a global war against AMDs; eradicating poverty, minimizing inequities, preventing infection, restoring faith in human dignity and providing a healing touch not only for those physically diseased but also for those mentally sick. In support of my belief let me quote Horton¹², 'The principles and practices of public health are much more likely than military activity in the long run to reduce the terrorist activity'. Even an ex-army General turned politician, Colin Powell, US Secretary of State has been quoted to state, 'Terrorism really flourishes in areas of poverty, despair and hopelessness, where people see no future'¹³. The war against AMDs no doubt would pave the way for a more peaceful

world at much less cost with more happiness than tears around.

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SCIENTIFIC CORRESPONDENCE

Apoptosis as a novel mode of secretion in endocrine corpuscles of Stannius of a teleost (*Clarius batrachus*)

The corpuscles of Stannius (CS) are tiny endocrine glands located in or close to kidneys of holostean and teleostean fishes^{1–3}. These glands are a source of stanniocalcin, a fast-acting homodimeric glycoprotein hormone, which reduces the uptake of calcium from ambient water via gill and gut^{4,5}. Recently stanniocalcin has been localized in tissues of other vertebrates including humans, where it functions as regulator of female reproductive system^{6,7}. In spite of increased research on fish CS, some areas like cell types and mode of release of stanniocalcin are still debatable. We have, therefore, investigated the CS of an obligatory air-breathing freshwater catfish *Clarius batrachus* (Ham.) to collect more information.

Ultra-thin sections were prepared to study the cellular composition of the corpuscles of Stannius of *Clarius batrachus*. The CS from the kidney were excised and prefixed in cacodylate glutaraldehyde (buffered – 0.15 M, pH 7.2) solution at room temperature for 10 min. The tissue was then fixed in a similarly buffered solution of 1% osmium tetroxide for 2 h at 0°C and then embedded in Epon. Ultrathin sections were stained with lead citrate and examined under electron microscope (Phillips EM 300).

The corpuscles of Stannius in *C. batrachus*, are small irregular shaped white bodies which lie on the peritoneal side in the posterior region of the kidney. At ultrastructural level (Figures 1 and 2) three structurally different cell types are clearly evident. The predominant cells (Type 1)

have electron dense cytoplasm, large secretory granules and abundant endoplasmic reticulum. In contrast, the second type of cells (Type 2) are less numerous and are characterized by electron translucent cytoplasm, scarce membrane bound small granules. These cells possess unique cytoplasmic extensions amidst type 1 cells. We have also encountered a third type of cells (Figure 2) which can be identified by their dark colour, small size, shrunken

nuclei separated by nuclear membrane and condensed cytoplasm. Furthermore, the most conspicuous feature of these cells is the presence of a large number of vacuoles of irregular shape which gives them an exhausted appearance. The large secretory granules are also separated from the surrounding membrane by wide space around them. The Golgi areas are scarce. The mitochondria are small and electron dense. The nuclei of these third type of

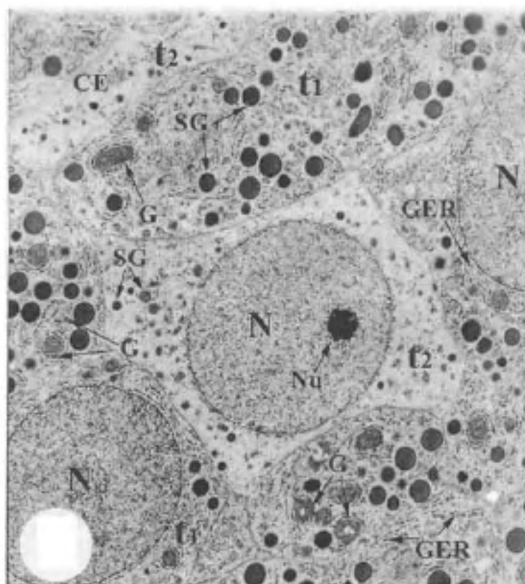


Figure 1. Section of CS of *C. batrachus*, showing two cell types. The type 1 (t_1) cells are characterized by large secretory granules (SG), abundant Golgi bodies (G) and granular endoplasmic reticulum (GER) in electron dense cytoplasm, whereas type 2 (t_2) cells possess electron translucent cytoplasm, small size secretory granules (SG), large nucleus (N) with dense nucleolus (Nu). ($\times 26400$).