Photos: ESS

Torrential rains from tropical storm Agnes inundated parts of Manassas, Va. (left), and Harrisburg, Pa.

The hard-learned lessons of Agnes

She was born a tropical depression June 15 off the eastern coast of the Yucatan Peninsula. The next day she grew into a tropical storm and by June 17 was a mature hurricane. Hurricane Agnes hit Florida with full fury, but weakened on a northward course through the southern states, which led away from the ocean from which the storm drew strength. But then Agnes rallied over South Carolina. She never again became a full-fledged hurricane but as a tropical storm marched up the eastern coast of the United States, turning inland again over New York and Pennsylvania before dissipating again over Canada. In her wake she left over 110 dead and damage estimated at between a billion and a half and two billion dollars.

Tropical storm Agnes was unusual but not unique. She caused what National Oceanic and Atmospheric Administration head Robert M. White termed "the most extensive flooding in the country's history" because a combination of circumstances kept her alive over land longer than usual and because the land over which she traveled was especially vulnerable to excessive rainfall.

Hurricanes draw their force from convective overturning of the air. Warm moist air spirals over tropical seas toward the storm center and flows upward in the band of clouds ringing the eye. Normally hurricanes dissipate when they reach land. Agnes did fade, but on reaching the Atlantic Ocean at Virginia and Delaware, she revived. As she traveled up the coast, says National Weather Service meteorologist Dave Greenberg, warm moist winds from the southeast contributed to her circulation and brought additional supplies of moisture from the Atlantic Ocean.

Another factor adding to Agnes' effect was that instead of veering out to sea again as hurricanes usually do, when she reached New York she instead turned westward, traveling up the Hudson River and circling back into Pennsylvania. The movement of a hurricane, says Samuel Grimm of the National Weather Service, is controlled by winds at high altitudes, between 10,000 and 30,000 feet. Winds flow from high-pressure to low-pressure areas. A low-pressure system to the west of Agnes caused the turn.

There were some complaints that National Weather Service predictions of when Agnes or flooding would hit certain areas were in error by a matter of hours. Rep. H. John Heinz (R-Pa.) charged that flooding began in Pittsburgh almost five hours before it was predicted and threatens to ask for an investigation. Grimm responds that a preliminary review shows that predictions were accurate and that most areas had at least 12 hours' warning. Such predictions were filtered through local agencies though, and "how they got out to the public we can't say." Agnes' erratic behavior, adds Greenberg, made accurate prediction difficult, and ultimately there are limits to how well, based on present knowledge, the behavior of the weather can be anticipated. "We can tell *whether* a storm is going to slow down, but not how much."

Usually the high winds of a hurricane are what cause the destruction. But Agnes, noted White, was "not a great storm in terms of wind velocity." The damage was a direct result of the vast amounts of rainfall dropped. But though Agnes did produce up to a foot of rain in some areas, a number of other factors contributed to the resulting damage.

The amount of water that can be added to a river before it overflows its banks depends in part on the composition of the river bed. A porous bed will absorb some of the flow. Some of the worst flooding was along the James River in Virginia and the Susquehanna River in Pennsylvania. The Susquehanna has a hard rock bottom. The James River is shallow, so that an addition of a few feet of water depth creates a proportionately large widening of the stream. In addition, many of the affected areas had already received a week of spring rain and were saturated.

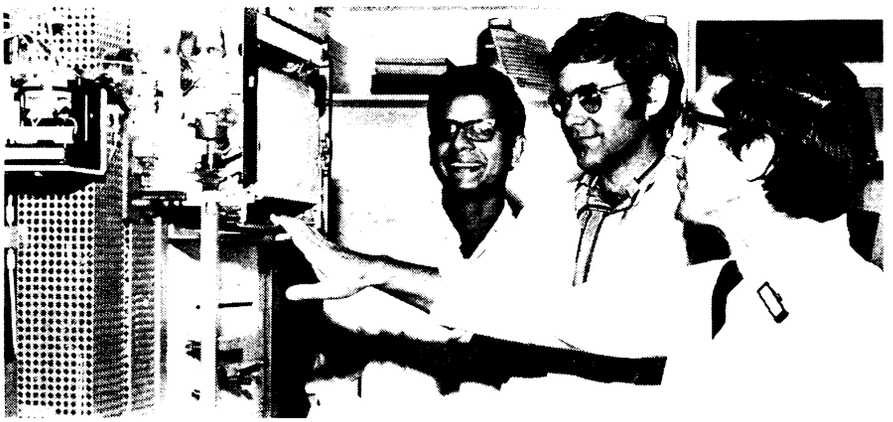
Then there is the simple fact, notes a spokesman for the Army Corps of Engineers, that many of the buildings destroyed were actually built on river beds or flood plains. This encroachment on flood plains, according to the U.S. Geological Survey, has not only put more people and structures within reach of the river but has actually diminished the river's native ability to cope with increased water burdens. Vegetation and absorbent soils alongside the river would normally soak up some of the water flowing toward streams. River bank development, by paving over soils and tearing down vegetation, increases the amount of water that ultimately reaches a river. Construction also contributes to soil erosion. The resulting increase in sediment loads in streams clogs them and leads to further flooding.

If people must build along rivers, says the Corps of Engineers spokesman, they should take better precautions against flooding. Dikes are helpful, if they are high enough. The trouble in

many of the Pennsylvania cities was that the dikes were built to contain what up to that time had been the record flood, and Agnes broke all records. He suggests a 25 percent safety margin.

Dams are another safety measure. Towns downstream from adequate dams were little affected by the recent flooding and if Pittsburgh hadn't been protected by a series of dams upstream, he says, damage there would have been ten times greater than it was. The Corps has been urging these river communities to install proper flood control measures for years. The problem has been to get Congress to appropriate the funds needed to help local areas carry the cost of construction. The costs would be high, but certainly not as high as the cost, in dollars and lives, of neglecting such precautions has been. □

Yes, there is a 'mother love' hormone



Scripps

Singh, Seavey, Lewis use amino acid analyzer to study prolactin structure.

In June 1970 Choh Hao Li and Thomas A. Bewley at the University of California published work showing that the primary structure of human growth hormone and sheep prolactin, the milk-secreting hormone, are similar chemically. More recently, Li's group showed that human growth hormone synthesized in his laboratory had both growth-promoting and milk-secreting activities, leading the researchers to conclude that growth hormone might actually play a dual role.

The possibility of this double function was intriguing, but it ran counter to hormone action in other mammals. Other mammals have both growth hormone and prolactin hormone. For some years clinicians have thought they saw a hormone in the blood of lactating women that was a little different from growth hormone. But they lacked the biochemical techniques to confirm their observations.

At the Fourth International Congress of Endocrinology last week in Washington, Canadian and California researchers reported that human prolactin indeed exists. It is what endocrinologists called the "mother love hormone" back in the 1930's. Their success derives from refining techniques to detect prolactin both in the tiny pituitary gland that makes it and growth hormone and in the bloodstream.

The Canadian group includes Henry Friesen and Peter Hwang of the Royal Victoria Hospital in Montreal and B. C. W. Hummel and G. M. Brown of the Clarke Institute of Psychiatry in Toronto. The California members are from the Scripps Clinic and Research Foundation in La Jolla. They include U. J. Lewis, W. P. VanderLaan, Y. N. Sinha, R. N. P. Singh and B. K. Seavey. Friesen and Lewis are actually the pioneers. For some years they have been working on the purification of prolactin and growth hormone in animals and man.

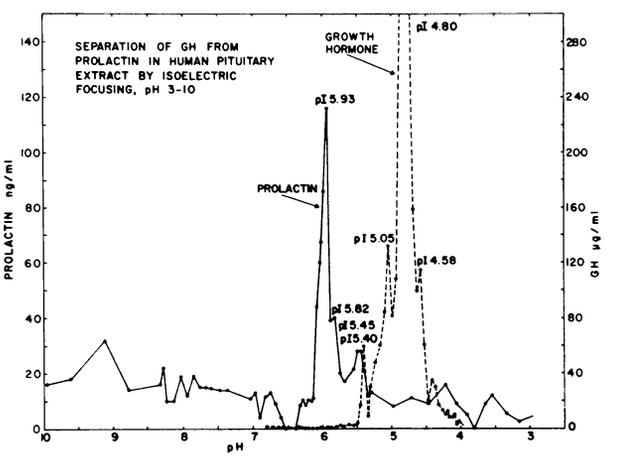
The Canadian and California scientists perfected techniques for separating out prolactin material from pituitary glands provided by the National Pituitary Agency (National Institute of Arthritis, Metabolic and Digestive Diseases). Their techniques then enabled them to determine more precisely that the material is prolactin. The physical and chemical techniques Friesen's group uses include solvent fractionation, chromatography, isoelectric focusing and radioimmunoassay. Lewis's group uses a purely physical technique called disk electrophoresis. After both groups identify their material as prolactin, they test it for biological activity.

Friesen's group has already obtained enough human prolactin material for determination of the hormone's complete chemical structure. They have submitted it to Hugh D. Niall of the Massachusetts General Hospital for this sequencing. Niall and Li together worked out the amino acid sequence of the human growth hormone (SN: 5/6/72, p. 302). Lewis has performed rough chemical sequencing of his material, enough to correlate it with sheep prolactin and to find that the two are 75 percent identical. When he gets enough material, he too will submit it to Niall for final sequencing.

Lewis's team will also soon be using radioimmunoassay to detect prolactin not in the pituitary gland but in the blood of women with breast cancer, to see whether there might be a high correlation between prolactin levels and breast cancer. Such a correlation is strong in the mouse. Other research teams in the United States and Europe will be conducting similar clinical screening in the near future.

The Canadian and California investigators also intend to obtain enough human prolactin to provide other scientists with it for study. The hormone may do more than cause milk secretion in nursing women or in women with breast cancer. There is evidence that men secrete prolactin, and that the hormone may circulate throughout the bodies of both men and women with daily fluctuations in levels. Prolactin also gives subtle indications of being a stress hormone. For example, heightened levels of prolactin appear to have been detected in the blood of patients about to undergo surgery. □

Isoelectric focusing shows that human prolactin and growth hormone differ.



Friesen, Hwang, Brown, Hummel