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Comment

Director John R. Davis

Let's get our act together

The productivity of the United States and our way of life just 50 years ago were based on the enterprise and hard work of the small business owner, the farmer, the trader and laborer. Almost everything was a relatively small business unit—the corner grocery store, a 160-acre farm, the one-horse junk collector. Even automobile manufacturers offered only a standard or deluxe model, and almost anything of any quality was made in the United States.

Those days are gone forever—the door-to-door seller, the ice dealer, the Huppmobile and the Packard, the grocery store that provided service to each customer, *Life* magazine and the superior quality of all goods manufactured in the U.S. Most of these businesses failed because of economic considerations—the personal services offered by the businesses became an economic burden, or the economy of small size became a real disadvantage. Just imagine, for example, the tremendous capital required to start up an automobile manufacturing operation or almost any manufacturing system today. All of us have seen many small businesses start and fail, and we attrfibute it to poor service, poor location, the wrong business at the wrong time, poor judgment.

Why is it, then, so many persons seem not to understand the reasons for failure of small farms, in contrast to other businesses? Many of us in university research are constantly under verbal attack, for example, for doing research on mechanization, fertilization and chemical pest controls, on the basis that it serves only large farms. In reality, mechanization often is necessary because no labor is available for harvesting, because organic farming may not provide for economic crop yields or because chemicals may be necessary to eradicate weeds or to support biological pest controls.

Maybe the sentimental attraction or interest in small farms stems from the cultural roots of most Americans—the small family farm. With the demise of the single family unit we are cut off from our past, and we have lost contact with a way of life that was tough but good, and was the backbone of rural America. But should people be forced to return to that way of life? How much is the American citizen willing to pay for food in order to support small farms to the exclusion of larger farms? After all, this is an economic consideration—most farmers left the 160 acres because they could no longer make a living for their family on that small farm. Those who stayed there bought or leased additional land in order to be efficient—to produce food at a reasonable price—and are now being criticized for being large operations with big capital investments.

The reason for these rambling thoughts about small versus large in food production is to call to your attention the fact that we have essentially *no* national policy regarding food production other than regulations administered by numerous federal and state agencies. Policy is therefore being formulated by individual states or by referendums, and special interests groups are forcing changes in each state that will have an impact on the food economy for the entire nation. Is it legitimate for special interest groups in a few states to exercise their legislative muscle so food prices across the country will be substantially increased, without the public having some knowledge or input into the system?

The farm strike of 1977-1978 will probably be unsuccessful, but it should be a warning to the American public that the lack of an effective national policy on food may result in losing not only the small farmer but also the larger ones. Regulations are demanding and others are harassing, and the spirited debate about small versus corporate farms will continue for some time, but these should not detract from the real issue—the need for a sound policy for food prices, food quality and for a productive agriculture.

We shouldn't let special interest groups pick us apart state by state or issue by issue. Let's get our act together—both consumer and producer —to determine our way of life. Without a national goal or policy, we will have these decisions made piecemeal or by advocacy groups with special axes to grind. A cheap food policy or a back to the earth philosophy is fine—until we run out of food or farmers!

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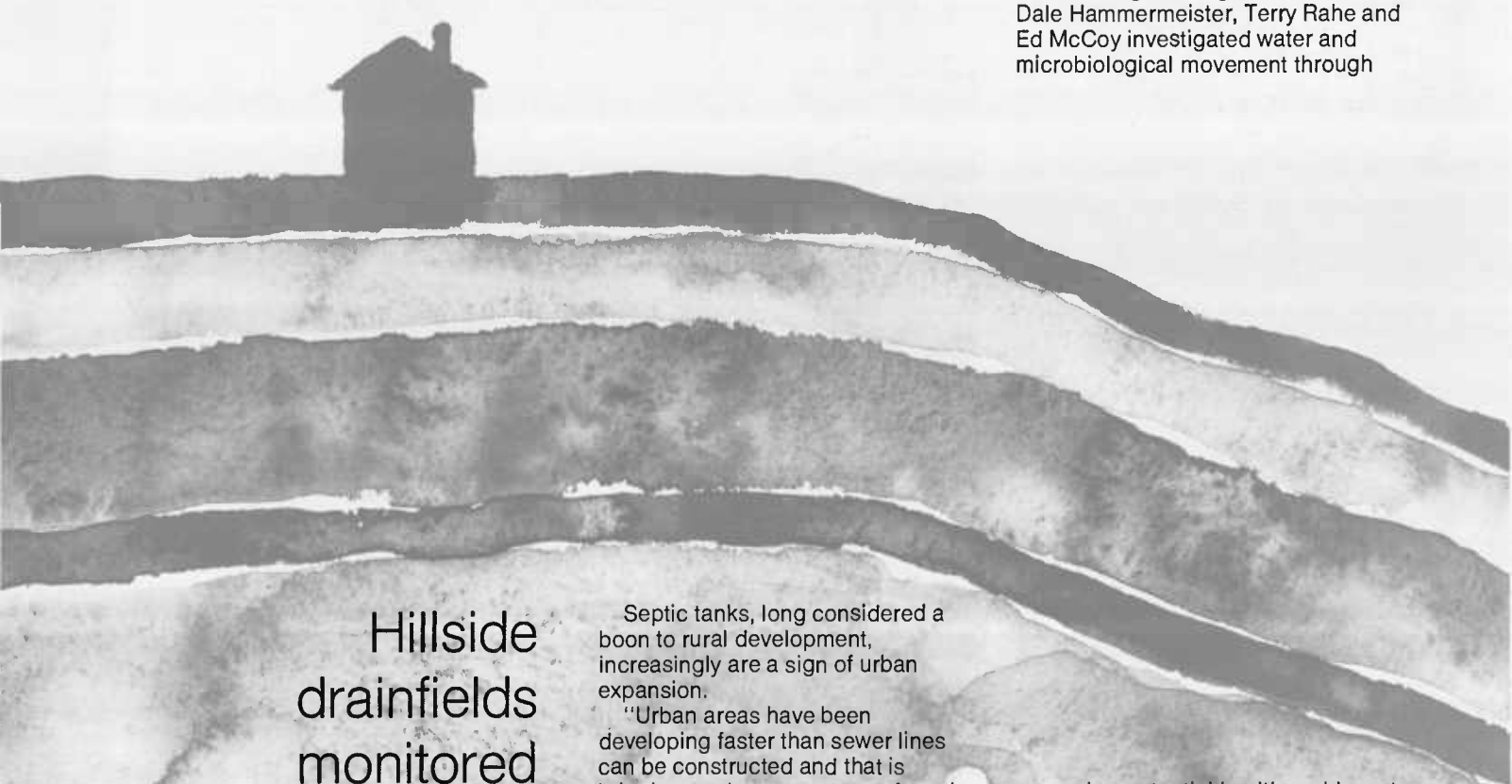
Septic tank failures during winter rains can threaten health

Ground saturated with water from winter rains can cause massive failures of septic tank systems, posing serious threats to the health of some Oregonians, a team of researchers at Oregon State Univeristy has concluded after a three-year study.

Soil scientists Moyle Harward, Gerald Kling, James Vomocil; microbiologist Charles Hagedorn; graduate students Dale Hammermeister, Terry Rahe and Ed McCoy investigated water and microbiological movement through



Hillside drainfields monitored

Septic tanks, long considered a boon to rural development, increasingly are a sign of urban expansion.

"Urban areas have been developing faster than sewer lines can be constructed and that is bringing up the percentage of septic tanks," said Moyle Harward, OSU professor of soil science. "One-third of all houses in the Northwest now are on septic tanks or cesspools, and in urban areas, the figure is close to 25 percent and climbing."

But conflicts between septic tanks and land use planning goals have arisen.

"The major problem is that those lands best suited for septic tanks also are best for agriculture because they drain easily," explained Harward. "The Land Conservation and Development Commission wants to preserve agricultural lands. Many hillsides would make choice homesites. But what are the limits of septic tanks on hillside soils?"

Many hillsides of the Cascade and Coast mountain ranges are composed of soils high in clay. During winter months when grounds are saturated by rain, inadequately treated wastes from septic tanks can be carried easily through the ground, posing potential health problems to homeowners downhill from septic tank drainfields.

"The problem is becoming more serious because housing on some valley hillsides is fairly dense," said Harward. "In some areas of the state, nitrates (indicators of decomposing wastes) already have been found in ground water."

County sanitarians are the officials responsible for granting septic tank permits.

"Only two other states in the nation have restrictions as tough as Oregon's," said Charles Hagedorn, OSU assistant professor of microbiology. "Here, the county sanitarian must grant a septic tank permit before a building permit can be granted and that gives the county sanitarian a great deal of responsibility."

However, even well-trained county sanitarians have not always been able to spot potential problems. Results of the OSU study indicated

eight mid-Willamette Valley soil series. Results of their research showed that when soils were very wet, septic tank wastes could be carried out of drainfields and into wells, streams and lakes where they could prove dangerous to human and animal health.

"We know that saturation depends on soil quality and rainfall," said Harward, project leader. "In many soils, early fall rains are like filling a barrel and when rains become more intense, the soil profile really fills up with water. That's when septic tank runoff can be the most serious."

Wastes associated with septic tank failure include fecal microorganisms and salts. The most serious contaminants are viruses and bacteria found in the intestines of all warm-blooded animals (including humans) and associated with body wastes. These organisms can cause a number of diseases including infectious hepatitis, typhoid fever, bacterial dysentery and intestinal ailments. Nitrates are characteristic of waste water and decomposing organic matter while salts are associated with soaps and waste water. Although not as serious as fecal organisms, nitrates and salts also can represent health hazards.

The OSU study had two main objectives. First, researchers wanted to find out how fast water traveled through the saturated soils and where it went. Secondly, they wanted to find out how long it would take microbial contaminants to die out as they moved through the soils.

"In a good septic tank system, wastes from the home enter the tank where they are partially decomposed," Harward said. "Then, they are supposed to filter slowly into the soil, where they continue to break down until they are no longer harmful. When it works correctly, it is a good system."

Previous studies had indicated water did move slowly from septic tanks into the soil, even during the winter. Hammermeister placed injection lines in eight hillside soils and inserted recovery wells into the soil at different depths so samples could easily be removed. Then salts unlike those naturally found in the soil were put into the ground along with water in much the same way as waste waters would enter a spetic tank drainfield.

"Previous data had indicated it would take weeks, if not longer, for the salts to move through the soils," Kling said. "The first time we checked the lines was two days after we had injected the salts into the soils and we found they already had passed an area where we thought they wouldn't show up for another week. We were already two days late."

Hammermeister tested the lines during saturated and unsaturated conditions. Results of his research showed that in all eight soils, salts moved much farther and must faster than ever before suspected when the soil was saturated. Instead of moving at rates of a foot per day or week, salts moved at rates of 20 feet per hour—500 feet per day.

"Rates that rapid are unheard of, completely unexpected and very frightening," said Kling. "The upshot of those results points to some real potential problems."

A closer look at the characteristics of the soils themselves gave the team more information on why the salts were moving so rapidly over such distances.

"We found channels in the soils caused by mole runs, worms, decaying

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theories of waste movement in saturated, hillside soils and some siting criteria may be in need of change.

"Modification appears to be needed in developing the criteria for septic tank suitability," said James Vomocil, Extension soil scientist at OSU. "We also may need to learn to modify the soil and make it more suitable. For instance, it might be as simple as installing drainage tile around areas where houses will be built to divert clean water from the septic tank drainfields, or tilling the soil to break up the underground channels where water moves too rapidly. Precedents for land use on hillside soils need to be developed."

But all researchers involved with the OSU research said the answers will be needed quickly.

"Under present conditions, it becomes a question of not whether septic tank drainfields on hillsides will fail, but how often," said Gerald Kling, assistant professor of soil science. "When the housing density is high enough, there will be real problems."

Timing tells when leaves will fall

Only nature used to know when the time was right for leaves to fall.

But now, Oregon State University researchers are unraveling clues to the long-kept secret and results of their investigations may mean life or death for many young trees.

Research stemmed from the growing interest in Oregon's nursery stock production industry. More than 80 percent of the deciduous nursery stock grown in the U.S. comes from Oregon, and 90 percent of the trees grown here are sent east of the Mississippi River, most to Northeastern states. Chemical defoliants are widely used to hurry harvest of the stock, an industry valued at $20 million annually in Oregon.

"The biggest problem growers face is defoliation," said Les Fuchigami, OSU horticulturist. "If trees are not defoliated, growth doesn't stop until late in the season and trees cannot be put into storage. Trees with leaves do not store well."

After trees are harvested by machine, they are transplanted and stored in piles of sawdust outdoors or inside warehouses until they are shipped in January or February.

"Growers would like to get trees out of the ground before the rainy season begins, usually around the first of November," said Fuchigami. "The machines used to harvest trees can be as much as 15 times more efficient in a dry field."

Researchers Fuchigami, Mary Hotze and horticulture department head C. J. Weiser started their study with the basic problem of determining when trees are ready to lose their leaves.

"We were trying to pinpoint a stage called vegetative maturity," said Fuchigami, an Agricultural Experiment Station researcher. "If plants are defoliated before they reach vegetative maturity, there will be some damage. We had to find out when trees were ready for defoliation."

By careful defoliation, scientists were able to determine when the red-osier dogwoods used in the study reached that stage. They also found vegetative maturity was weather related.

"This makes it impossible to predict vegetative maturity by a certain calendar date," Fuchigami said. "To be applicable, we had to find a reliable method of determining when maturity occurred."

In late August 1971, the scientists started the laborious task of hand-picking leaves once a week to see when trees would stop trying to regrow their leaves. Hand-picking continued until leaves naturally fell, beginning October 24.

"After September 5, hand defoliation did not trigger refoliation. That marked a point between summer growth and winter dormancy and plants defoliated before that date either died outright or had severe dieback of stems during winter, even in a protected lathhouse. Plants defoliated after September 26 survived without apparent injury and were considered mature," Fuchigami said.

In a second study, Fuchigami conducted similar research but defoliated trees with Ethephon, a chemical defoliant used in commercial nursery stock production.

"The major problem with this and other defoliants is toxicity to plants," he said. "Previous studies have shown that results of defoliants have been erratic—sometimes toxic to plants and sometimes not. Generally, the later in the season it is used, the more effective and safer chemical treatment will be. We theorized the conditions of the plants would have a major influence on their responses to defoliation."

Trees in the second study reached maturity on September 29. Ethephon treatments on September 11—19 days before plants were mature—did not accelerate maturity, but, in fact, seemed to delay development. After that date, Ethephon treatments made trees lose their leaves quickly and plants were less injured by the defoliation.

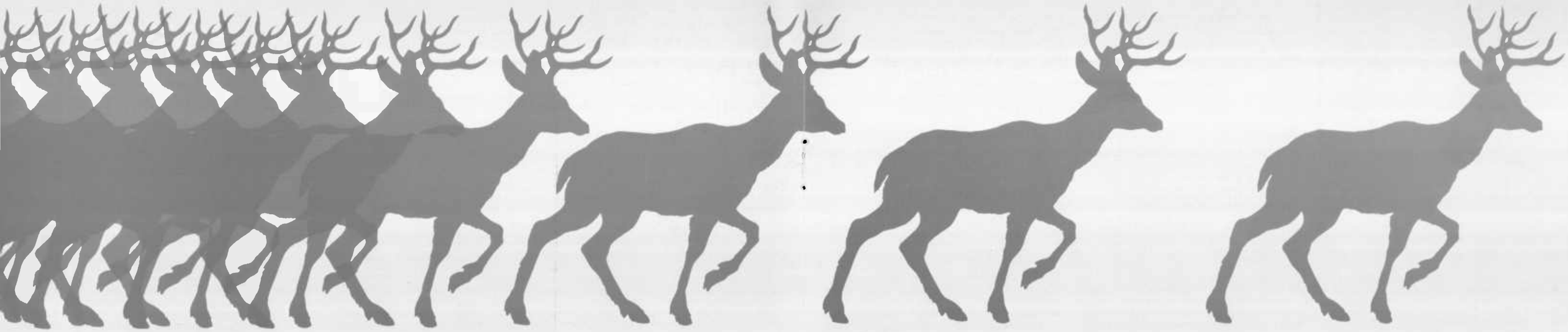
Another plus for chemical defoliation may come in the spring. Researchers said early defoliation at and slightly after vegetative maturity could give some trees—including fruit trees—a few additional days of protection to escape frost damage by delaying spring growth.

"By early defoliation the previous autumn, growth in the spring was delayed as much as 10 days. This has great potential for fruit growers to protect flower buds from spring frost," Fuchigami said. "But, unfortunately, there is not yet a quick way to determine when plants are mature."

Research on chemical defoliation will continue at OSU and Fuchigami hopes a time will come when a quick way to judge vegetative maturity will be available.

"There had been a lot of work done with chemical defoliation and 'maturity' previously. In fact, much of the work was started at OSU in the 1940s. But no one knew exactly what they were doing or why. They didn't know how to tell when a tree had reached maturity or what maturity meant. We started this research only after some other testing revealed that chemicals worked much more efficiently during the later part of the growing season and because growers were having storage and shipping problems," Fuchigami said.

Armed with the seeds of information, the scientists will branch out into other aspects of the defoliation problem. With time and work, nature's secrets may at last become beneficial knowledge for a growing Oregon industry.



Why are fawns of mule deer dying?

One clue to a 20-year mystery of declining mule deer populations in Oregon may have been uncovered by researchers at Oregon State University.

The mystery surfaced in 1959 when mule deer numbers began to decline. A major factor in the decline in Oregon was found to be poor fawn survival primarily attributed to coyote predation on fawns.

"Prior to that time, wildlife biologists anticipated and generally counted on half the mule deer fawns, born during June in eastern Oregon, surviving until spring. But during that year and in subsequent years, fewer fawns managed to make it through their first winter. By 1975, as few as 17 fawns per 100 does in some herds survived until spring," said Ted P. Kistner, wildlife disease specialist at OSU.

The Oregon Department of Fish and Wildlife initiated studies of the problem and, in 1972, asked Kistner to help find out whether diseases that would weaken fawns and make them easier for predators to kill were involved in the decline.

"We looked at animals for about three years and in March 1974, we found a microscopic protozoan (one-celled animal) in very large numbers—in fact, unbelievable numbers—in the muscle tissue of some fawns," Kistner said.

Kistner and graduate students started studying the parasitic protozoan and found the life cycle involved alternate generations of exchange between mule deer and their coyote predators. They theorized that the final stages of the parasite, tentatively named *Sarcocystis hemionilatrantis* (hemioni means mule deer, latrantis means coyote), live as cysts throughout the muscles of mule deer.

"When a coyote kills and eats a deer harboring the cysts, organisms are freed from the cysts, invade and reproduce in the intestinal tract of the coyote," Kistner said.

"The coyote acts as a host for the parasite but does not become diseased from the infection. Protozoa in the form of another cyst stage are passed off from the coyote through its feces and contaminate the ground and vegetation. Grasses and other contaminated plants then are eaten by mule deer and the cycle begins again."

Researchers theorized that the reproductive stage of the parasite in deer—particularly fawns—may cause disease. To test the theory, they raised 14 mule deer fawns under strict isolation at OSU. When the fawns were seven months old, 11 of them were inoculated with *Sarcocystis* sporocysts produced by 10 coyotes reared in captivity and fed naturally infected deer meat. The other three fawns were maintained as control animals.

Fawns were observed at least twice daily after the inoculation, and weights and blood samples were taken every week. All fawns remained normal for the first 17 days, but on the 18th day after inoculation, every inoculated fawn became sick. Then all but one of the fawns seemed to get stronger and returned to a nearly normal condition. The sick fawn died 10 days later.

But the improvement did not last long for the other fawns. Two days after the first fawn died, all the other fawns became ill again. Forty days after the inoculation, all but three of the fawns were dead. One of the remaining fawns died on the 63rd day and the other two fawns were killed. Tests showed all but one of the animals heavily infected with *Sarcocystis*. None of the control animals became ill.

Kistner said sick fawns had rough haircoats, high fevers, were sore and reluctant to move. Fat reserves were rapidly depleted and muscle tissue wasted away during the illness. Blood vessels of the nine fawns that died were extremely congested and six fawns had pneumonia. Severe damage was evident in intestines, bladder, adrenal gland and heart. Most lymph glands were filled with water and were three to four times their normal size. Kidneys and livers also were enlarged. Fawns that recovered had large numbers of sarcocysts in their muscles, examinations showed, similar to the initial finding in wild deer.

"This was the first time the life cycle of a *Sarcocystis* had been completed in a big game animal," Kistner said. "However, it was under experimental conditions."

Last year, Kistner, whose Agricultural Experiment Station research is conducted in the OSU department of Fisheries and Wildlife, hoped to determine if the cycle caused disease in mule deer fawns in the wild. But lack of snowfall led to better grazing conditions and allowed the fawns to roam more than in previous years, so not enough fawns could be observed to determine if sick fawns were present in enough numbers to form a sufficient sample. Also, a coyote management program may have influenced the prevalence of disease organisms.

"Nutrition is one of the keys to survival of fawn populations. Good nutrition is critical for development and maintenance of resistance to parasitic infections. Healthy, well-fed animals can stand the detrimental effects of parasites much better," Kistner said.

But a good year does not signal the end of the problem of fawn population declines. Kistner said the problem has continued to persist in many areas of the West, and full understanding of all factors involved may still be years away.

"How did *Sarcocystis* manage to infect mule deer in the first place? This is an age-old question. But we do know *Sarcocystis* species are found in a wide variety of birds and mammals, including humans," said Kistner.

He continued, "In most situations where hosts and parasites have co-evolved over a long period of time, parasites and hosts live together in a reasonable degree of harmony. That is, the parasite is not too damaging to its host. But the reverse also is true—newer parasites are frequently more damaging to their hosts."

Kistner said severe damage to mule deer fawn numbers could be an indication that the deer-parasite association is a new one. He theorized that the parasite could have adapted to mule deer from more traditional coyote foods like jackrabbits and ground squirrels.

"Mule deer fawns could be primarily a 'buffer' species in the coyote diet and fewer deer might be used as prey if adequate numbers of rabbits were available," he said.

Population studies have shown jackrabbit populations may be increasing and eventually might reach moderate levels, he said. Adequate numbers of rabbits could be very important during fall and winter when research figures have shown the highest mortality of mule deer fawns occurs and *Sarcocystis* transmission appears to be the heaviest.

"Even if fawns were weakened by *Sarcocystis*, a ready supply of jackrabbits might pull some of the pressure off the fawns and permit a greater recovery of those fawns less severely affected, which now might fall prey to coyotes," Kistner said.

The parasite has not yet been studied in other deer because dramatic declines in mule deer populations have presented the most pressing problem. And, although some questions seem to have found answers from the research conducted so far, the OSU scientist said that his theories about *Sarcocystis hemionilatrantis* still need more research.

So the mystery continues.

Pressure put on meat--for tenderness

By putting on a special squeeze, researchers at Oregon State University have found a new way to make tough meat tender.

Walter Kennick, meat scientist, said the idea for the experimental ultra-hydrostatic pressurization machine designed, developed and tested at OSU came from Australia via Ireland.

"While I was on sabbatical leave in Ireland, I read an Australian publication containing a report on a new method of tenderizing meat under ultra high pressure," Kennick said. "They regarded it as something probably not worth developing commercially, but I thought it probably could be engineered on a commercial scale."

When Kennick returned to Corvallis, he contacted Peter Meyer, scientific instruments technician at the OSU Department of Physics. Working with Kennick, Meyer designed a small model of the meat tenderizer.

"The pressure chamber we built was very small—it will only handle a piece of meat four inches by 12 inches," Kennick said. "But I think we have been able to show that the same technology of applying pressure to meat at 15,000 pounds per square inch could be applied on a larger scale. What we need to do now is build a pilot plant model."

The idea for the tenderizing machine is fairly simple, but requires a change in the way meat is handled.

Now, animals are slaughtered, skinned, eviscerated, washed and hung in a cooler at near-freezing temperatures for 48 hours before butchering. With the new tenderizing system, meat could be handled immediately after the animal is slaughtered, skinned, eviscerated and washed. The treatment in the small cylindrical chamber takes two minutes.

"Other studies showed that the contraction of the muscle when it enters rigor mortis has a profound effect on tenderness. The new tenderizing system contracts the muscle under pressure and it goes into instant rigor. The bands of fiber surrounding the meat fibers are broken down under the pressure and the meat becomes more tender," said Kennick.

At OSU, Kennick and graduate student Elgasim Elgasim Ali from Sudan tested the tenderizing treatment on beef and mutton. Half the carcasses were treated with the new method and the other halves were handled in the regular way. All tests indicated treated meat was more tender, and informal taste panels consistently gave the tenderized meat higher ratings.

"We ran a lot of samples and we feel we have a final confirmation of tenderness," Kennick said. "But the research is far from finished. We need to know how the major muscle masses will respond to the treatment because in some standard cuts of meat, several muscles are involved and, under pressure, they may contract in different directions. We need to know what that physical change will be, if meat treated this way will require different cutting, how the tenderized meat will be utilized and how it will sell in the stores. Meat processed this way tends to retain its thickness better and doesn't cook down as much. Uniform portion control may be one advantage."

Other advantages of the new tenderizing treatment also should appeal to meat handlers, the Agricultural Experiment Station researcher said.

"Under the new system, the animal comes from the kill floor to a hot boning table and the major muscle masses are cut from the carcass. Then the meat is vacuum packed and pressure treated. Chilling is eliminated until after the meat has been pressurized, then it can be run through a chilling tunnel and sent off either in boxes or cut for retail sales," said Kennick.

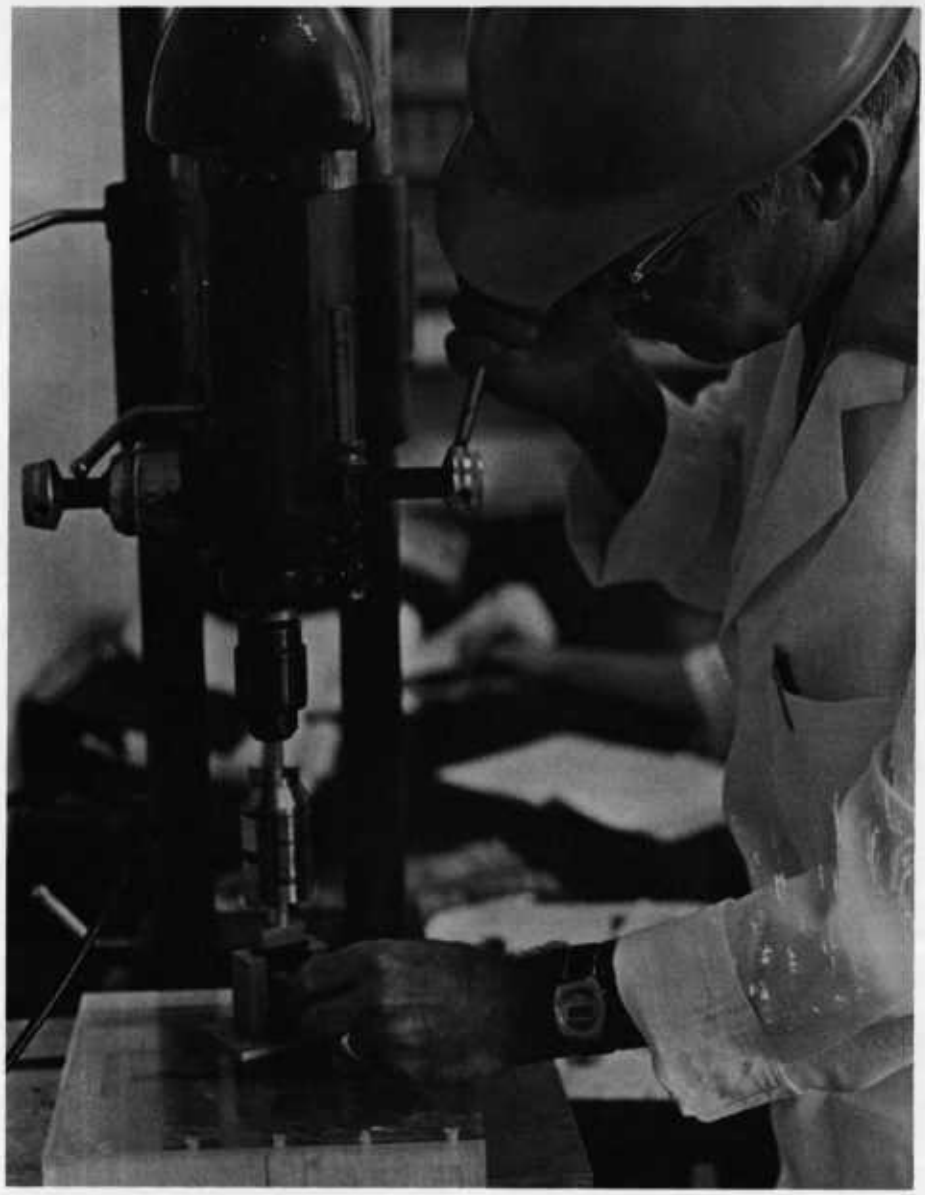
Space and energy savings also could be substantial.

"In the warehouse now, a meat packer might have room for only 20 head of beef. With the new system, 100 head of beef could be stored in boxes on pallets and the rest of the carcass could be sent off for rendering immediately. They wouldn't have to chill those parts, which represent about 30 percent of the animal.

"As for energy, it takes about .9 BTU's of energy for each degree of temperature reduction in an animal. Animals come off the kill floor at about 100 degrees and must be chilled to about 35 degrees. The new process would cut down on the energy required because only parts of the animal would have to be chilled," said Kennick.

Commercial application of the process probably will not occur for several more years because additional research is needed.

But Kennick is as confident now as he was when he first read of the process. "It can be done; it is just a matter of engineering," he said.



Walter Kennick, OSU meat scientist, tests meat tenderness with a special machine built for that purpose (top right). Elgasim Elgasim Ali, graduate student, surveys meat samples tenderized under pressure (above) and Zoe Ann Holmes, foods and nutrition researcher in the School of Home Economics, weighs meat samples.

Septic tanks

(Continued from page 5)

root systems and shrinking and swelling of the soil," said Vomocil. "Under all of these soils, there was a network of small streams—not as big or as fast as streams found on top of the ground—but big enough to allow water and microbiological agents freedom to move very quickly."

The final step in the Agricultural Experiment Station research was to approximate bacterial movement through the soils. Research aid came from OSU Water Resources Research Institute.

Said Hagedorn, "What we were concerned about was more in the realm of public health microbiology and involved determining what happened to certain fecal bacteria during an average Oregon winter in a typical system. In a regular drainfield, under unsaturated conditions, the microbiological agents die off before they get very far, but we wanted to find out whether, under saturated conditions, they could go far enough to contaminate wells, lakes and streams. We found they could."

The microbiologists developed antibiotic-resistant strains of harmless intestinal bacteria to use as microbial tracers in their experimental systems. Usually, when county sanitarians test soils suspected of septic tank contamination, they use special dyes, Hagedorn said, and sometimes the dyes can "get lost" in the soil and not show up. Tracer organisms—like those developed at OSU—are more reliable.

Tracer bacteria tested on the experimental slopes moved downslope through soils with the same ease as the salts tested previously. But, Hagedorn said, the "acid test" of the organisms was conducted when county sanitarians flushed some of them down the toilet of a home where the septic tank drainfield was suspected of failure but where tests with dyes had proven ineffective. The tracer organisms surfaced in a tile line beyond the drainfield and showed that the bacteria could move through soil under conditions which could not be detected with dyes used as tracers.

But the OSU scientists emphasized the situation is not the same everywhere. Vomocil said pockets of good soil—where septic tank drainfields would work well year-round—can be surrounded by poorer soils, where the systems are likely to fail when wet, rainy winters cause water tables to "perch," or build up above a tight, impervious layer of soil or rock.

Moyle Harward, soil scientist, checks runoff depth on one of the hillside research sites.

"These perched water tables are temporary and extremely variable," he said. "They can last sometimes for only a few minutes and in other cases, they may last most of the winter."

The researchers agreed that the key to solving the problem is finding out which soils are most affected. They have proposed a comprehensive study be conducted so Oregon hillside soils where septic tank drainfields will work well can be identified.

Hagedorn said only one other state—Wisconsin—has made a comprehensive study of soils, but results of that study are not applicable here. "In Wisconsin, soils freeze in the winter, and here, they just fill up with water. We have a different set of soil and climate conditions," Hagedorn said.

"Many may say this is a time-consuming and expensive study, but to avoid the use of prime agricultural land for housing and provide more housing choices in the future, it's worth it to take the chance," Vomocil concluded.

work in Progress

Pre-calving rations cut; so are costs

In winter, a cow chews more than a cud.

In fact, winter feed is one of the most costly phases of beef cattle production. Three Oregon State University scientists may have found a way to cut those costs.

Ralph Phillips, Martin Vavra and Robert Raleigh, animal scientists of the Eastern Oregon Agricultural Research Centers in Union and Burns, are working on a feeding program that trims pre-calving feed rations to 80 percent of National Research Council recommendations.

"The Council recommendations are a compilation of data from throughout the United States but in rangelands here in Oregon and, I think anywhere else that has rangeland similar to ours, this study can be used as a guide to help ranchers manage their herds more efficiently," said Phillips.

The process is simple. When pregnant cows are brought in from the range in the fall, their feed ration is held at 80 percent of the NRC recommendation until they have calves. Then, after calving, they are returned to 100 percent of the NRC recommendation until spring when they go back to the range.

The Agricultural Experiment Station researchers found that cows do lose some weight before calving but any weight gained during the summer can be lost during the pre-calving period and still not affect production.

"The key to the plan is the condition of the cows when they come off the range for winter," said Phillips. "They must have gained some weight during the summer to be able to lose some without detriment during the winter.

"We are watching this year's trial very closely. After a dry year like last year, it will be interesting to see how the cows do."

The study indicates there is no difference in the cows' performance on the range the summer following the restricted winter feeding.

"We figure if you feed hay that costs about $60 per ton during 100 days of feeding 100 cows, you could save as much as $1,000," said Phillips.

The five-year study is in its third year.

Ralph Phillips, animal scientist at the Union Station, weighs a ration.

Every day is Mother's Day for some sows

Motherhood has become an almost constant condition for some sows at the Oregon State University swine center.

Researchers at the center are studying the performance of sows which mate and conceive during the time when they still are nursing a litter of young. The scientists want to know whether this procedure can increase pig productivity while still protecting the health of the mother pig and her young.

"Mating of sows during lactation is not generally practiced in the United States," said Calvin Walker, OSU graduate student in the Department of Animal Science. "But a study done in New Zealand several years ago with sows on legume pastures showed that mating sows during lactation improved usage of food energy and had no adverse effect on reproduction."

In September 1976, Walker and David C. England, OSU professor of animal science, started a study to find out whether sows in a confined management system like the OSU Swine Center would conceive during lactation and successfully complete pregnancy and the following lactation. They studied the number of days of partial separation from their litters for mating to occur, the percentage of conceptions, number and weight of pigs born, and the number and weight of pigs weaned. They also wanted to find out if separating mother pigs from their litters while the sows mated would have any adverse effect on young pigs.

The two Agricultural Experiment Station researchers found sows could mate and conceive another litter successfully during lactation with no adverse effects to the litter about to be weaned nor the litter conceived during lactation. Studies are continuing to determine the effects of the practice when applied to a larger number of sows and litters.

The scientists recorded several advantages to early mating of sows.

"Sows exposed to mating during lactation gave birth to their litters about three weeks sooner than sows mated following weaning of their litters," said Walker. "That means a grower could increase the number of pigs produced per sow per year and the overall number of pigs produced without increasing the size of the sow herd."

Other advantages included decreased feed costs for sows because the first three weeks of gestation were accomplished without extra feed. Also more flexible use can be made of sows under the new system because already mated sows are available to be foster mothers to young pigs crowded out of other litters.

The research will continue at the OSU Swine Center until all necessary management aspects have been studied, England said.

Microwave oven cooking up a new success

The microwave oven has become a three-minute sucess in the laboratory.

At Oregon State University, three scientists have found that it answers a problem by providing an accurate, rapid and simple way to determine the moisture percentage of sweet corn varieties.

The percentage is commonly used to determine the best date to harvest sweet corn for processing. Usually a sample is dried for 24 hours in a vacuum oven.

The OSU team—horticulturists M. R. Becwar and N. S. Mansour and food scientist George W. Varseveld —test four sweet corn varieties at a time. Each sample is a composite of kernels from 12 ears.

Early tests showed that whole kernels spattered in the microwave oven. So all samples are blended for two minutes in a blender and stored in covered jars until needed. The samples are cooked for only three minutes.

They are then weighed and the moisture percentage calculated. When checked with percentages of samples dried in a vacuum oven which required 24 hours of drying, there is no significant difference.

For two years, the OSU scientists have used the microwave oven as an aid in harvesting trials of 20 or more varieties per season. The quick method has been useful in determining the harvest date for corn varieties so all of them can be harvested at a comparable moisture percentage.

Scientists growing own crude oil

Two Oregon State University botanists are trying to grow high grade crude oil.

Harry Phinney and Larry Julian work with a colonial fresh water alga found in the sloughs along the Willamette River that produces a hydrocarbon-based oil as a by-product.

"There are problems," said Phinney. "But this alga will displace

work in Progress

Harry Phinney (left) and Larry Julian view a laboratory beaker containing what may be the basis for tomorrow's fuel.

its entire volume in what is essentially a high grade crude oil under the proper conditions. We feel it has tremendous economic potential."

The amount of oil produced is phenomenal.

"In soybeans or other seed oil plants the oil comes from the seed only," said Phinney. "In this alga it comes from the entire plant. Anything made from hydrocarbon-based oil that we get from wells can be made from the oil produced by this alga."

Shale coal deposits—sometimes called boghead coals or kerosene shales—were formed by this alga as it accumulated and fossilized over the centuries.

"Coal deposits and, more recently, alga accumulations have been found up to a foot thick indicating one year's growth," said Phinney. "But that's the basis of the dilemma we face. It grows like crazy in nature, but we can't grow it in the lab."

One problem that inhibits alga growth in the lab is the naturally occurring bacteria and fungi found with it.

Julian found that the bacteria grows in a gooey substance that surrounds the alga cells. Ultimately a method of disrupting the colonies and treating them with antibiotics allowed the alga to be cultured bacteria-free.

"Creating the bacteria-free culture was a giant step in our project," said Phinney. "But the next step will be just as large. The alga still grows slowly in the culture but erratically fast in nature. We need to tame it."

The plant grows in two phases.

The first is vigorous new growth fed by many nutrients, including nitrogen. But then, as the culture grows older, the growth slows. As the growth slows, the oil substance appears. It first appears inside the alga cells and then begins to spill out. In nature, at this point in the alga development, there is an oil emulsion and distinct oil droplets in the water surrounding the alga.

"The slow growth appears to be caused by nitrogen being used up by the plant," said Phinney. "What we have to do is get the plant to the point where it begins to create the oil and then keep it growing."

The Agricultural Experiment Station researchers are continuing to try to grow the alga in the laboratory in sufficient amounts to make it economically viable.

"What are the chances?" said Phinney. "The chances are good. It can be done, and it will be done."

Station spotlights research

A photograph of a man, obviously taken several years ago, flashes onto your television screen, followed by some film footage of a group of women packing peaches into cans. One of the women smiles at the screen like a conspicuously overacted silent screen star. Suddenly, the scene changes and you find yourself watching a more modern packing operation in the OSU Food Science building, and an announcer tells you if you'd like to learn more, write to the Agricultural Experiment Station, Oregon State University.

What you've watched for the past 60 seconds is a public service announcement. Four of these "spots" now are appearing on television stations in Oregon, and more are scheduled to debut later this spring.

Dave King, assistant editor of Experiment Station Communications, explains how the public service announcements are produced:

"We use stock film from our television news release program and sometimes scrounge film from archives to explain agricultural research in our state. We try to keep the spots general, like *Oregon's Agricultural Progress,* only for television.

"As a public service to their communities, all television stations offer free time for announcements to help keep the public informed of useful or interesting facts. We fit into that process perfectly, and most television stations run our spots frequently," he said.

Production of the announcements is funded by the private Agricultural Research Foundation.

"The spots are appearing with various degrees of regularity on all television stations in the state and even a few out-of-state stations," King said.

"If you have seen any of the announcements and have any questions or comments, please write to us."

Director
Agricultural Experiment Station
Oregon State University
Corvallis, OR 97331